

Applied Computing

# Major Project Titles

2021-2022



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| Leigh Thomas, UWTSD Health and Safety Manager .....             | <b>Error! Bookmark not defined.</b> |
| NWIS, supervisor Professor John Rees .....                      | <b>Error! Bookmark not defined.</b> |
| Dr Tom McKinnell (Durham GP), supervisor Dr Nik Whitehead ..... | <b>Error! Bookmark not defined.</b> |
| Minor Injuries Unit, Newport, supervisor Dr Nik Whitehead ..... | <b>Error! Bookmark not defined.</b> |
| BT, supervisor James Williams .....                             | <b>Error! Bookmark not defined.</b> |

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|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| Project title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Benchmarking of high performance computing clusters |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Experiment                                          |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                     |
| <ul style="list-style-type: none"><li>• Development of an application which can be run on clusters to assess score in four key areas:<ul style="list-style-type: none"><li>○ CPU speed</li><li>○ Memory available</li><li>○ Disk space available</li><li>○ Network load capacity and latency</li></ul></li><li>• Possible scope for comparing CPU and GPU clusters through a single application</li><li>• Generation of some sort of “score” at the end, along with suggested improvements to eliminate bottlenecks</li><li>• Will require fluency in C/C++ or FORTRAN and a modicum of networking ability</li></ul> |                                                     |

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|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| Project title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Mixed mode parallelism - programmatic elicitation of optimal combinations of parallelism method(s) |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Development                                                                                        |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | SE                                                                                                 |
| <p>That is simultaneously implementing two or more methods of parallelism, e.g. cluster processing and threading, or threading and GPGPU</p> <ul style="list-style-type: none"><li>• Automatic code analysis to discover which portions (if any) of a specified code sample would benefit best from parallelism methods, including cluster processing<ul style="list-style-type: none"><li>○ Could include runtime analysis as an advanced feature to spot SIMD operations</li></ul></li><li>• This is very similar to some Intel software that already exists named Intel Advisor XE – I want someone to do it better</li><li>• The real crux is code analysis, be it pre-compile or at runtime</li></ul> |                                                                                                    |

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|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| Project title                                                                                                                                                                                                                                                                                                                                                                                                                                               | Automatic parallelism of embarrassingly parallel problems |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                     | Development                                               |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                              | SE                                                        |
| <ul style="list-style-type: none"> <li>• Code analysis resulting in automatic modifications to thread appropriate sections.</li> <li>• Large scope for iterative development; could be relatively simple or extremely advanced. <ul style="list-style-type: none"> <li>○ Could include more than one method of parallelism.</li> <li>○ Potential for inclusion of synchronisation.</li> <li>○ May investigate less trivial problems.</li> </ul> </li> </ul> |                                                           |

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|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| Project title                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Structured code analysis to grade code against best practice specifications and recommend improvements |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                              | Development                                                                                            |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                       | SE/CIS/WD                                                                                              |
| <ul style="list-style-type: none"> <li>• Code analysis resulting in a report of how well code measures up against best practice specifications. <ul style="list-style-type: none"> <li>○ May include a “grade” by way of a percentage.</li> </ul> </li> <li>• Suggestions for improvements to better meet best practice. <ul style="list-style-type: none"> <li>○ Automatic implementation of these modifications could be considered as an advanced feature.</li> </ul> </li> </ul> |                                                                                                        |

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| Project title                                                                                                                                                                                                                                                                                                                                                                                                            | Exploration of the CUDA framework around implementation boundaries |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                  | Development                                                        |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                           | GD/SE                                                              |
| <ul style="list-style-type: none"> <li>• Revolves around the implementation of an algorithm (potentially of the student's choosing) which involves the transfer of large arrays between the graphics and system memory</li> <li>• Analysis of bottlenecks pertaining to this and how they limit performance gains</li> <li>• Development of a framework for recommending parameters for CUDA-based algorithms</li> </ul> |                                                                    |

## Dr Carlene Campbell

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| Project title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Securing the Wireless Sensor Network |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Experiment                           |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | CNets                                |
| <p>The aim of the project is to have a live Wireless Sensor Network implementation in the School of Applied Computing. The application of the network can vary but must incorporate a number of nodes and sensors that can be attacked utilising established techniques. A secondary aim would be to identify what can be done to secure the network against these attacks.</p> <ul style="list-style-type: none"> <li>• The main objective is to perform penetration tests on a wireless sensor network in a physical environment, demonstrating the vulnerabilities</li> <li>• Simulation of the wireless sensor network for testing should be considered but must follow the same blueprints of the physical design. This will ensure the integrity of the simulated network against the physical results obtained.</li> <li>• The project must perform at a minimum three attack strategies and compare and contrast the expected results to the actual.</li> </ul> |                                      |

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|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| Project title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | SMART Building(s) utilising IoT and WSNs |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Experiment                               |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | CNets                                    |
| <p>The aim of the project is to create a simulation of an Office structure utilising both Wired and Wireless solutions. The implementation of the network can vary but must incorporate a sensor network to monitor the occupancy, building environment and provide security for an external car parking area.</p> <ul style="list-style-type: none"> <li>• The main objective is to utilise simulation software to fully implement a working enterprise network. The design must include a WSN and IoT devices that manage and maintain the building.</li> <li>• One of the main concerns for the project will be around the recording of occupancy as the companies have a number of floors and different departments. The main reason for this is to record attendance for Fire Safety reasons.</li> <li>• The simulation must consider the necessary protocols and standards required.</li> <li>• The network design at a minimum must consider the following; <ul style="list-style-type: none"> <li>○ Delay / Fade / No Fading</li> <li>○ At least 5 floors to be used</li> <li>○ Packet Loss / Throughput</li> <li>○ Applications to be used – SMTP, HTTP, FTP, DHCP etc.</li> <li>○ IP Addressing scheme – VLANs, IPv4 &amp; IPv6</li> <li>○ Wireless Sensors</li> <li>○ Access points</li> <li>○ Building Management</li> </ul> </li> <li>• The report must identify suitable technologies and devices used within the network and justify as to why they are suitable</li> </ul> |                                          |

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| Project title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Smart Patient Tracker using IoT |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Experiment                      |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | CNets                           |
| <p>The aim of the project is to create a network that can be used to monitor patients. They could be located at home, hospital, care home or generally out in town. Considerations should be given as to the patient's confidentiality but also continued connection with a network. The successful implementation of this project must consider the following;</p> <ul style="list-style-type: none"> <li>• What information is being transmitted</li> <li>• Potential for data loss or delay in transmission</li> <li>• What protocols to use?</li> <li>• Current devices and their application</li> <li>• Type of network</li> <li>• Physical vs Simulation implementation</li> <li>• Alert systems for Patients in distress and lost</li> </ul> <p>Should the project be able to physically implement a small test bed network? The results must be benchmarked against similar projects and if possible any simulated designs.</p> |                                 |

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| Project title                                                                                                                                                                                                                                                                                                                     | Performance Comparison of routing Protocols |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                           | Experiment                                  |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                    | CNets                                       |
| <p>The aim of the project is to use appropriate simulation tools:</p> <ul style="list-style-type: none"> <li>• To carryout performance comparison between two or more routing protocols such as AODV, DSR, DSDV etc. for either WLAN, MANet, WSN using metrics such as Delay, Jitter, Throughput, delivery ratio, etc.</li> </ul> |                                             |

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| Project title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Smart Campus and Internet of Things (IoT) |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Experiment                                |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | CNets                                     |
| <p>The aim of the project is to have a live implementation in the School of Applied Computing that that will utilise WSNs to manage classroom environment; this may include automated heating, light and window control, attendance monitoring, manage and monitor lights, temperature, carbon dioxide, humidity in a room.</p> <ul style="list-style-type: none"> <li>• The main objective is to implement a test a wireless sensor network in a physical environment, so that it can control light and heating systems.</li> <li>• Create a simulation of the wireless sensor network, following the same blueprints of the physical design, so that fair simulated results can be obtained.</li> <li>• Create a management device for the wireless sensor network, by using a Raspberry Pi.</li> <li>• Implement a two phased experimental approach, so that single and dual channel scenario findings can be evaluated and compared.</li> </ul> |                                           |

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| Project title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Comparison of 802.15.4 and 802.11 for Wireless Sensor Networks (WSN) |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Experiment                                                           |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | CNets                                                                |
| <ul style="list-style-type: none"> <li>• Simulate the performance of high data rate and small data size at long and short range. Vary the number of nodes, distance and data size and compare according to different performance metrics such as aggregate throughput, delivery ratio and access delay for 802.15.4 and 802.11</li> <li>• For the MAC layer use the distributed coordination function for both 802.15.4 and 802.11</li> </ul> <p>The main <b>aim</b> is to investigate if WSN data can operate in 802.11 environment<br/>The use of Discrete Event driven simulator, such as QualNet, Riverbed Model, OPNET, OMNET++, Netsim etc. may be used.</p> |                                                                      |

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| Project title                                                                                                                                                                                                                                                                                                                                                                                                                        | Investigate, analyse and demonstrate the importance of network security and penetration testing. |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                              | Experiment                                                                                       |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                       | CNets                                                                                            |
| <ul style="list-style-type: none"> <li>Design a prototype network scanner that will help novice network users run basic scans to uncover network vulnerabilities. Give novice users the information they will need to overcome most common network attacks so that they can secure their network. Simulate the affect different attacks have on a home network using a relevant network simulation and modeling software.</li> </ul> |                                                                                                  |

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| Project title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Develop a Computer Network Test-Bed to compare security between firewall and Access Control List (ACL) |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Experiment                                                                                             |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | CNets                                                                                                  |
| <ul style="list-style-type: none"> <li>Use Linux to build own firewall. The Shoreline Firewall more commonly known as 'Shorewall' (a high level tool for configuring Net-filter to provide security, quality of service and network management) may be used or other Linux net-filter features for firewall configuration. The Webmin feature may also be installed to give a GUI. A machine/computer will be given to design the Linux firewall of your choice. The firewall should entails all or most of the following components: <ul style="list-style-type: none"> <li>Network Zone</li> <li>Network Interfaces</li> <li>Default Policies</li> <li>Firewall Rules</li> <li>Masquerading</li> <li>Static NAT</li> <li>Proxy ARP</li> </ul> </li> <li>Set up test bed to carry out various penetration tests to examine the strength of security implementation and firewall entries.</li> <li>Do a comparison of both Firewall and network boundary ACLs results (critically analyses them). State the better method or should both work simultaneously? Full justify your statement.</li> <li>Recommend action to be taken in order to fortify the network against similar threats.</li> </ul> |                                                                                                        |

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| Project title                                                                                                                                                                                                                                                                                                                   | Simulation or test-bed security utilities |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                         | Experiment                                |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                  | CNets                                     |
| With the use of simulation or test-bed explore <b>two main security utilities such as firewalls and ACL's</b> in networking. To investigate how each methods works and identify the best option to be used on a certain network. Provide an investigation report outlining how the test has been implemented and final results. |                                           |

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| Project title                                                                                                                                                                  | Wireless ATM (W-ATM) |
| Project type<br>(Delete as appropriate)                                                                                                                                        | Experiment           |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                 | CNets / CNT          |
| <ol style="list-style-type: none"> <li>1. Simulate the effects of noise on choosing a channel</li> <li>2. Analyze the effects of mobility on a wireless ATM network</li> </ol> |                      |

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| Project title                                                                                                                                                                                                                                                        | MAC Layer – Wireless Networks |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                              | Experiment                    |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                       | CNets / CNT                   |
| <p>Student may wish to carry out simulation experiment on:</p> <ul style="list-style-type: none"> <li>▪ Multiple Channels (Can it be done at all?) <ul style="list-style-type: none"> <li>• With single radio</li> <li>• With Multiple radios</li> </ul> </li> </ul> |                               |

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| Project title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Physical Layer – Wireless Networks |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Experiment                         |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | CNets / CNT                        |
| <p><b>Student may wish to carry out simulation experiment based on the below criterion on wireless networks (<i>Wireless Mesh Networks, Wireless Sensor Networks, Adhoc networks/MANET (Mobile adhoc networks), WIMAX, LTE</i>)</b></p> <p><b>Or Student may wish to carry out the experiment to compare any two wireless networks on any of the below criterion <i>such as WiMAX vs WLAN performance based on bandwidth etc.</i></b></p> <p>➤ <b>Performance</b></p> <ul style="list-style-type: none"> <li>● Bandwidth</li> <li>● Robust modulation</li> <li>● Sensitivity</li> <li>● Short preamble</li> <li>● Fast switch between channels</li> <li>● Fast switch from Tx/Rx and back</li> </ul> <p>➤ <b>Other areas</b></p> <ul style="list-style-type: none"> <li>● Mobility (potentially high-speed)</li> <li>● Link adaptation</li> <li>● Variable transmission power (details shortly)</li> <li>● Multiple channels</li> <li>● Link quality feedback</li> <li>● Smart Antennas</li> <li>● Transmission Power Control</li> </ul> <p>Optimization Criteria</p> <ul style="list-style-type: none"> <li>● Network capacity</li> <li>● Delay</li> <li>● Error rates</li> <li>● Power consumption</li> </ul> <p>The ideal solution will depend on</p> <ul style="list-style-type: none"> <li>● Network topology</li> <li>● Traffic load</li> <li>● Throughput</li> </ul> |                                    |

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| Project title                                                                                                                                                                                        | Transport Layer |
| Project type<br>(Delete as appropriate)                                                                                                                                                              | Experiment      |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                       | CNets / CNT     |
| With the use of simulation or test-bed investigate congestion control in multi-hop wireless networks. Provide an investigation report outlining how the test has been implemented and final results. |                 |

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| Project title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Intrusion detection Systems (IDS) and/or Intrusion protection system (IPS) |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Experiment                                                                 |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | CNets / CNT                                                                |
| <p>1. Set up an isolated network to carry out test that would observe/examine user's profile and system files. This test would last for three weeks. Purpose of this test is to check for anomalies and intruders by observing:</p> <ul style="list-style-type: none"> <li>(a) The time files have been accessed</li> <li>(b) Who accessed them</li> <li>(c) How long a file as been access for</li> <li>(d) The number of attempts used to log onto system.</li> </ul> <p>These findings could give an insight into further developments on intrusion detection systems that rely heavily on users' profile and behaviour patterns. Specifically the statistical network intrusion detection systems.</p> <p>2. Set up an isolated network to carry out test to do a comparison of IDS and IPS</p> <ul style="list-style-type: none"> <li>• Your experiment result should critically analyses which is the prefer choice to use on a network (small, medium, large). It may be that both are equally important, this must be fully justified based on the experiments carried out.</li> </ul> |                                                                            |

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| Project title                                                                                                                                                                                                                                                                                                                                                                                | Study of MANET Routing Protocols |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                      | Experiment                       |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                               | CNets                            |
| Description: In this project comparison the performance of MANET routing protocols such as Ad-hoc On Demand Distance Vector (AODV) and Destination Sequence Routing (DSR) at different conditions such as various Node mobility models and node density under different Traffic loads using a parallel discrete event driven simulator, QualNet Riverbed Model, OPNET, OMNET++, Netsim etc.. |                                  |

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| Project title                                                                                                                                                                                                                                                                                                                                                          | Study of WSN Routing Protocols for healthcare scenarios |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                | Experiment                                              |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                         | CNets                                                   |
| Description: In this project comparison of the performance of WSN routing protocols such as Location Aware routing (LAR) and LANMAR (LANMAR) at different conditions such as various network scalability and node density under different Traffic loads using a parallel discrete event driven simulator, such as QualNet, Riverbed Model, OPNET, OMNET++, Netsim etc. |                                                         |

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| Project title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Performance Evaluation of QoS parameters in UMTS Network Using QualNet |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Experiment                                                             |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | CNets                                                                  |
| Description: In this student will carry out a project performance study of a UMTS network scenario using various values of the precedence bits of the CBR application. The performance of the scenario will be analysed by four metrics: average jitter, end to end delay, throughput and UMTS signals received and forwarded to MAC. The comparative analysis of all the four metrics according to the precedence bit values will be carried out using discrete event driven simulator, such as QualNet, Riverbed Model, OPNET, OMNET++, Netsim etc. |                                                                        |

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| Project title                                                                                                                                                                                                                                                                                                                                                                | Characteristic Analysis of VoIP Traffic for Wireless sensor Networks In Comparison with CBR using QualNet Network Simulator |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                      | Experiment                                                                                                                  |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                               | CNets                                                                                                                       |
| Description: In this project student will experimentally measure VoIP traffic and CBR or VBR traffic over the WiMAX network. Student can use the different routing protocols, quality analysis and discussion of the results is needed. This project will be carried out using discrete event driven simulator, such as QualNet, Riverbed Model, OPNET, OMNET++, Netsim etc. |                                                                                                                             |

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|------------------------------------------------|--------------------------------------------------------------------------------------|
| Project title                                  | Design and Simulation of Wireless Sensor Network scenario for underground coal mines |
| Project type<br>(Delete as appropriate)        | Experiment                                                                           |
| Target degree lines<br>(Delete as appropriate) | CNets / CNT                                                                          |

Description: In this project student will provide fully scripted scenario and they will implement a WSN network for underground coal mines using wireless sensor networks (WSNs). to produce accurate surveillance information and accident detection data.

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| Project title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Home Security Using Infrared and Ultrasound sensors |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Experiment                                          |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | CNets / CNT                                         |
| Description: in this project, students will build security systems to detect the motion in the surrounding environment by measuring the radiation emitted by the target bodies and changes in the frequencies of the reflected signals due to the motion of the bodies. They will use a combination of infrared and ultrasound sensors. The infrared sensors measure the radiation emitted from the bodies and the ultrasound Doppler sensors measure the apparent change in frequency by measuring the Doppler. |                                                     |

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|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|
| Project title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Real-time Network Intrusion Detection |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Experiment                            |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | CNets / CNT                           |
| <p>Intrusion detection is a security measure that protects organizations from hostile attacks from outside and also from misuse or attacks from inside the organization. The goal of intrusion detection is to detect illicit access and abuse of computer systems by both insiders and external intruders, in order to guarantee the system's integrity, confidentiality and usability.</p> <p><b>1. Presents an in-depth study of the intrusion detection techniques, the approaches and systems developed from these approaches as well as a number of issues and ways in which researchers have attempted to ameliorate them.</b></p> |                                       |

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| Project title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Smart Campus and Internet of Things (IoT) |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Experiment                                |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | CNets                                     |
| <p>The aim of the project is to use appropriate simulation tools:</p> <ol style="list-style-type: none"> <li>1. to implementation in the School of Applied Computing a WSNs system that that will manage classroom environment; this may include automated heating, light and window control, attendance monitoring, manage and monitor lights, temperature, carbon dioxide, humidity in a room</li> </ol> <p>or</p> <ol style="list-style-type: none"> <li>2. use of wireless sensor networks to implement smart car parking</li> </ol> <p>The overall aim is to create a better experience for students and staff, achieve cost and risk reductions, improve performance, flexibility and efficiency.</p> |                                           |

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| Project title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Network Layer – Wireless Networks |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Experiment                        |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | CNets / CNT                       |
| <p>Student may wish to carry out simulation experiment</p> <p>With the below criterion student may use simulation or test bed scenarios to <b>compare</b> Internet protocols (e.g. OSFP, BGP, RIPv2) and Ad-hoc routing protocols (e.g. DSR, AODV, OLSR). Which type (Internet or Ad-hoc protocol) is suitable for Wireless Mesh Networks, Wireless Sensor Networks, Adhoc networks/MANET (Mobile adhoc networks)?</p> <ul style="list-style-type: none"> <li>▪ Routing, Fairness (equal share of resources) and QoS <ul style="list-style-type: none"> <li>• Scalability <ul style="list-style-type: none"> <li>• Overhead is an issue in mobile WNs.</li> </ul> </li> <li>• Fast route discovery and rediscovery <ul style="list-style-type: none"> <li>• Essential for reliability.</li> </ul> </li> <li>• Mobile user support <ul style="list-style-type: none"> <li>• Seamless and efficient handover</li> </ul> </li> <li>• Flexibility <ul style="list-style-type: none"> <li>• Work with/without gateways, different topologies</li> </ul> </li> <li>• QoS Support <ul style="list-style-type: none"> <li>• Consider routes satisfying specified criteria</li> </ul> </li> <li>• Multicast</li> </ul> </li> </ul> |                                   |

## Dr Mike Dacey

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|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|
| Project title                                                                                                                                                             | Investigate SwDevOps Approach to Building Applications |
| Project type<br>(Delete as appropriate)                                                                                                                                   | Development                                            |
| Target degree lines<br>(Delete as appropriate)                                                                                                                            | Games / SE / WD                                        |
| Build an application using SwDevOps services that automates GIT checkouts, builds and software tests. Demonstrate the effectiveness of this approach for a software team. |                                                        |

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| Project title                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Angular/React/Vue |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                            | Development       |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                     | SE / WD           |
| Analyse common JS frameworks and construct an application that clearly demonstrates the advantages of their use. The project may take the form of: <ul style="list-style-type: none"><li>• A comparison of two or more frameworks</li><li>• An application designed to demonstrate the benefits and drawbacks of a specific framework</li><li>• A demonstration of mobile first development</li><li>• A usability study related to using such frameworks</li></ul> |                   |

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| Project title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | AI                |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Development/Study |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Games / SE / WD   |
| Create a web application that implements an e-Commerce product recommendation system. You may use an existing library, with the focus on applying the data mining approach to a web application rather than building data mining algorithm itself. Alternatively, this project may investigate “distributed intelligence” i.e. the analysis of data gathered from thousands of web users in order to discover crowd behaviour that can be used to promote/present more appropriate content to each user. |                   |

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| Project title                                                                                                                                                                                                                                                                                                                                                                                      | Graph Databases |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                            | Development     |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                     | Games/ SE / WD  |
| Construct a webservice that demonstrates the use of a graph based database for tracking links between data. Examples include: <ul style="list-style-type: none"><li>• A social media application</li><li>• A contact tracing application such as mobile applications for Covid19 track and trace</li><li>• A large scale multiplayer game or an open world game containing many entities</li></ul> |                 |

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| Project title                                                                                                                                                             | Amazing Mazes  |
| Project type<br>(Delete as appropriate)                                                                                                                                   | Development    |
| Target degree lines<br>(Delete as appropriate)                                                                                                                            | Games/ SE / WD |
| Construct an application that builds various mazes and demonstrates various approaches to solving them. Solutions may obviously consider path finding and influence maps. |                |

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| Project title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Cloud Computing      |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Development          |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Games / SE / WD/ DIS |
| <p>There are a number of related projects:</p> <ol style="list-style-type: none"> <li>1. Investigate a Big Data technology and NoSQL</li> <li>2. Performance optimisation of SQL using key-value databases such as Redis</li> <li>3. Investigate architectures for storing large quantities of unstructured data, such as images and audio, within a database.</li> <li>4. Install and manage a distributed database within a cluster (or pseudo cluster).</li> <li>5. Deploying applications to the cloud such as your own webserver or webservice</li> <li>6. Creating a virtual world</li> </ol> |                      |

## Gordon Dickers

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| Project title                                                                                                                                                                                                                                                                                                                                                                                                        | Language Teaching App Evaluation |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                              | Survey                           |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                       | All                              |
| <p>The aim here is to investigate a subset of existing language teaching software applications and to evaluate them identifying strengths, weaknesses, approaches, etc. You would be expected to create a small study to compare the effectiveness of two leading apps e.g. Duolingo and Rosetta Stone so it will involve finding at least one other willing participant and the desire to learn a new language!</p> |                                  |

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| Project title                                                                                                                                                                                                                                                                   | Steganography – the art and science of hiding messages within messages. |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                         | Development                                                             |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                  | SE, Web, CIS, Mobile, Nets, Games                                       |
| <p>The aim here is to investigate steganography methods and to develop steganographic software that can hide a text message within an image. It would also involve a review of existing software and methods. Would suit any student who has studied C, C++, C#, java, etc.</p> |                                                                         |

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| Project title                                                                                                                                                                                                                                                                                                                                                                                                                        | A.I. car controller |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                              | Development         |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                       | SE or Games         |
| <p>Previous students have developed a Unity Based Car Test Track that can generate and log all the car physics and control data for a race car. The aim of this project is to use the test track to log data and to then develop, train and evaluate a supervised learning algorithm (for example Naive Bayes, Neural Networks, etc. ) that can autonomously control a race car. Several versions of this project are available.</p> |                     |

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| Project title                                                                                                                                                                                                                                                                                       | AI Pathfinding         |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                             | Development            |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                      | SE, Games, CIS, Mobile |
| <p>Finding the best path through a dynamically changing environment and navigating this path in a realistic manner is an important goal for a good Game AI bot. You will review existing methods, select approach(es) suitable for a given game genre, implement and evaluate your solution(s).</p> |                        |

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| Project title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Agent Based Modelling        |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Development                  |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | SE, Games, Web, Mobile, CIS. |
| <p>Agent Based Modelling (ABM) is used to investigate the emergent properties of systems made up of thousands of interacting agents that follow a simple set of rules. Examples of systems simulated using ABM include epidemiological studies that model the spread of smallpox in a population; crowd panic scenarios and the famous “El-Farol bar” problem. Some well developed software tools such as Repast and NetLogo are used by many researchers and you would be expected to use one of these ABM tools to model one of several world problems. Please contact me for details. Several projects available.</p> |                              |

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| Project title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Teaching through Motivation in Video Games |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Survey / Development                       |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | All streams                                |
| <p>The use of computer games to facilitate teaching and learning has become fashionable in e-learning systems in part because it can motivate students to learn by satisfying the need for competence, autonomy and relatedness. This project aims to identify and evaluate the properties of video games that satisfy these psychological needs and select and apply them appropriately to develop a teaching game/app. If the project is selected as a dissertation then there will be no development of software, the goal might be a framework document and an evaluation of selected existing educational games against this framework. More than one project is available.</p> |                                            |

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| Project title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Attendance Monitoring using Face Detection and Recognition using Deep Learning Methods |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Development/Experiment                                                                 |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | SE/Games                                                                               |
| <p>Face Detection using Deep Neural Networks has come of age in the last few years and several machine learning libraries and training sets have been published which can detect and recognise faces in real-time. This project asks you to use these technologies to implement an attendance register using face recognition systems. The completed system is not the goal at this stage, instead the focus is upon creating a system that can recognise a face reliably and assessing the accuracy of the method.</p> |                                                                                        |

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| Project title                                                                                                                                                                                                                                                                                                  | Depth Maps and silhouette recognition using Microsoft Kinect |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                        | Development/Experiment                                       |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                 | SE/Games                                                     |
| The School has a number of Microsoft Kinect devices which are capable of capturing a depth field which can be used to recognise objects in real-time. The project will make use of this technology to investigate how effectively an individual's outline profile can be detected and their posture estimated. |                                                              |

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| Project title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Augmented Reality using Fiducial Markers |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Development/Experiment                   |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | SE/Games                                 |
| <p><i>A fiducial marker is an object placed in the field of view of a camera which can then be used to locate a point in the scene. A 3D rendered virtual object can then be incorporated in the captured image. This project will assess the effectiveness of several existing fiducial marker libraries.</i></p> <p><i>Other projects are available that use augmented reality, for example the development of an application that can support the display of virtual documents in a virtual meeting environment.</i></p> |                                          |

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| Project title                                                                                                                                                                                                                                                                                                                                                              | Statistical mapping (Epidemiology Studies) of Disease outbreak in Swansea and South Wales. |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                    | Development / Experiment                                                                   |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                             | BIT / CIS / SE / WD                                                                        |
| For example develop a GIS database to model incidences of measles or and other outbreak of infectious disease e.g. swine flu in the Swansea or a case study area. Use GIS techniques to analyse this data. Examine correlations between datasets, deprivation indexes, and other socioeconomic factors, e.g. MMR vaccination uptake. This is known as epidemiology mapping |                                                                                            |

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| Project title                                                                                                      | Accident Monitoring Using GIS |
| Project type<br>(Delete as appropriate)                                                                            | Development                   |
| Target degree lines<br>(Delete as appropriate)                                                                     | / CG / CIS / SE / WD          |
| Build a GIS to map accident occurrences in a given location which could be used to analyse and plan road networks. |                               |

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| Project title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Deprivation Studies using GIS              |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Development / Survey / Experiment / Review |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | BIT / CIS / SE / WD                        |
| <p>Using UK census data to map the socio-economic patterns found in South Wales, or whole of the UK. This could be linked to several project idea and titles:-</p> <ul style="list-style-type: none"> <li>• Analysis of student application statistics for SMU registry and marketing departments.</li> <li>• Looking at the incidences of house fires and deprivation and interactive guide for the Fire service.</li> <li>• Crime pattern analysis – is there a socio economic link could we build a database and a GIS to demonstrate this?</li> </ul> |                                            |

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| Project title                                                                                                                                              | Compare Statistical analysis with and without A GIS reference |
| Project type<br>(Delete as appropriate)                                                                                                                    | Development / Survey / Experiment / Review                    |
| Target degree lines<br>(Delete as appropriate)                                                                                                             | BIT / CIS                                                     |
| A GIS will allow for statistical analysis of data. Is this an advantage? Could we produce the same results using conventional database management systems? |                                                               |

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| Project title                                                                                                                                                                          | 3-D visualisation of Spatial data |
| Project type<br>(Delete as appropriate)                                                                                                                                                | Development / Experiment          |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                         | CG / CIS / SE / WD                |
| Using GIS and or a spatial database with visualisation techniques to examine coastal / terrain data. This, for example, could be used to look at issues in environmental conservation. |                                   |

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| Project title                                                                                                                                                                                  | Web applications of GIS  |
| Project type<br>(Delete as appropriate)                                                                                                                                                        | Development / Experiment |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                 | CIS / WD                 |
| Building and interactive web based GIS for a given application. How do we display 3-D geographical data on a website? Looking at spatial datasets and examining methods for web visualisation. |                          |

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| Project title                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Location based services LBS |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                          | Development / Experiment    |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                   | CG / CIS / SE / WD          |
| <p>What are location based services and how will they affect our lives? This could be linked to several project ideas:-</p> <ul style="list-style-type: none"> <li>• <b>Estate management.</b> How do large organisations such as Universities or hospital sites track maintenance requirements?</li> <li>• Could the use of GPS and location technology help with this MIS system?</li> <li>• Use of GPS and Smart Phones to build a GIS for student union services.</li> </ul> |                             |

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| Project title                                                                                                                       | Geographical Timetable   |
| Project type<br>(Delete as appropriate)                                                                                             | Development / Experiment |
| Target degree lines<br>(Delete as appropriate)                                                                                      | CIS / SE / WD            |
| Could link to LBS or estate management link to room building location. Could be used by a university or school. Smart phone ap etc. |                          |

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| Project title                                                                                                                                                                                                              | A comparison of End User Development Environments |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                    | Development / Survey / Experiment / Review        |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                             | BIT / CIS                                         |
| Software such as Microsoft office allows for end user development (via VBA) research this development environment and compare and contrast the facilities offered by other software vendors for example Lotus smart suite. |                                                   |

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| Project title                                                                                                                                                                                                                                                                 | End User Computing in SMEs                 |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                       | Development / Survey / Experiment / Review |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                | BIT / CIS                                  |
| Small to medium size organisations have to adapt the way in which they operate to survive in today global market. How do these organisations implement IT strategies and do they make effective use of End User Development software ( e.g. building applications using VBA)? |                                            |

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| Project title                                                                                                                                                                                                                                                                                                                           | Users / Managers perception of End User Computing / Development |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                 | Development / Survey / Experiment / Review                      |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                          | BIT / CIS                                                       |
| Research into the understanding of EUD/C, from a user's perspective and or from the management's viewpoint. How do organisations control EUD? Are we seeing a standard approach within organisation large or small to data analysis for example? What about quality issues with reference to the design of the end products being used? |                                                                 |

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|------------------------------------------------|---------------------------------------|
| Project title                                  | The impact of touch screen technology |
| Project type<br>(Delete as appropriate)        | Survey / Experiment                   |
| Target degree lines<br>(Delete as appropriate) | BIT / CG / CIS / SE / WD              |
|                                                |                                       |

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|---------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|
| Project title                                                                                                             | Alternative methods for data input and user interaction |
| Project type<br>(Delete as appropriate)                                                                                   | Development / Survey / Experiment                       |
| Target degree lines<br>(Delete as appropriate)                                                                            | BIT / CG / CIS / SE / WD                                |
| Alternative methods for data input and user interaction (using touch input, Wii remotes, Microsoft Kinect, VR gloves etc) |                                                         |

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|---------------------------------------------------------------------|-----------------------------------|
| Project title                                                       | An investigation into DAM         |
| Project type<br>(Delete as appropriate)                             | Development / Survey / Experiment |
| Target degree lines<br>(Delete as appropriate)                      | BIT / CIS / SE / WD               |
| An investigation into DAM (Digital asset management) (dissertation) |                                   |

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|--------------------------------------------------------------------------------|-----------------------------------|
| Project title                                                                  | Construction of a DAM             |
| Project type<br>(Delete as appropriate)                                        | Development / Survey / Experiment |
| Target degree lines<br>(Delete as appropriate)                                 | CIS / SE / WD                     |
| Construction of a DAM (digital asset management) system (software development) |                                   |

|                                                |                                    |
|------------------------------------------------|------------------------------------|
| Project title                                  | Cloud computing: The pros and cons |
| Project type<br>(Delete as appropriate)        | Development / Survey / Experiment  |
| Target degree lines<br>(Delete as appropriate) | BIT / CIS / SE / WD                |
|                                                |                                    |

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| Project title                                                                                                                                                                                                                    | Strategies for maximising PC performance |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                          | Development / Survey / Experiment        |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                   | BIT / CG / CIS / SE /                    |
| Strategies for maximising performance or price/performance when designing a PC/Workstation out of commercially available components. (effect of overclocking, bus speeds, RAM timing, CPU efficiencies, RAID configurations etc) |                                          |

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| Project title                                                                                                            | Changes in domestic computing     |
| Project type<br>(Delete as appropriate)                                                                                  | Development / Survey / Experiment |
| Target degree lines<br>(Delete as appropriate)                                                                           | BIT                               |
| A study into how domestic computing is shifting from the desktop PC into items such as the television and phones/tablets |                                   |

|                                                                  |                                   |
|------------------------------------------------------------------|-----------------------------------|
| Project title                                                    | Changes in portable computing     |
| Project type<br>(Delete as appropriate)                          | Development / Survey / Experiment |
| Target degree lines<br>(Delete as appropriate)                   | BIT / CG / CIS / SE / WD          |
| Portable computing: A study into future trends and implications. |                                   |

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| Project title                                                                                                                                       | Copyright violation detection tools |
| Project type<br>(Delete as appropriate)                                                                                                             | Development / Survey / Experiment   |
| Target degree lines<br>(Delete as appropriate)                                                                                                      | BIT / CG / CIS / SE / WD            |
| Net based Copyright violations and tools for detection (e.g. TinEye for web image searching)<br>A study of, or construction of tools for detection. |                                     |

|                                                                         |                                   |
|-------------------------------------------------------------------------|-----------------------------------|
| Project title                                                           | AI Music                          |
| Project type<br>(Delete as appropriate)                                 | Development / Survey / Experiment |
| Target degree lines<br>(Delete as appropriate)                          | SE                                |
| The use of AI algorithms for the production of computer generated music |                                   |

## Electronics Project Titles

Robotic arms / Remote buggies

Micro-generation and/or monitoring of power (turbine, solar etc)

Solar power - tracking the sun with a heliostat

GPS tracking device (e.g. for lost pets, dementia sufferers, vehicle tracking)

General Purpose or specialist data/temperature logger (Freezer lorries, horticultural aspects, general scientific data gathering, weather data etc)

Car park controller

Intelligent Traffic light systems

Home security – Intelligent alarms, remote webcams etc

Fridge alert (e.g. text message when the temp gets too hot)

Remote control/telemetry weather station

Data telemetry via gsm/internet (collecting gas/electric/water meter data)

Ultrasonic devices for distance measurements (car reversing sensors, water level indicators, digital tape measures etc.)

Galvo control to deflect mirrors in laser scanning applications.

Using a/interfacing to, a PLC in an industrial control application/simulation

Designing, Implementing and testing a PID control loop system to control an industrial control application/simulation

Medical monitoring devices (heartbeat, temperature, pedometer etc.)

Digital Voice recorder using a microcontroller

Analogue/Digital effects for music processing (guitar effects pedal, digital delay/reverb, chorus etc.)

Custom music synthesis devices – (drum machines, bass rhythm sequencers, complete synthesisers)

Music performance interface devices – (laser harp, Theremin types, wearable input devices using accelerometers etc.)

Benchmarking / measurement device design for imaging devices. E.g.:

- A device that will be able to measure the shutter/EVF lag time in modern cameras.
- A device to allow measurement of shutter shock/mirror slap in DSLRs

Programmable autopan device for controlling and triggering cameras for timelapse photography/video (think BBC nature programs when time is sped up)

## Dr Gary Jones

Areas of interest include:

- Digital electronics
- Microcontroller-based design and implementation
- Instrumentation
- Sensors and biomedical devices
- Communications
- Image processing
- Remote vehicles
- Robotics
- Analogue electronics and power electronics
- Energy management, energy generation
- Environmental monitoring
- Electronics design methods and techniques

## Dr Nitheesh Kaliyamurthy

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|------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| Project title                                                                                                                | Securing Software Defined Networking Environment |
| Project type<br>(Delete as appropriate)                                                                                      | Development/ Experiment                          |
| Target degree lines<br>(Delete as appropriate)                                                                               | Computing/ Computer Networks and Cybersecurity   |
| Various security aspects on SDN Networks could be experimented/ developed. (Control Layer/ Application Layer/ Physical Layer |                                                  |

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|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Project title                                                                                                                                                      | Optimal Protocols/APIs and Controllers in Software Defined Networking Environment |
| Project type<br>(Delete as appropriate)                                                                                                                            | Development/ Experiment                                                           |
| Target degree lines<br>(Delete as appropriate)                                                                                                                     | Computing/ Computer Networks and Cybersecurity                                    |
| Compare various protocols and controllers available in SDN environment for a SoHo/Medium/ Enterprise networks and implement cost effective network infrastructure. |                                                                                   |

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|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|
| Project title                                                                                                                                                                                                          | Analyse security standards of Computer Networks |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                | Development                                     |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                         | Computing/ Computer Networks and Cybersecurity  |
| The project work focuses on computer network security. Various analysis on existing security methods/standards are done and based on the analysis the outcome is discussed with necessary implementation and evidence. |                                                 |

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|-----------------------------------------------------------------------------------------------------|------------------------------------------------------|
| Project title                                                                                       | Social Engineering Attacks and Mitigation Strategies |
| Project type<br>(Delete as appropriate)                                                             | Experiment                                           |
| Target degree lines<br>(Delete as appropriate)                                                      | Computer Networks and Cybersecurity                  |
| Implement various Social Engineering attacks and propose feasible, effective mitigation strategies. |                                                      |

## Dr Steve Mosey

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|------------------------------------------------------------------------------------|--------------------------|
| Project title                                                                      | Smart AC circuit breaker |
| Project type<br>(Delete as appropriate)                                            | Development              |
| Target degree lines<br>(Delete as appropriate)                                     | SE / CIS / CNets / WD    |
| Network connected device to monitor AC power usage and provide circuit protection. |                          |

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|--------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| Project title                                                                                                                                          | Automatic guitar tuner |
| Project type<br>(Delete as appropriate)                                                                                                                | Development            |
| Target degree lines<br>(Delete as appropriate)                                                                                                         | SE / CIS / CNets / WD  |
| Device to turn machineheads on guitar in relation to pitch played on string. Ideally should also work for lute, gittern, and various sizes of ukulele. |                        |

## Dr Kapilan Radhakrishnan

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|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| Project title                                                                                                                                                           | <b>Anatomy of Hacking</b> |
| Project type<br>(Delete as appropriate)                                                                                                                                 | Experiment                |
| Target degree lines<br>(Delete as appropriate)                                                                                                                          | <b>Networks</b>           |
| Description:<br>The aim of this project is to analysis after effects of an attack on IT infrastructure and recommending necessary steps to stop it happening in future. |                           |

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| Project title                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Internet of Things or Internet of Everything based project</b> |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                        | Development/Experiment                                            |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Networks</b>                                                   |
| Description:<br>IoT is the latest technology that connects the unconnected; devices, vehicles, buildings, sensors, electronic devices, hardware and software. The technology allow us to achieve anything possible nowadays. There are number of projects available in this area and if you have an interesting feel free to discuss it with me. Some project may need Arduino and/or Raspberry Pi kits which we have to complete the project. |                                                                   |

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| Project title                                                                                                                                                                                                                                                                                                              | <b>Building a Secure Home Network</b> |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                    | Experiment                            |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                             | <b>Networks</b>                       |
| Description:<br>Most part of UK has broadband coverage and millions of home users are connected to Internet via ISPs. How secure are today's home network? The main aim of this project is to analyse the existing security measures on Home network and recommend steps or new security measures to home broadband users. |                                       |

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| Project title                                                                                                                     | <b>Implementing a converged Network solution to SMEs</b> |
| Project type<br>(Delete as appropriate)                                                                                           | Development                                              |
| Target degree lines<br>(Delete as appropriate)                                                                                    | <b>Networks</b>                                          |
| Description:<br>The aim of this project is to design and implement a converged (data, voice and video) network solution to a SME. |                                                          |

## Dr Nik Whitehead

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| Project title                                                                                                                                                                                                                                                                                                                                                                                                   | Pattern block maker |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                         | Development         |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                  | SE / CGD            |
| Cosplay has become a popular pastime in Geek culture, but costumes themselves can be very difficult to make because patterns are not available for many popular characters. A tool is needed that allows users to enter body measurements onto a simplified human form, draw the lines of the clothing they want, then automatically generates the patterns for the clothing as flat pieces ready for printing. |                     |

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| Project title                                                                                                                                                                                                                                                                                                                     | A game-based usability demonstrator |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                           | Development                         |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                    | CGD / SE / WD                       |
| There is a massive variation in visibility when objects of one colour are placed on top of a different background colour. This project aims to produce game-based demonstrator of this phenomenon that will also allow users with colour vision deficiencies to identify colour combinations that are particularly clear to them. |                                     |

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| Project title                                                                                                                                                                                                                                                                                                                                                   | Data visualisation using an interactive holographic display |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                         | Development                                                 |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                  | CGD / SE                                                    |
| “Pepper’s Ghost” is a Victorian visual trick used to make images ‘appear’ in mid-air. This has recently been demonstrated using computer graphics to generate moving holographic images using Unity or a similar tool. The aim of this project is to create a gesture-controlled (LEAP Motion) programme for displaying and manipulating multidimensional data. |                                                             |

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| Project title                                                                                                                                                                                                                                                                                                                                                   | ConNet – A Physical Web tool for conferences |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                         | Development                                  |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                  | CNets / SE / WD                              |
| Google’s Physical Web is based on the use of Bluetooth beacons to provide highly localised information to users via their mobile devices. A system is required that can allow conference organisers to automatically show a conference’s schedule, show what items are in each room, and possibly allow users to find other by triangulation of beacon signals. |                                              |

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| Project title                                                                                                                                                                                                                                                                                                      | A LEAP Motion controlled game |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                            | Development                   |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                     | CGD / SE                      |
| The LEAP Motion is a device for allowing gesture-based control of a computer for use with games or the main Windows interface. The aim of this project is to produce a demo game in Unity that will showcase the capabilities of the device. <a href="https://www.leapmotion.com/">https://www.leapmotion.com/</a> |                               |

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| Project title                                                                                                                                                                                                                                                                        | Semantic net-based chatbot |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                              | Development                |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                       | SE                         |
| A semantic net is a network of nodes that encode meaning. These can be used to predict sentences that can be used as part of a conversation with a human user. This project aims to create a semantic network that can hold a conversation with a user on a single pre-defined topic |                            |

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| Project title                                                                                                                                                        | Development of a resource aimed at users with a given disability |
| Project type<br>(Delete as appropriate)                                                                                                                              | Development                                                      |
| Target degree lines<br>(Delete as appropriate)                                                                                                                       | SE / WD                                                          |
| This would include the design and development of a suitable software resource, for example an E-Commerce or E-Government site, for users with a specific disability. |                                                                  |

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| Project title                                                                                                   | Usability issues in e-government and e-voting. |
| Project type<br>(Delete as appropriate)                                                                         | Development                                    |
| Target degree lines<br>(Delete as appropriate)                                                                  | WD                                             |
| A development project would include prototype development and evaluation in a suitable development environment. |                                                |

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| Project title                                                                                                                                                                                                                        | The design and evaluation of a prototype for a public use application. |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                              | Development                                                            |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                       | SE / WD                                                                |
| Public use applications are a challenge for developers and users. A development project would involve the design and evaluation of a suitable public use application such as one aimed at public transport users or museum visitors. |                                                                        |

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| Project title                                                                                                                                                                                                                                                                                                                                                        | Usability evaluation of an existing software application |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                              | Survey / Development                                     |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                       | SE / WD                                                  |
| This is a fairly generic usability project idea aimed at students with experience of an existing system which could be based on work or other experience. A development project would involve the building of a prototype interface employing usability principles. A survey would mean the application of usability techniques and recommendations for improvement. |                                                          |

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| Project title                                                                                                                                                                                                                                                                                                                   | Prototype home energy use display |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                         | Development / Experiment          |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                  | CNets / SE / WD                   |
| Ubiquitous interfaces are those embedded into objects in our environment. It would be possible to develop a mockup in Visual Studio or make use of electronics resources for development of a prototype. This could be conducted as a development project or an experiment involving comparison of alternative implementations. |                                   |

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| Project title                                                                                                                                                                                               | Prototype mobile interface for a given application |
| Project type<br>(Delete as appropriate)                                                                                                                                                                     | Development                                        |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                              | WD                                                 |
| With a focus on usability, this topic means the selection of a suitable task for a new mobile interface prototype. A survey would mean conducting analysis and developing and evaluating a paper prototype. |                                                    |

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| Project title                                                                                                                                                                                                                                                                                                                                                                                          | Smart city technology |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                | Development           |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                         | WD                    |
| In smart cities, investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable development and a high quality of life, through participation and engagement. A development project would mean the construction of a smart city prototype on a suitable platform (perhaps mobile), for example around smart transport or heritage. |                       |

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| Project title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Usability comparison of a set of websites |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Experiment                                |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | SE / WD                                   |
| Usability is generally explored as a method of ensuring that an individual website is as easy to use as possible. It is, however, also possible to use usability metrics to compare multiple websites within a business sector, both to identify those elements which are viewed as essential by the website owners and to investigate whether these websites actually meet the needs of sector stakeholders. This project will involve using a set of well-defined metrics to design and carry out a series of usability tests on a set of websites in a sector selected by the investigator. |                                           |

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| Project title                                                                                                                                                                                                                                                                                            | Development of a Public Information Dashboard |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                  | Development                                   |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                           | DIS / WD                                      |
| Large amounts of publicly-available data are generated every day by public authorities, but it is often the case that the data presentation leaves a lot to be desired. This project focuses on developing an interactive dashboard designed to allow members of the public to explore this data easily. |                                               |

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|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Project title                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Student reward system: Investigation and development of a student reward system/application to enhance attendance engagement and assessment outcomes. |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Development                                                                                                                                           |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                             | AC / Comp., CIS, CG, SE, WD.                                                                                                                          |
| <p>The student will investigate existing applications &amp; systems and stakeholder opinions to identify best practices and relevant needs. Gamification will be a key feature of the investigation and application as will the ability to develop a responsive mobile web application. Example: the developed application could include a Virtual currency and Virtual/digital to physical reward system with aim of enhancing student attendance engagement and assessment outcomes.</p> |                                                                                                                                                       |

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| Project title                                                                                                                                                                                                                                                                                                                                                                                        | Project Library Management System: Investigation and development of a student project library management System. |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                              | Development                                                                                                      |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                       | AC / Comp., CIS, CG, SE, WD.                                                                                     |
| <p>The student will investigate existing applications &amp; systems and stakeholder opinions to identify best practices and relevant needs. The developed application will likely include a log-in system, project catalogue, search &amp; filter features and different user-level access including admin. user level. The application will also likely be a responsive mobile web application.</p> |                                                                                                                  |

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|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| Project title                                                                                                                                                                                                                                 | Social Media strategies: Investigation and evaluation of Social Media promotion strategies for Organisations. |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                       | Survey / Experiment / Development                                                                             |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                | AC / Comp. / CIS.                                                                                             |
| <p>Your research will investigate and test up-to-date social media platforms and promotion strategies available for Organisations today. An up-to-date good practice guide will be produced based on your research and practical testing.</p> |                                                                                                               |

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| Project title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Augmented Reality Game: Investigation and development of an Augmented Reality Game. |
| Project type<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Development                                                                         |
| Target degree lines<br>(Delete as appropriate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | CGD, SE, WD.                                                                        |
| <p>Company: BrdSports Ltd.</p> <p>Project description: We are looking to develop an exciting new augmented reality game that will link the players physical world with the digital game. Augmented items will need to be placed at specific locations for collection on a board or kart (powered by gravity or an electric motor). The idea would be to create a game with similarities to Mario Kart in game play coupled with obvious real world physical activity health benefits. Taking what has been done with the WiiFit and Pokemon Go to the next level</p> |                                                                                     |

## WIDI Projects (Contact: Prof. Ian Wells)

1. Remote Monitoring of medical signals:  
Patients living in remote areas with no broadband may need to have their medical condition remotely monitored. This project will evaluate the use of LoraWAN technology as a possible solution for doctors to solve this issue.
2. Baby location monitoring in hospital security use  
Babies have, in the past, been abducted from hospital wards. This project will explore the possibility of using WiFi location technologies to monitor the location of babies and set alarms if they are moved out of the ward.
3. Two projects on COPD:  
COPD is a degenerative chronic illness that is very common in South Wales. AI can be used to detect the deterioration of this condition.  
There are two projects related to this area:
  - 3a. *COPD APP Development*  
Capturing voice data using an APP and storing it in the cloud. Will need to consider suitable bit rate for speech capture and development of a user-friendly interface as many sufferers typically have low level ICT skills.
  - 3b. *COPD AI Algorithm Development*  
AI algorithm development for COPD detection of voice data. Possible use of MATLAB or Python
4. AI Cancer Detection  
Medical imaging to detect the possible presence of cancerous tumours using Deep Learning or Machine Learning. Possible use of MATLAB or Python
5. GetFit Wales APP development  
App development to capture fit bit and user entered data for GetFit Wales project, could look at fitness and dietary issues of users and develop good data visualisation methods to assist users in life choices. May consider gamification techniques as incentivisation to change behaviour.