



12 Pages

Instructions to Candidates

1. Please give the information requested in the boxes below.
2. Enter your name in the space provided to the right, fold over and seal down (using the label provided) to hide your name.
3. The answers must be legibly written. The Examiners can either ignore illegible script or have it typed and the expense of typing charged to the candidate.
4. Write your answers in ink.
5. Begin each answer on a fresh page. Do all rough work in the answer book and cross it through.
6. No part of this book is to be torn out; it must be handed in complete.
7. If more books than one are used, fasten them together using the tags available from the invigilator(s).
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1	Student Number	2409841
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3	Module Code	ACCA7026
4	Date and Time of Examination	09/01/2025 3:00 PM
5	Examination Venue	IA310
6	Seat Number	010
7	Number of Answer Books handed in	1 of 2

List the numbers of the questions you have attempted	Office Use
2	18
3	10 + 1
4	23
Total	58

(Gweler yr ochr arall am y fersiwn Cymraeg)

68% ~~11/10~~
69% 20th Jan 2025

SECTION A

QUESTION 2 [18]

a, Reinforcement Learning (RL)

Reinforcement Learning is AI model called agent. The agent interact with the environment by the state and Action, These system is working upon the reward basis system, that the agent complete an action the agent gain positive for success and negative for failure.

The key principles of Reinforcement Learning are,

elements

- Agent
- State
- Action
- environment
- policy
- Reward
- value function.

Agent-environment interaction
 Reward based learning
 Decision making
 these are the principles
 so game engine support this

Agent

Agent is the person who interact with the environment
 eg: Robot or AI

State

State is defined as the current position or situation of the agent is called state

Action

Action is defined as the agent take a new action that taken action is defined as action.

eg: In AVs the AV is in stop, then they start to take a new ride that action is defined as action

Environment

Environment is the world where the agent interact with this space is called environment.

eg: In AV models the world or the environment is the roads and all things in the road.

Policy

Policy is defined as the strategy that taken by the agent to complete the action for the reward.

Reward

Reward defined as the coin that gain by the agent for the action if the action is success they get positive and if it is failure they get negative reward.

Value function

Value function is a long term foundation of the agent about the reward collection in the future.

These all systems or key points of RL is very useful in Autonomous driving for exploring new things and learn new things in the environment. Also these key principles are mainly working in the AVs.

b) The two key features of Reinforcement Learning is

⇒ exploration

⇒ exploitation

In exploration the Agent can take new action by exploring new environment with new things and also in this system the agent can study or learn new things as get high reward in this exploration. 04

In exploitation the agent take the action upon the ideas and information already gained before. So the agent know the reward basis system in this task.

eg: In exploration if an AV model get stuck in traffic then they take new way to destination they exploring new things

eg: In exploitation, in a way to destination the av model go same as the way last side go. There is nothing to learn new thing.

These strategies of agent is balanced by the learning method called Q-learning.

5. The Reinforcement learning is a AI model called agent to make action upon the basis of Reward basis system.

The key Elements of RL is,

- => Agent
- => Environment
- => State
- => Action
- => Reward
- => Policy
- => Value function

Agent

Agent is the person who interact with the thing. *entity* *environment*

eg: It may be Robot, or AI

The main role of these Agent is to control the AV system in the correct way without any failure.

In the context of AVs what is an Agent?

Environment

Environment is the world which the agent interact with.

- In AV models the agent take all the actions in the dynamic environment because, in dynamic environment there is open world there are lot of thing to concentrate like, road, traffic, pedestrians.

State

State defines the current situation or position of the Agent is defined as State.

In AV models the current position of the AV vehicle is defined corresponding to State.

Action

Action defined as the agent going to take a new project is called Action that project is Action.

In AV models Action means the AV model accept an order to destination that order is defined as Action.

Reward

Reward defined as the agent get reward based on the action if the action is failure the agent get negative reward, if the agent success the action they get positive.

Policy

Policy define as the strategy that taken by the agent to complete an action successfully to gain more reward.

In Aves it must be mainly defining the navigation and good way to the destination.

Value function

Value function is a function define about estimation of how reward that can be collect by in the future.

QUESTION 3

[1100]

a) Natural Language Processing (NLP)

NLP is a AI method structured to understand the computer to get the human - language and understand all the thing in a human language.

NLP is considered an effective approach for developing automated customer service systems, because the NLP is mainly established for understand the human language and also there key features to help the NLP to achieve this function.

Tokenization

entity

Relationship

Sentiment Analyse

these four factors is the working of NLP so it defines all the human language easily understandable for computers.

NLP handles the customer queries by taking the human language to tokenization. This tokenization take some words or sentence to tokens, and it divides to small chunks. And it take the nouns from the sentence.

the sentence called entity they take place, name or things. In NLP they get relationship between entities to get more information.

Example

In an online shopping site chat bot. is working upon the data that stored before of a user.

By this if the user is angry NLP can identify the emotion of the user by the human language then it can give smooth reply or cooling reply can sent.

It understand the customer query by taking information of the order.

And also in NLP there is Sentiment Analysis to know sentiment of the user.

b, In NLP Natural Language Processing the system is understand the human generated language by four key methods,

- ⇒ Tokenization
- ⇒ Entity
- ⇒ Relationship
- ⇒ Sentiment Analysis.

Read ~~understand~~ the question.
 Answer should focus on functionalities of
 entity recognition, sentiment analysis & language translation.

In Tokenisation the language of human is taken as a segment of word or sentence called token, and it also divides into small chunks, so by this feature the system can identify the main objects in the sentence.

Named entity recognise.

In entity ~~as it~~ works as take the name, place, thing or taking nouns to identify the main thing in the sentence.

In Relationship it checks the related things in the base for the ~~replaces~~ replaces.

eg: ~~entity~~ rate of iPhone 16.

entity (iPhone ₹900)

Relationship (iPhone 16).

The sentiment analysis is a ~~analysis~~ analysis to identify the sentiments of the user by 3 features positive, ~~neutral~~ neutral and negative. By these system user can give the review of the session.

The system transfers the human language to system understandable language by binary code 0s and 1s and the computer language is enhanced by 0 and 1 by this system understands the human language.

example

Language translation - the ability convert to different human language

In Customer Service system of an online order site. The user asked the

Language Translator

Status of the order. "What is the status of my order"

The NLP take the words to segment and take the main nouns from this, here order and status, taken then it check the relationship and the system checks the order details and by language to binary code the system get information and it change to human language by translator.

- c, The Main advantage of NLP application is Sentiment analysis, it can access the ~~more~~ emotion of the user by the customer queries.

it is very useful for summarizing a paragraph to short by taking the key points

NLP is useful to translate human language to any language as language translator.

NLP is also used in Review system in website to get information about the review by positive, neutral, negative.

- d, Ensemble learning is beneficial in Natural language processing by ensuring the identification that taken from the human language all these learning are at models so its very powerful to work in all systems and all ways.

how it is powerful

SECTION B

[23]

QUESTION FOURa) Convolutional Neural Network

CNN is a deep learning model mainly used for image related task like recognizing object, classifying image, detecting patterns.

The key features of CNN is,

- => Convolutional layer
- => pooling layer
- => Activation function
- => fully connected layer
- => error function. (loss func)

[10]

Convolutional layer

Convolutional layer defines to take the feature of image to a small grid called kernels or filters. kernels are minimum 2×2 grid maximum 5×5 grid it extract the features from the image. like edge, line, structure.

Activation function or ReLU layer

This layer decides the image or the feature want which neurons to functions like ReLU (Rectified Linear Unit) it helps to take improve the output.

What's the role of activation function?

pooling layer

Pooling layer reduce the size of the feature map to make or improve the computation faster and avoid overfitting

Fully connected layer

Fully connected layer takes the features from the convolutional layer and pooling layer to make the final output prediction

eg: it predict [it's a dog]

Error function

Error function define the error of prediction and feature map to improve the prediction

Main Application of CNN

=> stride

=> Depth

=> zero padding.

Stride

Stride means the movement while sliding. If movement is one the sliding is also one

Depth

Depth is the ~~map~~



Complete, fold and seal
(see note 2 below)

SURNAME: KOCHAMPARANDIL

ANIL

FORENAME(S): AKHIL

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[illegible]

Depth

Depth defines that the number of filters used in the process.

Zero padding

Zero padding is a process to adding zeros in the edge to ~~preserve the size~~ preserve the size of the filter.

The features of CNN

feature identification

Input definition

feature identification

CNN identify the feature of the image without any help of human supervisor

Input identification

CNN takes the image in 3 dimensional with the help of RGB channels each channels have different values.

b, $W \times H \times D = 128 \times 128 \times 3$

filters = 32

Stride $S = 1$

Padding $P = 1$

$F = 3$ $\rightarrow$ F/k su

$$W_2 = \frac{W_1 - F + 2P}{S} + 1$$

$$H_2 = \frac{H_1 - F + 2P}{S} + 1$$

$$W_2 = H_2$$

$$W_2 = 128.1$$

$$W_2 = \frac{128 - 32 + 2 \times 1}{1} + 1$$

$$= \frac{98}{1}$$

$$= 98 + 1$$

$$= \underline{\underline{99}}$$

$$\therefore W_2 = H_2 = 99$$

$$W_2 \times H_2 \times D_2$$

$$99 \times 99 \times 32$$

Always write eqns

03

d, Depth

The sole depth is defined as the count of filters used in image processing then depth is used to take the featureing of image.

If the 32 filter used in a image processing the depth also 32 both of them ~~equal~~ equal.

Slide

Slide define the movement of filter while sliding. If the movement of the slide is one at a time the slide is ~~not~~ also one. Almost all filter image featureing the slide remain same.

Padding (Zero padding)

Zero padding is a method that using in image featureing by adding zeroes in edge this done because of this to remain or precise the size of kernel. By this model the kernel understand there is no space to move then they change to the next line and start the featureing of image.

08

The working of these models in AV is very important by detecting object

~~Depth is means~~

Depth is measured in AV model by the distance of the object and the AV is done by this model so the AV can understand the distance of the car and object in front so they can make sudden brake.

Slide is working in the AV models by the movement of the object or ~~obstacle~~ in the road in AVs. By this movement the AV system well defined to get knowledge ~~it's~~ human or a vehicle. All this measure is very important in the AV system.

Padding

The padding method in AVs is the fast breaking system in when found and accident entry of objects.

More specific examples expected

5, Pooling layers are reduce the size of the image in CNN that make the AV system to grasp accident possibility.

pooling system is defined into 2 ~~+~~ many types of pooling.
min pooling & max pooling.

min pooling

min pooling mean take the minimum number from the filter.

eg: [1, 2, 4, 5] it takes '1'

max pooling

max pooling means take the maximum number from the filter.

eg: ~~[1, 2, 3, 4]~~ [1, 2, 3, 4]

It takes "4"

And also as we look at AVs the CNN working is very important. as object detection and so it can reduce the acceptance of accident in roads, and also CNN is very useful in medical system, to find tumors from an X-ray.

So, CNN is very defined and very effective method of image in deep learning model.

translative variance?