



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 cover 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).
8. **Every book must be handed in. In no circumstances may answer books, used or unused, be taken out of the examination venue.**

List the numbers of the questions you have attempted	Office Use
4	14
2	10
Total	24

(Gweler yr ochr arall am y fersiwn Cymraeg)

32%

~~1/25~~
20th January
2025

a. Convolutional ~~layer~~ neural network

~~beginning~~ ~~the~~ this is the method of recognising the input image.

3 key features

Depth : the Number of Pixels

Stride : the moving grid / filter / kernel ^{over the} in input image.

Padding / zero padding : Adding of pixels from edge of the input image.

convolution layer

- * first layer and the main layer of CNN Architecture. this layer makes a grid in the original input image and carefully watch and separate ~~layer~~ of filtering.
- * the grid can be 2×2 , 3×3 , 4×4 . etc....
- * convolution layer converts this RGB image Pixels into Number values.
- * The Number values use a grid of Binary values to multiply the image Number values. and use stride to and complete whole image. the move to ReLU layer.

ReLU layer

Activation Function

- * second layer of the CNN Architecture.
- * ReLU Make all ~~negative~~ ~~or~~ ~~less~~ less than 1 values into "0" zero.
- * ReLU is a non ~~linear~~ ~~linear~~ ~~linear~~ and works in hidden layer.

It is one of the activation functions

- * ReLU - use "0" zero or " ∞ " infinity.
After ReLU - Pooling layer.

Pooling layer

what's the purpose of pooling layer

- * the third step of CNN Architecture.
- * different types of pooling. eg: Max pooling and Average pooling.
- * Max Pooling use the Maximum value in the filter.
- * Average pooling use the Average value in the filter / kernel.

- * from ReLU layer Pooling layer uses the Max pooling and pick Maximum value and create pooling layer.

not always

Fully connected layer

- * This is last and final layer in CNN architecture.

- * ~~for~~ this ^{is the} stage of Make the pooling layer into a vertical / column style data representation.

- * from this layer the ^{input} is processed. ~~use the value~~ uses the values in the fully connected layer. the output can produce the image is Dog or Not a Dog.

loss function

b.

H = Height
W = Width
D = Depth.

Formula =

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

$$H_2 = \frac{H_1 - F + 2P}{S} + 1 \quad D_2 = k.$$

$$W_2 = \frac{128 - 32 + 2 \times 1}{1} + 1 = 128 \quad W_2 = 99$$

$$H_2 = \frac{128 - 32 + 2 \times 1}{1} + 1 = 128 \quad H_2 = 99$$

$$D_2 = 198$$

C.

Two Types of Pooling used in term of dimensionality reduction and translation.

eg: Max pooling and Average pooling.

Pooling is the ~~one~~ layer ~~that~~ of CNN architecture. in this layer. This makes all integers ~~into~~ ~~minimum~~ ~~and~~ ~~maximum~~, ~~change~~. the highest or ~~the~~ minimum value to a new filter.

d.

Depth

Depth is the one of the main feature of CNN. Number of pixels in a input image is called Depth. Depth, height, ~~and~~ width ~~are~~ ~~are~~ ~~are~~ This will be checked in a image. "D" used to denote Depth.

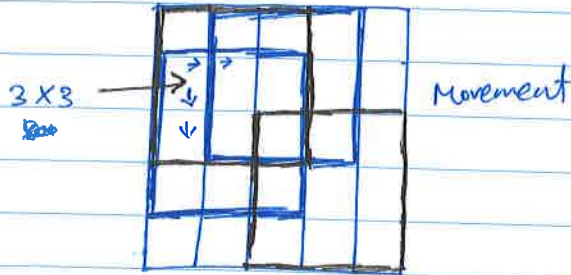
Stride

second main feature of CNN. the moving filter over the input image.

* stride consist of Rows and columns.

eg: 2×2 , 3×3 .

* ~~stride can move from~~
stride Movement:



you need to
based on
marks allocated

* Padding

* Last and final key feature of CNN.

* adding of Pixels from edge of the input image.

Types of padding - eg: zero padding.

e.

Section: A

Question = 2

- a. ~~there~~ three core ~~may be~~ principles for reinforcement learning.

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

basic principles.

Answer

Agent-environment interaction
reward
decision making

- b. exploration

* gathering more information from the environment as the given agent
eg: A robot that randomly pressing a button and see for what happens.

in content which AV

exploitation

* using the already gathered information to make more reward points.

eg: A robot the pressing the button which can generate maximum reward point.

Trade-off

* In exploration, cannot make on low level of chance to get reward points. but can explore more data and information from the environment. *for what purpose*

* In exploitation, using the same information and data to choosing the best known info/action

Make Maximum Reward point. But there is no chance for explore more data or more information from ~~outside~~ environment.

C. 1 key Elements

* Agent ✓ $T = \text{Agent, environment, state, Action, Reward, Policy, value function.}$

the decision maker. ✓

eg: Can be a chat bot, a software programme, Automated vehicle. etc...

* Environment

the Agent that interact in ✓
eg. Road, traffic, etc... Pedestrian.

* state ^{present}
The states of the Agent in the environment.
eg: Brake, Acceleration, Turning etc...
near by vehicles. etc...

* Action

the function that work ✓ in the environment by Agent.
eg: Brake, Acceleration, Turning etc...

* Reward

The output of the Action is ^{feedback} called Reward.
eg: ✓

If the AV in the same line gets a +10 points / rewards.

If the AV hit a pedestrian lose -20 ² points / rewards.

* Policy

The Agent that function using the set of Rules and regulation in the environment.

eg: if the AV hit a pedestrian that is a violation of Rules and regulation.

Status

* value function

the feedback from the previous thinks. and ^{to being} ~~and~~ ^{like that} ~~like that~~.
eg: after successfully completing a circle getting reward and no violation of Policy. studying the same one.