

# Decision Support Systems

Final Exam – DSC - B

Dated: 22nd Jan 2025

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# Important

- Please ensure that you copy the link to your solutions in the Submissions and Scores sheet:
  - DSC-B:  
[https://docs.google.com/spreadsheets/d/1SRPbsfTlVaqF\\_QYDD\\_pA4sIX9iouGJN8rVuMEB039CE/edit?usp=sharing](https://docs.google.com/spreadsheets/d/1SRPbsfTlVaqF_QYDD_pA4sIX9iouGJN8rVuMEB039CE/edit?usp=sharing)
- Caution: Edit your cells only, not for others in the class
- Please also ensure that you give me an edit access to your submissions: [humera.noor@gmail.com](mailto:humera.noor@gmail.com)

# Data Analytics

Question 1

# [DSC-B] Question 1 – Data Analytics – 10 marks

page 1 of 3

- You will work on `cafe_sales.csv` dataset for this question.
- Please import the csv file in a google / Excel sheet.
- Perform the given operations in your sheet (create new tabs within the same file) and answer the following questions
- You will not use any programming language like python for this question.
- Please make sure you share the link:  
[https://docs.google.com/spreadsheets/d/1SRPbsfTIVaqF\\_QYDD\\_pA4sIX9iouGJN8rVuMEB039CE/edit?usp=sharing](https://docs.google.com/spreadsheets/d/1SRPbsfTIVaqF_QYDD_pA4sIX9iouGJN8rVuMEB039CE/edit?usp=sharing)

# [DSC-B] Question 1 – Data Analytics – 10 marks

## page 2 of 3

- For the "**Total Spent**" parameter:
  - Identify rows where the data is unclean – Calculate the count of unclean rows in this column.
  - For rows with unclean or missing "**Total Spent**", calculate the correct value
  - For any rows where cleaning is not possible due to missing, flag them as "Unresolvable."
- **Deliverables:**
  - A summary of the number of unclean rows identified in "**Total Spent**."
  - The cleaned dataset with updated "**Total Spent**" values.
  - A list of rows flagged as "Unresolvable."

(Question 1 contd.)

# [DSC-B] Question 1 – Data Analytics – 10 marks

## page 3 of 3

- Using the cleaned dataset from the previous task, identify the top 3 items with the highest total spending across all transactions.
- Create a pie chart for these top 3 items.

# Expert Systems

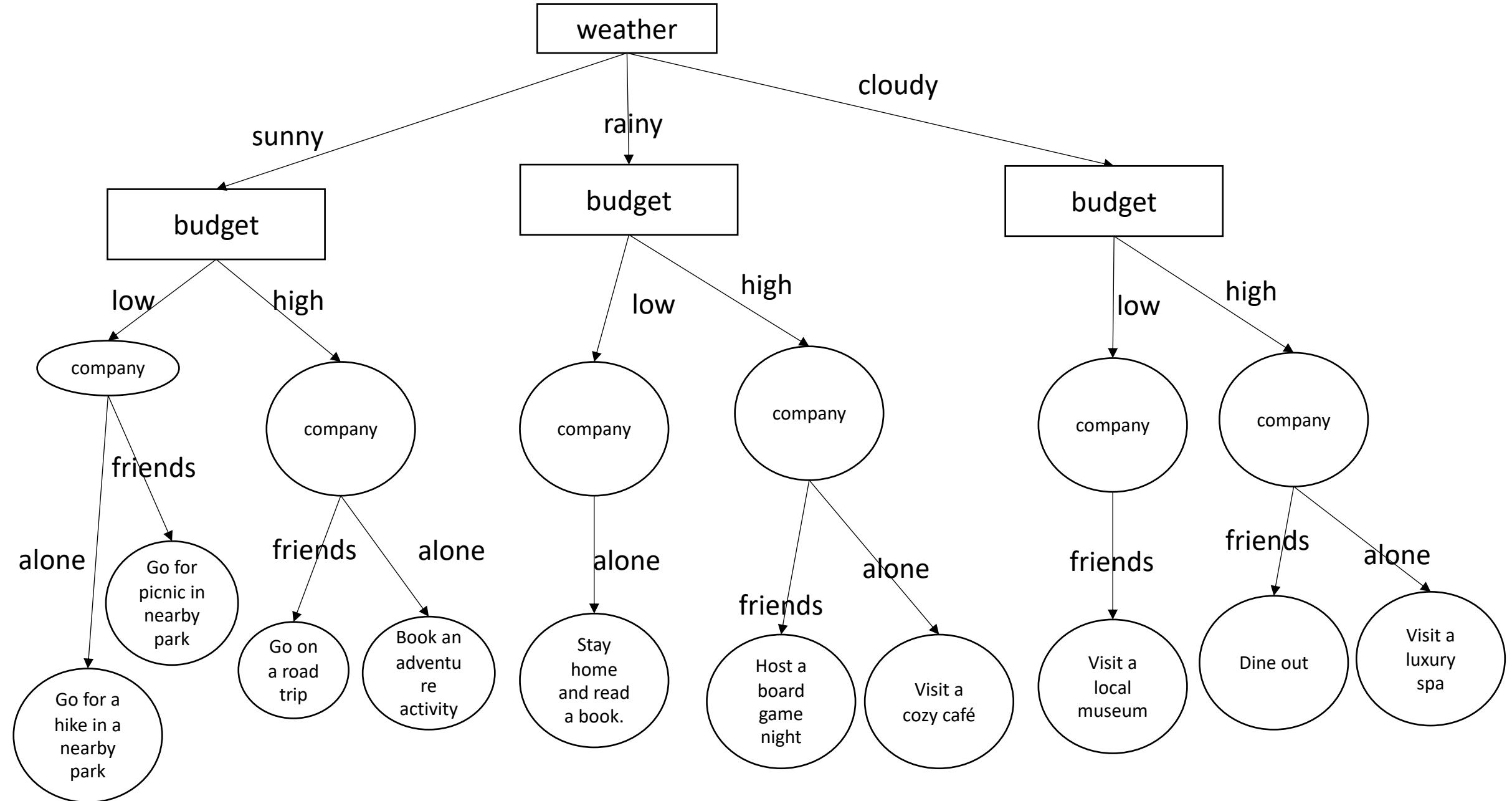
Question 2

# [DSC-B] Question 2 – Expert Systems – 10 marks

page 1 of 4

- You will use a colab or jupyter notebook for this question
- You can also program on your local machine
- Develop an expert system to model the following weekend-activity recommendation system

# [DSC-B] Question 2 – page 2 of 4



# [DSC-B] Question 2 – Expert Systems – 10 marks

page 3 of 4

- Run the code with the following input and print results
- If the last digit of your 8-digit matriculation no. is an even number:
  - Activity with friends on a rainy day with high budget
- If the last digit of your 8-digit matriculation no. is an odd number:
  - Activity alone on a sunny day with low budget

# [DSC-B] Question 2 – Expert Systems – 10 marks

page 4 of 4

- Re-run the code with the appropriate input so that the Expert system does not suggest any activity – in this case, update your code for the output to be „no suggestion“
- Please share the link to the notebook:  
[https://docs.google.com/spreadsheets/d/1SRPbsfTIVaqF\\_QYDD\\_pA4sIX9iouGJN8rVuMEB039CE/edit?usp=sharing](https://docs.google.com/spreadsheets/d/1SRPbsfTIVaqF_QYDD_pA4sIX9iouGJN8rVuMEB039CE/edit?usp=sharing)

# ChatGPT for Decision Support

Question 3

# [DSC-B] Question 3 – ChatGPT – 10 marks

page 1 of 3

- Login to chatgpt (or equivalent tool) and follow the instructions below for interaction

# [DSC-B] Question 3 – ChatGPT – 10 marks

## page 2 of 3

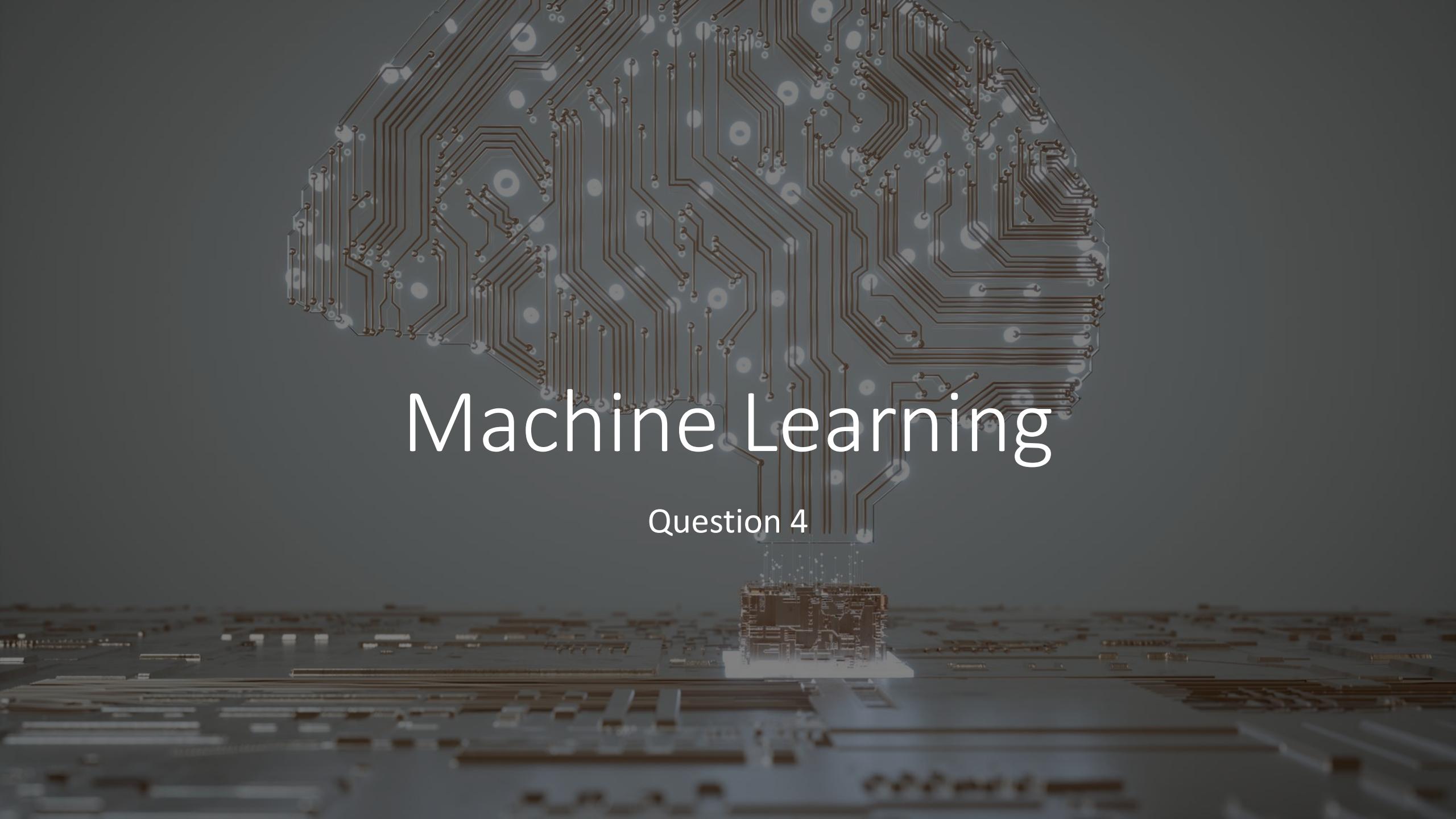
- Copy the Expert System code you wrote in Question 2 (page3) and ask ChatGPT to generate the output. Please ensure that it gives explanation about the inputs, output and the rules.
- If the answer is not correct, guide the gpt to the right answer.
- Next, use the same input that you picked in Question 2 (page 4) that led to “no suggestion”
- Ask ChatGPT to update the code so that it suggests an appropriate recommendation instead of “insufficient info”. Iterate to ensure the suggestion makes sense and doesn’t repeat other solutions.
- Run the code to verify it works.

# [DSC-B] Question 3 – ChatGPT – 10 marks

## page 3 of 3

- Please ensure that you share the link to the chat in the submission sheet:

[https://docs.google.com/spreadsheets/d/1SRPbsfTlVaqF\\_QYDD\\_pA4sIX9iouGJN8rVuMEB039CE/edit?usp=sharing](https://docs.google.com/spreadsheets/d/1SRPbsfTlVaqF_QYDD_pA4sIX9iouGJN8rVuMEB039CE/edit?usp=sharing)



# Machine Learning

Question 4

# [DSC-B] Question 4 – Machine Learning – 10 marks

page 1 of 3

- You will use a colab or jupyter notebook for this question
- You can also program on your local machine

# [DSC-B] Question 4 – Machine Learning – 10 marks

## page 2 of 3

- We will train a classifier for a 2-input Xor gate. Please copy the following code in a code cell. Please ensure it is running without any syntax errors:

```
from sklearn.tree import DecisionTreeClassifier

# XOR gate
X = [
    [0., 0.],
    [0., 1.],
    [1., 0.],
    [1., 1.]
]
y = [0, 1, 1, 0]

# Configure and train the Decision Tree
clf = DecisionTreeClassifier(max_depth=1, random_state=42)
clf.fit(X, y)

# Predictions
print(clf.predict([[0.5, 0.5]]))
print(clf.predict([[1.0, 0.0]]))
print(clf.predict([[0.2, 0.8]]))
print('Code executed successfully')
```

# [DSC-B] Question 4 – Machine Learning – 10 marks

## page 3 of 3

Based on this code, answer the following questions:

- i. Is the predicted output correct? If not, please specify the correct output.
- ii. Update the code to set `max_depth=2`. Does this improve the model's ability to classify the XOR dataset? Explain your answer.
- iii. Find the minimum value of `max_depth` where the tree can perfectly classify the XOR data.
- iv. Which criterion is being used to split the nodes by default? Update the code to use `criterion='entropy'` and re-run the predictions.
- v. Compare the performance of the tree with original code vs your changes in terms of handling XOR logic. What are the key insights?

# ML - Video Recording

Question 5

# [DSC-B] Question 5 – ML-Video – 10 marks

## page 1 of 2

- In this question you'll record a video of yourself and your screen and answer the following questions
- Please limit your answer to 1-3 minutes
- Please save the video either in your teams folder or upload at a place of your choice and paste the link in the sheet:  
[https://docs.google.com/spreadsheets/d/1SRPbsfTIVaqF\\_QYDD\\_pA4sIX9iouGJN8rVuMEB039CE/edit?usp=sharing](https://docs.google.com/spreadsheets/d/1SRPbsfTIVaqF_QYDD_pA4sIX9iouGJN8rVuMEB039CE/edit?usp=sharing)

# [DSC-B] Question 5 – ML-Video – 10 marks

## page 2 of 2

- In 1-2 sentences describe your dataset and the motivation behind picking it
- Explain the model trainings that you did:
  - How much was initial accuracy and how much was the accuracy of your best model? What configurations contributed to the improvement?

# Agents

Question 6

# [DSC-B] Question 6 – Agents – 10 marks

## page 1 of 2

- Give the PEAS for the given agent. For the environment, please also provide the following information:
  - Fully Observable & Partially Observable
  - Episodic & Sequential
  - Static & Dynamic
  - Discrete & Continuous
  - Deterministic & Stochastic
- Write the solution in a google/MS-Word doc and ensure the link is mentioned in the submissions sheet.

# [DSC-B] Question 6 – Agents – 10 marks

## page 2 of 2

- Refer to the last digit of your 8-digit matriculation no. and attempt the following:
- 0-1: voice assistant like siri and alexa
- 2-3: elevator system
- 4-5: health monitoring smart watch like fitbit
- 6-7: chatbot like chatgpt
- 8-9: autonomous car

Wind up and Submit

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