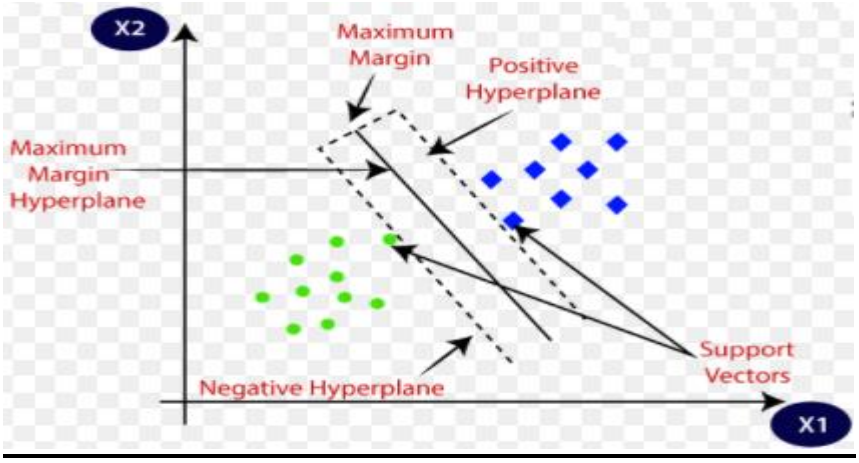
Comp 428 Machine learning and analytics

CAT II

a) A 4 - input neuron has weight 1 2 3 4 , The transfer function is linear with constant proportionality of 2 , the inputs are , 4, 10 , 5 and 20, Calculate the output (4**Marks**)

b) Identify the machine learning technique and explain how they work (4**Marks**)



c) Discuss FOUR categories of machine learning algorithms (8**Marks**)

d) A transformer model is a type of deep learning model originally introduced in the paper "**Attention Is All You Need**" by Vaswani et al. in 2017. Transformers have since become the foundation for many state-of-the-art natural language processing (NLP) and machine learning models, including BERT, GPT, and more. Using a diagram describe the architecture of the transformer model **(5 Marks)**

e) Menengai police station in Rongai County- Nakuru often rely on manual description methods to help witnesses and victims of crimes construct likenesses of faces from memory. These 'face composites' are typically circulated to law enforcement officers and made accessible to the public in the hope that someone familiar with the depicted person will recognize their likeness and thus provide the police with a suspect. As an AI expert you been tasked by this law enforcement agency to develop an algorithm for them to automate this process.

i) Design a general face composite construction algorithm **(4 Marks)**

ii) Explain how you will determine the fitness score for your algorithm **(2 Marks)**

f) A patient has been suffering from shortness of breath (called dyspnea) and visits the doctor, worried that he has lung cancer. The doctor knows that other diseases, such as tuberculosis and bronchitis are possible causes, as well as lung cancer. She also knows that other relevant information includes whether or not the patient is a smoker (increasing the chances of cancer and bronchitis) and what sort of air pollution he has been exposed to. A positive X-Ray would indicate either TB or lung cancer.

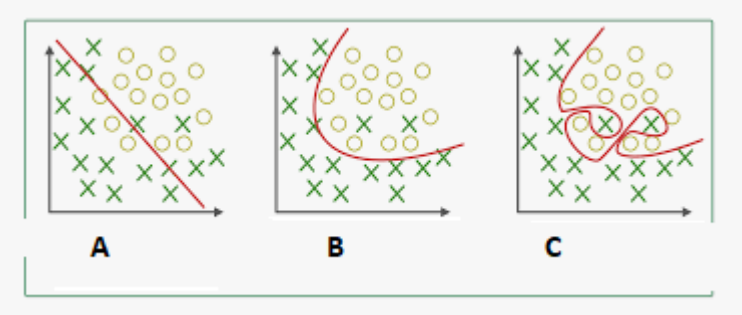
i) What are the nodes, names to represent and what values can they take? (4**Marks**)

ii) Prepare a conditional probability table (CPT) for the above scenario (4 **Marks**)

g) Describe the use of ReLu activation function (2**Marks**

h) Using python programming demonstrate how you can Split the dataset into training and Testing set (4**Marks**)

Data fitting is the process of fitting models to data and analyzing the accuracy of the fit. Engineers and scientists use data fitting techniques, including mathematical equations and nonparametric methods, to model acquired data. Identify and explain the following data fitting models(6**Marks**)



i) Using python programming demonstrate how to:-

i) Split the dataset into training and Testing set (3**Marks**)

ii) Load data set on a notebook (3**Marks**)

j) Explain the importance of the following libraries (8**Marks**)

i. Numpy
ii. Python
iii. Tensorflow
iv. Sklearn