**Question 1**

Describe the use of Machine Learning, if any, in the following computer systems, clearly identifying and explaining whether it is supervised, unsupervised, semi-supervised, reinforcement learning or a combination of two or more of them:

1. A coin classification system for a vending machine based on exact coin specifications from the U.S. Mint. The vending machine uses a statistical model of the size, weight, and denomination to classify coins.
2. Detection of violence from surveillance camera feeds.
3. Detection of disease re-emergence based on past observations and present conditions.
4. Identifying newer plant diseases based on leaf images.
5. Strategized Chess-playing by playing repeatedly and adjusting the strategy by penalizing moves that eventually lead to losing.

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**Question 2**

a. Using scikit-learn’s linear regression, compute the Mean Squared Error for the Boston House Prices dataset that comes with sklearn. Use all the features of the dataset (Multiple Linear Regression) for the purpose. Please feel free to refer to the following tutorial for guidance:

<https://scikit-learn.org/stable/auto_examples/linear_model/plot_ols.html>

b. Do the same using H2O package (instead of scikit-learn) for the same Boston House Prices dataset. Please feel free to refer to <https://www.h2o.ai/wp-content/uploads/2018/01/GLM-BOOKLET.pdf> for details.

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**Question 3**

a. Assume we have only two features in our training dataset that is already classified into class C1 and class C2. The transposes of the feature vectors are given below for each class:

C1: [2 6], [1 1], [3 4], [3 2], [-4 8], [-1 3], [2 2]

C2: [-5 -7], [-2 -3], [-1 -2], [3 -7], [1 -3]

Giving details and derivations, determine the

1. number of support vectors from each class
2. the support vectors
3. the equation of the hyperplanes (straight lines in this case) defining the sides of the margin
4. length of the maximum margin
5. equation of the maximum margin linear classifier. You do not necessarily have to solve this programmatically (equivalent of paper and pen handwork is fine).

b. Follow the tutorials on SVM at

<https://chrisalbon.com/machine_learning/support_vector_machines/find_support_vectors/> and <https://towardsdatascience.com/breast-cancer-classification-using-support-vector-machine-svm-a510907d4878>

After thoroughly reading the tutorials, without referring to them, write your own python code to list the support vectors, their indices, and the number of support vectors in each class of the breast cancer dataset.

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**Question 4**

a. MLOps: Please try the tutorials at <https://docs.microsoft.com/en-us/azure/machine-learning/> for one of the above programming exercises. Provide the documentation in the form of screenshots and other evidence. List your top 5 takeaways from your MLOps experience.

CAUTION: Make sure that you do not exceed the Free tier allowances.

b. Learn about an ML Researcher's work and get inspired: Check out the work and thoughts of Prof. Pedro Domingos on Google Scholar at <https://scholar.google.com/citations?hl=en&user=KOrhfVMAAAAJ&view_op=list_works&sortby=pubdate>, YouTube <https://www.youtube.com/results?search_query=pedro+domingos>, Twitter @pmddomingos, and generally on the Internet.

List the top 5 questions you have for him for a chance to get answers directly from him