# **CVI620 – Assignment 2**

Summer 2025

| Total Mark: | 7.5 marks (7.5% of the total course grade) |
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| Submission file(s): | * Python files for train and inference * Assignment2.docx (this document with some sample tests) |
| Deadline | * July 28th, 2025 |

If you are unable to complete the assignment on-time for any legit reason, please provide documentation explaining your absence (e.g., an appointment confirmation or a work letter).

Please submit the submission file(s) through Learn@Seneca. Make sure to use GitHub and provide the link to your GitHub account for all your contributions in the box below:

|  |  |
| --- | --- |
| Project GitHub repository: |  |

**Please attach some of your test images along with any required explanations in this document.**

1. In Folder Q1, there is a dataset in which we aim to estimate the house price using two features: the number of bedrooms and the basement area.

Use Multiple Linear Regression for this task. Display the coefficients of the model and calculate the MAE (Mean Absolute Error) and MSE (Mean Squared Error). Search about RMSE (Root Mean Squared Error) and explain the trade-offs between these metrics. Finally report RMSE score of your model.

Perform this task using both LinearRegression and SGDRegressor.

Additionally, study the MAPE (Mean Absolute Percentage Error) metric using [this link](https://scikit-learn.org/stable/modules/generated/sklearn.metrics.mean_absolute_percentage_error.html), and apply it to evaluate your model.

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Both models produced similar. Results on the test data. The SGD Regressor had better metrics, but the difference was slight. RMSE for both of the models was $92,700–$92,800, this indicate that predications deviate from actual prices by the calculated amount on average. The MAPE shows the model averages predication error which is around 17% of the true price. However, this percentage is acceptable given the simplicity model and limited data.

1. For the Cat and Dog dataset provided in the Q2 folder, perform classification using all the methods you know and try to achieve the best possible result. Compare the algorithms carefully and tune the parameters so that the best result can be obtained.

Save the trained model and test it on several images from the internet. Was the model able to correctly predict the images?

I initially trained a CNN from scratch for 10 epochs using the training images and achieved a test accuracy of **60%.** Which was a low test accuracy, hence I increased it to 30 epochs and got 70%, improvement but I still wanted more accuracy, hence I changed it to 35 which had increased it to 80%.

I tested the trained model on an internet image of a Chihuahua, golden retriever and. The model predicted **"Dog" with 55% confidence when testing the chihuahua image**. The low confidence suggests the model was unsure, likely due to the visual similarity between small dogs and cats. The image for the Maine coon cat although correctly predicted as “Cat”, still had a low confidence of 53%.However, the picture with the golden retriever got a confidence of 100%, this further consolidate that images with smaller dog and cats has a lower confidence rate due to their feature’s similarities. With further training and better augmentation, accuracy could be improved.

A screenshot of a cat

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1. A screenshot of a computer screen

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   AI-generated content may be incorrect.The MNIST dataset is one of the most well-known datasets in the field of image processing. It contains 60,000 images related to handwritten digits from 0 to 9 and is provided as a CSV file in the Q3 folder. In this file, each image is represented as a flattened vector. Classify this dataset using different methods and try to achieve at least 90% accuracy.

I have used5 different models on the MNIST dataset: Keras MLP, KNN, SVM, Random Forest and Logistic Regression. All models achieved around 90% and higher accuracy. Out of all the models, it seems that MLP keras has the best overall performance with an accuracy of 97% and the lowest was logistic regression although it was fast.

1. MLP (KERAS) – 97.5%
2. Random Forest – 94.8%
3. SVM – 93.5%
4. KNN – 90.9%
5. Logistic Regression- 90.0%