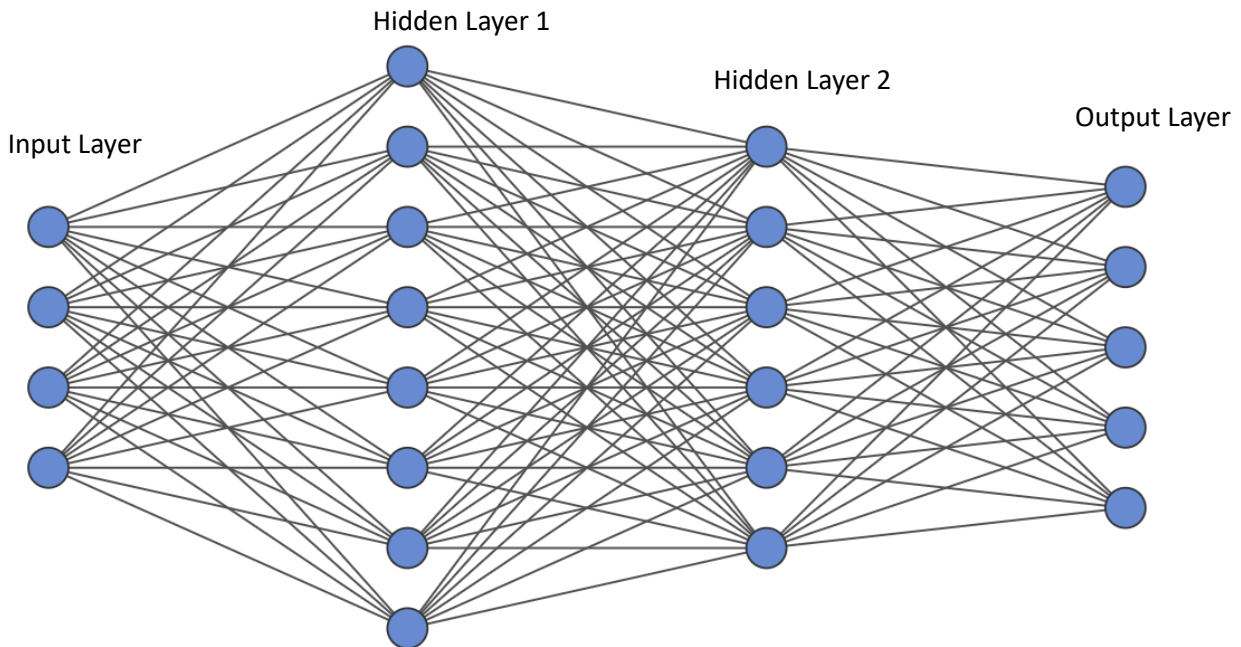


# CSCI-561: Foundations of Artificial Intelligence

## Assignment-3: Report

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### 1. Architecture



Basic Network Architecture as described above has an input layer, 2 hidden layers and an output layer.

### 2. Data Prep

On analysis of data, we could find out that there were **5 numerical features** which could be used namely **Price, Bath, Property sqft, Latitude** and **Longitude**. Few features were merely categorical and few quite not categorical.

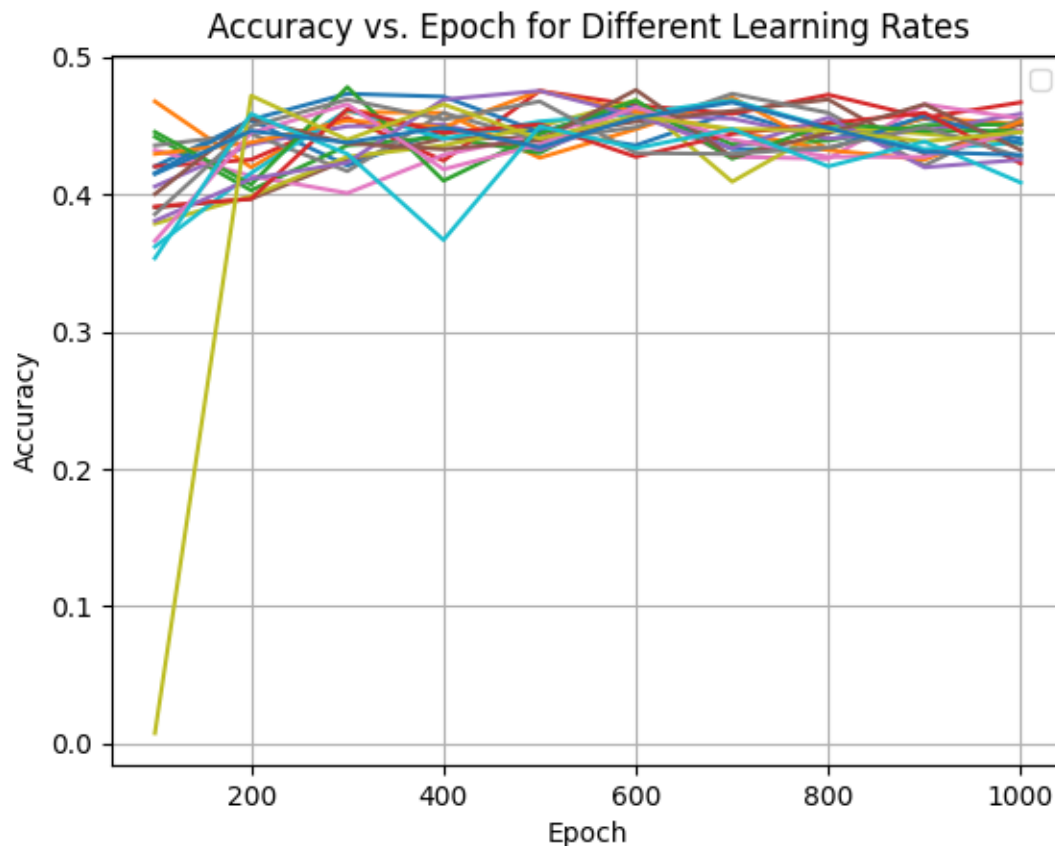
Due the presence of Categorical data and them being text fields, we must encode them so that they can be used for training. **Categorical data** which were chosen to be encoded for this purpose were **TYPE, LOCALITY, SUBLOCALITY, ADMINISTRATIVE\_AREA\_LEVEL\_2**.

The fields were encoded using **one hot encoding** method.

Additionally, after the above transformation, fields except Latitude and Longitude are **normalized**.

### 3. Hyper Parameter Tuning

Initial analysis started with varied range of learning rates and epochs ranging from 100 – 1000 in increments of 100. 1000 epochs yielded the best training accuracies and test accuracies for the model developed. So further on selection of epoch as 1000 further analysis were done as summarized further.

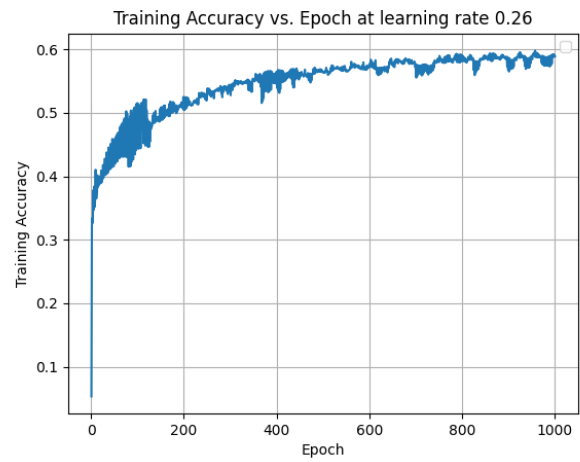
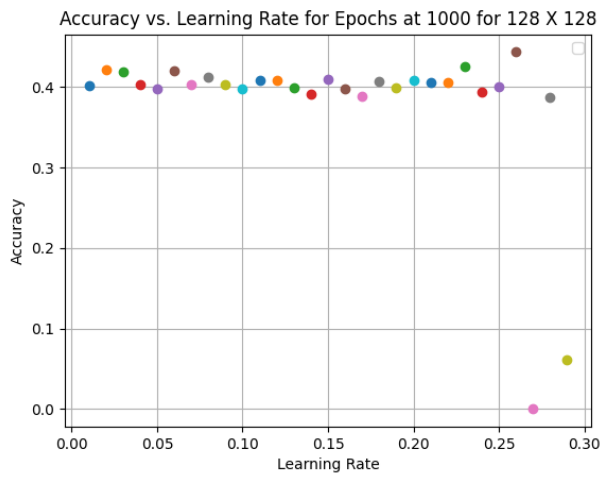


Analysis was performed on the following sets where **size\_1 X \_size\_2** defines **number of neurons in hidden layer 1 and hidden layer 2** respectively over a range of learning rates from 0.01 to 0.30:

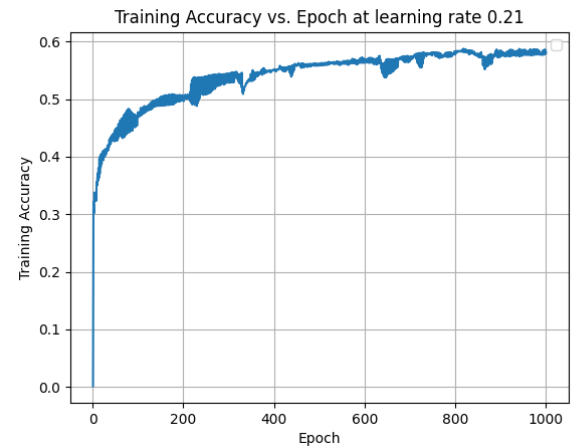
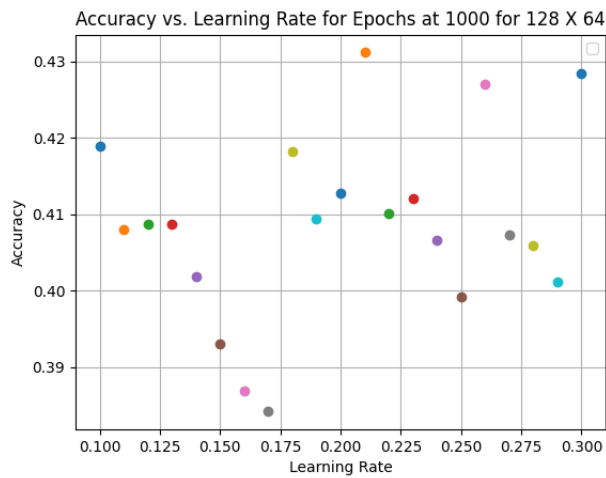
- i. 128 X 128
- ii. 128 X 64
- iii. 64 X 64
- iv. 64 X 32
- v. 32 X 32

The results are as follows:

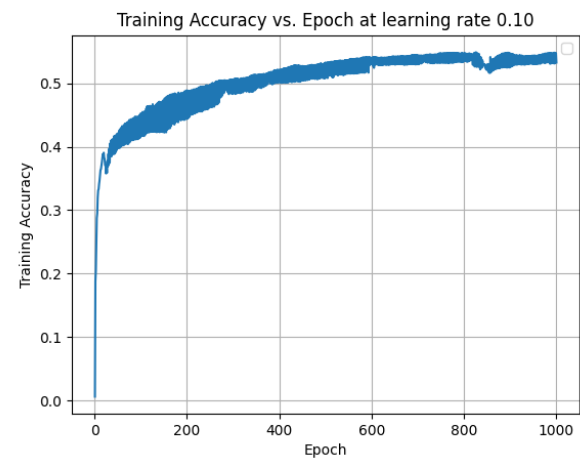
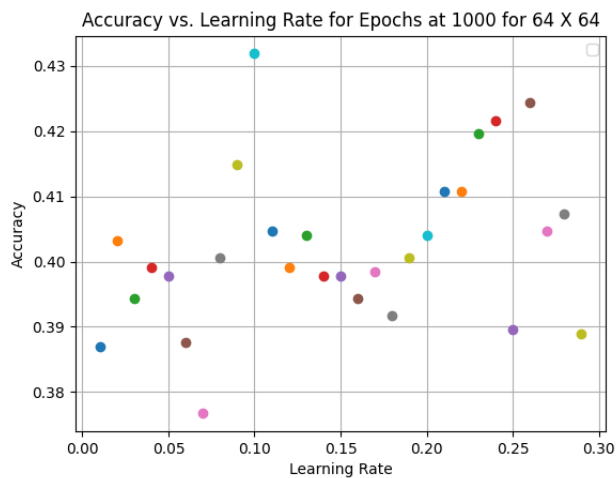
**i. 128 X 128**



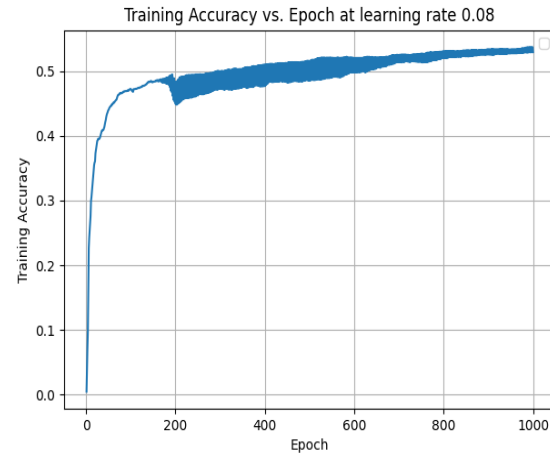
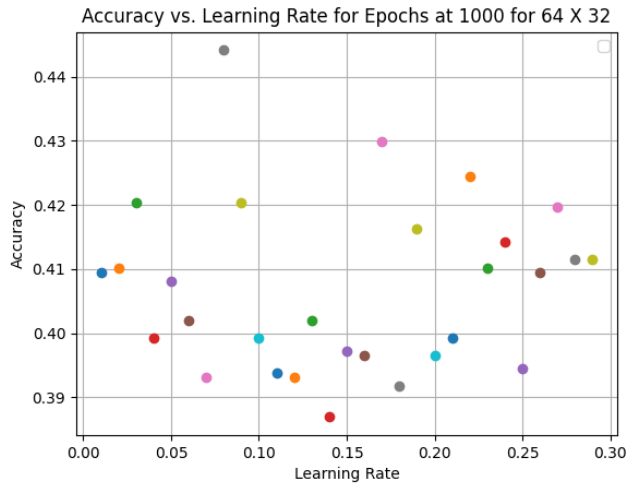
**ii. 128 X 64**



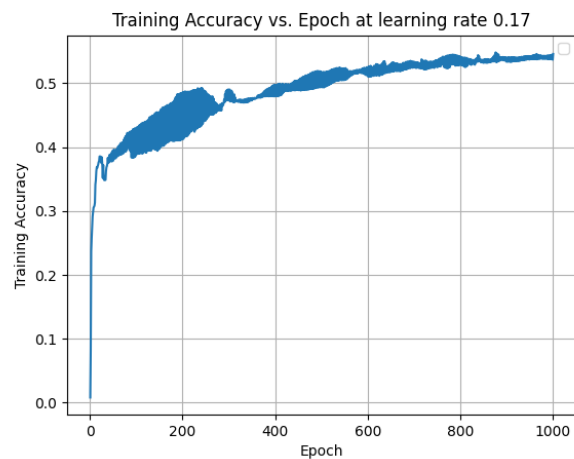
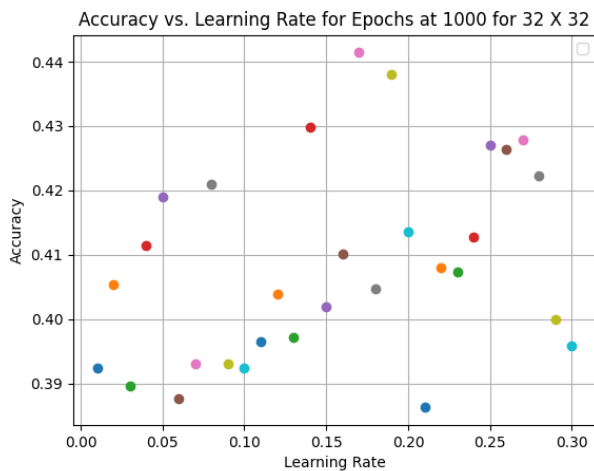
**iii. 64 X 64**



#### iv. 64 X 32

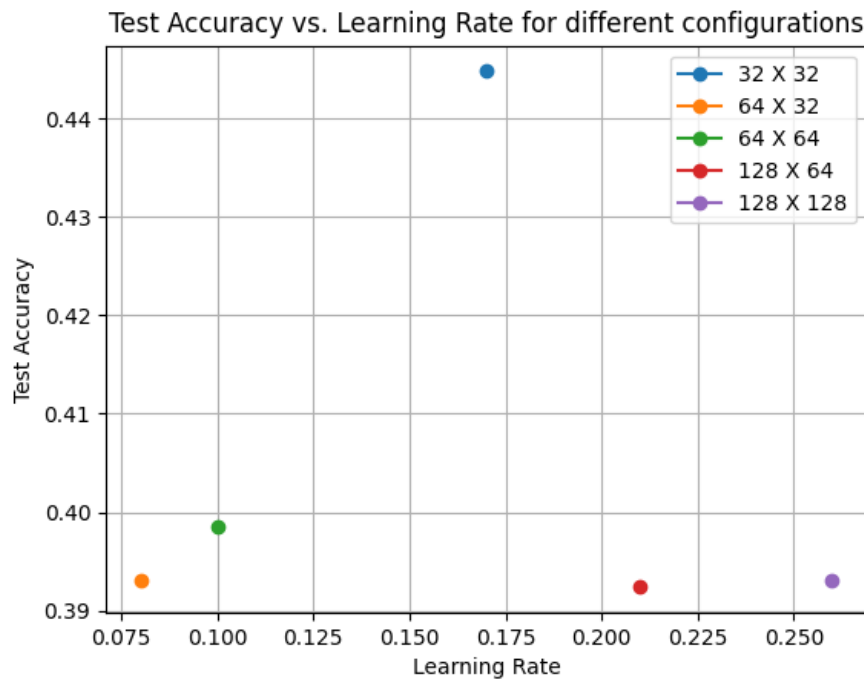


#### v. 32 X 32

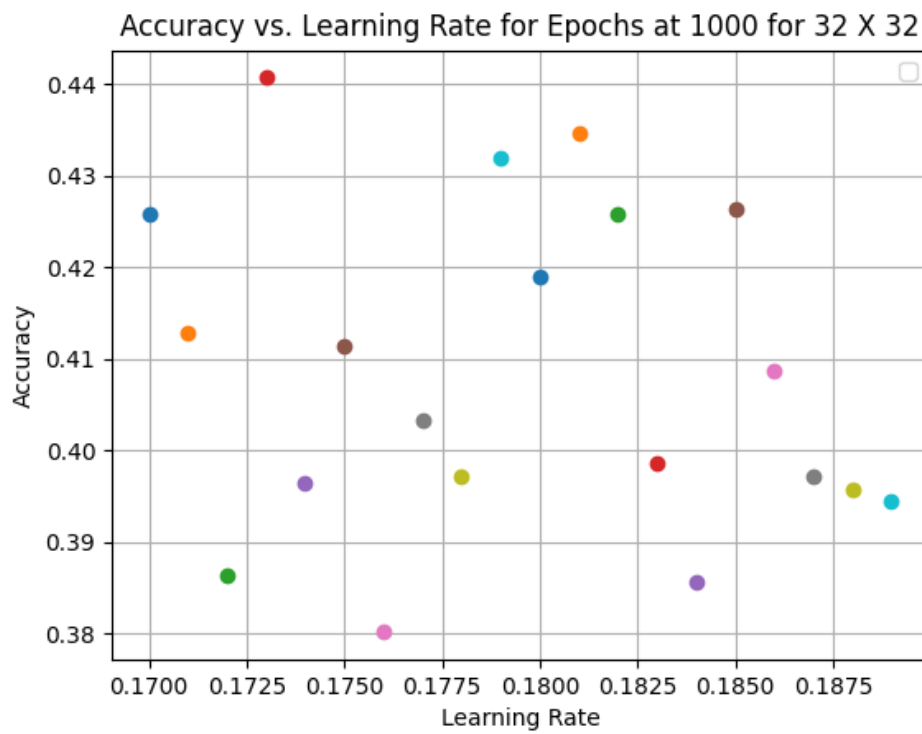


On each configuration the model was tested for a range of learning rates. The left graphs above represent the plot between accuracy and learning rates. The right graphs depict the training accuracy against 1000 epochs.

Based on the above graphical observations best training accuracies are observed at **128 X 128, 128 X 64, and 32 X 32** neuron configurations. To narrow down the **best testing accuracies** was plotted against the **best learning rate** of each configuration as **below**:



Since 32 X 32 config gives the best testing accuracy. Further testing was performed to find the best learning rate between **0.170 to 0.190** where the test accuracies were higher.



#### 4. Final Parameters Based on Tuning

Based on the observations and multiple testing I arrived at the best final configuration for my model which as below:

Hidden Layer 1 Size: **32**

Hidden Layer 2 Size: **32**

Number of Epochs: **1000**

Learning Rate: **0.173**

Furthermore, this configuration was applied on vocareum. On relative grading on scoring, **0.170** and **0.180** tends to score better. Hence the learning rate was set to **0.180**.