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# Fruit Image Recognition

CS 412 - Fall 2017/2018 - Project

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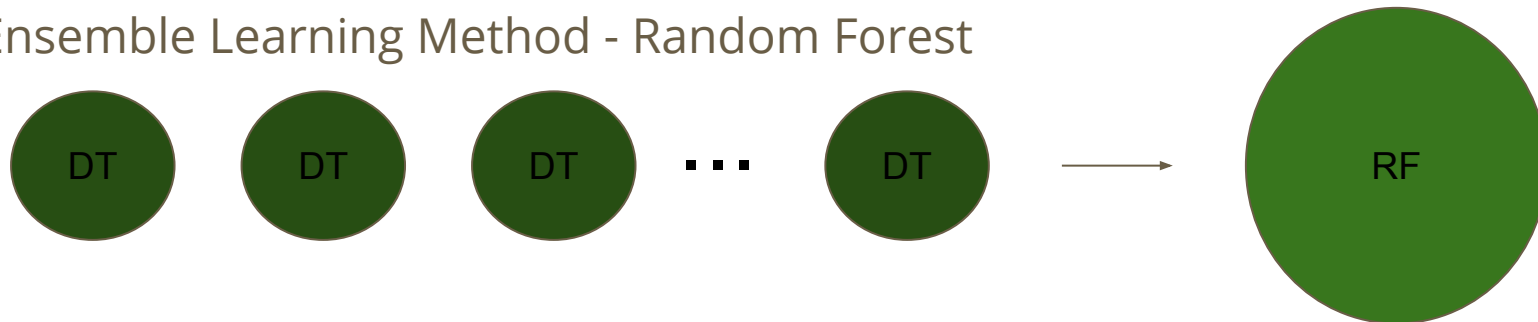
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# Data Analysis and Pre-Processing

- Discarding Latitude & Longitude - N/A Values in %58 of the data.
- Discarding Date - Relationship with Latitude & Longitude.
- Feature Importance - Feature & Label Correlation
  - Extra Tree Classifier - Rank Importance
  - Correlation Matrix
- '104' classes problem - Initial trials vs. Final models
  - Discarding Ones & Test Train Split vs. Duplicating Ones & Stratified Shuffle Split
- Differences of feature values between Train and Test data.
  - Mean & Max of Test Data = 1.4232 & 101.3616
  - Mean & Max of Train Data = 12951.414 & 1080286
- Rescale the features - between [0 , 1]

# Random Forest Model

- Decision Tree
  - Base Model - 25% Accuracy on Validation Set
  - Overfitting Problem
- Ensemble Learning Method - Random Forest

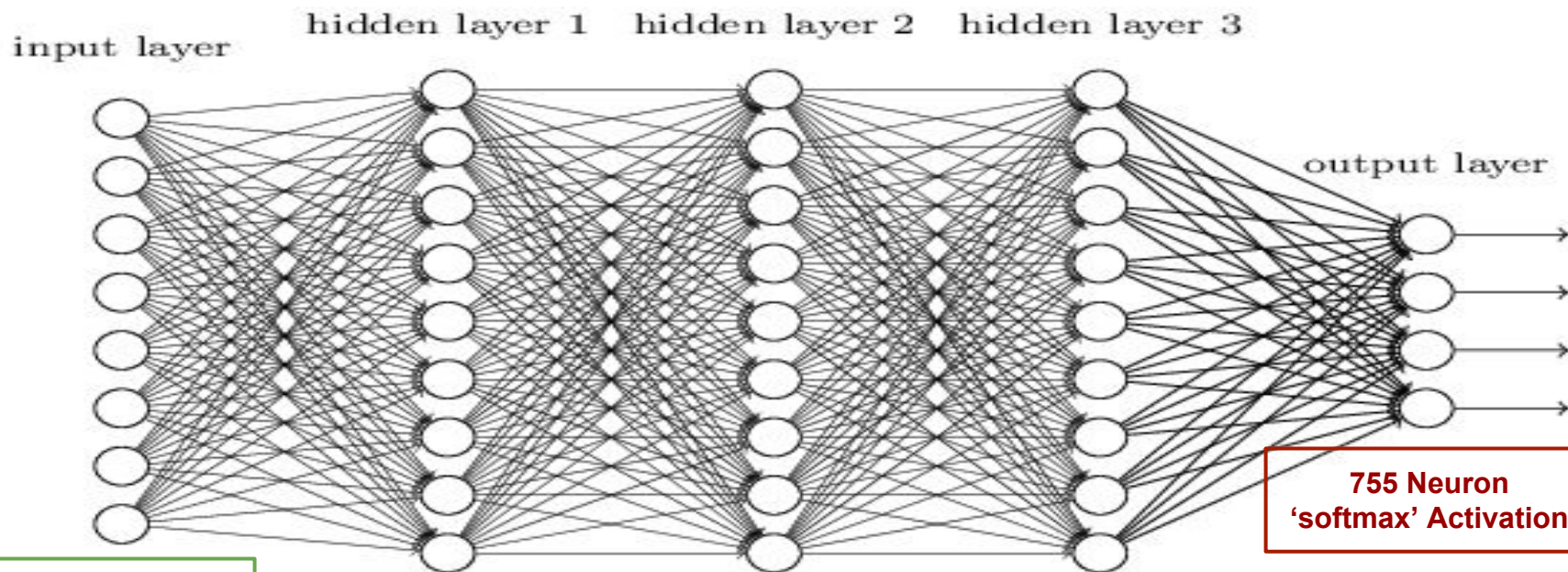


- Bagging
- Gini Purity vs Entropy
- 5-Fold Cross Validation → ~65% Accuracy on Validation Set

# Boosting Random Forest

- Fastest way to achieve high accuracy with random forest
  - Large number of trees - linear time complexity
  - Small number of features per tree - nonlinear
  - $(\text{Feature per tree}) \times (\text{Tree \#}) \geq (\text{Total feature count})$
  
- Improving with AdaBoost
  - Multiple random forests
  - Time / resource requirements as # of estimators change
  - ~69 - 70% accuracy, cross validation with 5 folds

# Neural Network Model



Batch Size: 32  
Input Dim: 1024

1024 Neuron  
Batch Normalization  
'elu' Activation

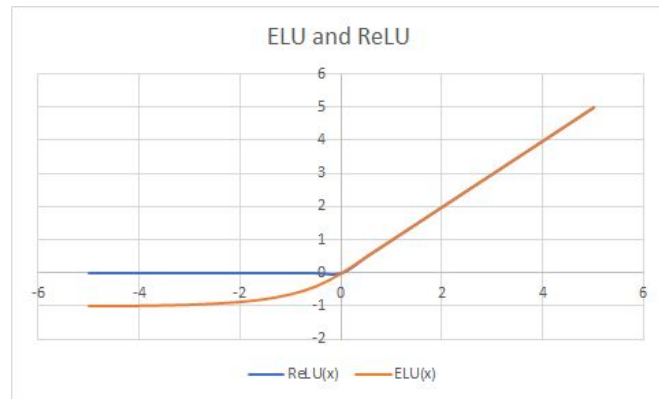
512 Neuron  
Batch Normalization  
'elu' Activation

256 Neuron  
Batch Normalization  
'elu' Activation

755 Neuron  
'softmax' Activation

# Neural Network Model

- Python - Keras Library
- Adam optimizer - first-order gradient-based stochastic optimization
- 'elu' - Exponential Linear Unit
- 50 epoch
  
- Choose argmax of output layer for class prediction - softmax
- ~73 - 74% accuracy on validation set



**Thank you**

**QUESTIONS?**