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

- **Input Dim**: 1024
- **Batch Size**: 32
- **Hidden Layer 1**: 1024 Neuron, Batch Normalization, 'elu' Activation
- **Hidden Layer 2**: 512 Neuron, Batch Normalization, 'elu' Activation
- **Hidden Layer 3**: 256 Neuron, Batch Normalization, 'elu' Activation
- **Output Layer**: 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?