# Progress Update

Hurricane Wind Speed Prediction Using Deep Learning and Machine Learning

# Milestones

- **October 19:** Completing of preparation of images for baseline model and implementation and initial results of baseline model.

- **November 2:** Hyperparameter Tuning results for baseline model. Completion of preparation of images for pre-trained models (converting single-band images to RGB images based on timestep).

- **November 16:** Completion of pre-trained model training, hyperparameter tuning.

- **November 30:** Training classifier and constructing a pipeline for the proposed architecture.

- **December 14:** Model evaluation and Performance Comparison. Completion of Final Report.

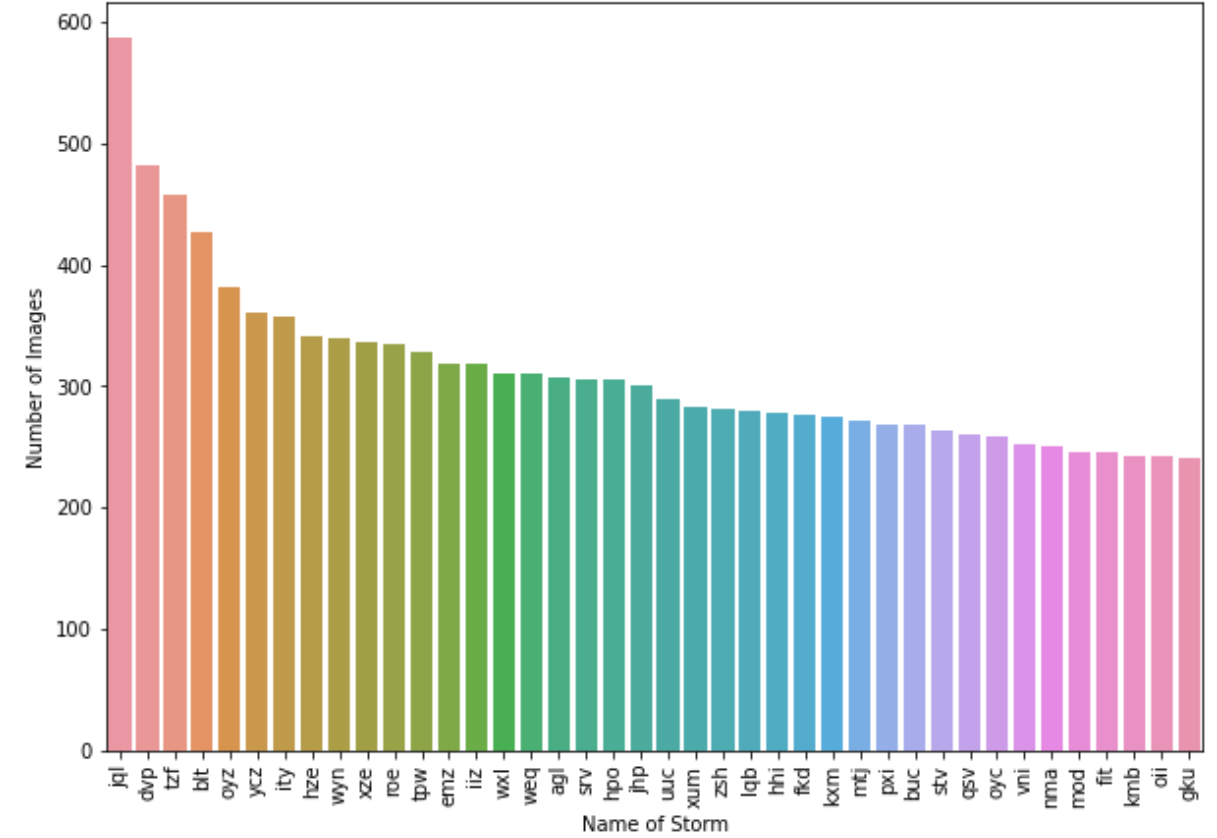# Train v/s Validation data distribution
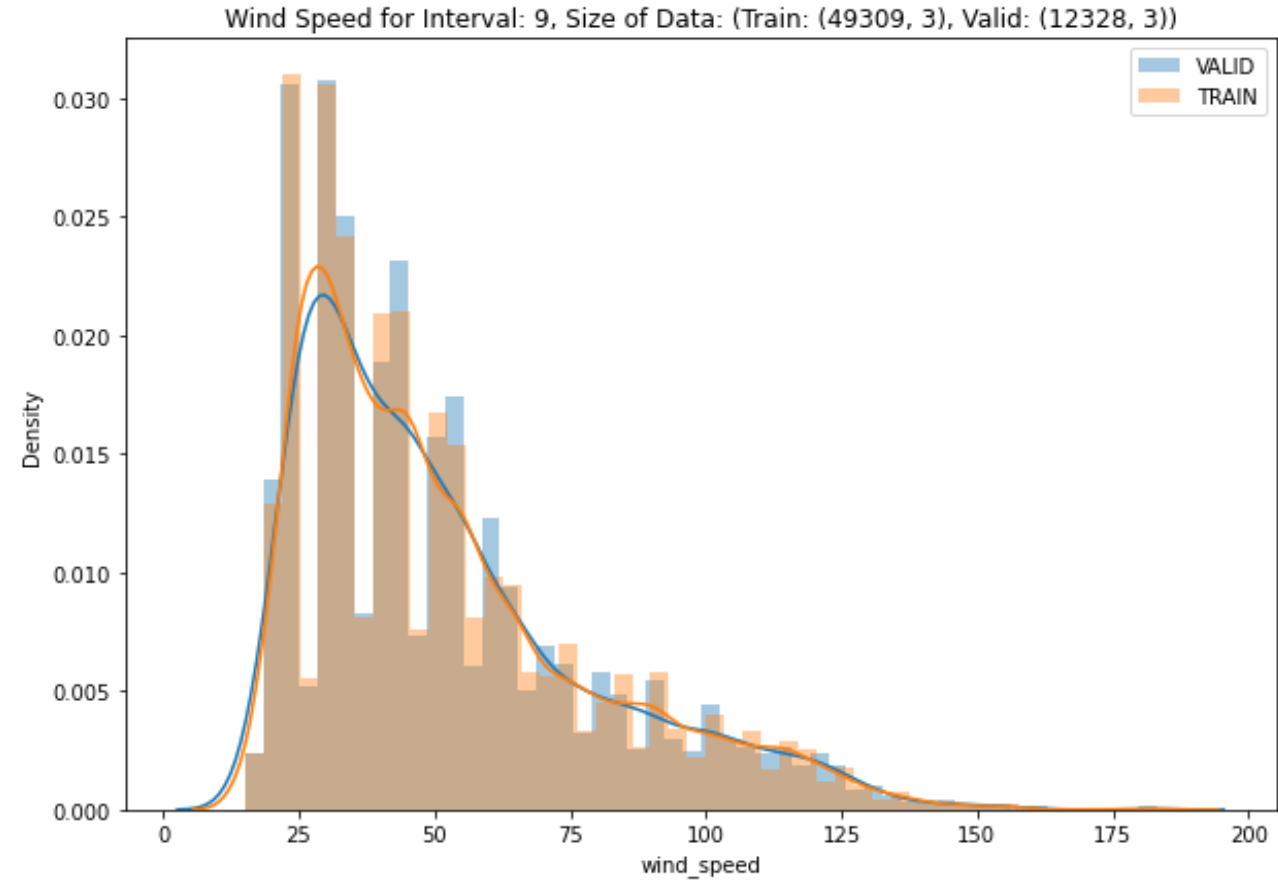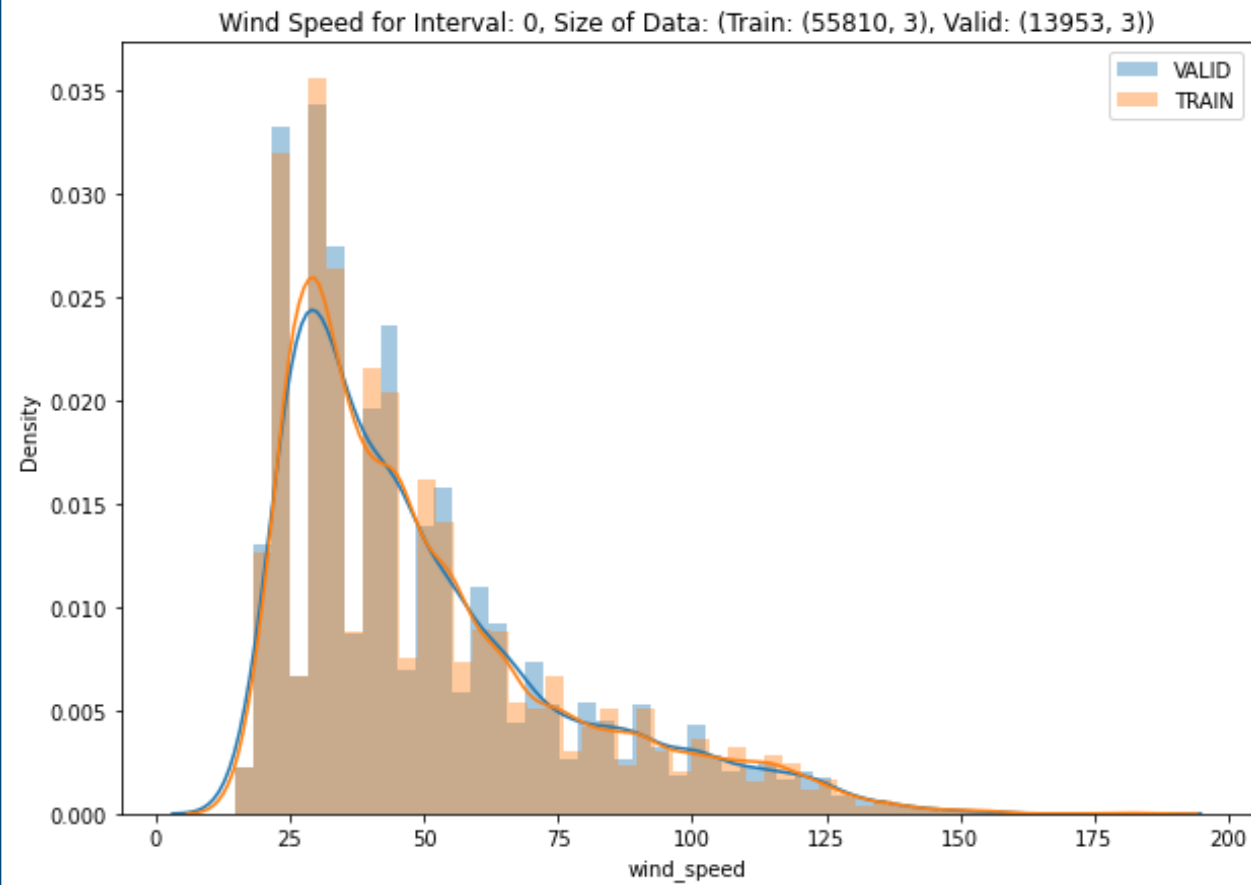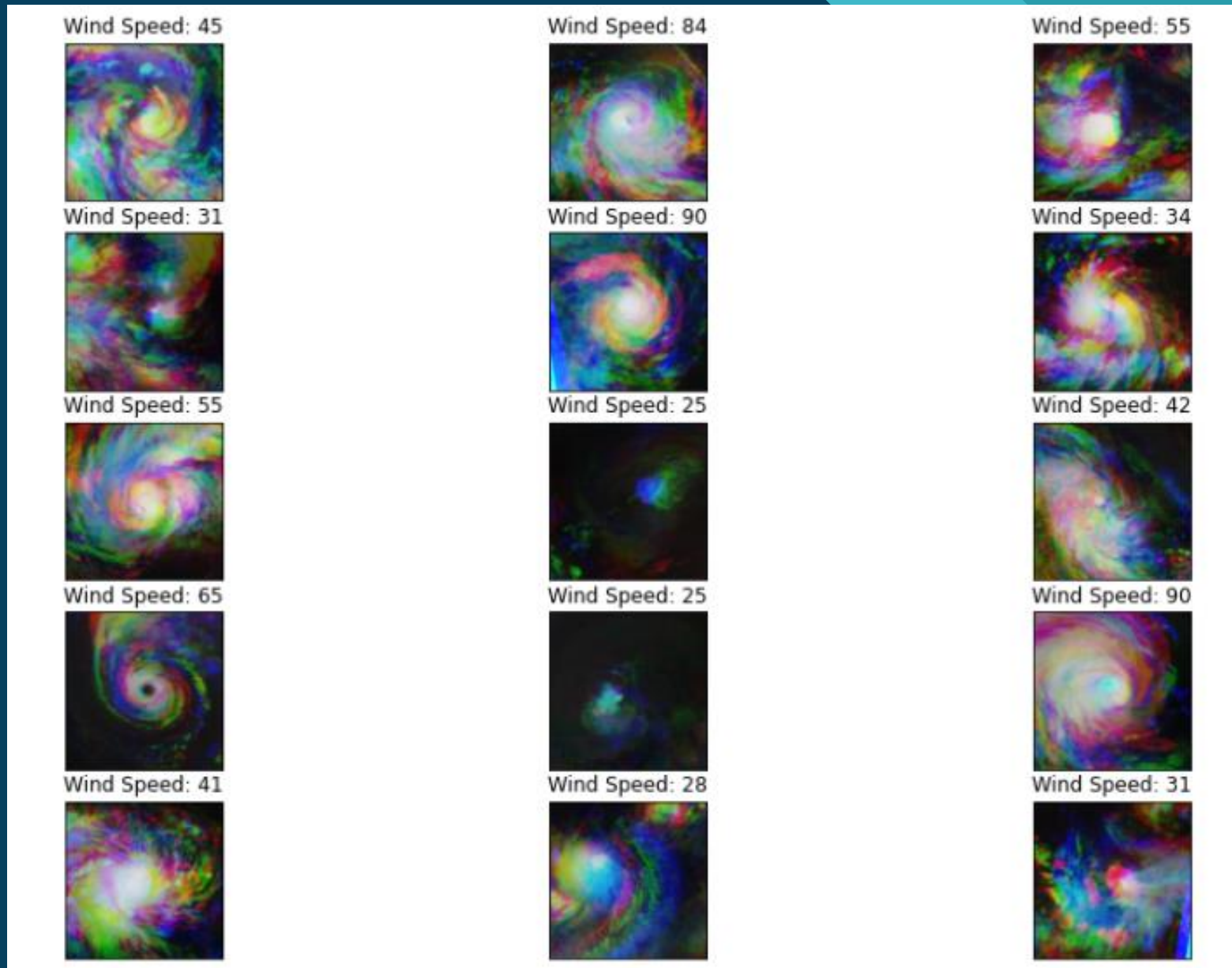
# Data Distribution



Number of Images for the Top 40 Storms (Train Set)
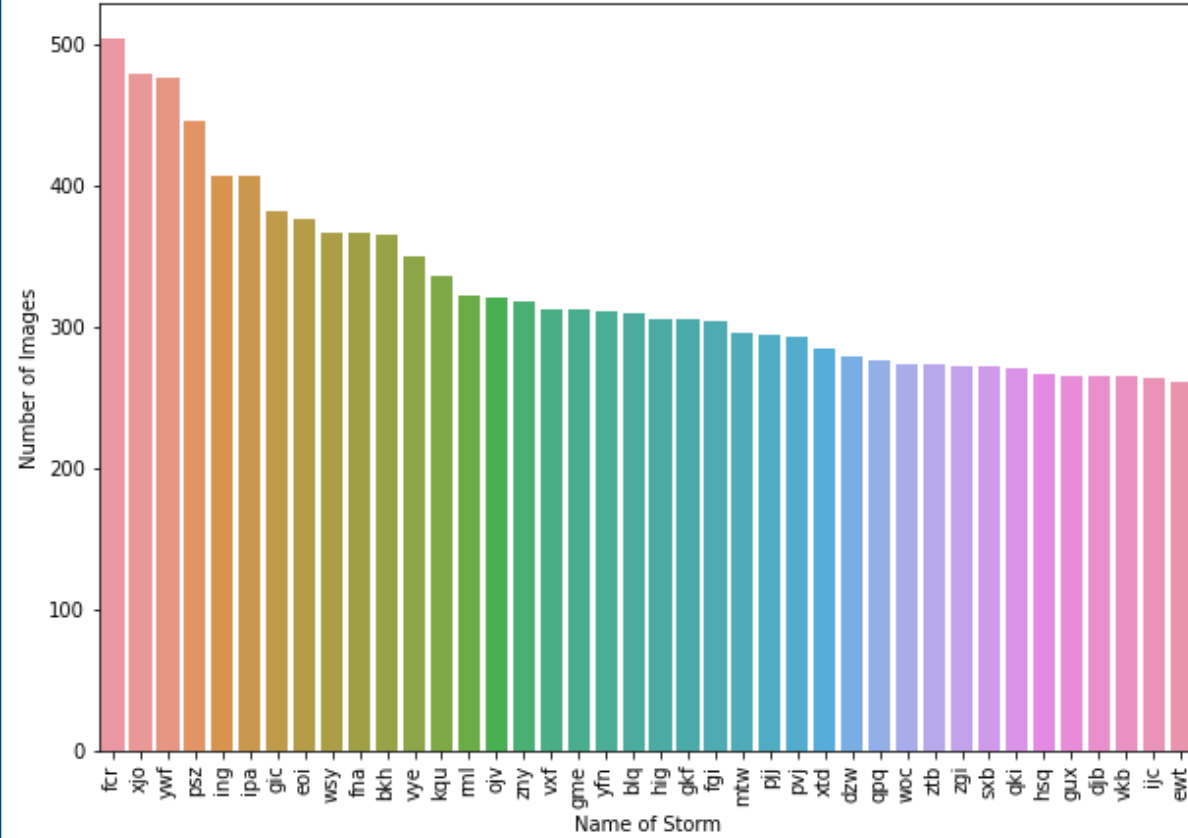
Number of Images for the Top 40 Storms (Test Set)

# Sample Training Data

# Model Performance Comparison

| Model Name | Optimizer | Learning Rate | Scheduler | Loss Function | Batch Size | Number of Epochs | Image Size | Data Augmentation | Train MSE | Train RMSE | Validation MSE | Validation RMSE | Test MSE | Test RMSE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Best Baseline CNN | Adam | 0.001 | No | MSELoss | 256 | 50 | 224x224 | No | 29.62 | 5.43 | 29.2 | 5.39 | 128.64 | 11.32 |
| Densenet 161 | Adam | 0.001 | No | MSELoss | 128 | 34 | 366x366 | No | 92.57 | 9.58 | 104.607 | 10.188 | 112.063 | 10.53 |
| Densenet 161 | Adam | 0.001 | Yes | MSELoss | 128 | 34 | 366x366 | Vertical Flip, Horizontal Flip, Rotations | 119.93 | 10.91 | 120.69 | 10.948 | 117.62 | 10.8 |
| Densenet 161 | Adam | 0.001 | Yes | MSELoss | 128 | 35 | 366x366 | Vertical Flip, Horizontal Flip | 107.267 | 10.319 | 111.725 | 10.52 | 112.87 | 10.57 |
| EfficientNet B4 | Adam | 0.001 | No | MSELoss | 128 | 35 | 366x366 | No | 431016215.4 | 5731.29 | 123446924.5 | 3457.81 | 364110087.6 | 5976.97 |
| EfficientNet B6 | Adam | 0.001 | Yes | MSELoss | 128 | 35 | 366x366 | Vertical Flip, Horizontal Flip, Rotations | 120.36 | 10.92 | 127.43 | 11.24 | 137.76 | 11.69 |
| EfficientNet B7 | Adam | 0.001 | Yes | MSELoss | 128 | 35 | 366x366 | Vertical Flip, Horizontal Flip | 82.69 | 9.06 | 102.85 | 10.1 | 131.545 | 11.42 |

# Train loss and Validation loss all models
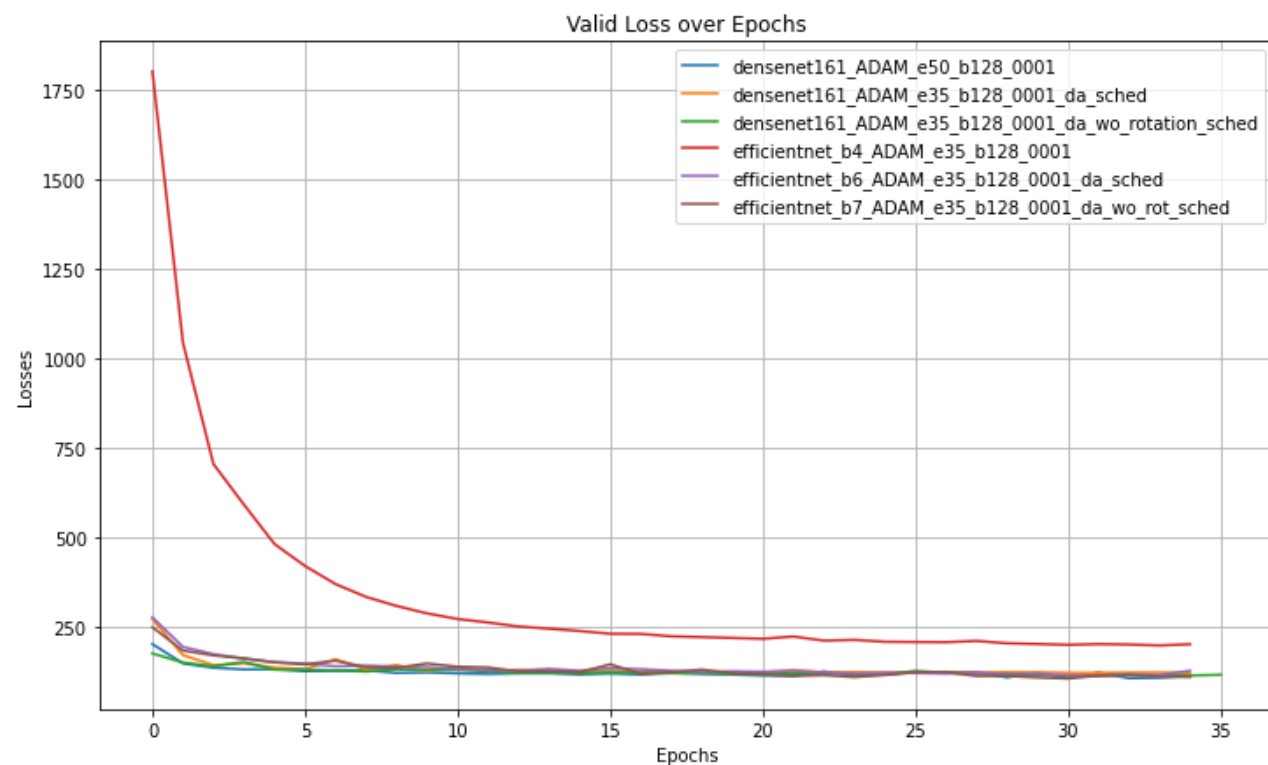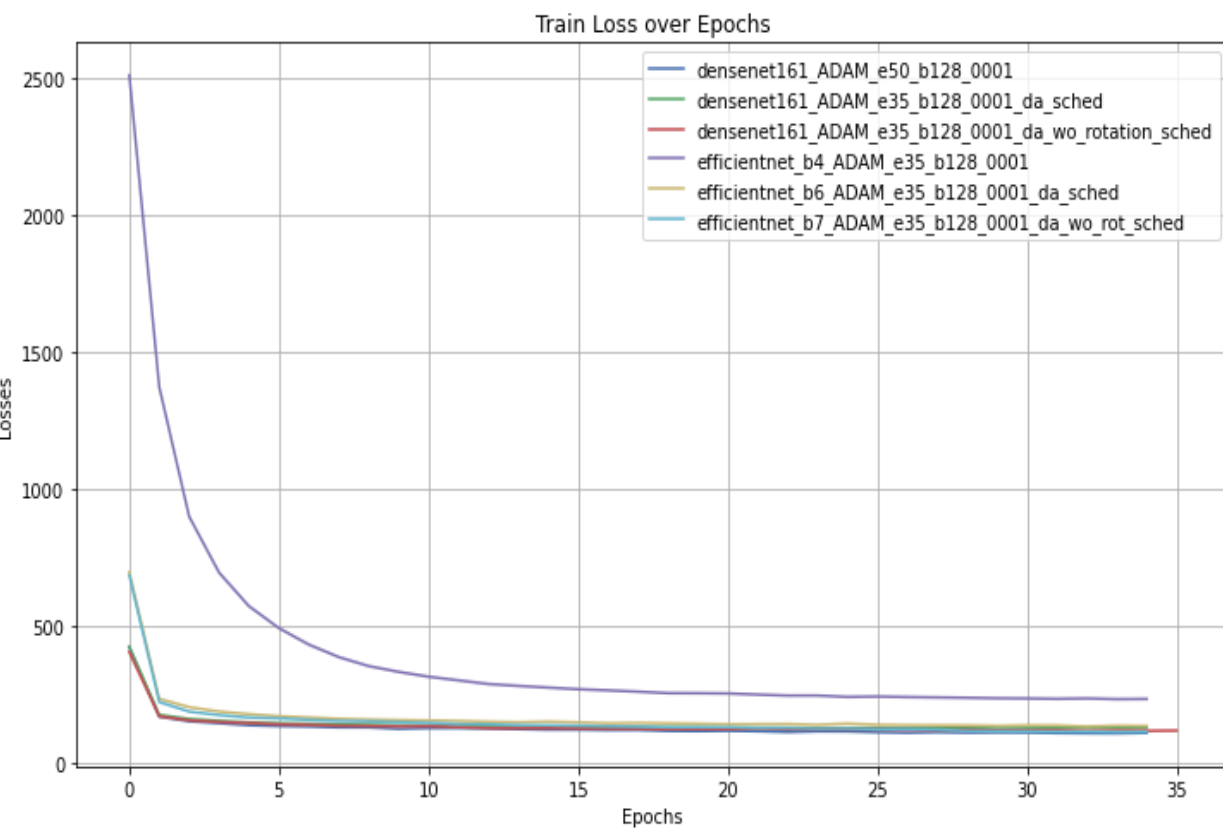
# Train loss and Validation loss without efficient net b4
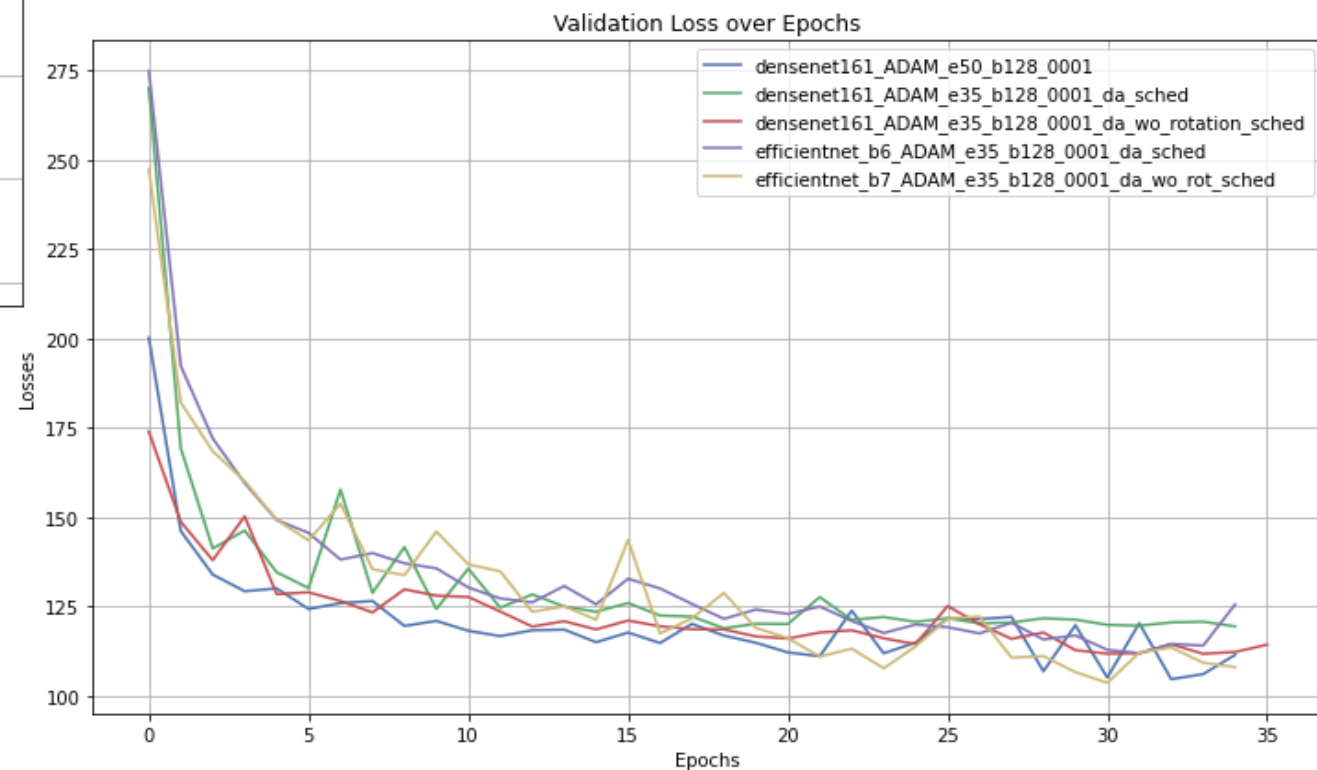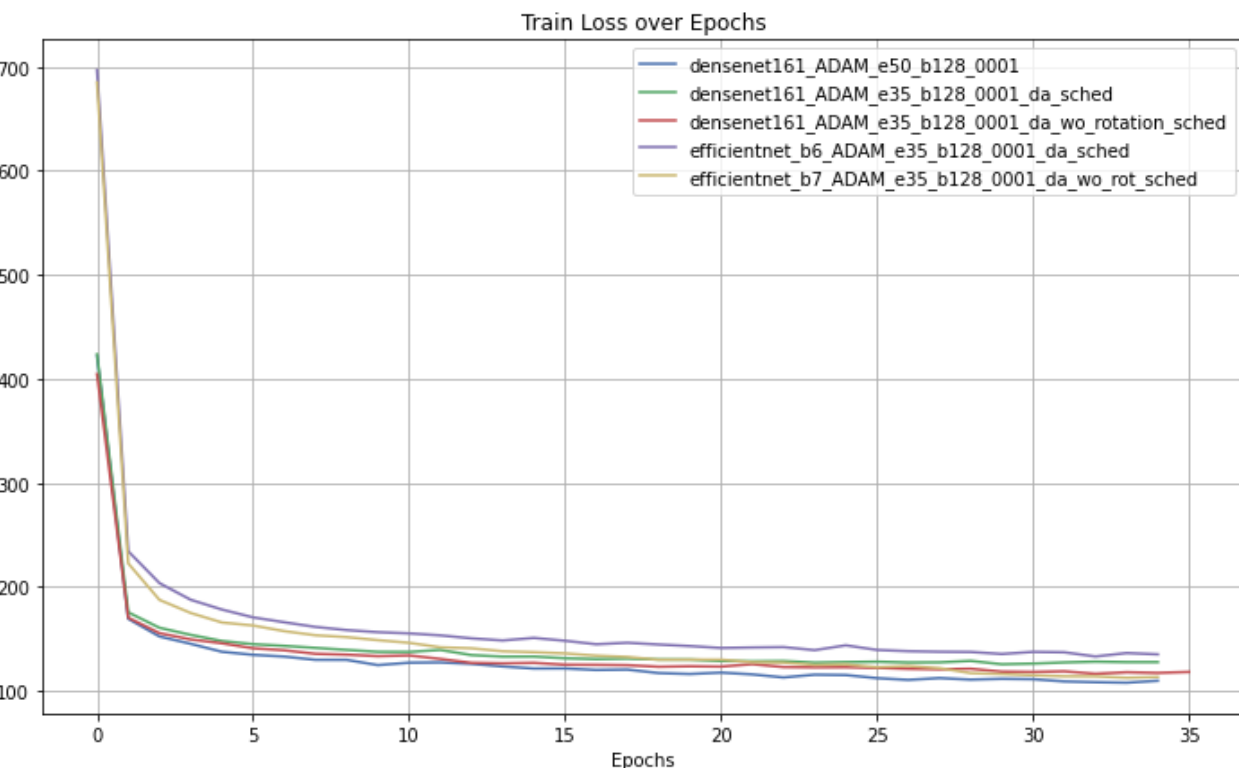
# Next Steps
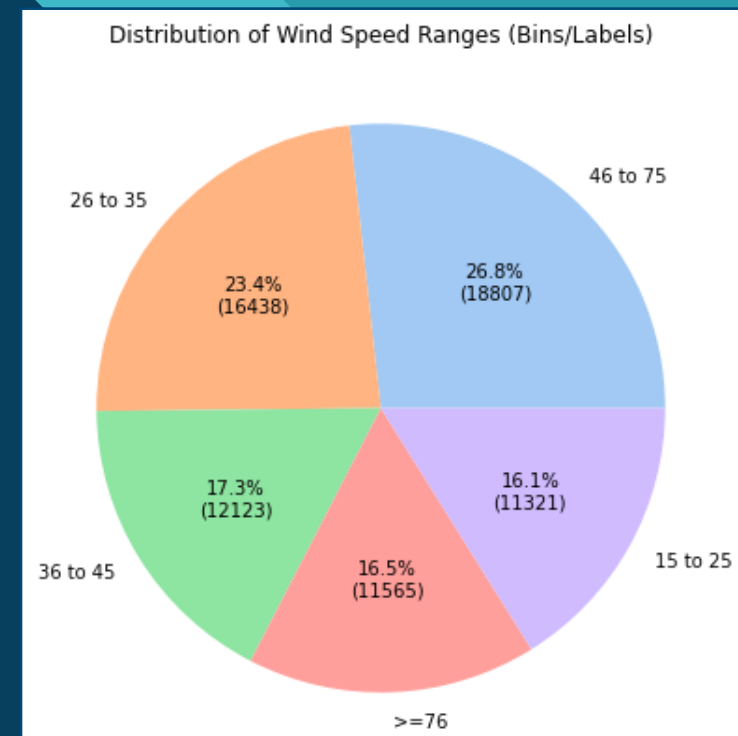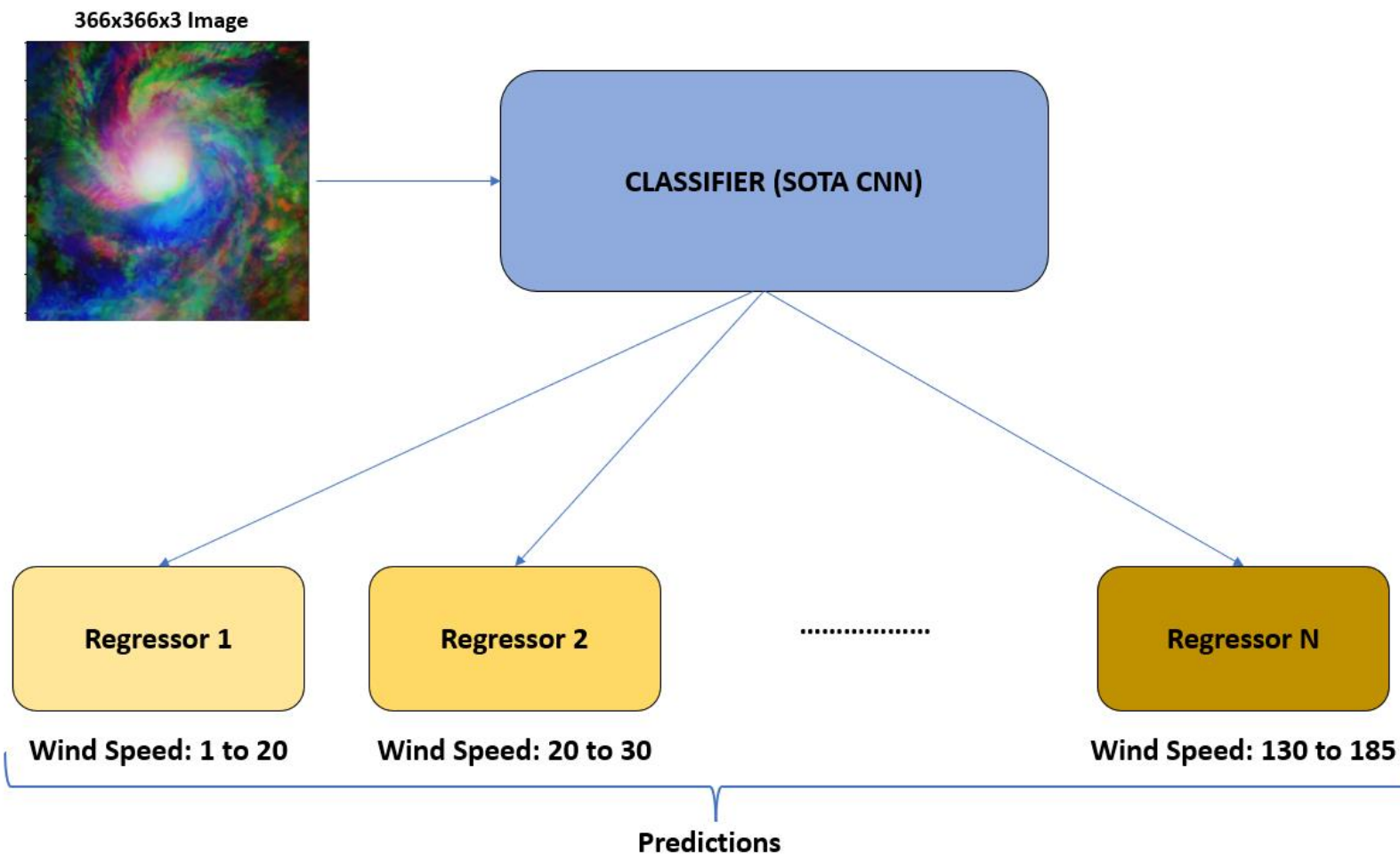
# Next Steps

- Test out best models for classification, hyperparameter tuning to achieve better performance.

- Hyperparameter tuning (for Densenet161 and EfficientNet B7) to get the best model for regression, retrain this model on individual bins, use this for prediction.

- Generate a pipeline, evaluate performance.

# Thank You