Data Challenge AiSight GmbH

ATRAYEE NEOG

Problem Domain

Machine → AiSight Sensor → Machine Learning Model → Predictive Maintenance
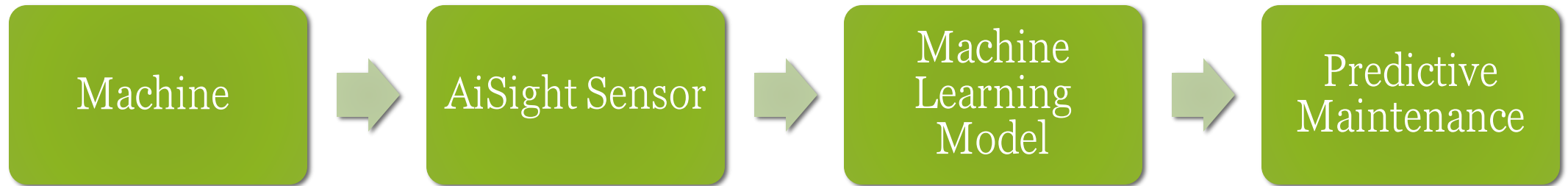
Resources

DataSet	project_fan.csv
Language	Python
Platform	Google Colab
Libraries	Tensorflow, Keras, Numpy, Pandas, ScikitLearn, Matplotlib, Seaborn

Training
Data Preprocessing

Data Loading

as Pandas DataFrames summarized

Feature Extraction

Sensor Data converted to individual columns of float datatypes

Join method (scikitlearn)

Missing Values

Removed using 'pad' method from scikitlearn

Normalization

using 'StandardScalar' package from scikitlearn
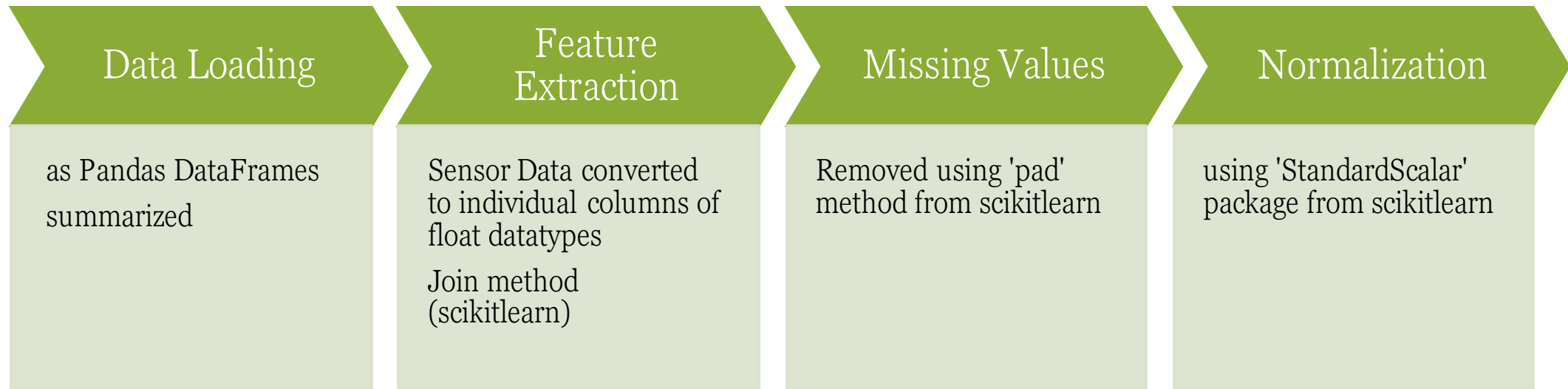
Training Unsupervised Learning

Iterative Clustering (k=5-30)

+ →

Silhouette Score (for optimal k)

K-Means with 17 clusters
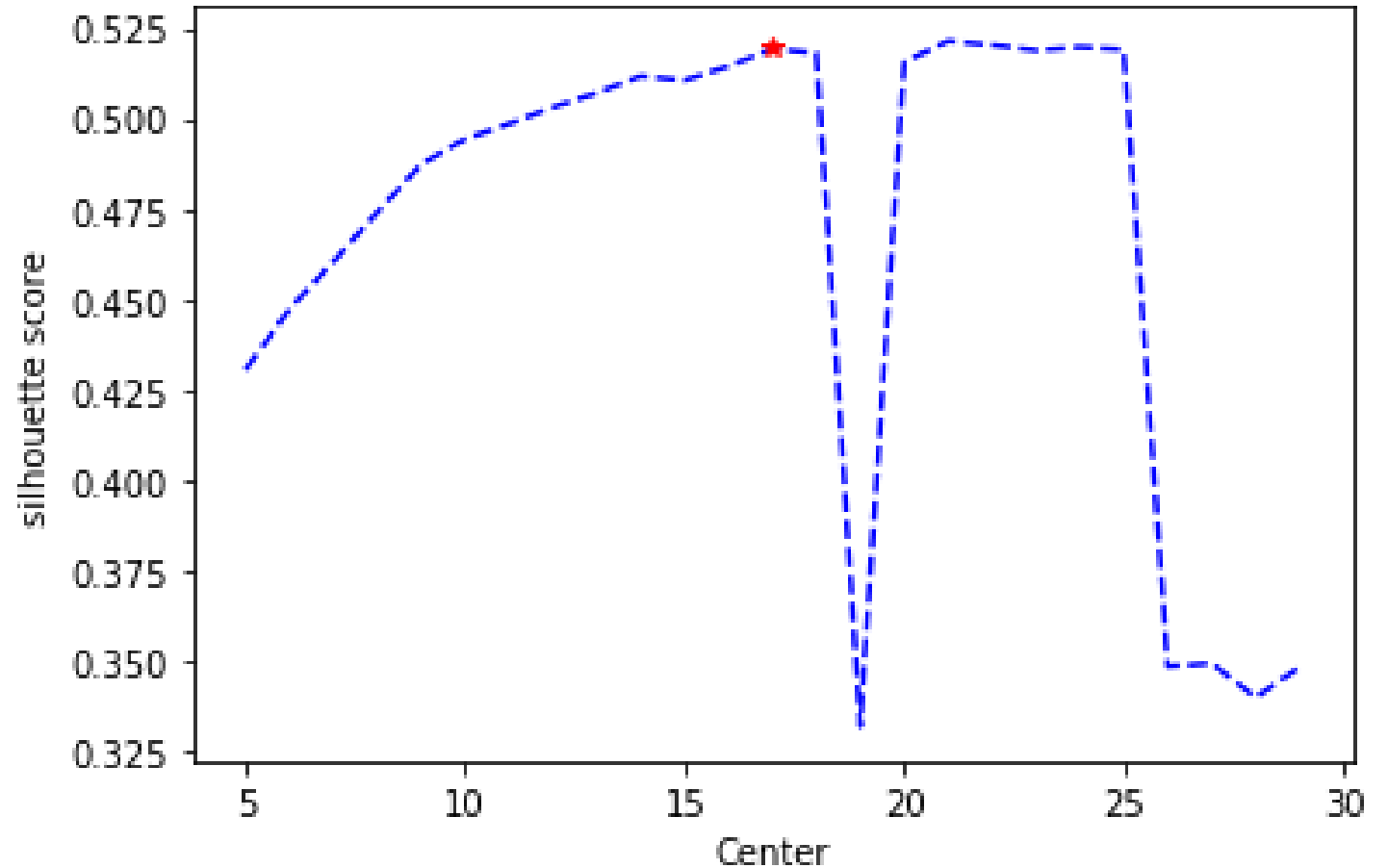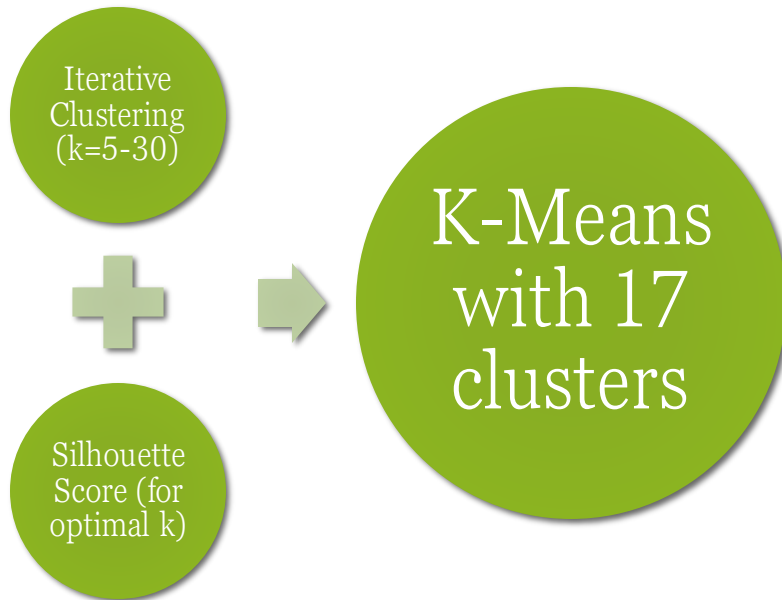
Classification
Deep Neural Network

16539 neurons   512 neurons   20% dropout rate   128 neurons   17 neurons
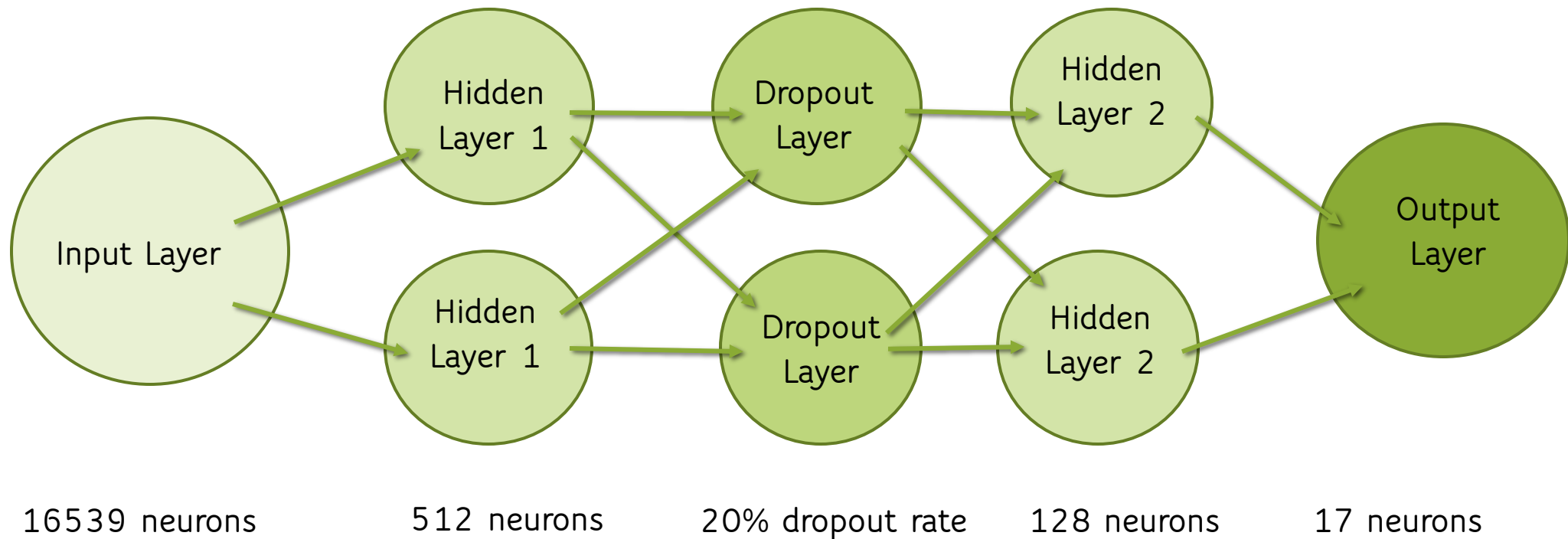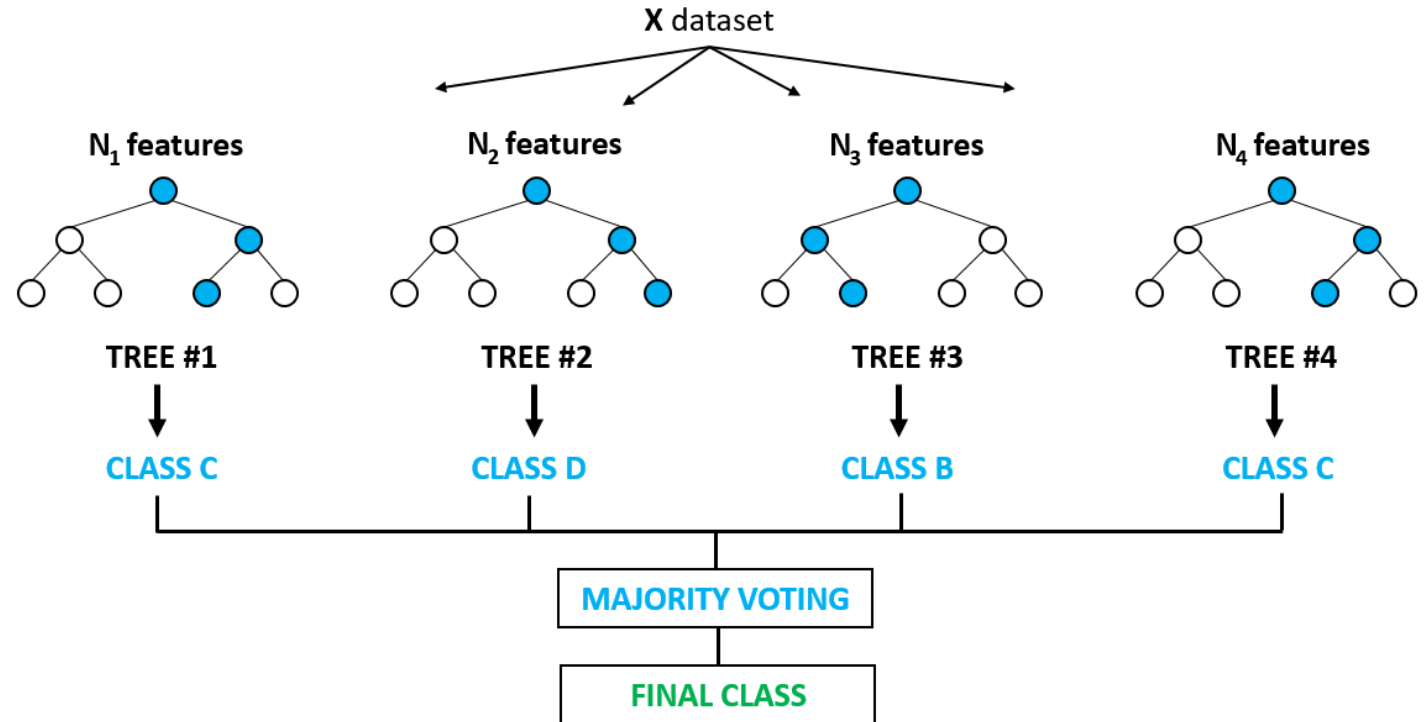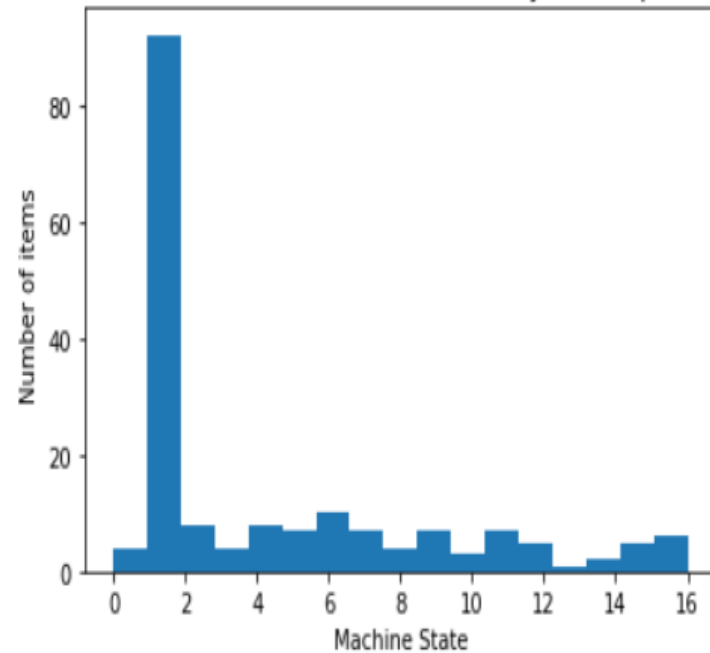
Classification Random Forest

- Alternative to Deep Neural Network
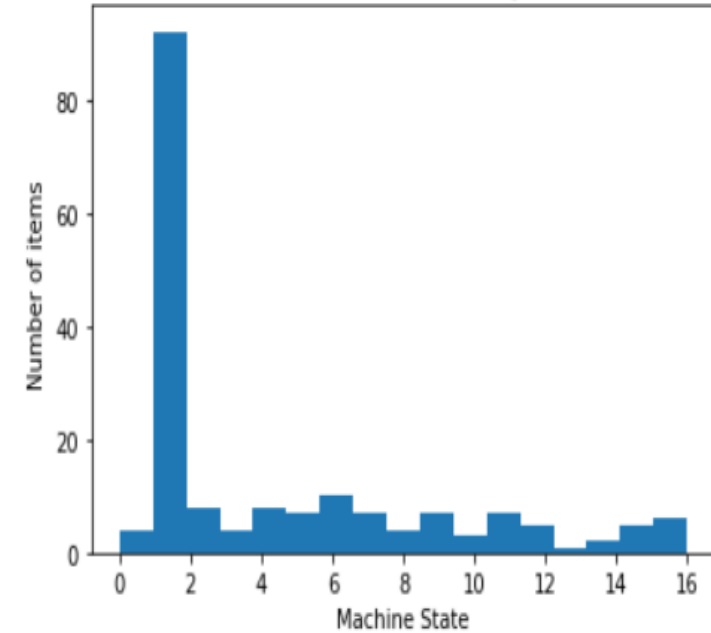- 100 Decision Trees
- Majority Voting

Results

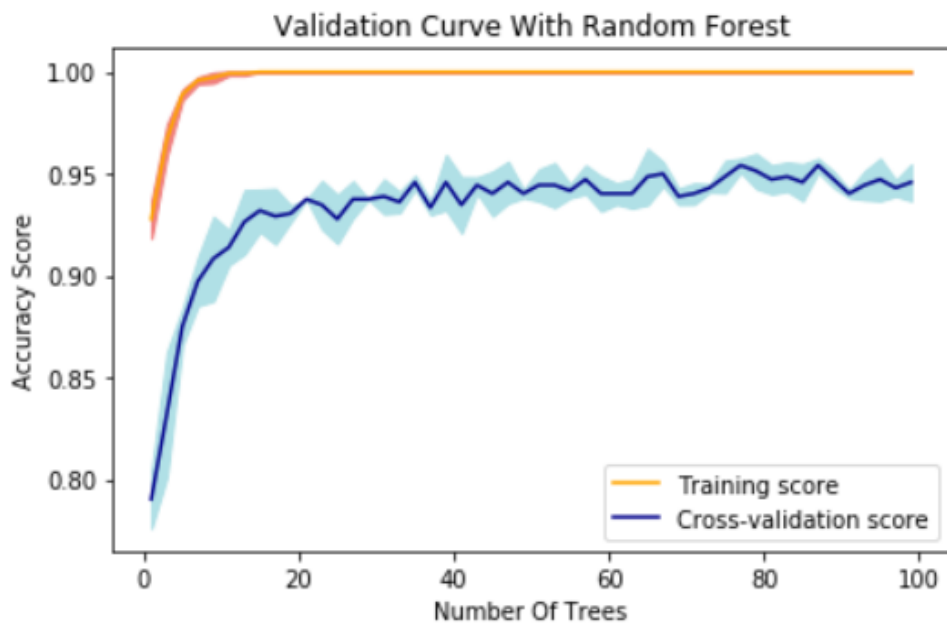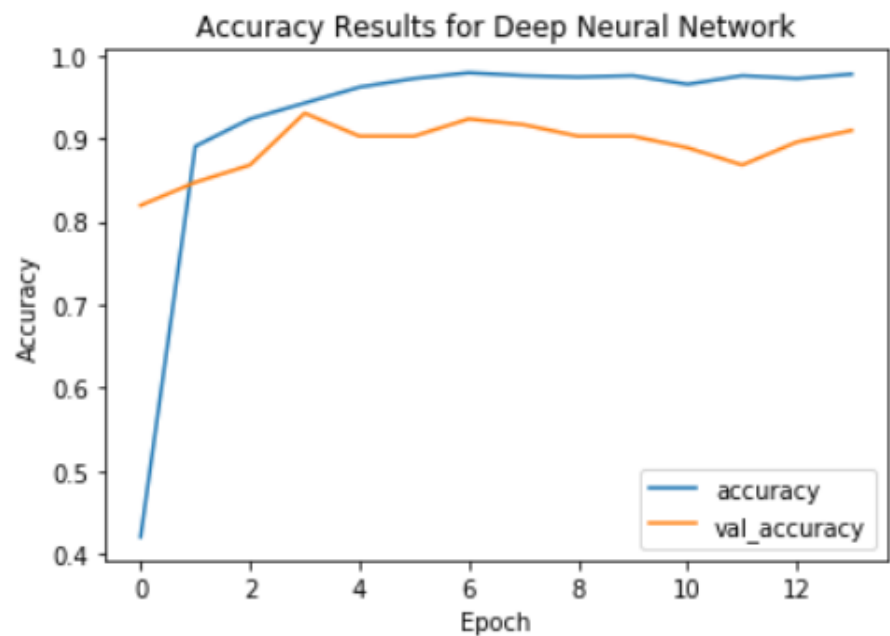Histogram for number of items in each Predicted class by the Deep Neural Netwrok Model

Histogram for number of items in each Predicted class by the Random Forest Classifier Model

Evaluation
(Accuracy and Validation)

Evaluation
(Confidence Intervals)

	precision	recall	f1-score	support
Machine_state 1	1.00	1.00	1.00	4
Machine_state 2	1.00	0.98	0.99	94
Machine_state 3	0.88	1.00	0.93	7
Machine_state 4	0.75	1.00	0.86	3
Machine_state 5	0.75	1.00	0.86	6
Machine_state 6	1.00	1.00	1.00	7
Machine_state 7	0.70	0.88	0.78	8
Machine_state 8	0.86	0.86	0.86	7
Machine_state 9	0.75	0.60	0.67	5
Machine_state 10	0.86	0.86	0.86	7
Machine_state 11	1.00	1.00	1.00	3
Machine_state 12	1.00	0.88	0.93	8
Machine_state 13	0.60	0.75	0.67	4
Machine_state 14	1.00	0.50	0.67	2
Machine_state 15	1.00	1.00	1.00	2
Machine_state 16	1.00	0.62	0.77	8
Machine_state 17	0.83	1.00	0.91	5
accuracy			0.93	180
macro avg	0.88	0.88	0.87	180
weighted avg	0.94	0.93	0.93	180

	precision	recall	f1-score	support
Machine_state 1	1.00	1.00	1.00	4
Machine_state 2	1.00	0.99	0.99	94
Machine_state 3	1.00	1.00	1.00	7
Machine_state 4	0.75	1.00	0.86	3
Machine_state 5	0.75	1.00	0.86	6
Machine_state 6	1.00	1.00	1.00	7
Machine_state 7	0.78	0.88	0.82	8
Machine_state 8	1.00	0.86	0.92	7
Machine_state 9	1.00	0.60	0.75	5
Machine_state 10	0.88	1.00	0.93	7
Machine_state 11	1.00	1.00	1.00	3
Machine_state 12	1.00	0.88	0.93	8
Machine_state 13	1.00	1.00	1.00	4
Machine_state 14	1.00	1.00	1.00	2
Machine_state 15	1.00	1.00	1.00	2
Machine_state 16	1.00	0.88	0.93	8
Machine_state 17	0.83	1.00	0.91	5
accuracy			0.96	180
macro avg	0.94	0.95	0.94	180
weighted avg	0.97	0.96	0.96	180

Accuracy for Deep Neural Network model = 93%

Accuracy for Random Forest Classifier = 96%