

# Machine Predictive Maintenance

Failure Classification



December, 2022

## **Project objective:**

Deliver a product to Northrup

Grumman to predict machine failure

# Data

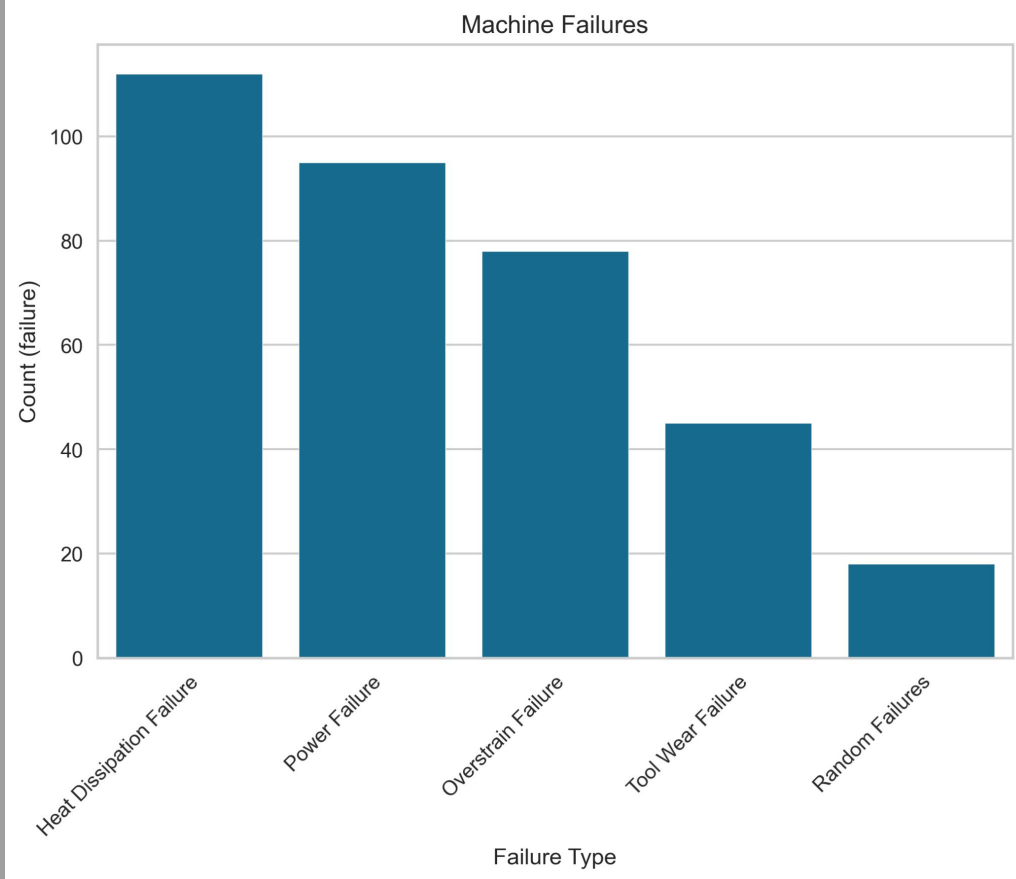
**Northrup Grumman Machine Failure**

# Data

## **Northrup Grumman Machine Failure**

- Contains a data point for each product run through the machine
- 10000 points in dataset accounting for about 76 days of machine time
- Includes information on air temp, process temp, rotational speed, torque, tool wear, and failure

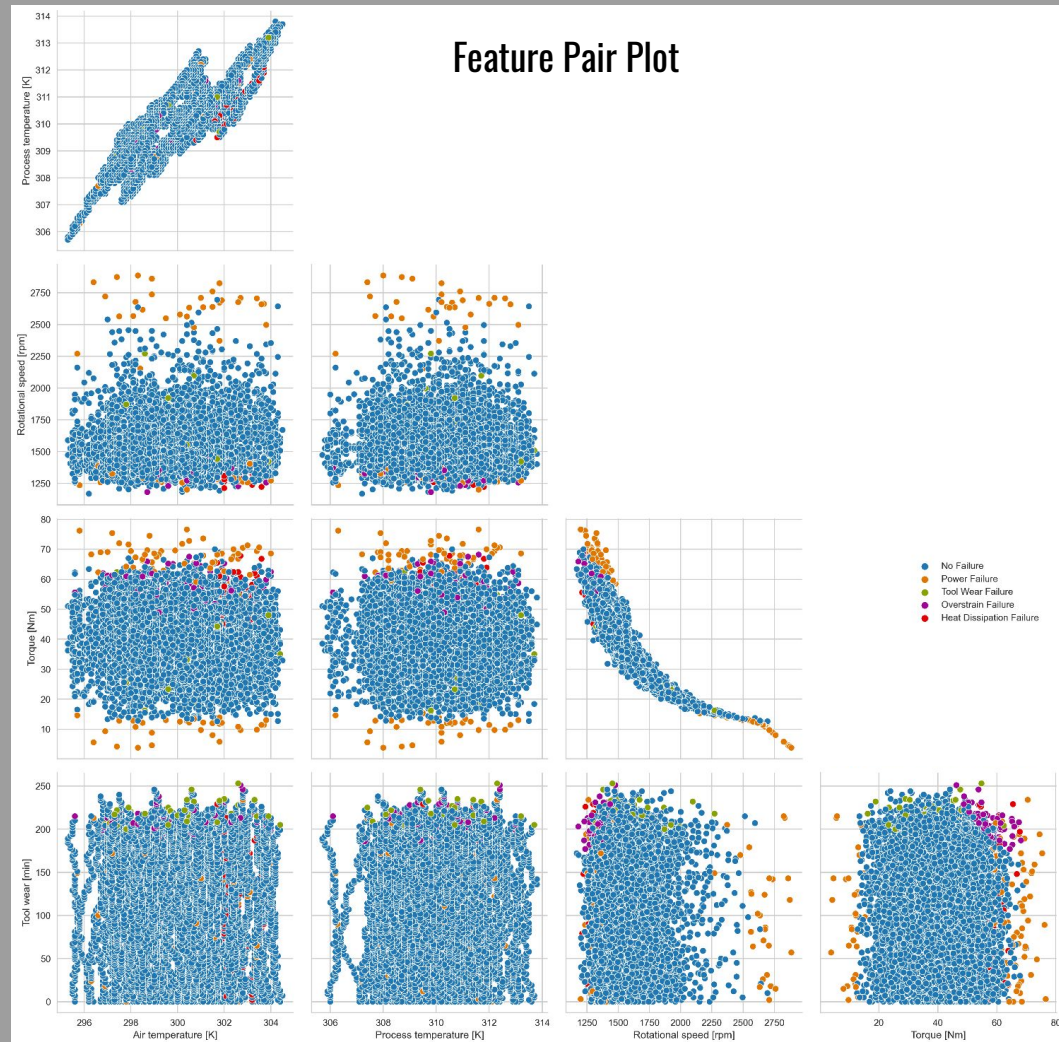
# Range



Heat Dissipation, Power Failure, and Overstrain Failure are most common failures

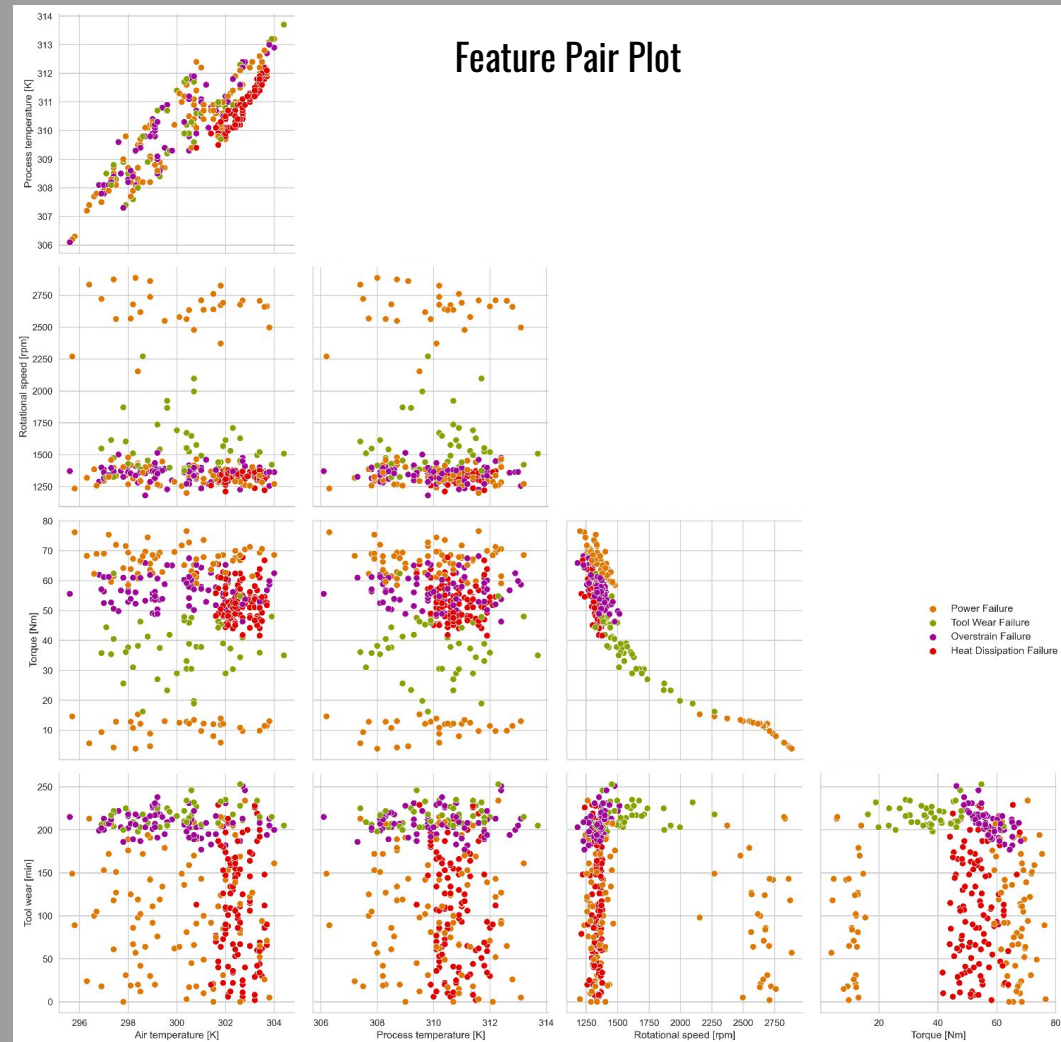
# Relationships

Grouping between features show correlation between type of recorded data and type of failure

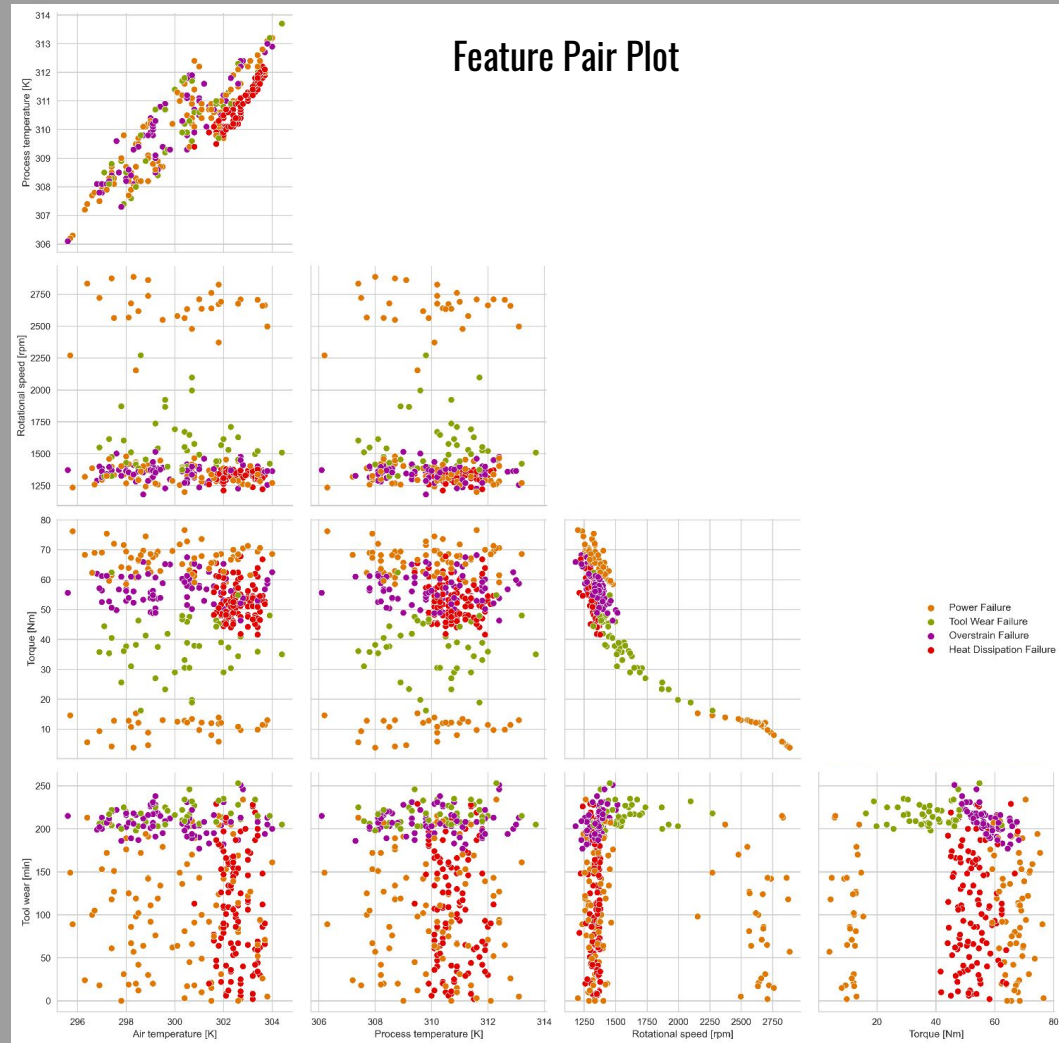
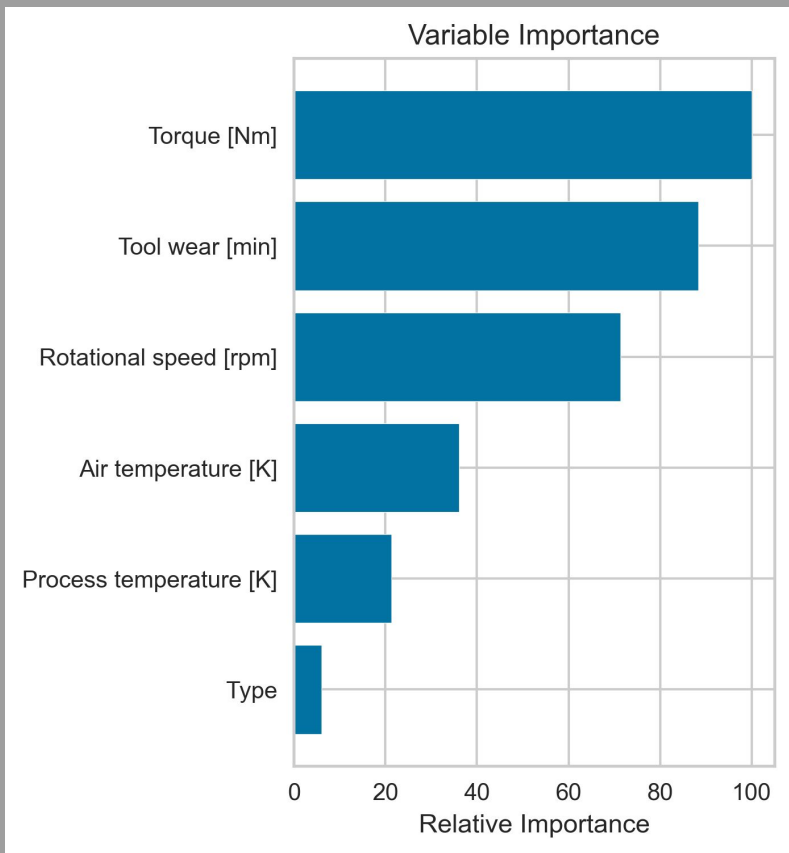


# Relationships

Grouping between features show correlation between type of recorded data and type of failure



# Relationships





# RESULTS

GridSearchCV Confusion Matrix						
True Class	Heat Dissipation Failure	19	3	0	0	0
	No Failure	6	1922	0	0	1
	Overstrain Failure	0	9	7	0	0
	Power Failure	0	8	1	10	0
	Tool Wear Failure	0	8	0	0	1
		Heat Dissipation Failure	No Failure	Overstrain Failure	Power Failure	Tool Wear Failure
		Predicted Class				

Final Model has the most incorrect predictions in no failure

98% Accuracy  
82% Precision

# CONCLUSIONS

- Avoid the following to prevent failure:
  - Torque (power failure): less than 20 Nm or more than 58 Nm
  - Tool Wear (tool wear failure): more than 190 minutes of use
  - Rotational speed (overstrain and heat dissipation failure): less than 1200 rpm
- Final model 98% accurate with 82% precision

# FUTURE WORK

**1. Expand Dataset to confirm results**

**2. Predict Maintenance for other machines in the facility**

**THANK YOU**