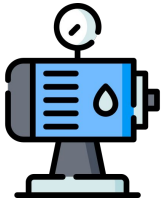
An Analysis of a Complex Hydraulic System

Phase III Final Project

Presenters: Drew Alderfer and Skye Jeanat

Agenda



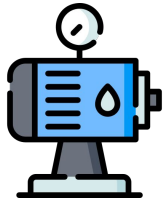
- ❏ Stakeholder Requirements
- ❏ Data Set Details
- ❏ Top Performing Models
- ❏ Summary and Recommendation
- ❏ Questions

Stakeholder Requirements

- Needs / Goals:
  - Minimize repair costs
  - Minimize equipment down-time
  - Quickly troubleshoot
  - Aid in preemptive maintenance

- Metrics:
  - High-accuracy
  - Low false-negative probability

Data Set Details



- Source:
  - UCI - Machine Learning Repository
- Characteristics:
  - 2205 tests
  - 60-second cycles
  - 17 different sensors
- Target Variables:
  - Valve Condition
  - Cooler Condition
  - Internal Pump Leakage
  - Hydraulic Pressure
  - Stable Condition

Raw Data

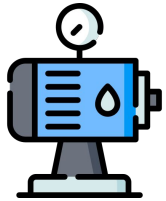
cycle	1s	2s	3s	..	60s
first:	0	1	2	...	59
second:	0	1	2	...	59
...	...	...	...	...	...
last:	0	1	2	...	59

Transformations

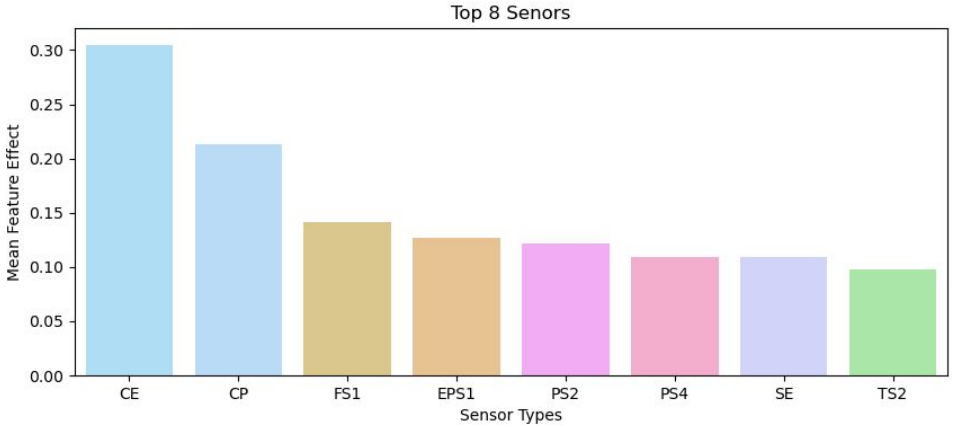
test	1s-60s	<<
first:	avg[0]	<<
second:	avg[1]	<<
...	...	<<
last:	avg[-1]	<<

test	1s-20s	21s-40s	41s-60s	<<
first:	avg[0][0]	avg[0][1]	avg[0][2]	<<
second:	avg[1][0]	avg[1][1]	avg[1][2]	<<
...	...	...	...	<<
last:	avg[-1][0]	avg[-1][1]	avg[-1][2]	<<

Top Performing Models

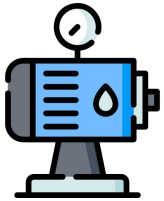


- Model Types:
  - XGBoost
  - KNN Accuracy
- Target Variable and Feature Pairings:
  - Cooler condition
    - Based on change between 20-second intervals
  - Internal pump leakage
    - Based on average 20-second intervals



	Accuracy Score:	ROC-AUC Score:	F-1 Weighted Score:
Cooler_Condition_std_3rds	0.990937	0.999956	0.990955
Hydraulic_accumulator_bar_avg_3rds	0.987915	0.999648	0.987899
Internal_pump_leakage_avg_3rds	0.996979	1	0.996979
stable_flag_avg_3rds	0.996979	1	0.996979
Valve_Condition_avg_3rds	0.987915	0.999692	0.987896

Summary and Recommendation



- Recommendation:
  - Utilize an XGBoost model
    - Cooler condition
    - Internal pump leakage
- Benefits:
  - Save ~$80k on repairs annually
  - Optimize workflow efficiency
- Next Steps:
  - Review other testing data
  - Collect real-world data
    - Improve model accordingly

Questions?

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