Analysing Appliance Breakdowns

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Problem statement

Task 1: Data Insights Presentation
Data Analysis:

Using the historical service and field failure data provided, identify:

Top 3 most common causes of breakdowns.

Trends in service costs over time.

Components or systems with the shortest service life.

Present your findings with supporting visualizations (charts, graphs, etc.).

Task 2: Predictive Model Development
Model Creation:

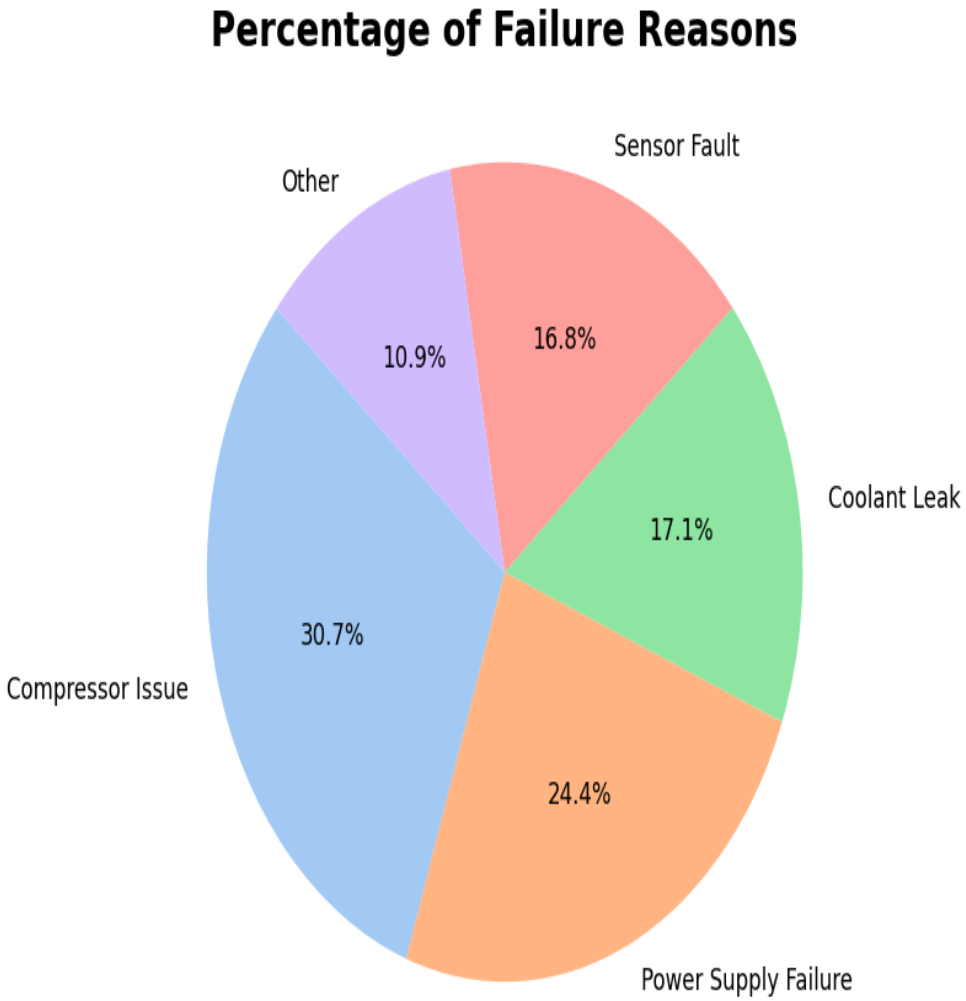
Develop a basic predictive model to estimate the service life of a critical component or subsystem and Service TAT.

Failure Type Distribution

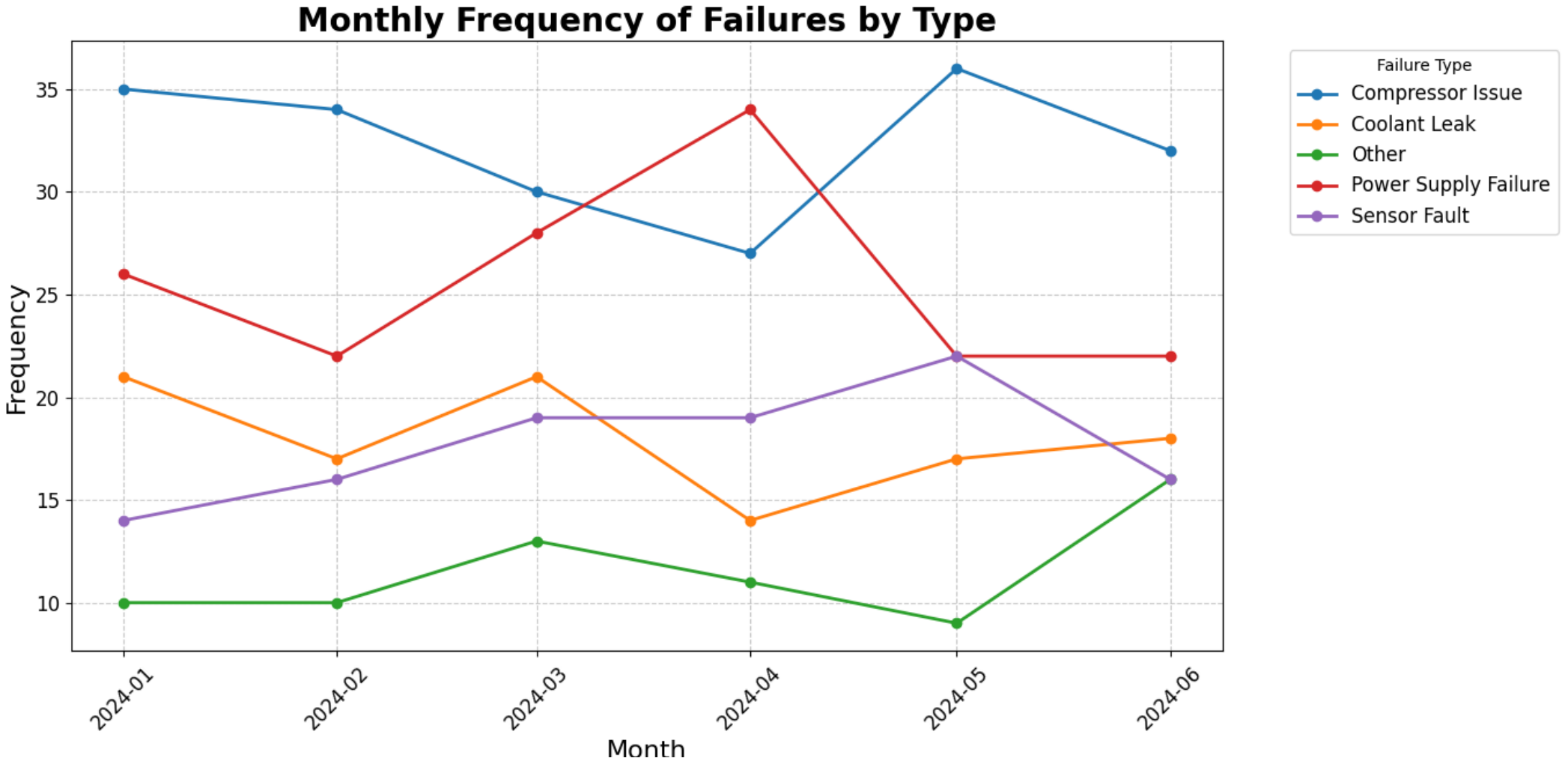
Top 3 Most Common Breakdov

Compressor Issue	194
Power Supply Failure	154
Coolant Leak	108

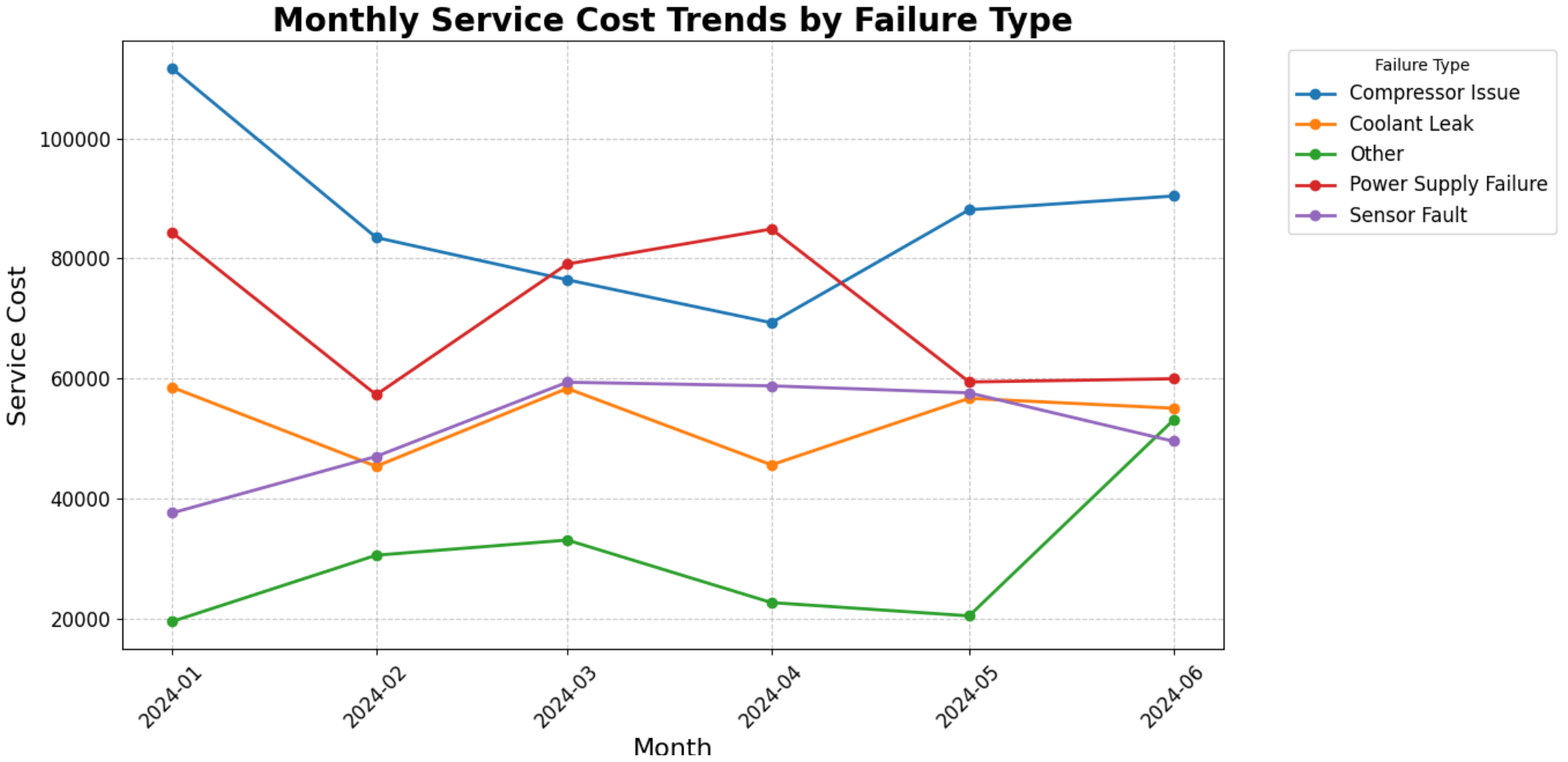
Above issue are most common across devices
For failure in their functioning hence requires
Most monitoring



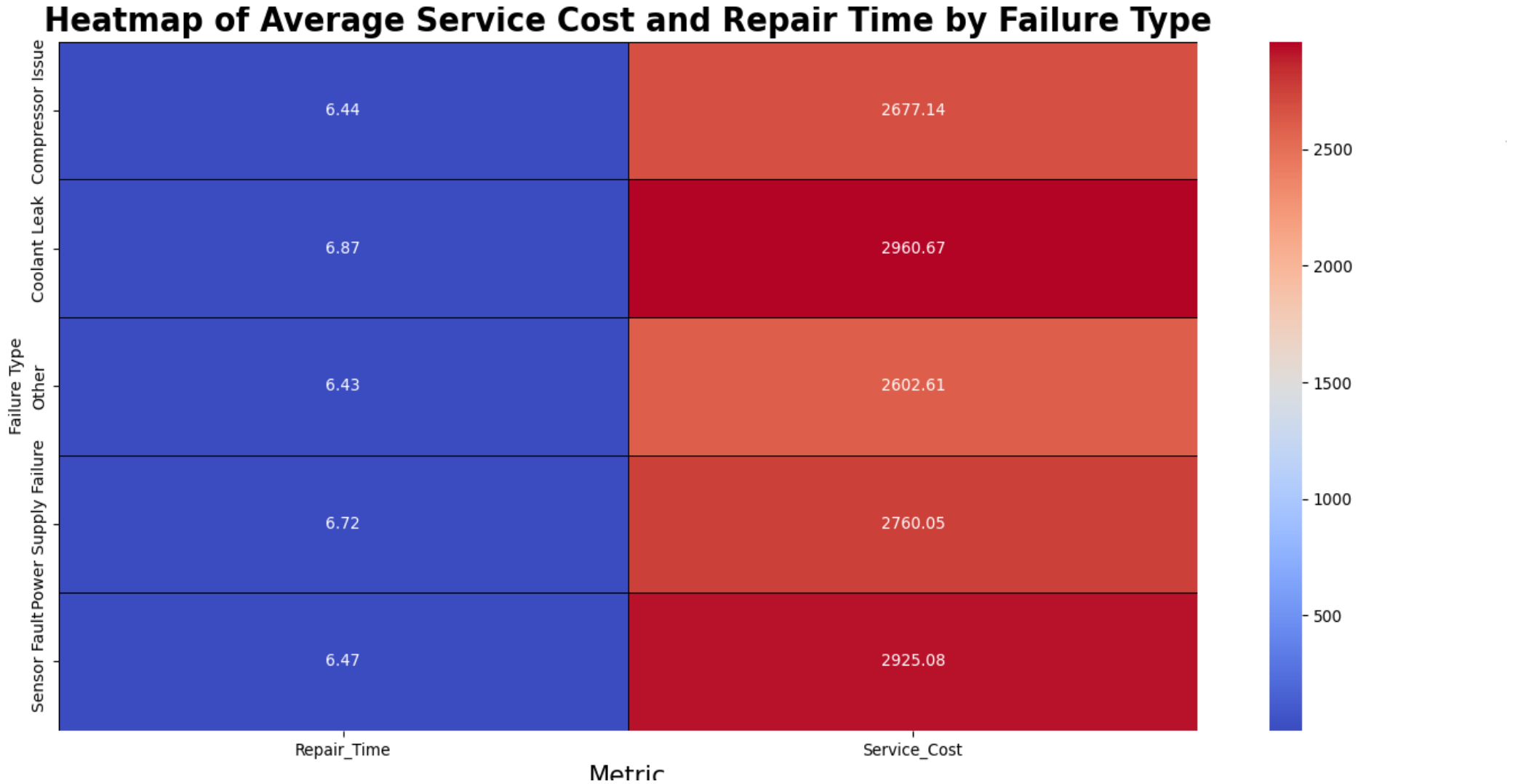
Monthly frequency of failure



Trends in Service cost over time

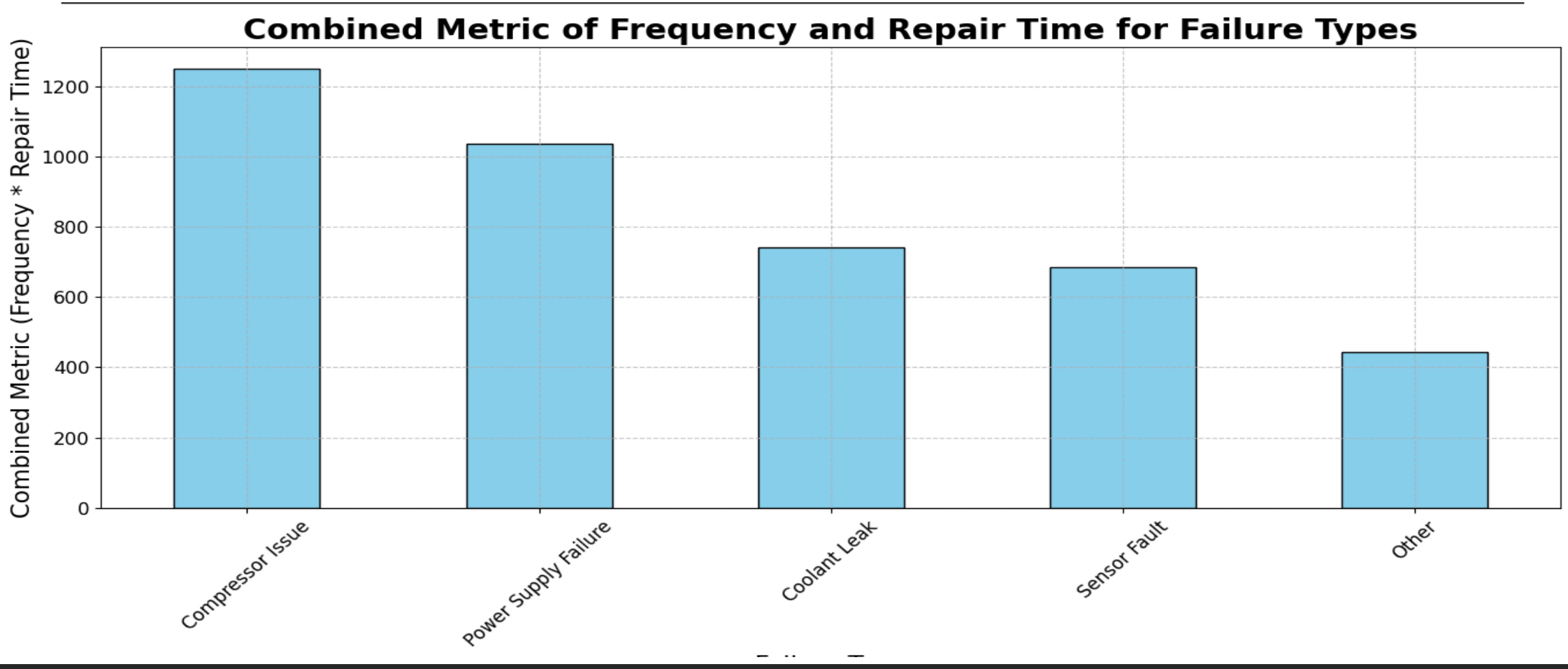


Average service cost and repair time



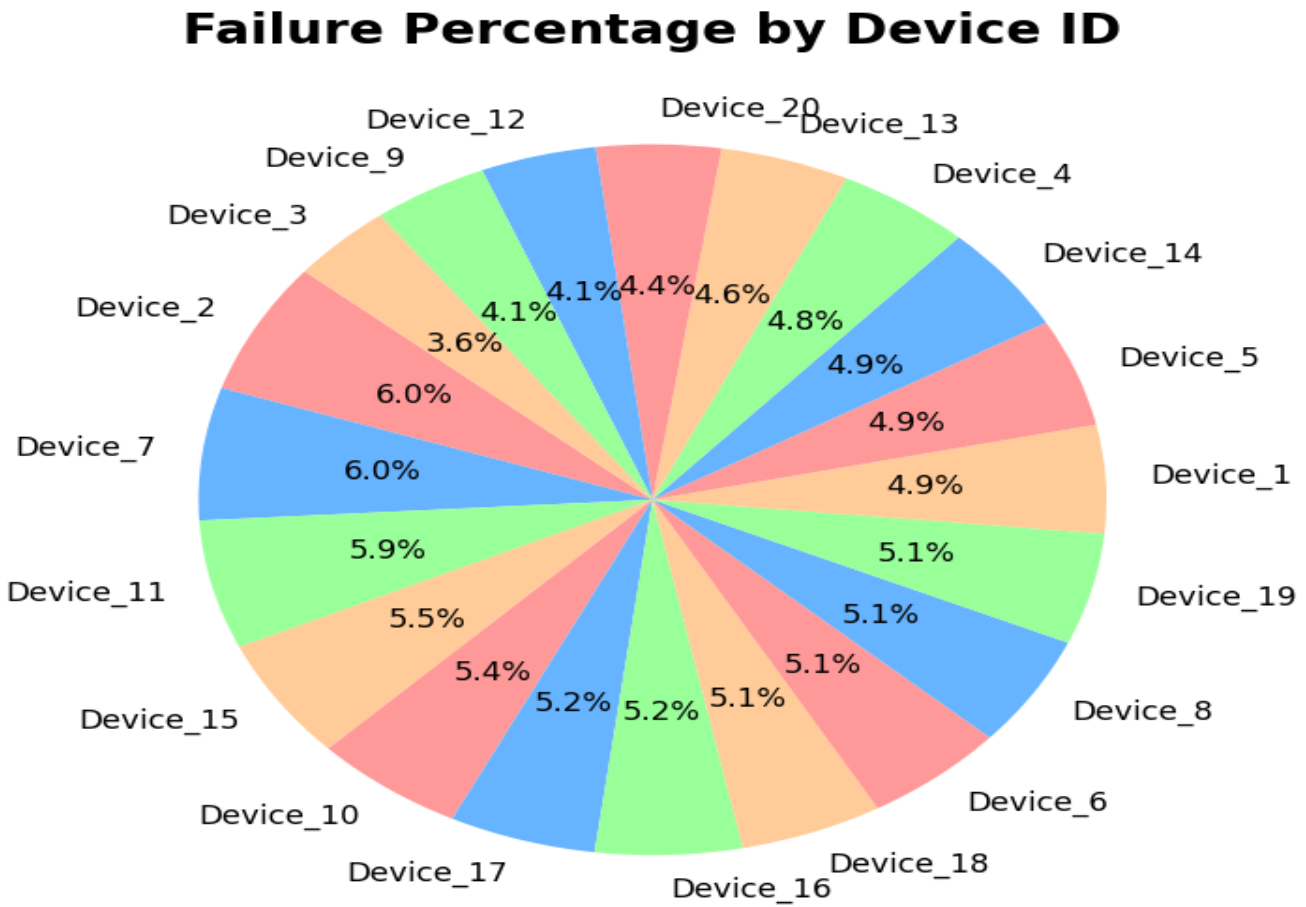
Components with lowest service time

The component with highest metric has lowest service life hence compressor of device is having lowest service life , service life of a component increases as it’s metric value decreases

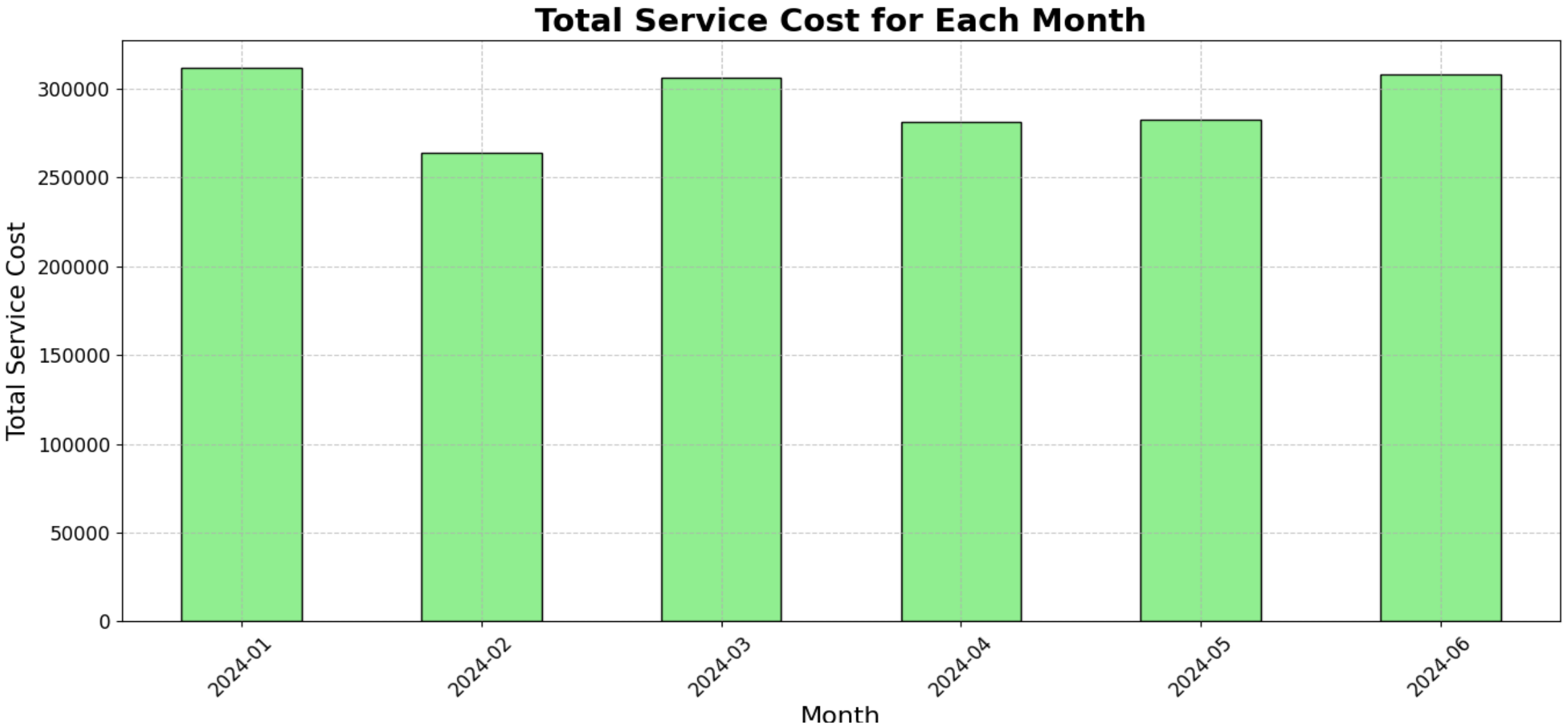


Systems with highest failure rate

Device with high failure percentage require more maintenance hence having less service life.



Total expenditure on service each month



ML model for predicting repair time based on failure type

Predictive Model for Service Turnaround Time (TAT)

Objective :To predict the time required to repair or service a component based on historical data.

Approach: Built an LSTM-based predictive model. Included temporal features (lagged values, rolling averages) to capture trends.

Key Features Used: Service Cost, Lagged Repair Times, Rolling Averages, Failure Types

Evaluation Metrics :1. MAE: Indicates average prediction error around this 0.04745138724019208 6

. **2. R^2 Score:** Explains variance captured by the model close to 1 (0.9995716827)

Outcome: Accurate prediction of Repair Time for proactive service planning

Link to the code for model

Conclusion

Top Failures :

1. Compressor issues(194) ,power supply failures(154), coolant leaks(108)
2. Require heightened monitoring and maintenance

Service trends :

1. Monthly service costs show predictable patterns and efficiencies
2. High-metric components like compressor have shorter service lives

Failure prone systems:

1. Device with high failure rates like (device 2 and device 7) require frequent maintenance and have reduced lifespans