Background & Motivation:
• Autonomous manufacturing relies on complex data analysis for customization, presenting the critical challenge of maintaining machine longevity and performance.
• Predictive maintenance is essential for operational efficiency, targeting components like bearings to significantly reduce downtime and costs.
• Thus, experiments with novel features are needed to explore different predictive maintenance solutions.

Objective:
• To develop an automated rotary platform equipped with advanced sensors.
• Aimed at conducting future experiments regarding proactive monitoring and predictive analytics of bearing health. Future results will facilitate timely maintenance actions and enhance component lifespan.

Novelty:
• Incorporates sound sensors to complement vibrations in detecting failure.
• Employs high RPM range to accelerate bearing degradation, producing faster data recording sessions.

Methodology
Component Selection:
Selected a compatible motor and bearing for the core of the platform, ensuring the correct operating conditions.

Physical Assembly:
By integrating the selected mechanical and electrical components for data capture.

AI Model Development:
By using pre-existing datasets to recognize patterns and predict bearing health.

System Integration:
By combining the mechanical assembly, sensor systems, and AI analytics into a cohesive platform. Further failure methods (poor lubrication, debris) introduced to further accelerate testing.

Applications
• Improved machinery uptime and reduced operational costs
• Proactive monitoring and predictive analytics of bearing health

Framework
• LabView: For capturing data from sound sensors and a load cell, and for platform control.
• Control Lookup Table: For actuator force adjustment.
• AI Model: Receives sensor data for analysis and processing. Built using multivariable linear regression. Time domain features determined to be most important.

Platform Design
DC Motor
Coupler
Bearing Housing
Polycarbonate Casing
Load Cell
Linear Electrical Force Actuator

LabView Interface

Data Trends (Vibrations)

What’s Next?
• Additional data must be collected to refine the AI model.
• Multiple bearings will be tested in different conditions (RPM, Actuator Force, Failure Methods)
• Confirm data trends in sound.