**User story: Anomaly detection to find bearing failures proactively.**

**As a** Data Scientist, **I want to** perform anomaly detection on sensor data using LSTM Autoencoders. **So that** I identify anomalies and potential equipment failures in the sensor data.

**Acceptance Criteria:**

1. **Given** sensor data in a structured format with timestamps,

- **When** I preprocess and transform the data to have it in a suitable format for LSTM Autoencoder training,

- **Then** I expect the data to be in a time-series format, ready for modeling.

2. **Given** the pre-processed data,

- **When** I train an LSTM Autoencoder model with specified architecture and parameters,

- **Then** I expect the model to be trained successfully, with training loss curves and evaluation metrics available for analysis.

3. **Given** the trained LSTM Autoencoder model,

- **When** I apply the model to the test data,

- **Then** I expect it to identify anomalies and calculate loss values for each data point.

4. **Given** the results of anomaly detection,

- **When** I set a predefined threshold for anomaly classification,

- **Then** I expect anomalies to be flagged as 'True' or 'False' based on whether the loss exceeds the threshold.

5. **Given** the annotated results of anomaly detection for both training and test data,

- **When** I visualize the anomalies over time,

- **Then** I expect to see a clear representation of bearing failure or anomalies for further analysis.

6. **Given** the trained model and anomaly detection results,

- **When** I save the model and results in a specific format,

- **Then** I expect to have the model and data available for future use or sharing with others.

By following this user story, I will be able to leverage LSTM Autoencoders for anomaly detection in sensor data, ultimately improving equipment maintenance and reliability.