1. Smoothing and Filtering:

🔲 Implement simple moving average or median filtering to smooth out noise in the signals.

🔲 Apply digital filters such as low-pass, high-pass, or band-pass filters to remove unwanted frequency components.

2. Frequency Analysis:

🔲 Calculate the frequency spectrum of the signals using techniques like the Fourier transform.

🔲 Identify dominant frequency components and analyze their significance in the context of engine operation.

3. Feature Extraction:

🔲 Extract relevant features from the signals that capture important characteristics of engine behavior.

🔲 For example, you could compute statistical features like mean, variance, skewness, or kurtosis over time windows.

4. Time-Frequency Analysis:

🔲 Apply time-frequency analysis techniques such as the Short-Time Fourier Transform (STFT) or Wavelet Transform to analyze signal properties across both time and frequency domains.

5. Pattern Recognition:

🔲 Use machine learning algorithms to recognize patterns or anomalies in the signals that indicate specific engine states or conditions.

🔲 Train classification models to classify different operating conditions based on signal patterns.

6. Correlation Analysis:

 Investigate the correlations between different signals to understand how they relate to each other.

 Explore techniques like cross-correlation to quantify the similarity between pairs of signals.

7. Predictive Modeling:

 Develop predictive models to forecast future values of engine signals based on historical data.

 Use time-series forecasting techniques such as autoregressive models, moving average models, or machine learning algorithms like recurrent neural networks (RNNs).