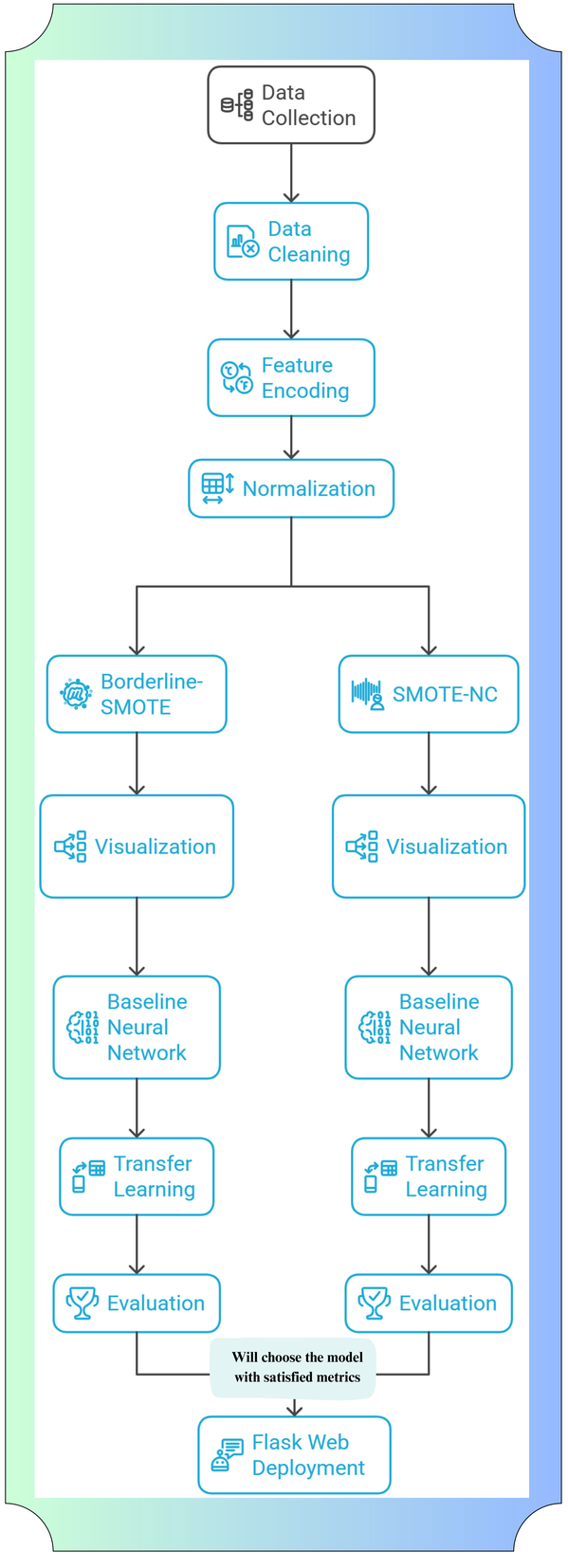
INDUSTRIAL EQUIPMENT MAINTENANCE VIA DEEP LEARNING

Dataset - Machine Predictive Maintenance Classifiaction (Kaggle)

10,000 x 10 Original Size



Data Collection

Collect real-time or historical data from industrial sensors, logs. This data may include temperature, pressure, torque etc.

Data Cleaning

Remove missing values, handle outliers, and correct inconsistencies in the dataset to ensure high-quality input for the DL model.

Feature Encoding

Convert categorical features (like quality, Failure type) into numerical format using techniques such as one-hot encoding or label encoding.

Normalization

Scale all numerical features to a range (e.g., 0 to 1) to ensure faster convergence and better model performance.

Borderline-SMOTE

Apply Borderline-SMOTE to oversample the minority class, especially near the decision boundary, to improve class balance and model robustness.

22,722 x 7 size

SMOTE-NC

Use SMOTE for Nominal and Continuous features to generate synthetic samples for imbalanced datasets that contain both types of variables.

46,332 x 7 size

Visualization

Plot the visualization using differnent plots and analyze the data, also to get more familiar with the data.

Baseline NN

Develop a simple neural network as the initial model to test the pipeline. Helps to evaluate basic performance before advanced techniques are applied.

Transfer Learning

Enhance model performance by using pretrained models or transferring learned weights from similar tasks to the predictive maintenance model.

Evaluation

Assess model performance using metrics such as Accuracy, Precision, Recall, F1 Score, and ROC-AUC to ensure reliable predictions.

Web Deployment

Deploy the final trained model using Flask to create a lightweight web application, allowing real-time predictions and integration into production environments.