**Machine Learning Predictive Failure Times Data**

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**Overview:**

Failure times models, such as the Jelinski-Moranda Model (JM Model), use past data to calculate either the mean time to failure or the failure rate of the specific data. Given the current state of the economy, it is not reliable to depend upon data that is not in real-time. In order to overcome the problem of inaccuracies caused by past data, a failure time model should be able to predict failures in real time with respect to the past data and then calculate the mean time to failure.

* The whole time series is challenging and model data should be validated using estimations compared with actual failures.

**Specification:**

We will make single-step and multi-step predictions using a recurrent neural network (specifically a LSTM [Long Short-Term Memory] network) that, when given the past data, takes this past data and predicts possible real time values. The LSTM stores pattern data to some extent in every level giving higher accuracy. By predicting possible real times, we can consider the model to be more reliable than other failure rate models. It is important to note that as there are many constraints with respect to data (when a failure value is considered, if the failure is stored and if so what kind of failures, etc.), predicting would not help with these constraints – the model would primarily provide a better chance at understanding the failure rate.

**Process:**

1. Take the failure time data, create a dataset, and use it to train the data
   1. Feature scaling in the range for the pattern (standard mean of the data)
2. Neural network (LSTM) **single-step prediction** strategy (direct approach for the next prediction)
3. Estimate the parameters (Mean Time to Failure, Failure Rate)
4. Visualize the data with the predicted value and without the predicted value
5. Use the data from Step 2 for **multi-step prediction** strategy using a LSTM
6. Validate, test, and plot the data
7. Estimate and compare the parameters.

PLANNING:

ERIC : lstm single step and multi step,

Editing the report

Resources for LSTM

Naveena : RNN single step and multi step (both univariate and multivariate data)

Report first write

Resources for RNN