**Electric Motor Speed Prediction**

**Business Objective:**

Predict Motor Speed based on other attributes available

The dataset comprises several sensor data collected from a permanent magnet synchronous motor (PMSM) deployed on a test bench. The PMSM represents a ccTest bench measurements were collected by the [LEA department](https://ei.uni-paderborn.de/en/lea/) at Paderborn University. This dataset is mildly anonymized.

All recordings are sampled at 2 Hz. The dataset consists of multiple measurement sessions, which can be distinguished from each other by the column "profile\_id". A measurement session can be between one and six hours long.

The motor is excited by hand-designed driving cycles denoting a reference motor speed and a reference torque. Currents in d/q-coordinates (columns "i\_d" and i\_q") and voltages in d/q-coordinates (columns "u\_d" and "u\_q") are a result of a standard control strategy trying to follow the reference speed and torque. Columns "motor\_speed" and "torque" are the resulting quantities achieved by that strategy, derived from set currents and voltages.

Most driving cycles denote random walks in the speed-torque-plane in order to imitate real world driving cycles to a more accurate degree than constant excitations and ramp-ups and -downs would.

**Data Set Details:**

Comprehensive csv files containing all measurement sessions and features. Each row represents one snapshot of sensor data at a certain time step. Sample rate is 2 Hz (One row per 0.5 seconds). Distinctive sessions are identified with "profile\_id".

**Feature set**:

ambient

Ambient temperature as measured by a thermal sensor located closely to the stator.

coolant

Coolant temperature. The motor is water cooled. Measurement is taken at the outflow.

u\_d

Voltage d-component

u\_q

Voltage q-component

motor\_speed

Motor speed

torque

Torque induced by current.

i\_d

Current d-component

i\_q

Current q-component

pm

Permanent Magnet surface temperature representing the rotor temperature. This was measured with an infrared thermography unit.

stator\_yoke

Stator yoke temperature is measured with a thermal sensor.

stator\_tooth

Stator tooth temperature is measured with a thermal sensor.

stator\_winding

Stator winding temperature measured with a thermal sensor.

profile\_id

Each measurement session has a unique ID. Make sure not to try to estimate from one session onto the other as they are strongly independent.

**Acceptance criteria:**

The project work would be accepted and deemed completed upon meeting the following criteria:

* All possible models with different algorithms should be evaluated
* 90-95% accuracy alongside a least error should be attained
* The models should be deployment ready and should be easily understood by non-technical/business teams
* The insights should be clearly documented
* The visualizations should be used in respective areas for story telling

**Milestones:**

The project should be completed in 45 days. A detailed breakdown of the schedule is as follows

| **Milestone** | **Duration** | **Task start - End Date** |
| --- | --- | --- |
| Kick off and Business Objective discussion | 1 day | 17th Jan 2023 |
| Data set Details | 4 days |  |
| EDA | 1 week |  |
| Model Building | 1 Week |  |
| Model Evaluation | 1 week |  |
| Feedback |  |
| Deployment | 1 Week |  |
| Final presentation | 1 day |  |

Protocols:

1. All participants should adhere to agreed timelines and timelines will not be extended
2. All the documentation – Final presentation and R/python code to be submitted before the final presentation day
3. All the participants must attend review meetings