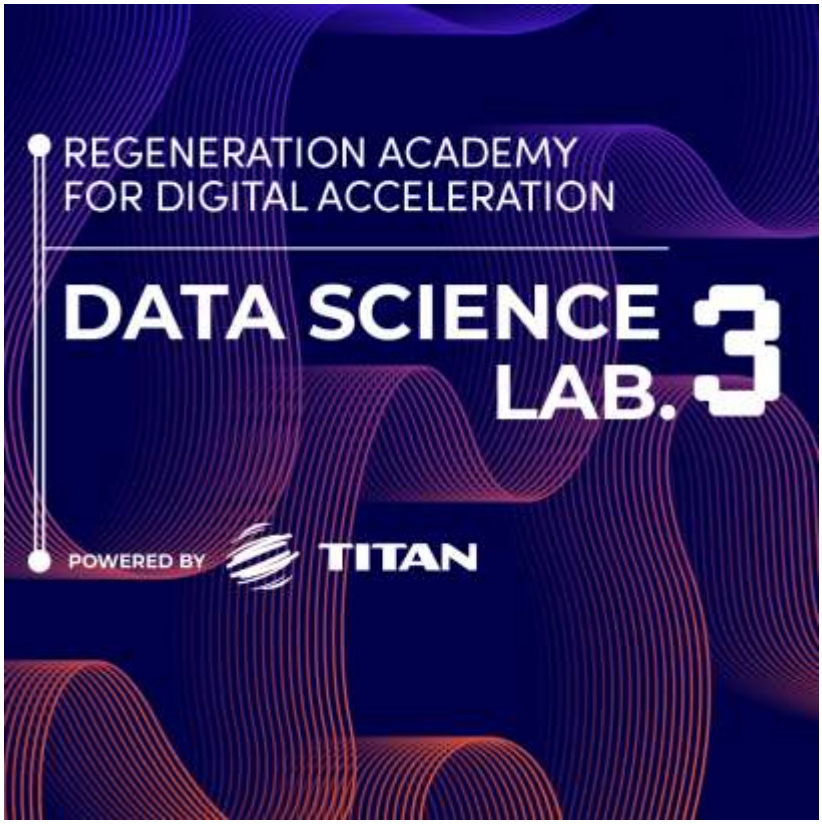
Code.Hub



Final Project

Project Requirements

May 2023

REGENERATION®

TITAN

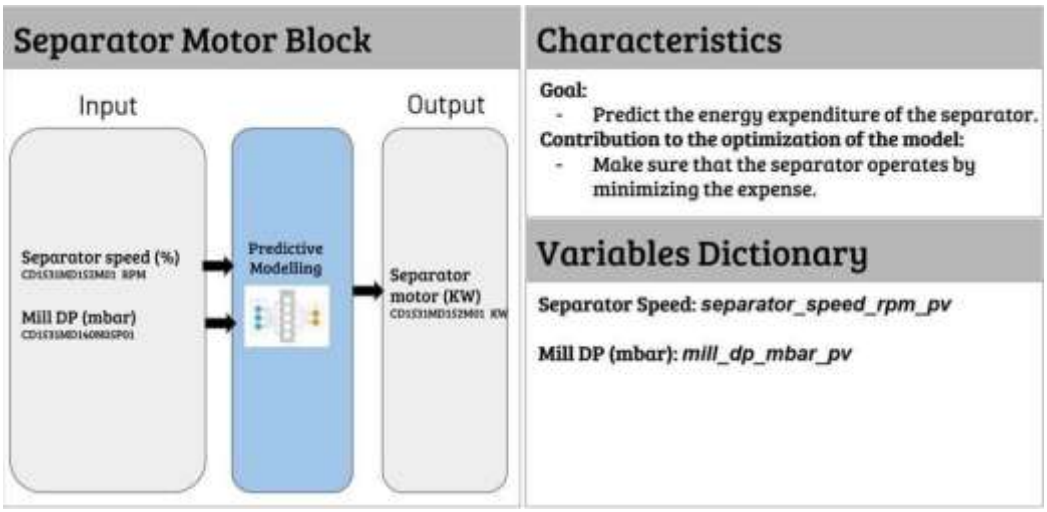
Cement Mill Process

This is a mimic of the Cement Mill in PECEM Plant in Brazil. This gives an overview of the process of the mill.

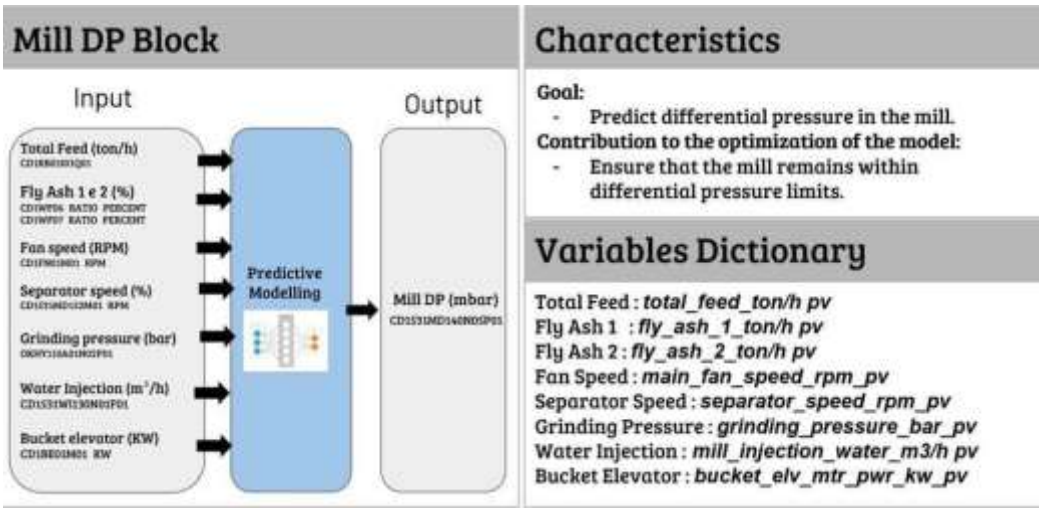
You can find a more detailed mimic in a separate file accompanied with an excel file which maps the numbers in the mimic with the tag names of the sensor variables.

Block 1: Separator Motor Block

For analysis purposes the production process can be broken down to several blocks. Each block describes a specific part of the process. For example, the Separator Motor Block gives us the dependence of the energy expenditure of the separator from the input variables. These dependencies have been determined by business knowledge, which means that there might be other dependencies that can be identified by extra analysis.



Block 2: Mill Differential Pressure Block



Tasks

You are given a dataset that contains measurements for a 4-month period from a cement mill plant. There are **2 separate problems** that need to be addressed, i.e. the *Blocks* above. Each of these has a series of inputs (which are the independent variables that should be used) and one output (that will serve as the target variable). These are described in the Figures above.

For each of the two blocks:

1. Check the dataset for irregularities (e.g. missing or extreme values, values in bad format) and make the appropriate actions if needed.
2. Understand the main statistical characteristics of the important (input, output) variables of the dataset using visual and statistical methods.
3. Quantify the delay time (if any) between a variation in the input variables and the outcome effect in the output variable.
4. Explore the correlation of the output variable with the input variables using visual and statistical methods and describe the influence on the output variable that a variation of the input values causes.

Main Task

5. Using the proposed input variables (and any other variable from the received dataset that you think is relevant) create a model that, given the operating conditions of the mill, can predict the output variable for the next 5 minutes, in 30 second intervals.

Bonus Tasks

6. Investigate if the use of any other variables, not present in the block's "input variables", can help.

Comments

- You might be asked to produce predictions for any of the two blocks in new, previously unseen, data.
- This cement mill produces two types of cement. There are relevant variables in the dataset that give this information.
- We are interested in predictions when the mill operates in normal conditions. E.g. we are not interested in the periods when the mill starts or stops its operation. The main variables that determine a normal operating condition for the mill is the Mill Motor KW and the Mill Fresh Feed.