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IIA1420 2022

Assignment 2 - Data Visualization and Regression Models

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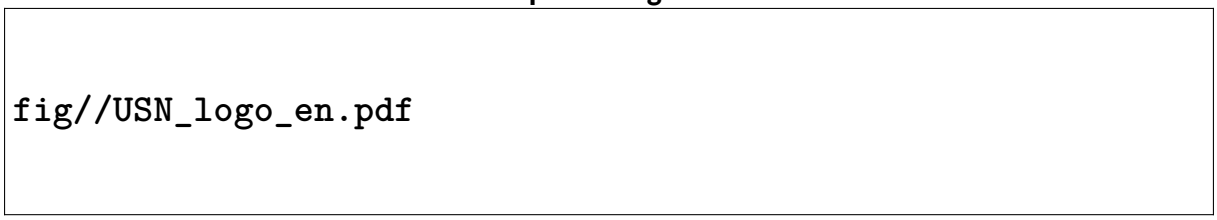

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Contents

1 Understanding the problem

The following chapter discusses and answers a few questions regarding the problem and the dataset, to better understand the following chapters.

1.1 What type of problem is it?

The problem at hand is in fact a regression task. The dataset available contains monitored sensory data, with noise, and can be considered labeled. The goal is to develop a model that can predict/extrapolate the RUL (Remaining Useful Life) of turbofan jet engines.

1.2 What category of machine learning is required?

As the dataset can be considered labeled, i.e. the columns in the dataset are labeled and have some physical meaning, the supervised learning category will be used.

1.3 What does each column in the dataset represent?

The dataset contains multiple columns, see figure 1.1 for brief descriptions of each column.

Table 1.1: Column descriptions

Engine	Identification number.
Cycle	Counted rotations since initialization.
Settings 1-3	How the systems configurations change over time.
Sensor 1-21	Various sensor measurements.
RUL	Remaining useful life.

1.4 Features and targets

Attributes are data types in the dataset that reflect the name of configured or measured values such as voltage set on a motor or pressure. Features are attributes bundled with a value. Targets are usually the information that is intended to predict. In this case features are all configuration and sensory data and the target is the RUL.

1.5 Not features or targets

Identification columns aren't features if they are all the same brand and make of fan. Time might be a feature.

2 Data Visualization

This chapter contains visualizations of the dataset that can be used to get better understanding of the system.

2.1 Histogram

All the available data was plotted, see figure 2.1.

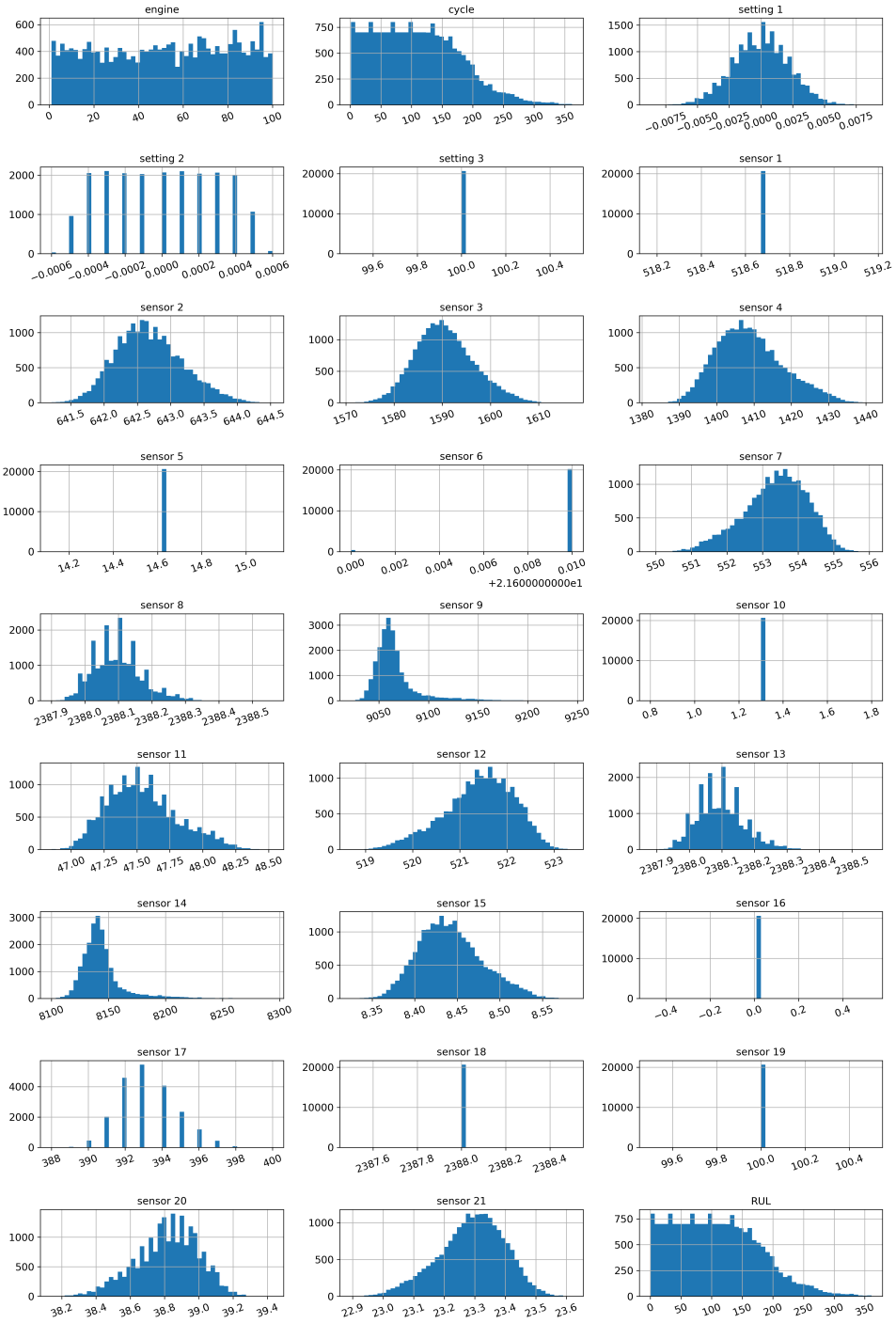

Figure 2.1: Histogram plot of all attributes.

3 Preprocessing and feature selection

This chapter discusses the dataset plotted in the previous chapter.*

3.1 Feature removal

Low correlation with feature: The engine (id) attribute is again not a feature or a target, and we can see that most engines have similar amounts of data points, engine attribute can safely be removed.

Highly correlated: Cycle and RUL are almost identical in terms of value frequency, which isn't strange since these are opposites, we should only use one of them.

High difference between feature values: Setting 2 and sensor 17 display gaps between recorded data. This may or may not be an issue.

Constant value:

Setting 3 and sensors 1, 5, 6, 10, 16, 18, 19, all have constant or close to constant values throughout the whole dataset. These should be removed.

Remaining attributes: Cycle or RUL, setting 1, 2, sensor 2, 3, 4, 7, 8, 9, 11, 12, 13, 14, 15, 17, 20, 21.

4 Regression models

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5 Regression models with extended features

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Appendix A

Source code

The source code, Jupyter notebook, used to load, transform and plot data.