

Thesis Proposal:

Classification and Pattern Recognition of Sensor Data

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This thesis project will be part of a research line on automatically understanding the meaning of data collections. It will be supervised collaboratively by the Faculty of Computer Science and the company TechnoAlpin in Bolzano. TechnoAlpin is the leading innovator in the snow-making sector and has been optimizing solutions for snow-making systems since 1990.

Background. Pump stations are crucial components of each snow-making plant and therefore continuously monitored. Various sensors are measuring the key parameters of each pump, valve, etc. Sensors have been installed in the past for controlling the pump stations locally, to be used by the operators of the station. Today with worldwide data connectivity it is possible to collect these data centrally. Besides other sensor types, data from temperature sensors are particularly helpful to detect malfunctions and errors early on. To do this, it is necessary to what kind of measurements is reported by which sensor.

However, while each sensor has an ID and it is clear to which pump station it belongs, it is often not known where exactly it has been placed in the station and what it does measure: it may be the room temperature, the temperature of the water, the temperature of the pump, or the temperature of the bearings.

It is not realistic to let humans identify what data exactly a sensor collects: pump stations exist in many countries and have not all been built by TechnoAlpin; documentation is not necessarily up to date; in the ski season, technicians are too busy with other tasks to systematically study the sensor equipment at a station.

Goals. We would like to classify the temperature sensor data of a pump station, i.e. distinguish sensors that measure the room temperature, the temperature of the water, the temperature of the pump, or the temperature of the bearings. Furthermore, we try to detect patterns that indicate a possible error.

Approach. The student will be guided and supported by the supervisors during the entire duration of the thesis. During an initial period, the student will familiarize himself with the topic and the available data. TechnoAlpin will provide historical measurement data of different ski resorts around the world that will enable the student to evaluate different classification methods. Later, the student will try to detect patterns in the temperature data that indicate possible errors.

Outcomes. The thesis project comprises of analyzing real-world data. We expect the first part of the project to be performed quickly, as the data and several classification methods are available. Identifying important patterns and anomalies in the temperature data is a more challenging task and the findings might be of interest for other applications.

In collaboration with