

Modelling one hour level heating energy consumption of buildings

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can AI algorithms enhance the understanding?

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Background thinking: the power of data analysis

- Project: Artificial intelligence assistance in the energy efficiency work
- How data analysis can be helpful in understanding the heating energy consumption?
 - E.g. multiple linear regression analysis and artificial neural networks are applied for describing the energy consumption
- Work still in progress
 - Now shortly two cases (examples) are presented



Case1. How wind conditions affect to the consumption of the heating energy?

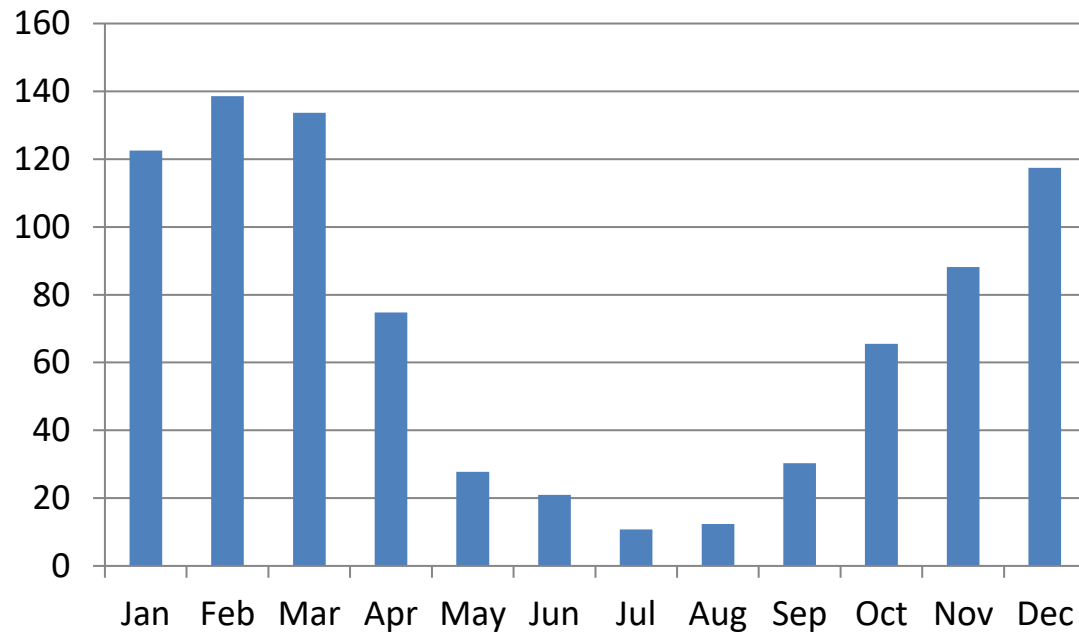
- Let us observe one hour level district heating consumption data (2018)
 - Also the weather data is at one hour level
- Method: Multiple linear regression analysis (MRA)
 - We will perform one equation which describes all factors affecting the energy consumption

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District heating consumption in case1 (MWh) 2018

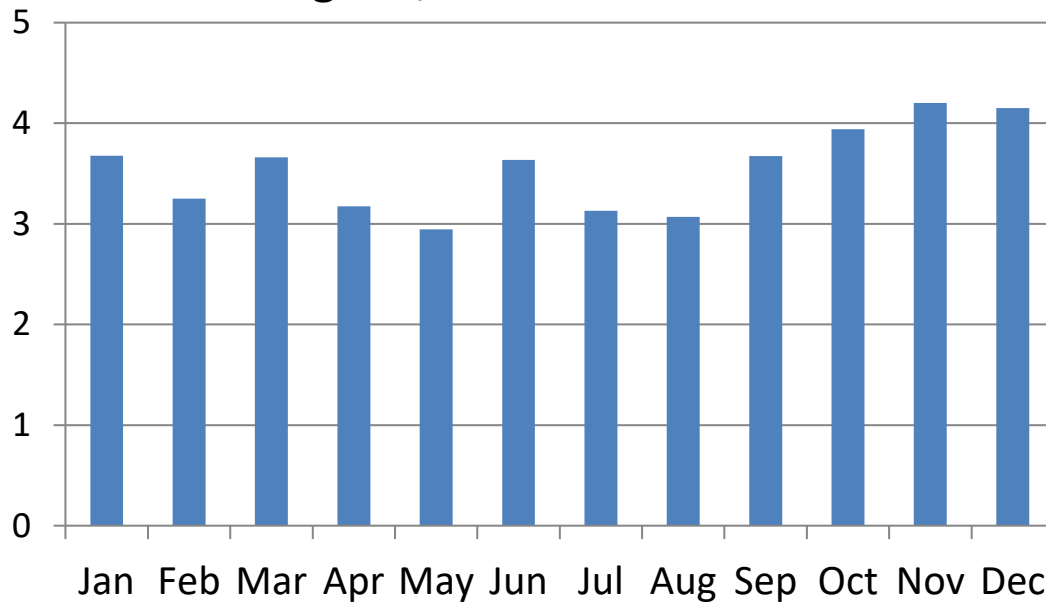
- Office type of building in the shoreline of Helsinki



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Finnish Meteorological Institute (FMI) open weather data 2018 (Kaisaniemi Helsinki)

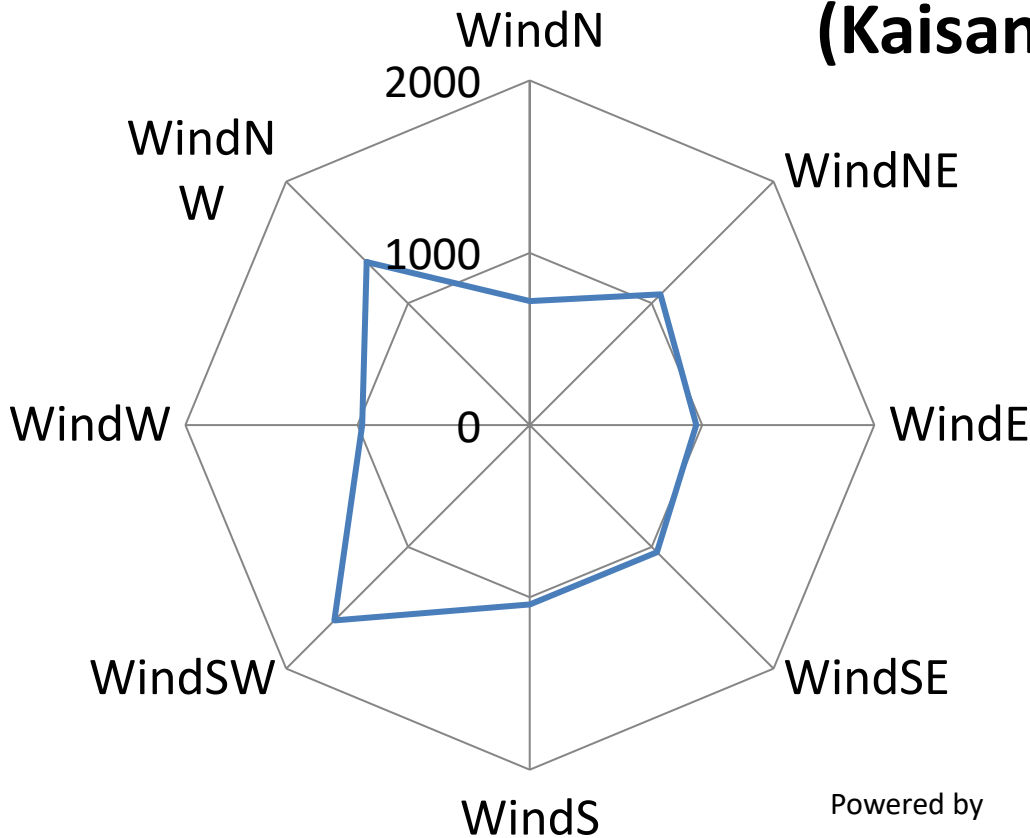
Wind in average m/s



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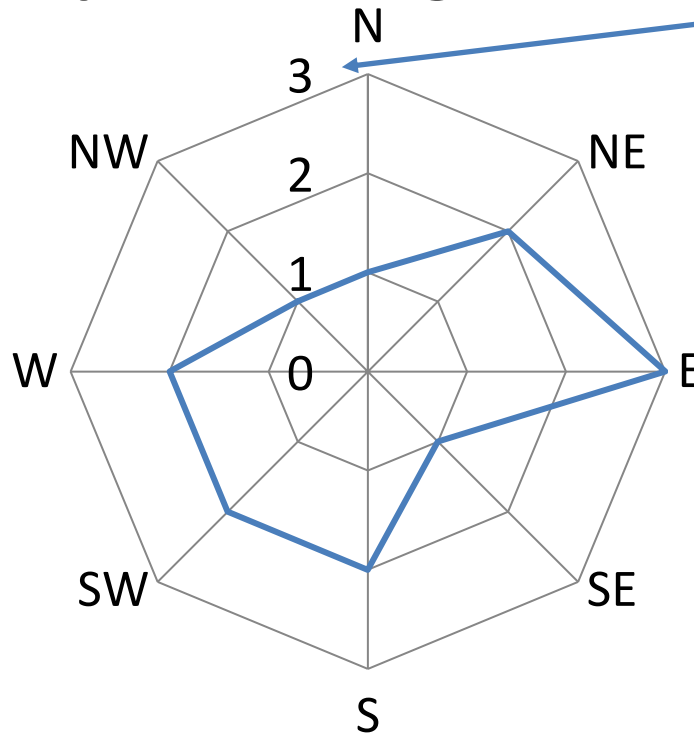


Wind directions (hrs) (Kaisaniemi Helsinki 2018)



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RESULTS: 1 m/s wind effect to heating energy consumption during 1 hour (kWh/h)



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Discussion

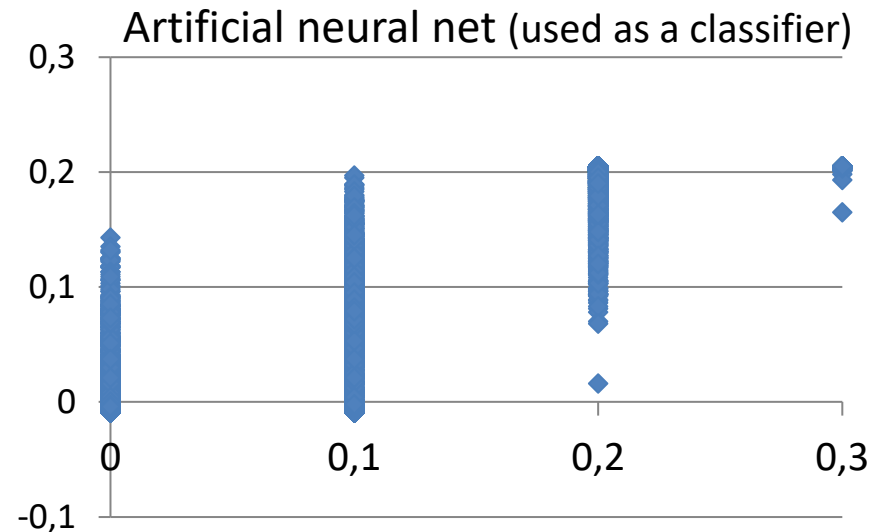
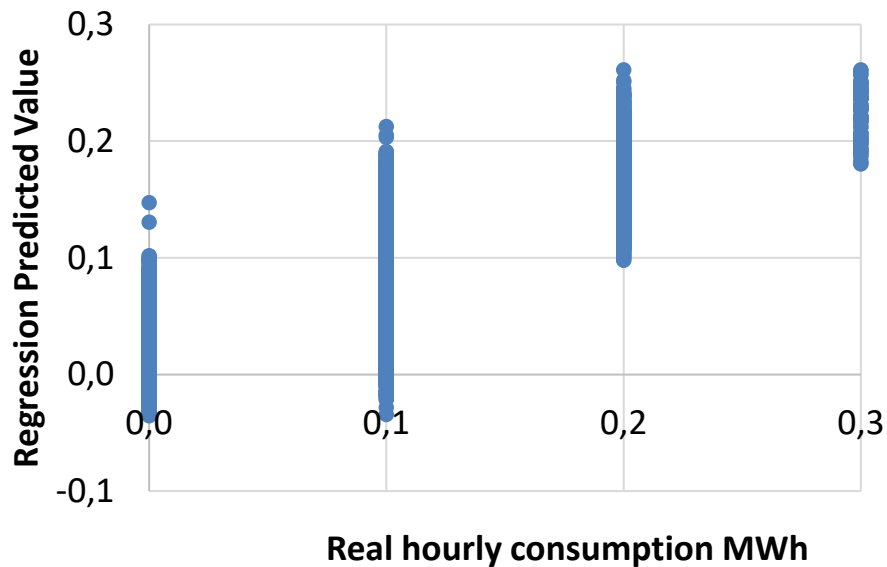
- Is there an effect also to the indoor temperature?
 - So far this data is missing
- Bigger picture: What kind of differences (correlations) there are between the buildings?
- How large the differences in wind conditions are between different years (months)?
- Weather corrections between different years are practically based on HDDs (heating degree days) i.e. outside temperature
 - Is this too simple approach?

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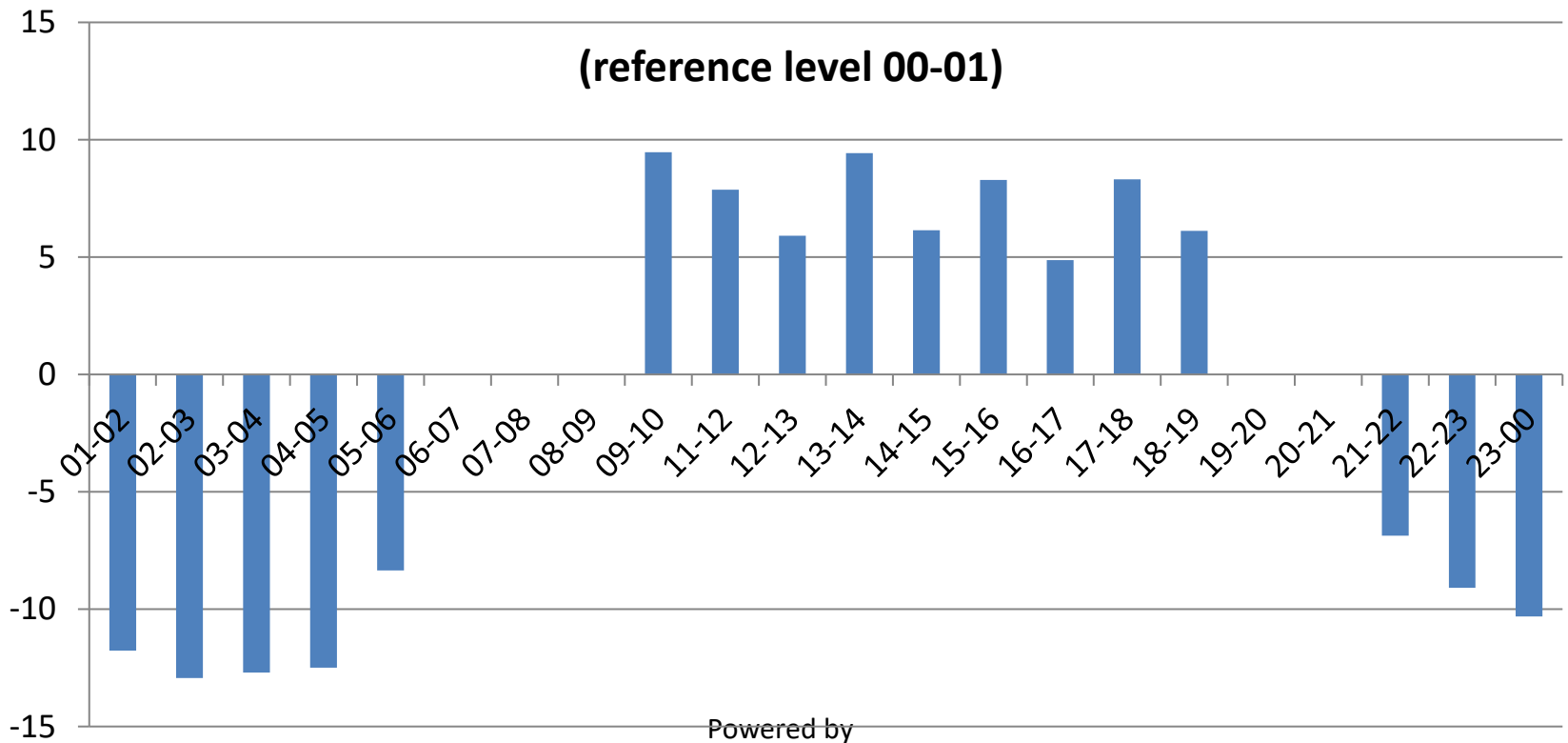
Case 2. Tackling the weakest link...

- It could even be the quality of the dependent variable: consumption data



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Case 2. How time of day is affecting to the heating energy consumption kWh/h (MRA)



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Preliminary conclusions

- Data analysis report of the all bigger buildings energy consumption is likely useful
 - If somewhat decent data is available, about the one week work is enough to produce the report
- Usefulness is expected to grow essentially when data of the indoor conditions is included
 - We are using at the moment Ruuvitag sensors e.g. (promising results)
- Further work is needed! Looking partners for the next steps...

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Thank you

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