



# **Smart Energy System Management**

A case study of an Autonomous Car

Project Plan

WS 2018/19

# Smart Energy System Management: A case study of an Autonomous Car (WS 2018/19)

#### Group:

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**Group 3** 

Project Plan

#### Content

- Project Description
- Project Goals
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- Tasks
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#### **Project Description**

Implementation of a smart energy system including autonomous car

#### **Machine learning & Optimization**

- Forecast power load and generation
  - Optimize power flow schedule

#### **Grid model**

- -Visualize power flow
- Test algorithm and finding constraints

### **Project Goals**

- 1) Analyze historical data and build the model
- 2) Implement forecast
  - a) power consumption
  - b) power generation
- 3) Optimize energy flow under aspect of user preferences
  - a) minimize energy cost
  - b) minimize CO2 emission
  - c) Maximize user comfort
- 4) Implement user interface:
  - a) Give the user the possibility to adapt weight of defined objectives

#### Conceptual Overview

- •Input metrics: e.g. historical data (load- & generation-data,)
- Training set, test set and labels
- •Output metrics: consumption of house or car, Production (e.g. PV), ...

Forecasting

## Optimization

- Input: Forecasted and grid model data (e.g. Power generation/ consumption ...)
- Multi-objective: min economic expenses/ CO2 consumption, max user comfort
- Output: scheduling use of loads and generators

- •Input: Model generation and loads (in Pandapower)
- Output: Power flow

**Grid Model** 

## Project Tasks

Goal	Task		
Data preparation	Data analysis & preparation for machine learning task		
	Discussion about objective, variables, constraints $\rightarrow$ task planning and distribution		
Grid model	Implementation in python with pandapower library		
Multiple machine learning models	Generation PV		
	Consumption/generation Autonomous Electric Car (Prosumer)		
	Consumption TEL		
Optimization	Define objective function, constraints, decision variables		
	Run with historical data		
	Integrate forecasted data		
User Interface	Implement a simple architecture		
	Optical reprocessing of historical and forecast data for plotting		

#### Organisation

- Using agile method
- Using tools: TUB Gitlab (code and issues) & Overleaf and OneDrive (organization and documentation)
- Weekly meeting for discussion of further task and challenges
- ► There will be roles : moderator, experts, documentation responsible

Team member	Studies	Expert' in	
Lucie	computer sciences	machine learning, forecasting during internship	
Claudi	electrical engineering	focusing on energy	
Luisa	energy engineering	focusing on renewable energy technologies and grid integration	
Asma	computer sciences	machine learning, optimization, user interface	
Lara	computer sciences	machine learning, data	
Nikhil	computer sciences	machine learning, cloud computing, electrical eng background	
Hanggai	computer sciences	machine learning, optimization, data analysis	

## Project Plan

Research & conceptualization

Basic implementation

First testing phase implementation

Final testing phase

## Task Distribution Backlog

Week No	Due Date	Milestones and Task	Responsible person	Done
		presentation layout	Asma, Nikhil	x
		git: project plan	Lara, Nikhil	x
		google drive (include planning, documentation & presentations)	Luisa, Nikhil	x
		presentation: include tasks for upcoming week (see below)		x
		presentation: include project description (general motivation & goals)	Claudia, Nikhil	х
1 04. Dez	Planning presentation			
	Data analysis	Claudia, Luisa, Nikhil		
	architecture	Haggai, Asma		
		algorithm research	Lucie, Nikhil, Asma	
2	11. Dez	Share information about data and research outcome (group intern)		
3	18. Dez			
4	25. Dez	Basic simple system		
5	01. Jan			
6	08. Jan	Milestone presentation		
7	15. Jan			
8	22. Jan			
9	29. Jan	Finish implementation		
10	05. Feb	Final presentation		
11	12. Feb			



Get In Touch



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