Lucerne University of
Applied Sciences and Arts

HOCHSCHULE
LUZERN

Technik & Architektur

Applied Maschine Learning Days 2020

AI & Energy

Braulio Barahona, Andreas Melillo, Patrick Meyer, Philipp Schütz

Competence center for thermal energy storage, Lucerne University of Applied Sciences and Arts

philipp.schuetz@hslu.ch

FH Zentralschweiz

AMLD EPFL

Session 1: 13.30 – 15.00

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THERMAL ENERGY STORAGE
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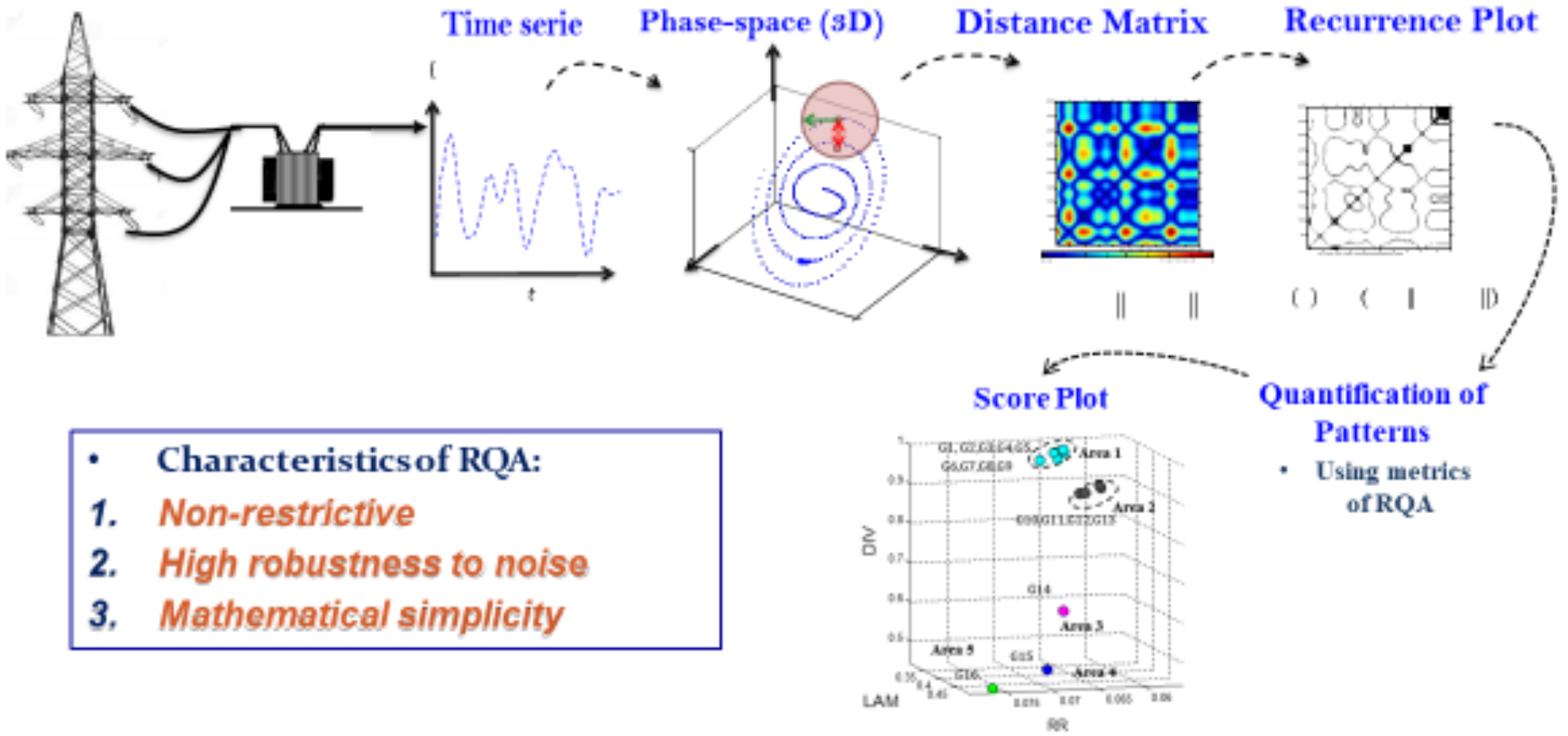
13:30 - 13:55	**Bringing intelligence in system health management of power systems: From system health monitoring to decision support**	Olga Fink, ETH
13:55 - 14:07	**Data analytics and machine learning applications for a sustainable energy future**	Angelos Selviaridis, EKZ
14:07 - 14:19	**Monitoring, control, and digitalization of electrical distribution grids using automated and data-driven solutions**	Omid Alizadeh-Mousavi, DEPSys
14:19 - 14:31	**From big data to a virtual power plant**	Sabine Vincent, Florian Hochstrasser, tiko energy solutions
14:31 - 14:43	**Digital Transformation in Renewables: Challenges and Opportunities**	Pramond Bangalore, GreenByte
14:43 - 14:55	**Academic and business research in AI for Energy**	Emanuele Fabbiani, xtreamers
14:55 - 15:00	**POSTER PITCHES**	All poster presenters are welcomed

zh aw School of Engineering

"Recurrence Quantification Analysis for Power Systems Coherency Identification"



- **Characteristics of RQA:**

1. *Non-restrictive*
2. *High robustness to noise*
3. *Mathematical simplicity*

Exploring the spatio-temporal dynamics of urban energy consumption using visual analysis

Department of Management, Technical University of Denmark, 2800 Lyngby Denmark
Xiufeng Liu (xiuli@dtu.dk), Zhibin Niu, Russell McKenna and Per Sieverts Nielsen*

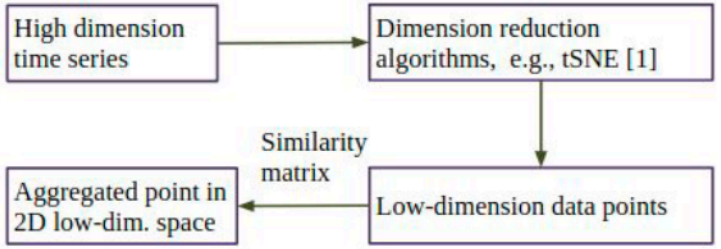
Introduction

A **visual analysis tool** for exploring the spatio-temporal dynamics of urban energy consumption, through:

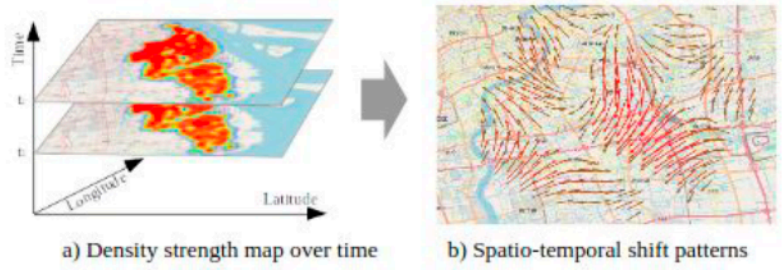
- interactive data analysis;
- analysis in combination with human cognition
- answer business questions in visual graphs

Methods

- **Typical energy consumption pattern discovery**

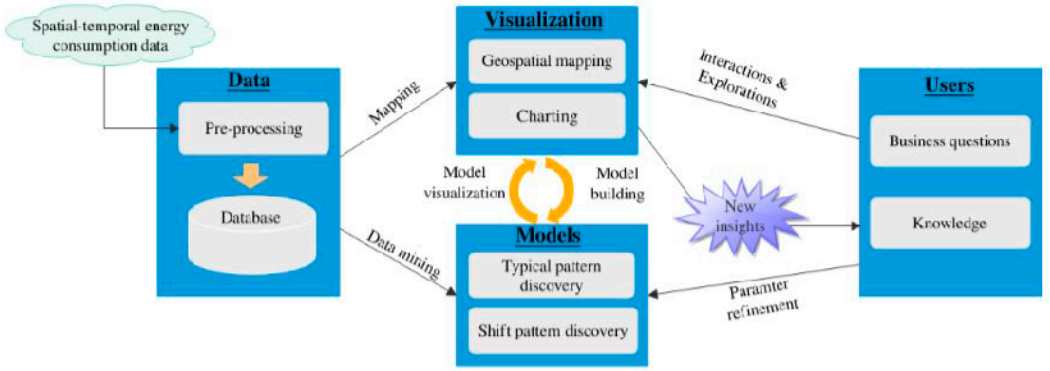


- **Energy demand spatial shift pattern discovery**

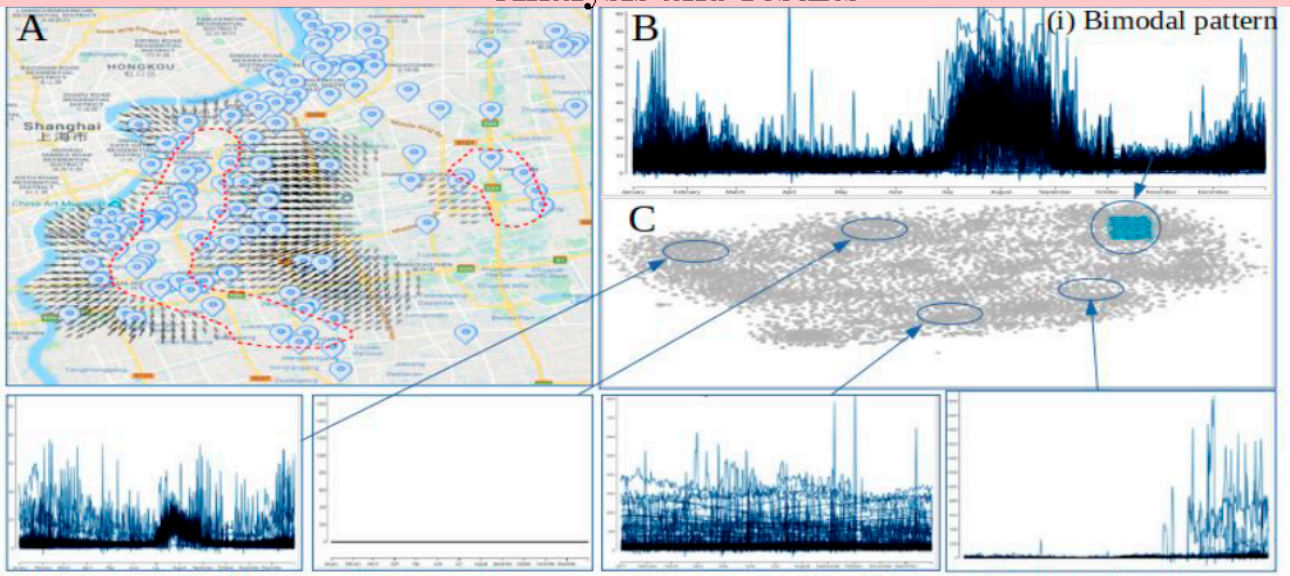


a) Density strength map over time b) Spatio-temporal shift patterns

Visual analysis overview



Analysis and results



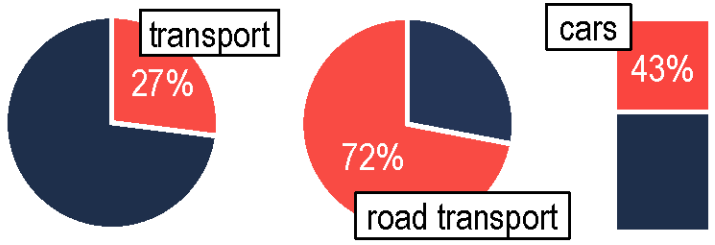
Energy-efficient routing of electric vehicles with intermediary charging stations: A reinforcement learning approach

Dorokhova M., Ballif C., Wyrsch N.

PV-lab IMT NEUCHATEL EPFL

Motivation

- Emissions reduction potential



- Parked 90% of time

EV optimal routing problem

- Limited cruising range
- Sparse charging infrastructure
- Possibility to recharge on the way
- Ability to recuperate energy

State

- Location
- Charge

Action

- Location
- Decision

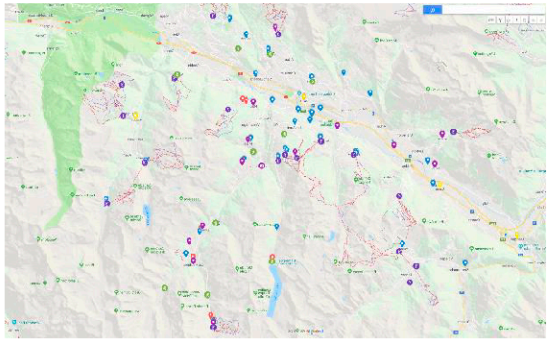
Rewards

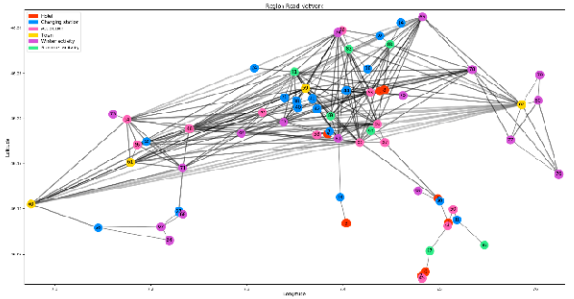
Positive (+1)

- Destination reached
- $charge > bat_{min}$

Negative (-1)

- No actions available





One-step temporal difference (TD) with Q-learning

$$Q(s,a) \leftarrow Q(s,a) + \alpha(reward(s,a) + \gamma \max_{a'} Q(s',a') - Q(s,a))$$

learning rate

discount factor

- Citroen C0
- 16 kWh battery
- 150 km range
- 12.6 kWh/100km

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Break until 15.30

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Session 2: 15.30 – 17.00

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15:30 - 15:55	**Long-term heat load forecasts using hierarchical archetype modelling and hourly smart meter data**	Martin Christensen, Municipality of Aarhus/Aarhus University
15:55 - 16:07	**A Model Selection Approach for Time-Series Based Local Day-Ahead Electric Load Forecasting for Industrial Customers**	Gwendoline Wilke, FHNW
16:07 - 16:19	**A fast inference Machine Learning model to assess the rooftop solar photovoltaic diffusion**	Roberto Castello, EPFL
16:19 - 16:31	**Semi-deep learning with user feedback improving energy prediction models and improving user experience**	Jiufeng Shi, discovergy
16:31 - 16:43	**PID autotuning via two-stage safe Bayesian optimization for heat pump control: Simulation and experimental results**	Bratislav Svetozarevic, EMPA
16:43 - 16:55	**Wind Farm Dynamic Yield Optimization using Reinforcement Learning**	Giorgio Cortiana, EON
16:55 - 17:00	**FINAL WRAP UP**	Philipp Schütz, LUASA