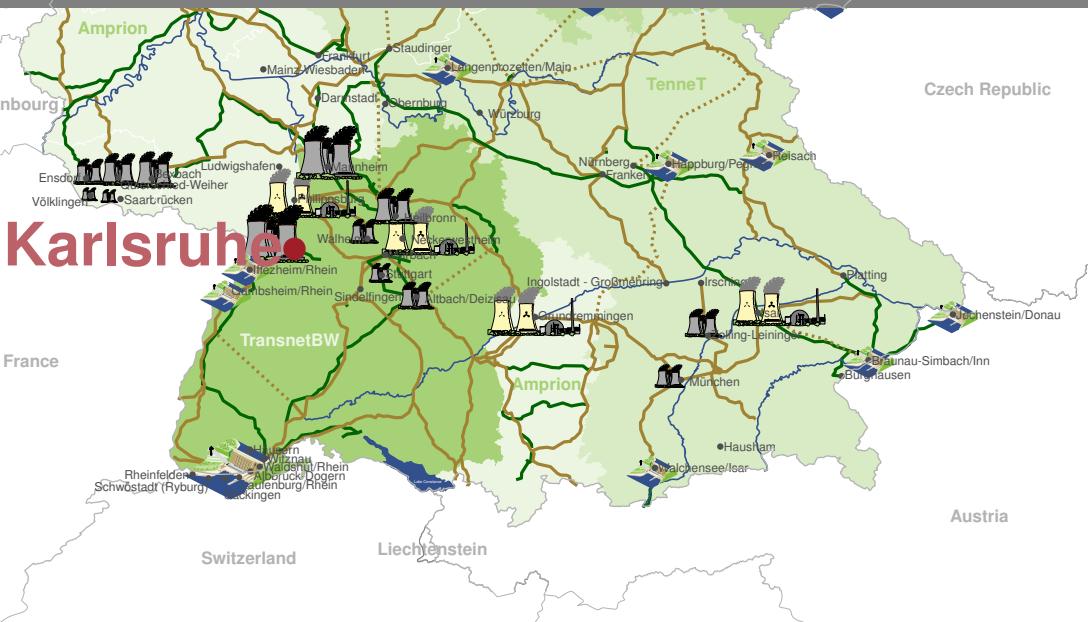
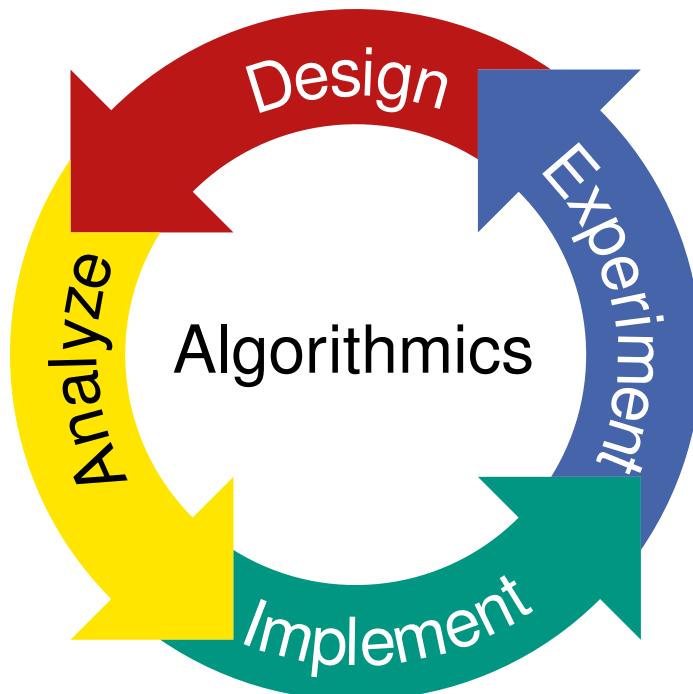


NSERC Energy Storage Technology Network

KIT · March 7th, 2019
Franziska Wegner

INSTITUTE OF THEORETICAL INFORMATICS · ALGORITHMICS GROUP





- **Algorithm Engineering**
- Route Planning
- Graph Clustering
- Graph Drawing
- Geovisualization
- Energy Networks
- Social Network Analysis
- Sensor Networks
- ...

Chair for Algorithmics - Prof. Wagner

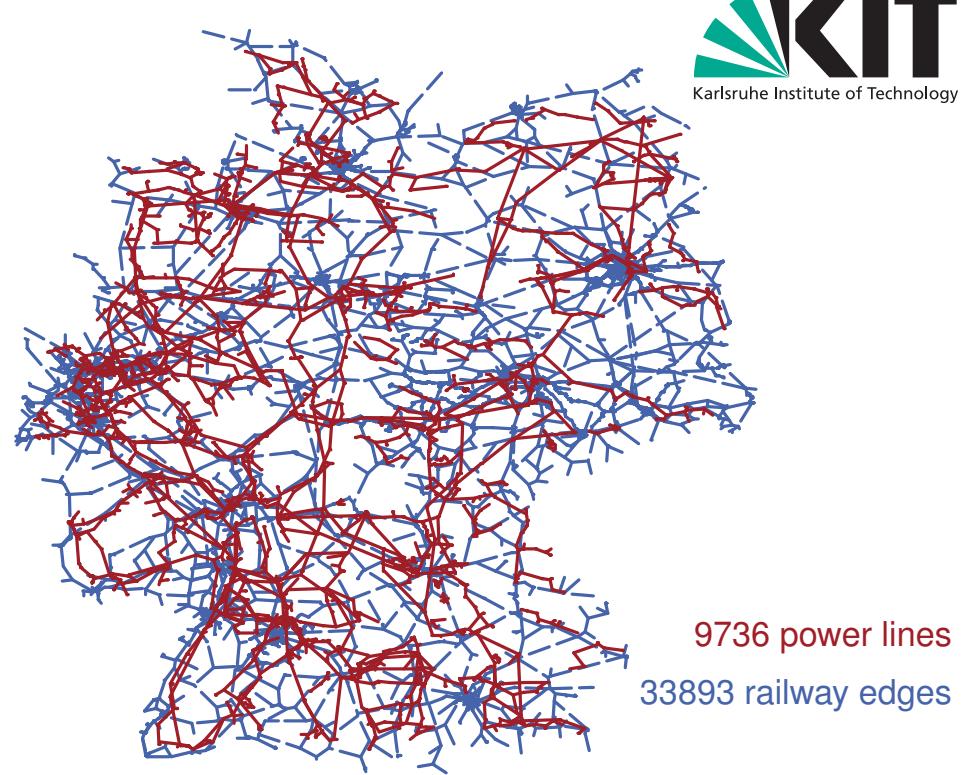
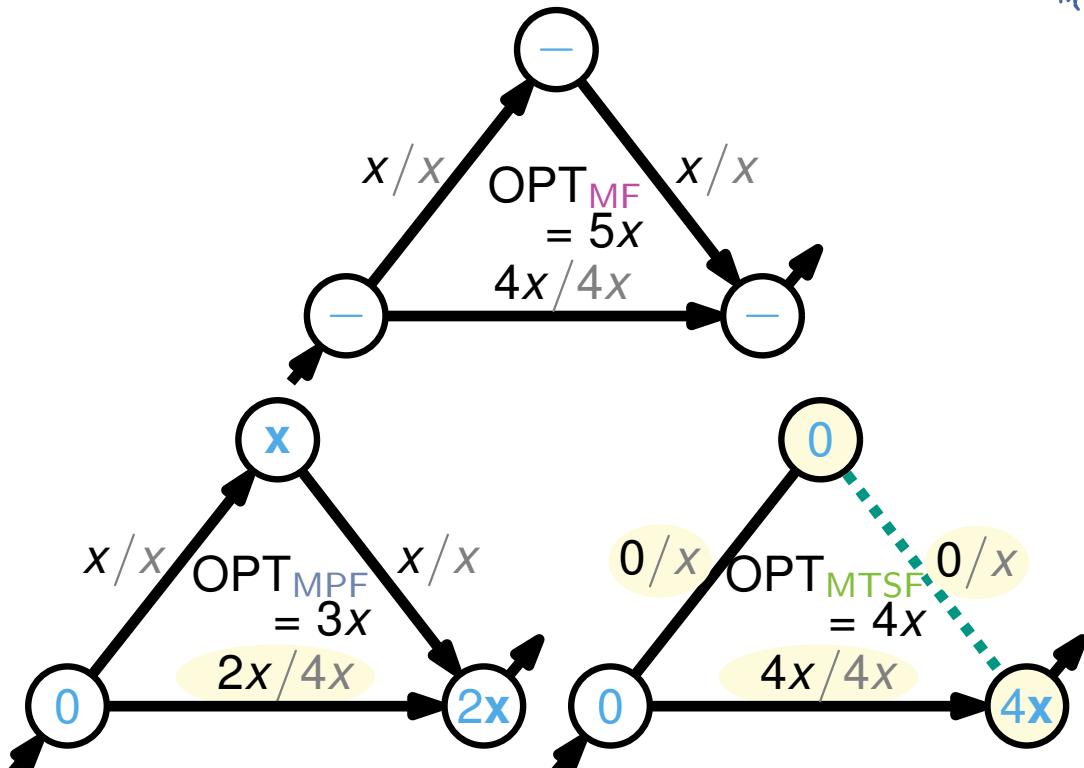


- Chair for Algorithmics
- Professor: Prof. Dr. Dorothea Wagner
 - Member in the department of computer science and mathematics
 - 12 doctoral researchers
 - 2 postdocs
 - 2 secretary

Projects

Transmission Network Expansion

- given a power grid
- extend the power grid to
 - maximize the throughput
 - minimize generation costs



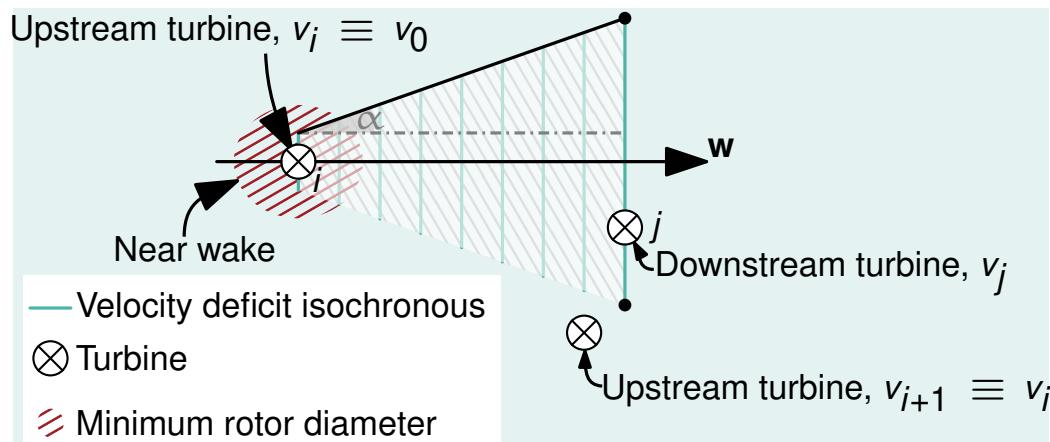
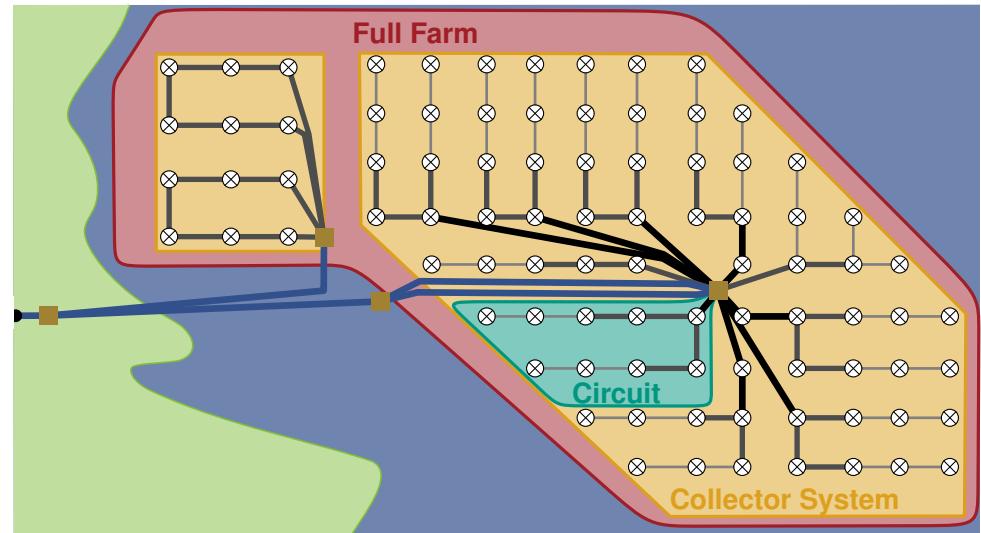
Placement of Control Units

- given a power grid
- place switches or FACTS to
 - maximize the throughput
 - minimize generation costs

Projects

Wind Farm Cable Placement

- placement of turbines and substations is fixed
- different cable types
- find a cost-efficient cabling in the wind farm



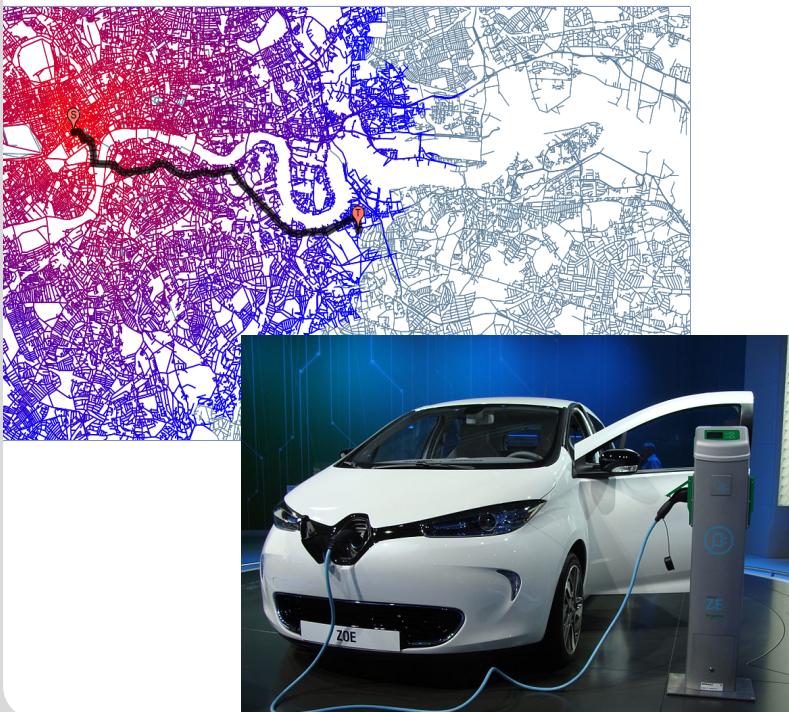
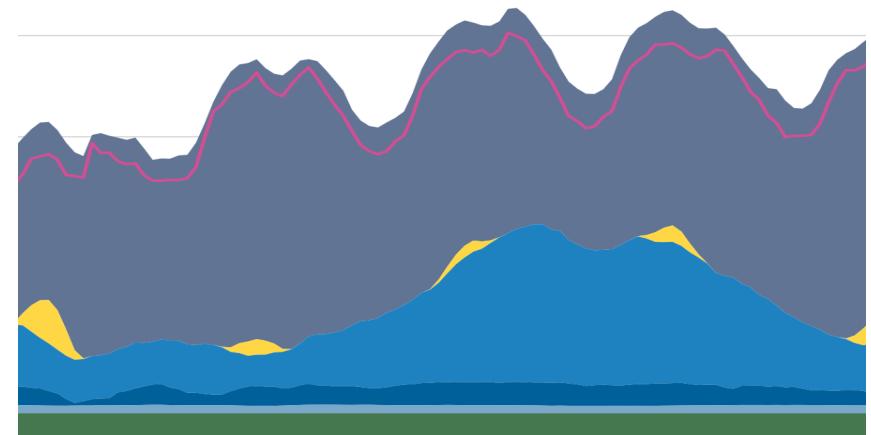
Wind Turbine Placement

- given an arbitrary area, turbine type and wind distribution
- place turbines in the area such that the output is maximized

Projects

Smart Grid – Schedules

- scheduling of flexible demands in smart grid
- scheduling with augmented graphs
- modelling job dependencies



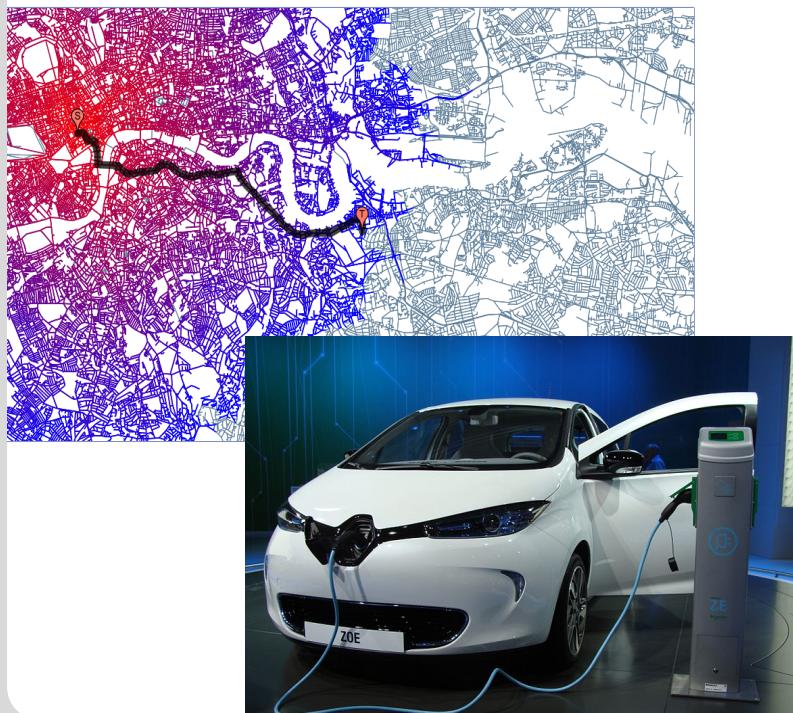
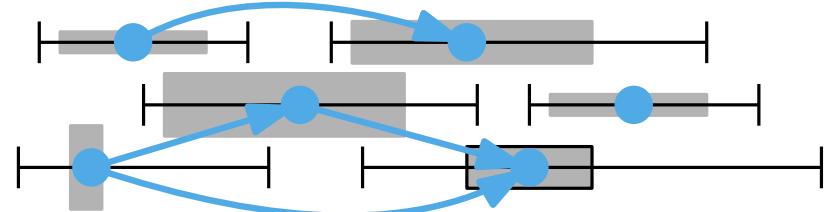
Electric Vehicle Routing

- fast computation of energy-optimal routes for electric vehicles
- battery constraints (capacity, small range, long charging, few charging stations, ...)
- recuperation
- changing parameters (weather, vehicle type, driving style, ...)

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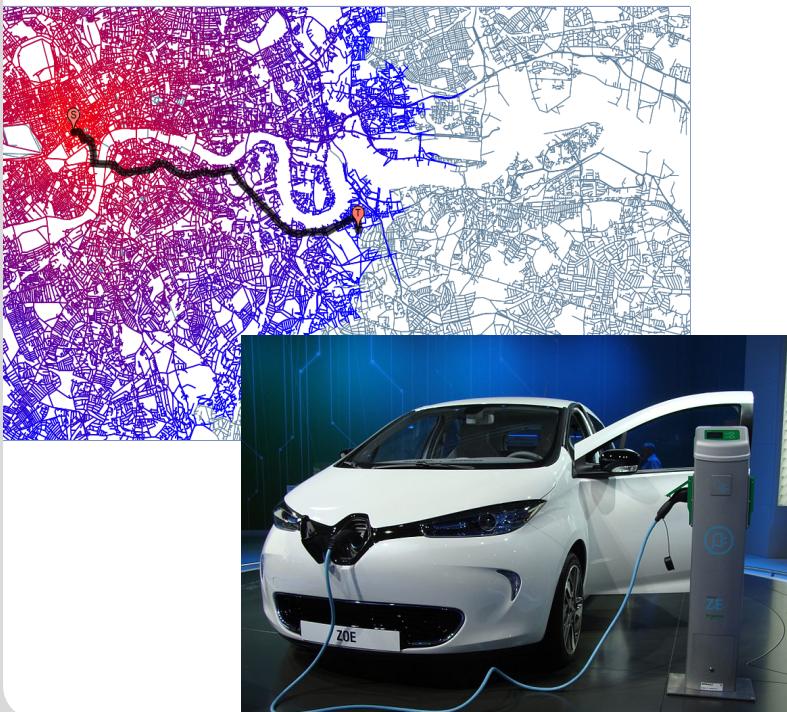
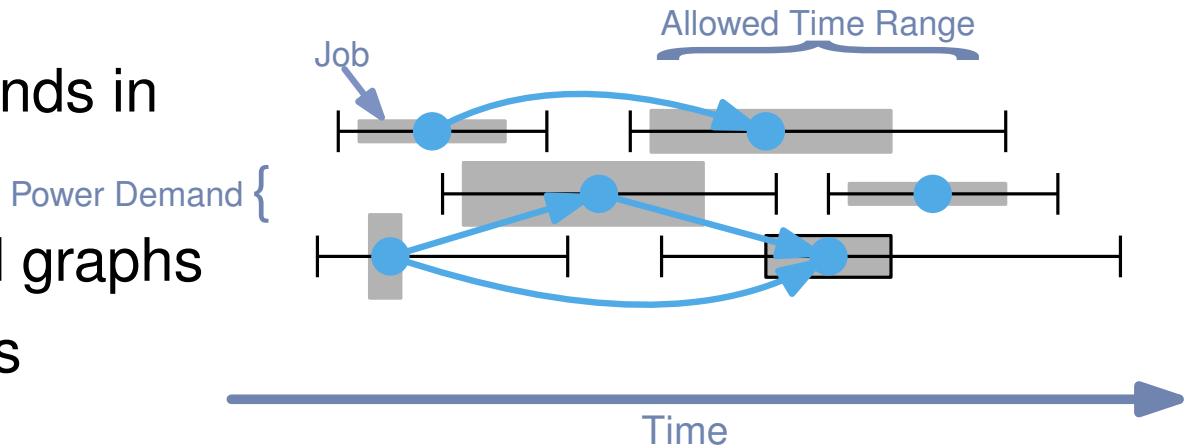
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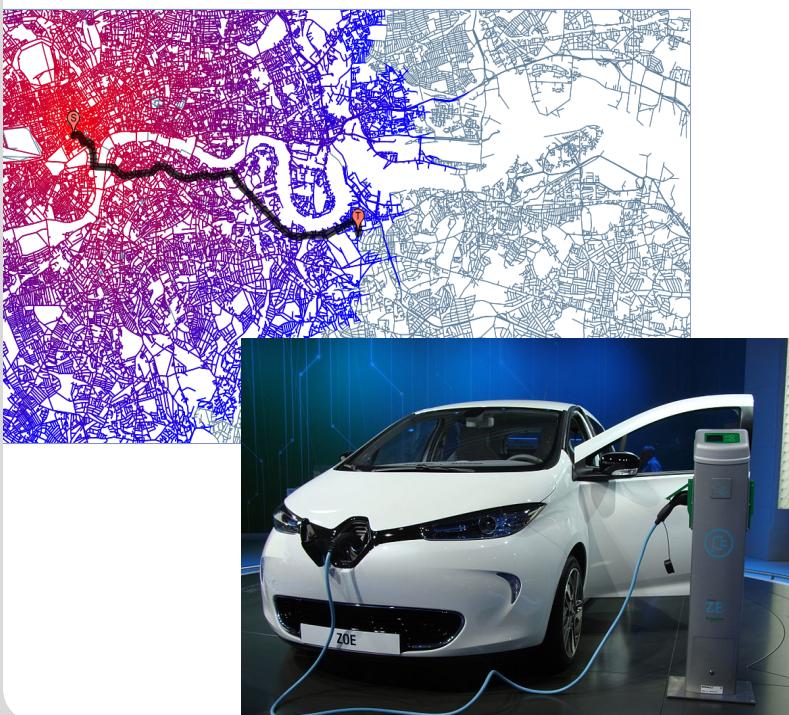
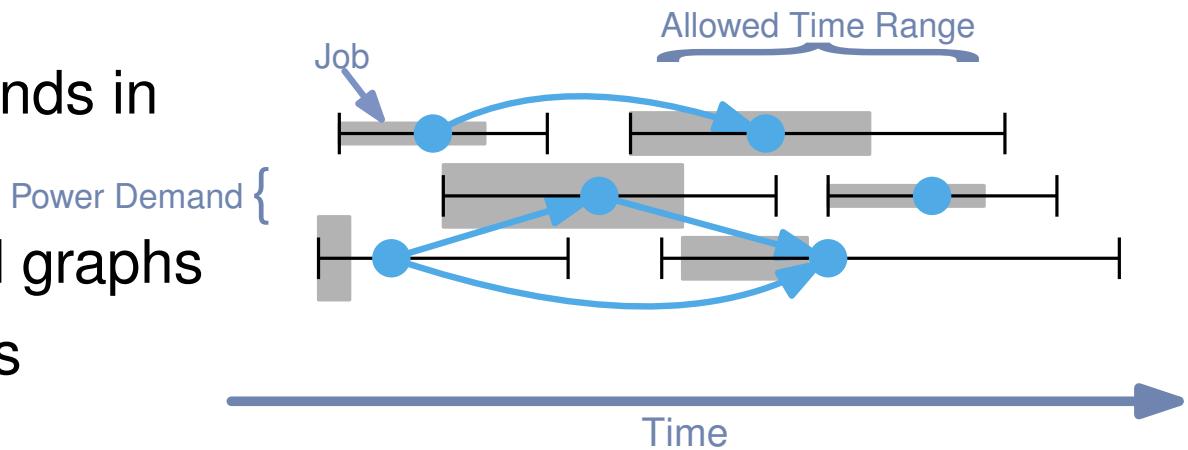
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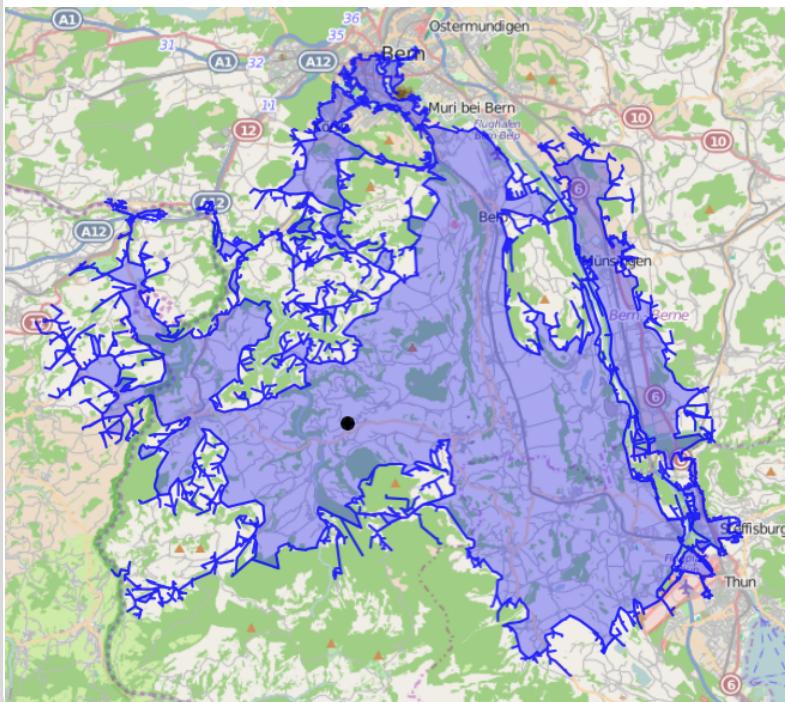
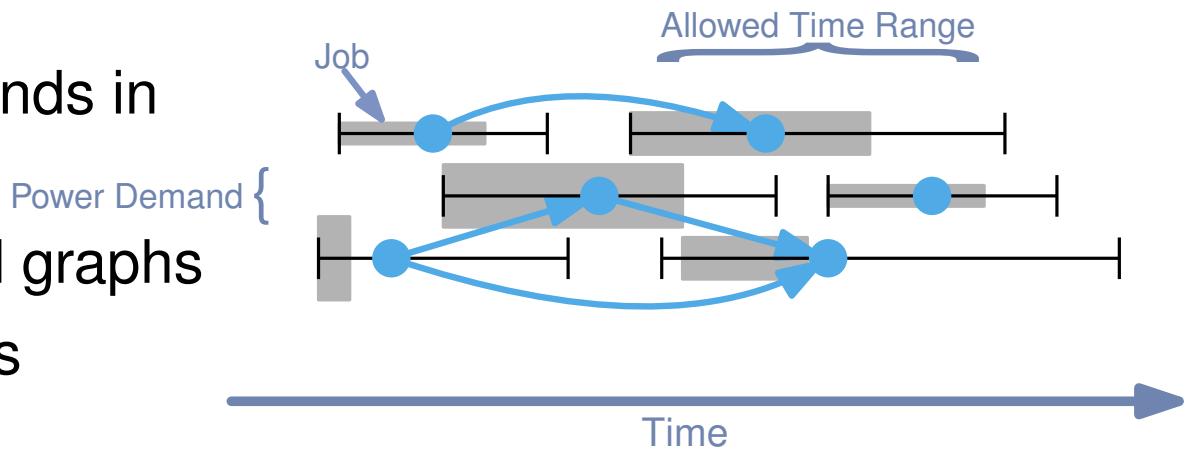
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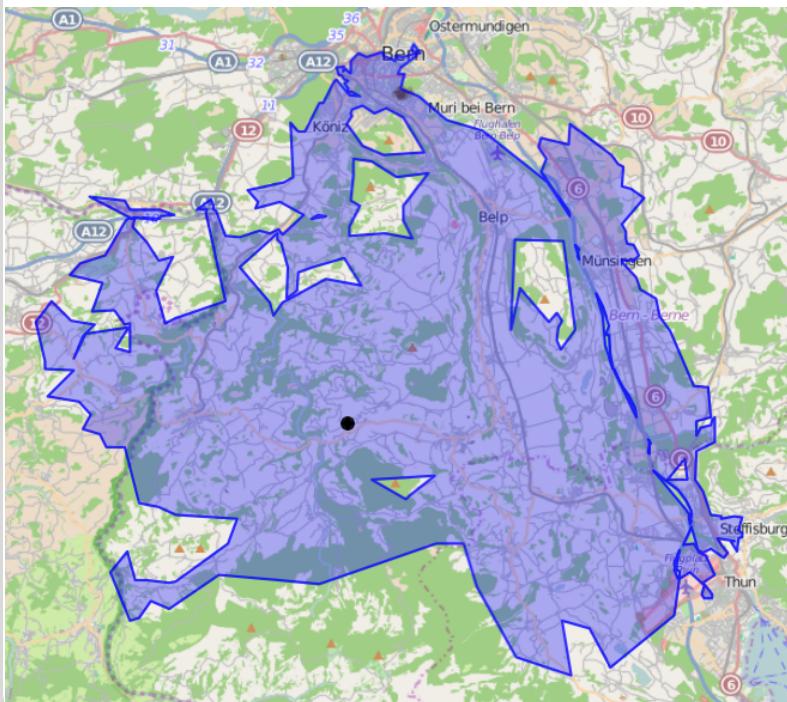
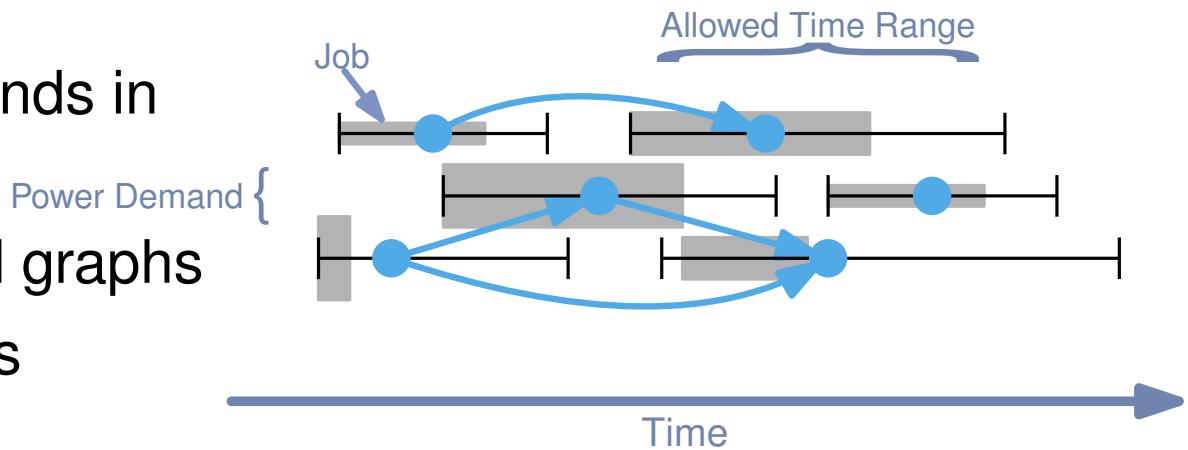
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Scalability Challenge

Given:

complex physical
model

- many constraints
- dynamic scenarios
- not linear

medium-sized instances
already problematic

Scalability Challenge

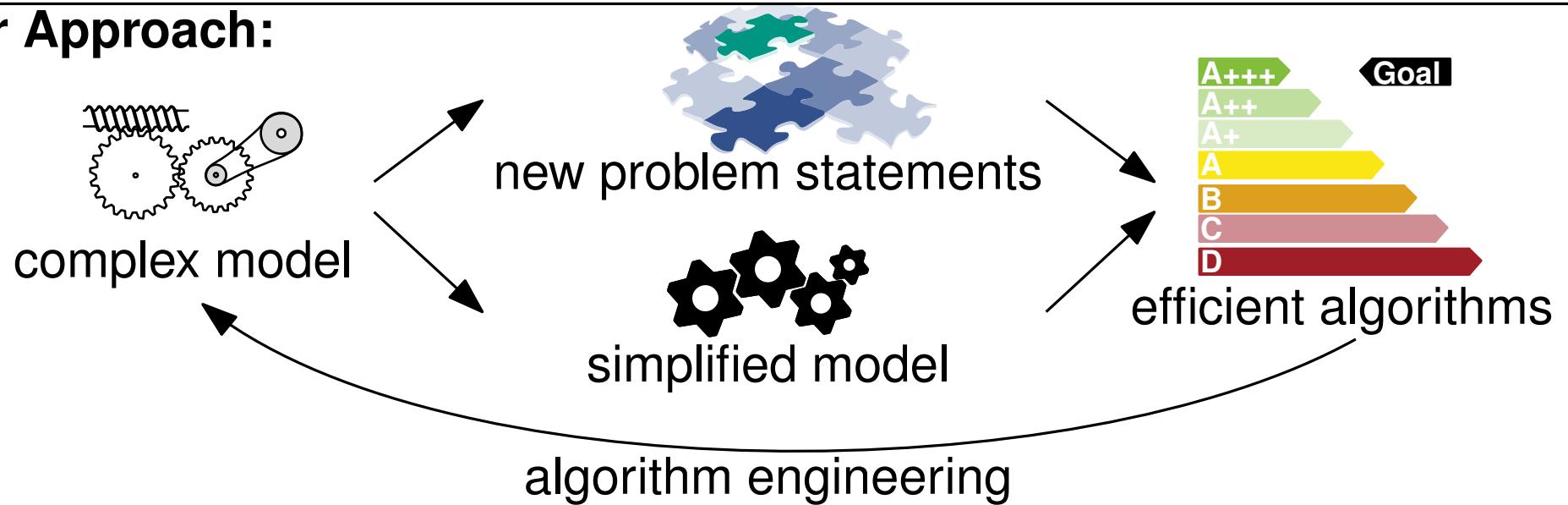
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Our Approach:



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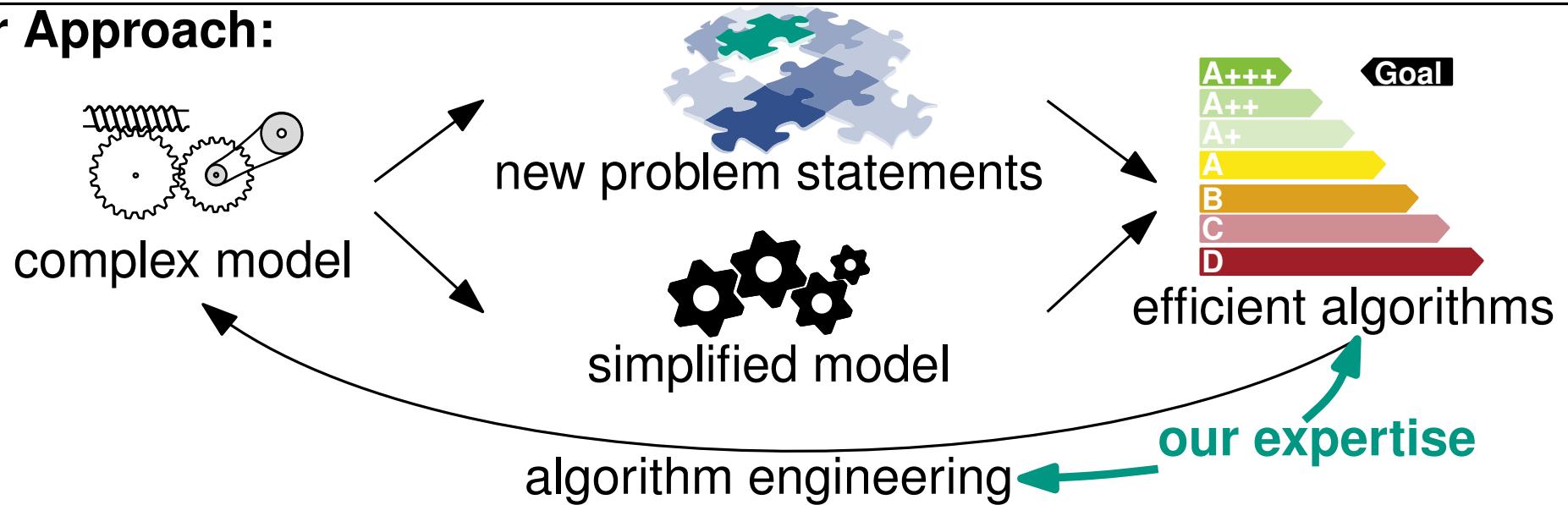
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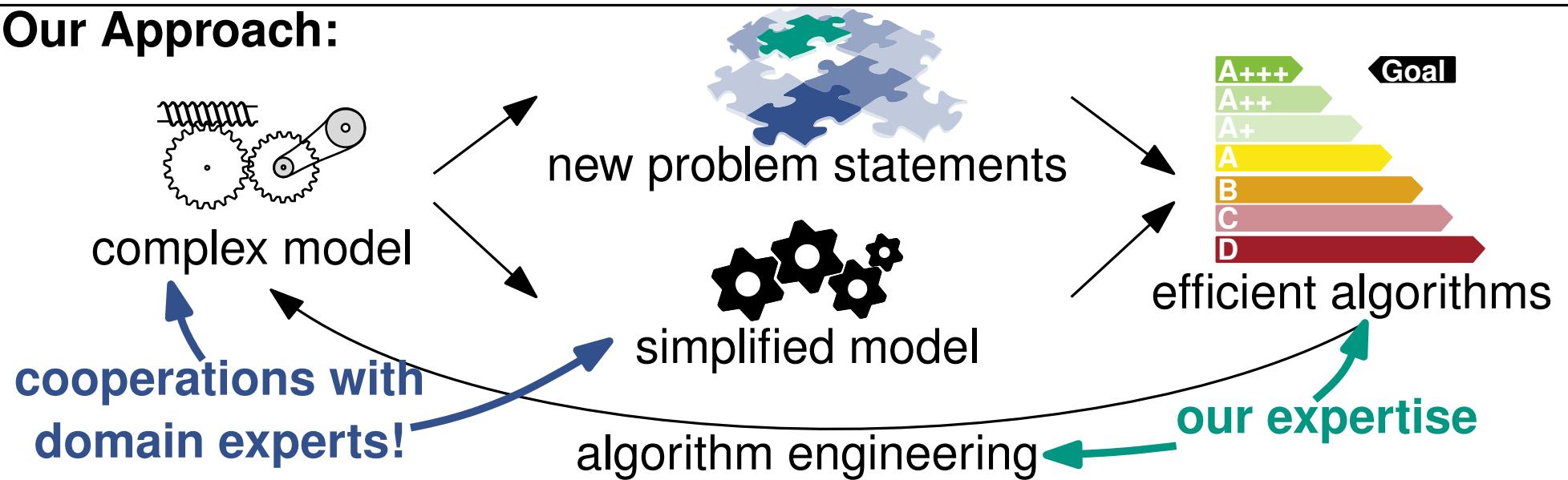
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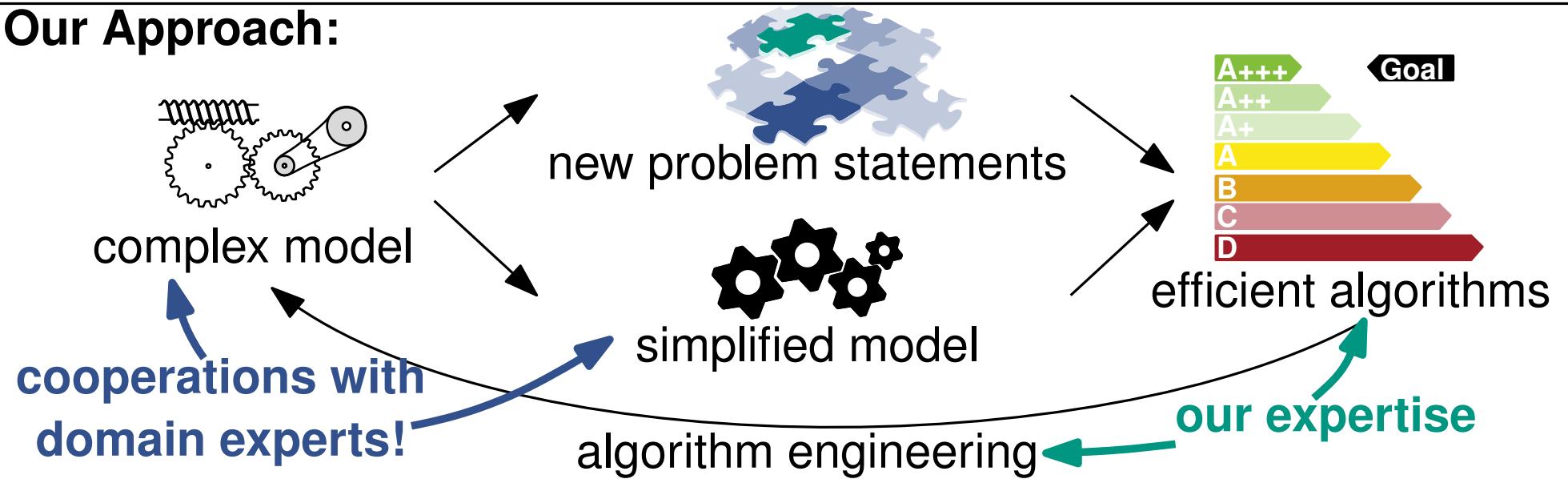
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Application: Energy Networks – placement of switches and FACTS
– wind farm planning
– load peak shaving