

Reinforcement Learning Portfolio Optimization of Electric Vehicle Virtual Power Plants

Master Thesis Proposal

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1 Introduction (10%)

1.1 Research Motivation

1.2 Research Question

1.3 Relevance

2 Related Literature (10%)

2.1 Smart Charging and balancing the electric grid

2.2 Car Sharing of Electric Vehicles

2.3 Reinforcement Learning in Smart Grids

3 Theoretical Background (10%)

3.1 Electricity Markets

3.1.1 Balancing Market

3.1.2 Spot Market

3.2 Reinforcement Learning

3.2.1 Notation

The input to the network $x \in \mathbb{R}^D$ is fed to the first residual layer to get the activation $y = x + \sigma(wx + b) \in \mathbb{R}^D$ with $w \in \mathbb{R}^{D \times D}$, and $b \in \mathbb{R}^D$ the weights and bias of the layer.

3.2.2 Markov Decision Processes

3.2.3 Q-Learning

3.2.4 Function Approximation

3.2.5 Exploitation-Exploration Tradeoff

3.2.6 Deep Reinforcement Learning

4 Empirical Setting / Data (5%)

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8.2 Future Electricity Landscape

8.3 Limitations

9 Conclusion (5%)

9.1 Contribution