Bayesian Optimization of Battery Fast-charging Protocols

TECHNISCHE UNIVERSITÄT DARMSTADT

Master's Thesis

Lithium-ion batteries are used in a wide range of applications as energy storage devices, e.g., in mobile phones, laptops, electric vehicles, or smart grids. In particular for electric vehicles, charging time is critical and fast-charging protocols are needed. However, these usually result in higher battery degradation and, thus, a shorter battery life. Optimization techniques could be used to design optimal fast-charging protocols, that also consider reducing battery degradation.

Bayesian optimization is a powerful and flexible approach that can handle these complex systems. This thesis shall investigate Bayesian optimization to find smart fast-charging protocols.[1]

Your tasks will be:

1. Literature review on battery fast-charging protocols and Bayesian optimization
2. Implementation of Bayesian optimization in HILO-MPC[2]
3. Design of battery fast-charging protocols via Bayesian optimization

Experience with / knowledge about:	Modeling, optimization, Bayesian statistics
Programming skills:	Python (good to very good skills required)
Language:	English
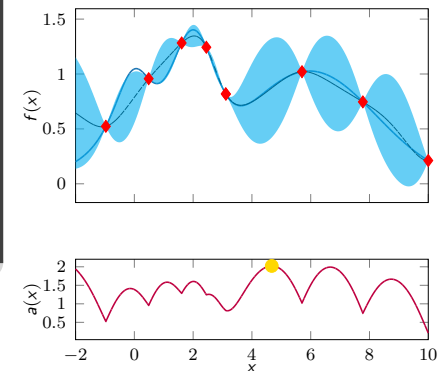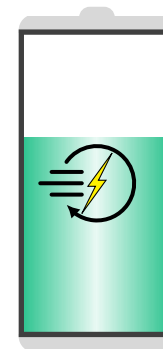
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1 https://doi.org/10.1016/j.apenergy.2021.118244
2 https://www.ccps.tu-darmstadt.de/research_ccps/hilo_mpc/index.en.jsp

CCPS — Control and Cyber-Physical Systems