Institut für Systemtheorie und Regelungstechnik
Universität Stuttgart

Open Thesis (MA)

Open theses on Advanced Topics in Convex Optimization

Description:
Convex optimization underpins many problems of great relevance in engineering. Examples include: trajectory design and fuel-optimal guidance algorithms implemented in reusable launchers; optimal power-flow formulations for real-time dispatch, demand response, and renewable-integration scheduling used by grid operators; and motion planning routines employed to enable safe, collision-free, and energy-efficient tasks robotics. It is also the computational module of many breakthroughs in machine learning and data science (e.g. regularized regression, support-vector machine, matrix completion). This motivates a lot of ongoing research in the field, despite its technical maturity and the number of outstanding achievements in theory, algorithms and open-source implementations already available.
Building on the offered master course bearing the same name (in short: ATCO), we offer a number of open research projects on advanced topics in convex optimization. Examples include open theoretical questions on the following topics:
* adaptive algorithms for online convex optimization
* distributed optimization of open multi-agent systems
* bilevel optimization
* online distributionally robust optimization
The project can also focus more on the application side and investigate implementation on engineering and machine learning problems with the goal of thoroughly testing modern algorithms on state-of-the-art problems (e.g. autonomous mobility on demand, incentive-based demand response in energy markets).

Prerequisites:

- *Advanced Topics in Convex Optimization* or similar courses provide a good background in convex optimization
- Interest in (convex) optimization theory and/or implementation of optimization algorithms on case studies from machine learning or engineering

Supervisor:

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Area:

Convex Optimization

Properties:

Type: **MA**

20% literature
50% theory
30% simulation

The project can also have more applied emphasis depending on the candidate's preference.

Beginning:

anytime

Further information: http://www.ist.uni-stuttgart.de/teaching/bama