# Summer of Optimization for Learning and Control

Systems Control and Optimization Laboratory (Prof. Dr. Moritz Diehl)
University of Freiburg, Germany

Attractive full-time summer jobs for postdocs, PhD and master students in engineering, mathematics and computer science. Start: May 2019 or later. Duration: 2-6 months (also long term employment possible).

The systems control and optimization laboratory looks for highly motivated students and researchers with experience in the field of optimal control, machine learning and software development. The candidates will have the chance to get hands-on experience on industrial applications of embedded learning and control and contribute to the development of state-of-the-art numerical methods.

**Background:** The positions will be involved in three newly established research programs on optimization-based learning and control. The role of the Freiburg team in the projects is to develop numerical optimization methods and open-source software for model predictive control (MPC), estimation, and learning, and to help applying these methods to real-world systems, such as autonomous cars, wind turbines and power converters, operated by the project partners. The positions are of pay level E13 (100%) from 2 to 6 months. Subsequent longer term employment is a possibility. The chosen candidates will be fully embedded into the Systems Control and Optimization Laboratory, led by Prof. Dr. Moritz Diehl, which is part of Freiburg University's young and growing Faculty of Engineering as well as the Faculty of Mathematics and Physics. They will partially be supervised by Dr. Gianluca Frison, expert in high performance algorithms for estimation and control and senior team member. In addition, the team is in close contact with two of the faculty's strong research groups in machine learning, Prof. Dr. Frank Hutter, and Prof. Dr. Joschka Boedecker, who would be available as scientific discussion partners.

The current research focus of the Systems Control and Optimization Laboratory is in the area of algorithms for numerical optimal control and embedded optimization in the milli- and microsecond range with application to renewable energy systems. The participants will cooperate with a vibrant team of five internal and four closely interacting external PhD students, three postdocs, and a number of master and job students, and contribute to a successful track record in open-source software development including widely used tools, such as CasADi, ACADO/acados, BLASFEO, HPMPC/HPIPM. The team's current vision is to create algorithms and software for embedded nonlinear optimal control and system identification based on modern machine learning and estimation techniques. The contributions of the newly formed "summer team" are expected to play an important role in this effort.

The city of Freiburg is one of the sunniest cities in Germany and it is surrounded by the black forest, offering ample opportunities for outdoor activities during lunch breaks, evenings or weekends.

**Candidate Profile:** Ideal candidates are currently looking for, pursuing or have already a PhD degree in one of the following disciplines or a related field: control engineering, numerical mathematics, computer science. The candidates should have a good background or strong interest in mathematical optimization, numerical mathematics, dynamic system simulation, machine learning, and programming (C, MATLAB, Python), as well as a desire to contribute to the collaborative development of open-source software for numerical optimal control and the success of real-world experiments. Proficiency in English is a requirement. The positions adhere to the European policy of balanced ethnicity, age and gender. Both men and women are encouraged to apply.

**Application:** For the first application phase, please fill in the following non-binding google form before March 15st, 2019.

https://goo.gl/forms/uExIjE5epjaPiApI2

More information on the team and its activities can be found at http://www.syscop.de/