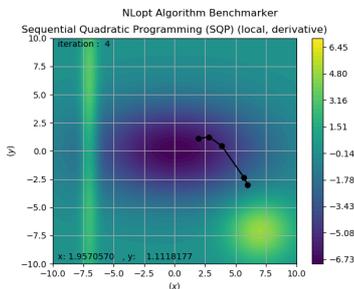


## Student Research Assistant

# Numerical Optimization Methods



$$\min_{\mathbf{x}} \quad \frac{1}{2} \sum_i \rho_i \left( \|f_i(x_{i_1}, \dots, x_{i_k})\|^2 \right)$$

$$\text{s.t.} \quad l_j \leq x_j \leq u_j$$

Iterations of a Sequential QP (left), A nonlinear Least-Squares problem formulation (right).

The Institute of Measurement Control Systems lead by Prof. Dr.-Ing C. Stiller has been focusing on self-driving cars for over 15 years and is highly reputed for its contributions in this field. Over the last decade there has been profound development in this field, but there are still quite a lot open research questions that need to be tackled.

The proposed student research assistantship position focuses on solving problems with numerical optimization libraries in real-time. The assistant should inspect the pros and cons of various libraries, solve specific toy benchmarking examples in C++. The results will later be used for solving more complex decision making and planning problems in urban automated driving.

The student should ideally:

- + know the basics of numerical methods, preferably the fundamentals of nonlinear programming and linear algebra
- + has experience with one of the following optimization libraries or is motivated to dig in one of these:  
Google-Ceres, OSQP, NLOpt, IPOPT, Acado, Gurobi.
- + has experience with one of the unit testing libraries:  
Google-Test, unittest, hypothesis.

I am happy to answer any questions you might have. Feel free to ask for an appointment. Please attach a brief Résum  and your transcript of records while asking for an appointment!

**Some additional information:** it is not problem, if you are inexperienced with some of the topics listed above, as long as you are willing to learn these. You can apply and take a multitude of my job postings. Working hours are very flexible: you can specify how many hours you would like to work and when to work. Upon completion of the assistantship, it is possible to start a master's thesis that is related to the student job, in case you are enrolled in School of Informatics or School of Mechanical Engineering (for students of electrical engineering this might be possible as well). If you do not receive a response to your application within one week, you can regard this as a refusal.

**Institute of Measurement and Control Systems (MRT)**  
Prof. Dr.-Ing. Christoph Stiller

### Advisor:

Ö. Sahin Tas, M.Sc.

### Programming language(s)<sup>1</sup>:

C++ proficient  
Python advanced

### System, Framework(s):

Linux, Git

### Required skills:

- Work on your own

### Language(s):

German, English

For more information please contact:

### Ömer Sahin Tas

Web: [bit.ly/2xFk1WZ](https://bit.ly/2xFk1WZ)

Phone: +49 721 9654-262

Email: [sahin.tas@kit.edu](mailto:sahin.tas@kit.edu)

Or directly send in your application including your current grades as well as our questionnaire!



### <sup>1</sup> skill levels:

*beginner* < 500 lines of code (LOC)

*advanced* 500 – 5000 LOC

*proficient* > 5000 LOC