Research Training Group π^3:
Parameter Identification – Analysis, Algorithms, Applications

π^3 is a collaborative project between mathematicians of the Center for Industrial Mathematics (ZeTeM); mathematicians in analysis, topology, and statistics; and applied scientists of the University of Bremen. We invite applications for a

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PhD position (75% of a full position)

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in the area of optimal control and nonlinear optimization in the framework of project R2-5: **Convergence to preferable minima in real-time nonlinear optimization problems**.

The optimization of dynamical control systems leads to challenging parameter identification (PI) problems for the control signals. This is due to a number of reasons: typically, PI problems are highly non-linear in the constraints, such that there exists many local optima, control signals are infinite-dimensional parameters which have to be approximated adequately by numerical PI methods, oftentimes, e.g. in autonomous driving applications, real-time constraints apply. Thus, finding global optimal solutions is virtually impossible; instead, one is interested in finding a *preferable local optimum*. However, the convergence behavior of nonlinear optimization methods highly depends on the problem formulation. For instance, transcription methods for optimal control or PI problems with few variables and constraints (single shooting) are more likely to get stuck in local optima than equivalent formulations of the PI problem with higher numbers of variables and constraints (full discretization). An automated reformulation-step within the PI method is required for black box models, in particular.

We are searching for an enthusiastic and committed researcher with interest in optimization and optimal control as well as in developing and applying new mathematical models and algorithms. Within the research training group, the PhD student will be part of the Optimisation and Optimal Control group at the Center for Industrial Mathematics, working under the supervision of Prof. Christof Büskens.

Requirements:
- M.Sc. or equivalent degree with excellent grades in mathematical sciences or related fields.
- Skills in scientific computer programming.
- Experience in the fields optimal control and optimization is advantageous.
- Industry or research internships are advantageous.
- Fluency in English.
- Desire to work in an international and interdisciplinary team.

The position is for a fixed term of 3 years. The earliest starting date for each position in the research training group is 1 October 2019. The salary is according to the German federal employee scale TV-L E13, 75% of a full position (i.e., approximately € 1700-1900 monthly net income). This call is open until all positions are filled.

Applicants are invited to submit their letter of motivation including a reference to PhD project R2-5, an extended CV including copies of certificates, a publication list (as far as applicable), one recommendation letter from a math professor, and contact information of two more scientists as possible referees.

The recommendation letter should be sent by the math professor directly to us (pi3-application@math.uni-bremen.de), while the application file should only include her/his name and affiliation.

All relevant documents, quoting the official reference number A 297 / 18, should be submitted by May 15, 2019, – preferably electronically as a single PDF file to pi3-application@math.uni-bremen.de – to the π^3-coordination: Dr. Tobias Kluth, Zentrum für Technomathematik, Universität Bremen, Bibliothekstr. 5, 28359 Bremen.

The University of Bremen has received a number of awards for its gender and diversity policies and is particularly aiming to increase the number of female researchers. Gender equality will be given special emphasis within this research training group. Applications from female candidates, international applications and applications of academics with a migrant background are explicitly welcome.

Disabled persons with the same professional and personal qualifications will be given preference.

Further enquiries may be addressed to

Prof. Christof Büskens
Center for Industrial Mathematics
bueskens@math.uni-bremen.de