

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

PhD position (75% of a full position)

in the area of regularization theory and inverse problems in the framework of project R1-7: **Generalized tolerance regularization.**

Classical Tikhonov regularization of inverse problems is based on minimizing functionals $\Phi(x) = \text{dist}(F(x), y^\delta) + \alpha R(x)$ which balance a discrepancy term $\text{dist}(F(x), y^\delta)$, measuring the mismatch on the data side, and a regularization or penalty term $R(x)$, which encodes some information of the searched for parameter. Recently, motivated by applications in engineering tolerance based discrepancy and penalty terms have been investigated (Type I). These tolerance measures take zero values in a certain region around the origin, which allows to incorporate expert knowledge on y and/or on x . In this project we aim at investigating Tikhonov functionals based on three terms, which separately measures data misfit, tolerance based fidelity in the data term. We will start with considering sparsity constrained functionals of the form (Type II) $\min_{x,y} \Phi(x, y) = \min_{x,y} \|F(x) - y\|_Y^2 + \|y - y^\delta\|_{tol,p}^p + \alpha \|x\|_1$. Taking L_2 -norms in all three terms leads to the classical Tikhonov regularization, however, alternative choices require more complex investigations of analytical properties and convergence.

We are searching for an enthusiastic and committed researcher with interest in inverse problems and regularization theory 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 Industrial Mathematics group at the Center for Industrial Mathematics, working under the supervision of Dr. Iwona Piotrowska-Kurczewski.

Requirements:

- M.Sc. or equivalent degree with excellent grades in mathematical sciences or related fields.
- Skills in scientific computer programming.
- Experience in the field inverse problems 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 R1-7, 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 January 13, 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

Dr. Iwona Piotrowska-Kurczewski
 Center for Industrial Mathematics
iwona@math.uni-bremen.de