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

RTG 2224

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 deep learning and inverse problems in the framework of project R1-6: **Deep image prior approaches to inverse problems**.

Deep image priors (DIP) has been recently introduced as a machine learning approach for some tasks in image processing. Usually, such machine learning approaches utilize large sets of training data, hence, it was somewhat surprising that DIP is based on a single data point y^δ . In the context of linear or non-linear inverse problems, the task of DIP is to train a network $\varphi_W(z)$ with parameters W and fixed input z by minimizing $\|A\varphi_W(z) - y^\delta\|^2$. In image processing it has been observed, that minimizing this functional iteratively by gradient descent in combination with a suitable stopping criterion leads to amazing results e.g. for denoising and image inpainting. In terms of operator equations these applications in image processing relate to the identity or a projection operator. The experimental investigation of deep image priors for ill-posed inverse problems, e.g. for compact operators A, is just starting.This project aims at determining analytical properties of DIP approaches to inverse problems with the final aim of embedding these approaches in the classical regularization theory for inverse problems.

We are searching for an enthusiastic and committed researcher with interest in deep learning and inverse problems 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 Prof. Peter Maass.

Requirements:

- M.Sc. or equivalent degree with excellent grades in mathematical sciences or related fields.
- Skills in scientific computer programming.
- Experience in the fields machine/deep learning and 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 R1-6, 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

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