

# Job vacancy

Application deadline: 16.04.2017

**Reference number: 1002EU/17**

**Technology  
Arts Sciences  
TH Köln**

The TH Köln (University of Applied Sciences) offers a fulltime PhD research position for a period of three years at Faculty of Computer Science and Engineering Science in Gummersbach (Germany) starting September 1st, 2017.

## **PhD position - Robust Mixed-integer Optimisation in Uncertain Environments**

This scholarship is offered within the UTOPIAE (Uncertainty Treatment and OPTimisation In Aerospace Engineering) training and research network funded by the European Commission through the H2020 funding stream.

### **Job description**

When faced with real-world optimization problems in aerospace transportation, several important challenges have to be resolved. Uncertainties affect the performance of candidate solution, hence requiring optimization methods that yield robust solutions. The cost of experimentation or simulation only allows for a limited number of evaluations. The problems may have mixed-integer search spaces. Finally, a large number of objectives may have to be optimised simultaneously.

Hence, it is important to develop and analyse efficient algorithms for the solution of multi and many-objective expensive optimization problems in aerospace transportation.

Within this framework, the objectives of this ESR scholarship are:

- To develop and study evolutionary optimisation methods with regard to mixed-integer problems involving uncertainty.
- To define a procedure that can efficiently explore large parameter spaces in robust design.
- To integrate the identified methods in the sequential parameter optimisation toolbox (SPOT).
- To analyse and develop suitable optimisation methods and parameter settings for efficient optimisation of constraint robust mixed-integer design problems.

Part of the research project should be carried out in two secondments of three months each. The first secondment is planned at the end of the second year at the University of Strathclyde (UK) and it will be mainly related to work on mixed integer, non-linear optimization applied to optimal multi-target tracking with FSS. The second is planned in the third year at the Institute of Aerodynamics and Flow Technology DLR (National Aeronautics and Space Research Centre of Germany) and it will be mainly related to applying mixed integer, non-linear optimization to a drag reduction problem under uncertainty.

The training programme will involve attendance of the UTOPIAE network formal training events (Global Virtual Workshops) and enrolment in a PhD programme of TH Köln and partner universities in Ghent and Ljubljana.

Prof. Dr. Thomas Bartz-Beielstein and Prof. Dr. Boris Naujoks will supervise this position.

The UTOPIAE research programme aims at training, by research and by example, 15 Early Stage Researchers (ESRs) in the field of Uncertainty Quantification and Optimisation. The ESRs will be provided with the training and skills needed for pursuing successful careers in academia and industry and for increasing the innovation capacity of the EU. Through the ESRs individual research projects, the UTOPIAE network will develop fundamental mathematical methods and algorithms to bridge the gap between Uncertainty Quantification and Optimisation, and between Probability Theory and Imprecise Probability Theory for Uncertainty Quantification, and to efficiently solve high-dimensional, expensive and complex engineering problems.

Position-related questions to  
**Prof. Dr. Thomas Bartz-Beielstein**  
T: + 49 221-8275-6391

Informal enquiries about the post to  
**info@utopiae.eu**

Please send your application to  
**apply@utopiae.eu**

Website for additional job details:  
**<http://www.utopiae.eu>**

Please visit: [www.th-koeln.de/stellen](http://www.th-koeln.de/stellen).

## Requirements

- Education Level:
  - Engineering: Master Degree or equivalent
  - Computer science: Master Degree or equivalent
  - Mathematics: Master Degree or equivalent
- Eligibility Criteria: Early-Stage Researchers (ESRs) shall, at the time of recruitment by the host organisation, be in the first four years (full-time equivalent research experience) of their research careers and have not been awarded a doctoral degree.
- All researchers recruited in an ITN must be Early-Stage Researchers (ESRs) and undertake transnational mobility (including, but not limited to secondments with other UTOPIAE partner institutions, conference attendance, outreach and engagement work and any other appropriate work requiring travel as deemed necessary by their supervisor).
- For all recruitment, the eligibility of the researcher will be determined at the time of their first recruitment in the project. The status of the researcher will not evolve over the life-time of the project.
- Mobility Rule: At the time of recruitment by the host organization, applicants must not have resided or carried out their main activity (work, studies, etc.) in the country of their host organization (Germany) for more than 12 months in the 3 years immediately prior to the recruitment date. Compulsory national service and/or short stays such as holidays are not taken into account.

## Mandatory Skills/Qualifications

- Proficient knowledge of English and good communication skills (both written and spoken)
- Good knowledge of at least one computer programming language
- Excellent scientific writing skills, LaTeX
- Good capacity of working both in a team and independently
- Publications (including MSc thesis), preferably on themes related to the planned research work
- Experience in optimization, especially w.r.t. mixed-integer problems and robustness

## Desirable Skills/Qualifications

- Advanced programming skills (R, Python, C, C++)
- Experience in Optimization or Reliability based optimization
- Background on statistical methods and machine learning
- Awards (for example "best conference paper", "best student paper", "award to MSc thesis")
- University experience in different countries or work experience in international groups

## Conditions of employment

- We offer a 3 year full-time PhD contract. The first 6 months will constitute a probation period.
- TH Köln was awarded the logo "HR Excellence in Research" by the European Commission for its commitment to create excellent working conditions for researchers, and to promote academic careers. The university is currently implementing all principles laid down in the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers.
- We offer a dynamic and challenging job in an internationally-oriented organisation within a congenial, open working environment.
- You will participate in the research training sessions in the framework of the Marie Skłodowska-Curie Project.
- Financial conditions: 3072,68 €/month living allowance + 600€/month mobility allowance + 500 €/month family allowance (if relevant). These amounts are gross amounts, subject to taxation according to each host institution national law. Consequently, the net salary results from deducting all compulsory (employer/employee) social security contributions as well as direct taxes (e.g. income tax) and insurance from these gross amounts.

Position-related questions to  
**Prof. Dr. Thomas Bartz-Beielstein**  
T: + 49 221-8275-6391

Informal enquiries about the post to  
**info@utopiae.eu**

Please send your application to  
**apply@utopiae.eu**

Website for additional job details:  
**<http://www.utopiae.eu>**

Please visit: [www.th-koeln.de/stellen](http://www.th-koeln.de/stellen).

### **How to apply**

Please send your application to: [apply@utopiae.eu](mailto:apply@utopiae.eu), submitting the following documents:

- a CV
- a cover letter
- two letters of reference

You can apply for a maximum of 2 posts within the network, please indicate your order of preference.

Applications from women are particularly encouraged. In accordance with the North Rhine-Westphalian Equal Opportunities Act, women will be given priority consideration if deemed equally suited, qualified, and in possession of equal professional achievements. Severely disabled persons with equal qualifications will also be treated preferentially.

We offer our researchers an inspirational work environment. Technology, Arts, Sciences reflects our academic diversity, our interdisciplinary approach, and our internationality. With this concept we consider ourselves a model for the future in teaching and research. We foster a culture of enablement and cooperation between colleagues. International scientific standards, gender equality and inclusion are the guiding principles of our human resources development. We are a certified family-friendly university.

Position-related questions to  
**Prof. Dr. Thomas Bartz-Beielstein**  
T: + 49 221-8275-6391

Informal enquiries about the post to  
[info@utopiae.eu](mailto:info@utopiae.eu)

Please send your application to  
[apply@utopiae.eu](mailto:apply@utopiae.eu)

Website for additional job details:  
<http://www.utopiae.eu>

Please visit: [www.th-koeln.de/stellen](http://www.th-koeln.de/stellen).