Open Early Stage Researcher/PhD Position at FAU Erlangen-Nürnberg, Germany, as part of

European Innovative Training Network
Reduced Order Modelling, Simulation and Optimization of Coupled systems (ROMSOC)

ROMSOC is a European Industrial Doctorate (EID) project in the programme Innovative Training Networks (ITN) and part of Marie Skłodowska Curie Actions within the Horizon 2020 programme. The ROMSOC EID Network brings together 15 international academic institutions and 11 industry partners and supports the recruitment of eleven Early Stage Researchers (ESRs). Each ESR will be working on an individual research project in the host institution with secondments related to their research in other academic and industrial partners of the network. The research is focused on three major topics: coupling methods, model reduction methods, and optimization methods, for industrial applications in well selected areas, such as optical and electronic systems, economic processes, and materials. The ROMSOC EID Network offers a unique research environment, where leading academics and innovative industries will integrate ESRs into their research teams for the training period, providing an excellent structured training programme in modelling, simulation and optimization of whole products and processes.

We seek excellent open-minded and team-spirited PhD candidates who will get unique international, interdisciplinary and inter-sectoral training in scientific and transferable skills by distinguished leaders from academia and industry. Within the ROMSOC network we offer the following PhD position at FAU Erlangen-Nürnberg:

Integrated Optimization of International Transportation Networks.
Reference number: ROMSOC-ESR07

Transportation networks have an increasing share of border-crossing services. The conditions to implement such services are often different in neighbouring countries. For resource planning, this may make it necessary to change between resources at the border. In the case of railway networks, for example, this might apply to different electricity systems which require a change of locomotive, different track gauges which require suitable wagons, or labour agreements as well as different technical skills which might require staff changes. The challenge is to provide decision makers with suggestions on how to find optimal resource allocations to deal with these differing regulations in the best possible way. Ideally, it is also possible to make suggestions for additional investments into more flexible resources, such as locomotives that are suited for different electricity systems or training of employees.

The PhD candidate shall develop mixed-integer optimization models for the above problem setting of an optimal resource allocation and investment for border-crossing transport services, focussing on a suitably chosen subset of resources to plan. The optimization models should form a hierarchy in the sense that they represent the given problem in different levels of detail, for example with respect to the planning horizon (strategic, tactical or operational view), or with respect to time and space resolution. This enables the development of solution algorithms based on adaptive refinement or suitable decomposition approaches based on Benders decomposition, for example. The mathematical work on these models will then focus on structural analysis, for example identifying combinatorial subproblems or drawing upon graph theory and polyhedral analysis. Data uncertainties, for example in demand forecasts or in the form of delays, might require robust or stochastic model extensions. The PhD candidate will spend secondments for technical and scientific training at DB Cargo Polska in Zabrze, Poland. The PhD degree will be awarded by FAU Erlangen-Nürnberg, Germany.

Requirements:
- Master degree (or equivalent) in Mathematics, Mathematical Engineering, Mathematical Economics or Computer Science.

- Experience in modelling, model analysis and algorithm development in mixed-integer optimization, combinatorial optimization and (optionally) optimization under uncertainties.
- Experience with state-of-the-art mixed-integer programming solvers, such as Gurobi and CPLEX.
- Programming skills Python and (optionally) in Java or C++.
- Strong interest in interdisciplinary scientific work.
- Ability to work independently and as part of a team.
- Strong motivation to pursue a PhD degree.
- Preferred qualifications include excellent grades, research talent (as proven by the master thesis), a background in the modelling of transportation systems and personal ambition.
- Excellent command of English, together with good academic writing and presentation skills.

Starting Date:	1st of March 2018
Contract:	Full-time contract for 36 month
Host institution:	FAU Erlangen-Nürnberg, Erlangen, Germany
Salary:	The Marie Skłodowska-Curie programme offers highly competitive and attractive salaries. Gross and net amounts are subject to country-specific deductions as well as individual factors and will be confirmed upon appointment.
Information/Contact:	Prof. Dr. Alexander Martin (Primary Supervisor) Email: Alexander.Martin@fau.de
Application:	Applications (motivation letter, detailed CV, certificates, list of MSc courses and grades, copy of the master thesis, reference letter etc.) with indication of the position reference number should be send to Alexander.Martin@fau.de Applicants that apply for more than one individual research project should indicate the order of preference (e.g. 1st, 2nd and 3rd choice).
DEADLINE	**15.12.2017**

To ensure the equality of opportunities we strongly encourage women with the appropriate qualifications to apply. If equally qualified, handicapped applicants will be preferred. Upon request of the applicant, the equal rights representative can be included in the interview without any disadvantages for the applicant.

Eligibility: *The candidate recruited in the ROMSOC project must be in the first four years from the date when the candidate obtained the degree entitling him or her to embark on a doctorate (e.g. master degree). No doctoral degree has been awarded during these four years. The candidate must not have resided or carried out her/his main activity (work, studies, etc.) in Germany for more than 12 months in the 3 years immediately prior to the recruitment date. Compulsory national service, short stays such as holidays, and time spent as part of a procedure for obtaining refugee status under the Geneva Convention are not taken into account. The candidate must work exclusively for the project during the employment contract. The candidate must fulfill the conditions to be admitted in the PhD programme indicated in the job vacancy. Tuition fees will be covered by the fellowship. These conditions must be fulfilled at the starting date of the contract. The starting date for each position is tentative.*