ANNOUNCEMENT
(Marie Curie ITN H2020)
2 Early Stage Researcher Positions in the framework of the
BIGMATH - INNOVATIVE TRAINING NETWORK (ITN) ON
BIG Data challenges for MATHematics
http://www.itn-bigmath.unimi.it
at the
Instituto Superior Técnico (IST)
University of Lisbon (UL), Lisbon, Portugal
http://tecnico.ulisboa.pt/

BIGMATH is an EU funded PhD programme aimed to train a group of young, creative mathematicians with strong theoretical and practical skills, needed to tackle the major challenges of the Big Data era. These abilities will result from a close partnership between academy, providing the students with up-to-date training and knowledge on cutting-edge research on targeted mathematical disciplines, and the group of industries, who will complete the competences of the PhD students by exposing them to a set of Big Data-related real industrial problems. For more information please visit the website: http://itn-bigmath.unimi.it.

The research activities that will be undertaken by the researchers hired by IST will be carried out at the Institute for Systems and Robotics (ISR), the Mathematics Department, and the industrial partners 3lateral (http://www.3lateral.com), SDG consulting (http://www.sdggroup.com/), and CIF (http://cif.co.rs).

IST (http://tecnico.ulisboa.pt/) is a public institution of higher education with statutory, scientific, and financial autonomy. Its mission is to train world-class engineers in a R&D environment of excellence.. IST is one of the leading schools of engineering in Portugal, with approximately 700 professors and 1,200 PhD students. IST hosts nearly 1,000 international students from 70 countries, and is a member of the prestigious CLUSTER network (www.cluster.org). IST is strongly involved in multiple international MSc and PhD Programs: Erasmus Mundus, IST-EPFL joint PhD, and the US-Portugal partnerships including the Carnegie Mellon | Portugal program.

ISR (http://welcome.isr.tecnico.ulisboa.pt) - By bringing together theory and practice, ISR/IST affords young and senior researchers the proper intellectual setting for training in the interdisciplinary fields of Machine Learning and Data Science.

The Mathematics Department (https://math.tecnico.ulisboa.pt/index.php.en) is one of the largest mathematical departments in Portuguese universities. The Department of Mathematics offers programs covering a broad range of topics leading to a Doctoral Degree. The majority of Department of Mathematics research activities is pursued through 4 Research Centers and is organized into eight research/scientific areas.

3Lateral is in business of producing biokinetic models of human form in computer graphics field with strong focus on a face. 3Lateral is also building a database of such models through 3D and 4D scanning and accurate registration of this data for purpose of statistical modeling and machine learning.

SDG is a global consulting firm with a broad focus on data analytics in all its aspects. The data science practice is firmly rooted in strong mathematical and statistical know-how and a sound computing expertise. SDG is constantly growing by hiring many young people coming directly from universities, and some more experienced people to support the growth in a consistent way.

CIF is a leading developer of risk management and compliance solutions for commercial banks, fintechs, central banks, ministries of finance, supervisory agencies, insurance companies, pension funds and investment funds and related software products in the region of South-East Europe.

WE HAVE OPENINGS FOR TWO POSITIONS FOR EARLY STAGE RESEARCHES TO WORK TOWARDS A Ph.D. DEGREE AT THE INSTITUTO SUPERIOR TÉCNICO (IST), LISBON, PORTUGAL, in the framework of the BIGMATH project (Marie Curie ITN H2020).

The candidates will be enrolled in the Doctoral Programme in Statistics and Stochastic Processes, offered by the Mathematics Department of IST, and will study and develop advanced algorithms for Big Data processing with emphasis on the following topics:

i) Distributed optimization of biokinetic models based on large 4D sequences (IST & 3Lateral)

Objectives: Companies working in production of videogames or virtual reality devices use biokinetic models of human form in computer graphics field. In particular 3Lateral is posing a strong focus on the realistic reconstruction of human face expressions. This is done based on a database of biokinetic models through 3D and 4D (spatial or space-time) scanning of real human faces and accurate registration of this data for purpose of statistical modeling and machine learning. Biokinetic model or "Rig Logic", as it is called in the industry, is composed by a series of vectors representing muscle contractions, appearance of which is obtained through scanning, and layers of corrective vectors. In order to be compatible with real time rendering engines, the model can be seen as hand crafted nonlinear principal component analysis (PCA) and it models the deformations of the human face from parameters to mesh. Given the function curve for each parameter, animation of the model can be created in order to render the appearance of the human face. Evaluation of Rig Logic parameters based on 4D data is done through a series of both linear and non-linear optimizations. 4D data sets can be extremely large (millions of frames) and often Rig Logic has to be calculated in real time (max 200ms delay from event to render). For this reason this project's main goal will be to provide and implement innovative techniques of distributed optimization on a GPU cluster in an efficient way, in order to enhance human face and body representation.

ii) Credit scoring and statistical prediction of credit default (IST & CIF, SDG)

Objectives: The variety and volume of financial data is ever-expanding. In the past decade, information coming from traditional sources (e.g. exchanges, databases of financial institutions, or commercial data providers) became comparable in both size and velocity to the one available in social media, mobile interactions, server logs or customer service records. Companies are increasingly turning to data scientists to seek a meaningful relationship with these vast amounts of data. The large number of decisions involved in the consumer lending business makes it necessary to rely on models and algorithms rather than human discretion, and to base such algorithmic decisions on "hard" information, e.g., characteristics contained in consumer credit files collected by credit bureau agencies. Models are typically used to generate numerical "scores" that summarize the creditworthiness of consumers and may estimate the probability of credit default. This project is focused on the improvement of existing credit scoring models and of the related prediction of default by combining the "traditional" databases of companies and individuals (financial reports, behavioral data, bank data, credit bureaus, etc.) with loan servicing data (days in arrears, collateral, loan-to-value, etc.) and with other available sources, in particular those available through open social media activity or transaction data. In the first phase, suitable measures of relevance of the considered variables will be introduced, through modern techniques of machine learning and data mining. In the second phase, new statistical models, more interpretable than the "black box" techniques cited above, will be introduced, and then optimized to come up with optimal risk-based financial funding procedures. Depending on the introduced measures and risk functions, the optimization problem to be solved can be non-convex.

1. Duration and regulations: The contract will be awarded for 12 months renewable up to a maximum of 36 months and with a predicted starting date March 1st, 2019 subject to the regulations

of the Marie Slodowska Curie Innovative Training Network Fellowships of the European Commission and in accordance with the work contract regulations of Portugal.

2. Qualifications & Nationality requirements: The position concerns an Early Stage Researcher, which means a researcher who, at the time of recruitment by the beneficiary, has not yet been awarded the doctorate degree and is in the first 4 years of his/her research career. The researcher may be of any nationality. At the date of recruitment, the researcher must not have resided or carried out his/her main activity (work, studies, etc) **in Portugal** for more than 12 months in the 3 years immediately prior to his/her recruitment under the project. The researcher should be a holder of a university degree, giving access to doctoral studies.

3. Scientific coordination at IST: Prof. Cláudia Soares, Prof. M. Rosário Oliveira, and Prof. Cláudia Nunes.

4. Academic training: We are looking for individuals who show strong motivation to pursue a Ph.D. degree. We will give preference to candidates with a Master's degree in the field of Applied Mathematics, Mathematics, Electrical Engineering, Computer Science, or related fields. Applicants must have strong mathematical skills, in-depth knowledge of computer programming, and expert knowledge of the English language. The BIGMATH training program includes secondments and a range of network-wide collaborative research and training activities. The selected researcher should be ready to interact closely with the BIGMATH partners, in particular, to spend considerable time in the respective companies.

5. Method of Selection: The selection method will take into consideration the Curriculum Vitae of the candidates, taking into particular consideration the academic records, participation in research projects, publications in peer reviewed journals and proceedings of conferences, motivation letter, letters of recommendation, and a remote interview via video conference, weighting 60% and 40%, respectively. ***Only the top 6 candidates who are screened based on their submitted documents (including the CV) will be invited for the interview.***

6. Stipend:

· € 33.040/year
· Mobility allowance: €600/ month
· Family allowance: €500/month (subject to family situation)

The position also includes tuition fees for the period of the contract.

These amounts are gross amounts, subject to taxation according Portugal national law. Consequently, the net salary results from deducting all compulsory (employer and employee) social security contributions as well as direct taxes (e.g. income tax) and insurance from these gross amounts.

Successful applicants will have the opportunity to interact with world class researchers from around Europe and will be encouraged to promote collaborative work between the various partners of the BIGMATH project (http://www.itn-bigmath.unimi.it).

7. Documents of application: The applications should be e-mailed to Professors Cláudia Soares (csoares@isr.tecnico.ulisboa.pt) and Cláudia Nunes (cnunes@math.tecnico.ulisboa.pt) with the following data

 i) detailed **biographical vitae (CV),** including a description of prior research, participation in research projects, and publications in peer reviewed journals and proceedings of conferences.

ii) **copies of all academic records** (official documents will be requested if the candidate is accepted)

iii) **motivation letter** (also called letter of intent) describing the rationale behind the decision of the candidate to apply for an Early Stage Researcher Position and highlighting the long term vision of his (her) career.

iii) **names of three academic references** (name, title, affiliation, e-mail and telephone number(s)) who are willing to provide detailed recommendation letters about the candidate.

iv) **letters of recommendation**: must be emailed directly by the academic references stated in item ii) above to Prof. Cláudia Soares at csoares@isr.tecnico.ulisboa.pt by the end of the present call, indicated below. ***Please make sure that the letters are submitted on time.***

iv) **declaration of honor regarding the residency for the last three years. Please download the template from [here](#).**

8. Deadline of the competition: The competition is open from the date of this call and will end on December 31, 2018. All applicants will be informed of the results of the first screening by January 31, 2019.

9. Contacts:

Prof. Cláudia Soares
Email: csoares@isr.tecnico.ulisboa.pt

Prof. Cláudia Nunes
Email: cnunes@math.tecnico.ulisboa.pt