POLITECNICO DI MILANO

PhD in MODELLI E METODI MATEMATICI PER L'INGEGNERIA / MATHEMATICAL MODELS AND METHODS IN ENGINEERING - 41st cycle

THEMATIC Research Field: KINETIC MODELS BY BAYESIAN AND PHYSICS-INFORMED STATISTICAL LEARNING METHODS

Monthly net income of PhDscholarship (max 36 months)
1400.0 In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity	
Motivation and objectives of the research in this field	Crucial challenges related to product stability, whether long-term or under accelerated conditions, as well as viral growth dynamics, demand the development of advanced statistical methods for kinetic modeling. These methods must effectively integrate available data with prior knowledge from subject matter experts, and incorporate relevant physical laws, expressed through differential equations governing the underlying processes. This research program aims to develop appropriate physics-informed statistical learning methods and bayesian methods. More broadly, it seeks to advance the integration of statistical, mathematical, and numerical modeling approaches for kinetic modeling, in support of sustainable development.
Methods and techniques that will be developed and used to carry out the research	The research plan focuses on the development of innovative statistical learning methods for kinetic modeling, with particular emphasis on stability modeling (both long-term and accelerated) and viral growth dynamics. These methods will incorporate differential equations that encode the relevant physical-chemical knowledge of the underlying processes. The models will be made publicly available through peer-reviewed publications and implemented in R or Python, using advanced scientific computing techniques. Their performance will be evaluated through extensive

	simulation studies, and a proof-of-concept will be conducted using real experimental and laboratory data. This research is conducted in collaboration with Dr Bernard Francq at GlaxoSmithKline Biologicals SA, and the student will also spend visiting periods at GlaxoSmithKline Biologicals SA in Belgium.
Educational objectives	The doctoral student will become a skillful data scientist, with expertise in advanced statistical learning methods. The research will be developed in a lively and stimulating research environment, within a team of statisticians working in academia and in industry.
Job opportunities	Data scientists are the most in-demand job today, among high-qualification jobs. In all industrial and business sectors, the demand for data scientists continues to outpace supply and dominates both the US and the European job market.
Composition of the research group	4 Full Professors 3 Associated Professors 1 Assistant Professors 23 PhD Students
Name of the research directors	Prof.ssa Laura M. Sangalli

Contacts
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Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents	--

Scholarship Increase for a period abroad	
Amount monthly	700.0 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
Educational activities (purchase of study books and material, funding for participation to courses,

summer schools, workshops and conferences): financial aid per PhD student per year
1st year: max 1.902,40 euros
2nd year: max 1.902,40 euros
3rd year: max 1.902,40 euros

The PhD students are encouraged to take part in activities related to teaching, within the limits allowed by the regulations.1 individual PC per student +several shared PC.
Access to one cluster with 32 processors and 384 GB RAM, and to several multi-processor servers.