POLITECNICO DI MILANO

PhD in DATA ANALYTICS AND DECISION SCIENCES - 41st cycle

THEMATIC Research Field: MATHEMATICAL MODELLING OF STOCHASTIC BIOLOGICAL PROCESSES

Monthly net income of PhDscholarship (max 36 months)
1750.0 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	Cell populations in health and disease evolve through the interplay of stochastic processes. In cancer for example, these dynamics generate the cell-to-cell variability that enables the emergence of cells that evade therapy.Similar stochastic processes happen in the human immune system.But little is known about how cells evolve escape to therapy. In bacteria, models grounded in resource allocation and metabolic constraints have successfully predicted how resistance mutations affect growth and response.Drawing on lessons from microbial systems, this project will build models that couple stochastic population dynamics with measurable cellular processes to understand how physiological constraints shape somatic cell adaptation.
Methods and techniques that will be developed and used to carry out the research	This project combines classical theoretical population genetics, which models dynamical stochastic processes over time, with modern machine-learning tools to predict how cell populations adapt to therapeutic stress and perturbations. We will analyze longitudinal datasets of patient-derived model systems from humans. We will use stochastic branchingprocess matched to data to design new mathematical models of how populations of somatic human cells change over time and predict their evolution.
Educational objectives	

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	To learn how to design mathematical methods for real biomedical problems.
Job opportunities	Jobs in computational biology and biomedical sciences.
Composition of the research group	2 Full Professors 3 Associated Professors 3 Assistant Professors 16 PhD Students
Name of the research directors	F. Ieva (Polimi)/F. Pinheiro (HT)

Contacts
POLIMI: Francesca Ieva francesca.ieva@fht.org https://sites.google.com/view/francesca-ieva/home Human Technopole: Fernanda Pinheiro: fernanda.pinheiro@fht.org https://humantechnopole.it/en/research-groups/pinheiro-group/

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	875.0 €
By number of months	12

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

List of Universities, Companies, Agencies and/or National or International Institutions that are cooperating in the research:
Fondazione Human Technopole (HT)

Additional support
Educational activities (purchase of study books and material, funding for participation in courses, summer schools, workshops and conferences):
financial aid per PhD student per year:
1st year: max 2.378,25 euro per student
2nd year: max 2.378,25 euro per student
3rd year: max 2.378,25 euro per student

Teaching and lab assistantship: availability of funding in recognition of supporting teaching and lab activities by the PhD student.
Further support is available for students who engage in activities of teaching or additional lab duties coherent with their academic mission and doctoral training.
The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.

Computer availability:
1 st year:individual use
2 nd year: individual use
3 rd year: individual use

Desk availability:
1 st year:individual use
2 nd year: individual use
3 rd year: individual use