



PhD in DATA ANALYTICS AND DECISION SCIENCES - 38th cycle

THEMATIC Research Field: REPRESENTATION AND ANALYSIS OF COMPLEX INTERACTING BIOLOGICAL SYSTEMS

Monthly net income of PhDscholarship (max 36 months)
€ 1300.0
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	<p>A growing body of scientific work suggests that at the root of complex human diseases is an intricate interplay between genetic and epigenetic factors that is mediated by interactions between regulatory DNA sites, non-coding RNA, proteins and other molecules in the cell. To achieve novel biological and clinical discoveries beyond the limits of single gene/single disease traditional approaches, there is the need to identify the proper way to represent each layer of omics information (among others, genomics, transcriptomics and proteomics) and the relationships between them, and to design methods to analyze these potentially huge interacting systems. Indeed, such methods would allow the exploration of the pathogenesis of complex diseases, shed a light on disease aetiology, improve our understanding of the latent molecular mechanisms that regulate the interplay among molecular and phenotype expressions, and promote treatment strategy optimization and new drug discovery.</p>
Methods and techniques that will be developed and used to carry out the research	<p>The research will focus on the development of methodologies that construct effective representations of biological information at single or multiple levels (i.e., combining one or more omics layers with clinical, personal, or treatment information), to enhance and complement statistical approaches aimed at understanding complex human diseases, identifying causal biological processes or predicting a clinical endpoint of interest.</p>



	<p>endpoint of interest.</p> <p>Among others, graph theory is widely used in biological mathematics, as complex biological systems can be meaningfully represented by networks. Therefore, from a methodological standpoint, the research will be centered around developing novel approaches (i) to build rich and informative networks from several sources of biological and medical information, (ii) to spot relevant fingerprints triggering for relevant phenotypes, (iii) to analyze these objects and (iv) to exploit such representations within novel statistical models or Machine Learning algorithms.</p> <p>Possible application domains are, among others: cardiovascular diseases and diabetes, cancer treatments, maternal and child health.</p>
<p>Educational objectives</p>	<p>The successful candidate is expected to be able to collect, analyse and manage healthcare data available in the projects developed in the joint Center for Health Data Science of Human Technopole. Moreover, the candidate is expected to support the definition of potential and limitations of the data as well as to develop knowledge and evidences from data itself, through the use of advanced data analytics techniques.</p>
<p>Job opportunities</p>	<p>The profile of data scientist and the applications proposed in this project are of interest to of a broad range of actors, including (but not limited to): public and private institutions dealing with healthcare, hospitals, clinical and pharmaceutical companies, as well as international institutions and research centres working in healthcare research, and policy makers in charge with healthcare governance.</p>
<p>Composition of the research group</p>	<p>1 Full Professors 1 Associated Professors 7 Assistant Professors 2 PhD Students</p>
<p>Name of the research directors</p>	<p>Prof. Emanuele Di Angelantonio (HT)</p>

<p style="text-align: center;">Contacts</p>	
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Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad	
Amount monthly	650.0 €
By number of months	12

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
<p>Funding for educational activities:</p> <ul style="list-style-type: none"> •1st year: max 1.766,75 euro •2nd year: max 1.766,75 euro •3rd year: max 1.766,75 euro <p>There are various forms of financial aid for activities of support to the teaching practice.</p> <p>The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.</p>