



PhD in DATA ANALYTICS AND DECISION SCIENCES - 39th cycle

**THEMATIC Research Field: MULTIPLE CHRONIC CONDITIONS SCORING VIA VIRTUAL
AND DIGITAL TWINNING APPROACH**

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

Precision medicine increasingly leverages on the integration of two key technologies: (i) multi-scale and multi-organ, dynamic, modular computational models, capable of accurately simulating the individual patient patho-physiology, spanning different anatomical scales, from the molecular to cell, tissue, organ and systems level, and (ii) improved personalised diagnostics, devices, and therapeutic strategies tailored to the individual patient patho-physiology. This interaction brings the concept of predictive models and "digital twin" closer to the clinical community, for both enhancing prevention and therapeutic strategies. We propose to foster this trend by means of new methodological and computational approaches, heavily based on statistical learning and deep learning based scientific computing, that significantly increases the interoperability of advanced computational models and complex medical data.

Methods and techniques that will be developed and used to carry out the research

We plan to put this approach into action, developing research with two main purposes: (i) to reduce the computational cost entailed by the numerical simulation of biophysical models and increase the interoperability of heterogeneous models in the framework of multi-physics, multi-scale simulation; (ii) to enable the integration of medical data, in the form of clinical covariates, imaging data and advanced biomarkers into the personalised analysis based on the in-silico models developed in point (i). We will work in the context of precision medicine for



	(i). We will work in the context of precision medicine for chronic diseases (e.g. oncology, cardiovascular diseases, etc.).
Educational objectives	To be able to critically analyse, model, ask and answer pertinent biological questions from data. To develop skills in statistical data analysis, scientific computing, machine learning and their application to chronic conditions.
Job opportunities	The profile proposed here are broadly relevant for a range of employers including (but not limited to): public and private healthcare institutions, hospitals, clinical and pharmaceutical companies, technology, and biotech companies, as well as Research institutes in healthcare domain.
Composition of the research group	2 Full Professors 2 Associated Professors 1 Assistant Professors 1 PhD Students
Name of the research directors	Prof. E. DiAngelantonio & Prof. P. Zunino

Contacts	
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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
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Amount monthly	700.0 €
By number of months	12

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

List of Universities, Companies, and Institutions cooperating in the research:

- Health Data Science Center (HT)
- Insyde group &Health Analytics group @MOX, Dept. of Mathematics (PoliMi)
- <https://mox.polimi.it/research-areas/insyde/>

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.