POLITECNICO DI MILANO

PhD in DATA ANALYTICS AND DECISION SCIENCES - 38th cycle

Number of scholarship offered	5
Department	DIPARTIMENTO DI ELETTRONICA, INFORMAZIONE E BIOINGEGNERIA

Description of the PhD Programme

The PhD program in Data Analytics and Decision Sciences (DADS) aims at training highly qualified senior data analysts and data managers capable of carrying out research at universities, international institutions, tech and financial companies, regulatory authorities, and other public bodies. The program stems from the cooperation between three departments: Dipartimento di Elettronica, Informazione e Bioingegneria (DEIB), Dipartimento di Ingegneria Gestionale (DIG), Dipartimento di Matematica (DMAT), and the Center for Analysis, Decisions and Society (CADS) at Human Technopole. It gives the enrolled students the opportunity to work in a highly interdisciplinary environment with strong connections to international research centers and private companies. The program provides successful candidates with the opportunity to acquire a high degree of professional expertise in specific scientific and technological fields. The program lasts three years: upon its successful completion and final exam, candidates will be awarded the title of PhD in Data Analytics and Decision Sciences. The first year is devoted to the courses that build the broad competence and the strong interdisciplinary set of skills required by data analytics. The next two years focus on the development of the Doctoral thesis. Students are required to spend at least one semester in a research institution abroad, taking advantage of the network of international collaborations of the three departments involved in the program. All the students enrolled in the DADS Doctoral Program are supported by scholarships from public institutions and private companies.

POLITECNICO DI MILANO

PhD in DATA ANALYTICS AND DECISION SCIENCES - 38th cycle

THEMATIC Research Field: ADVANCED ANALYTICS AND FORECAST TECHNIQUES FOR ENERGY MARKETS IN A DECARBONIZED POWER SYSTEM

Monthly net income of PhDscholarship (max 36 months)
€ 1300.0 In case of a change of the welfare rates or of changes of the scholarship minimum amount from the Ministry of University and Reasearch, during the three-year period, the amount could be modified.

Context of the research activity	
Motivation and objectives of the research in this field	The recent publication of the Green Deal confirmed the EU intention to decarbonize its economy through the large deployment of Renewable Energy Sources (RES). RES unpredictability, together with decentralization of energy production, will challenge power system security and calls for an efficient functioning of electricity markets. The research will hence focus on the analysis of EU spot markets, from day-ahead to real-time energy trading, with a particular attention on rising trends (commercial vs physical exchanges, local markets for ancillary services).
Methods and techniques that will be developed and used to carry out the research	The research will be developed in collaboration with Falck Renewables Group. Adopted methods will consist in statistical learning techniques and forecast instruments useful to handle the great volume and complexity of available data. Examples consist in the spatio-temporal analysis of data capturing the evolution over time of offer and demand, taking into account space dependence as well as the specific features characterizing different producing units, together with exogeneous covariates influencing the market. Methods for the analysis of complex data, like functional data, in presence of spatial dependence (Object Oriented Spatial Statistics ¿ O2S2) will also be considered and tested within the new framework of energy market analysis.

Educational objectives	The research will provide the candidate with a deep knowledge of energy markets dynamics, especially concerning challenges imposed by decarbonization and way to cope with them, despite maintaining a data-scientist approach. Capability to interact with people and problem solving are also needed to complete the work.
Job opportunities	The profile resulting from the research is of wide interest for lots of actors, including: private company of the energy sector (market and system operators), public and governmental authorities (ministry, regulators), energy agencies (IEA, IRENA), and research centers/ universities.
Composition of the research group	1 Full Professors 1 Associated Professors 1 Assistant Professors 0 PhD Students
Name of the research directors	Prof. P. Secchi (POLIMI) Dr. R. Barilli (Falck)

Contacts
Piercesare Secchi • email: piercesare.secchi@polimi.it • voice: 0223994592 • webpage: https://www.mate.polimi.it/pagina-personale/?id=85&lg=en#ann

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	6

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:

- Falck Renewables S.p.A.

There are various forms of financial aid for activities of support to the teaching practice.The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.

POLITECNICO DI MILANO

PhD in DATA ANALYTICS AND DECISION SCIENCES - 38th cycle

THEMATIC Research Field: DATA ANALYTICS FOR ELECTRONIC HEALTH RECORDS

Monthly net income of PhDscholarship (max 36 months)
€ 1300.0 In case of a change of the welfare rates or of changes of the scholarship minimum amount from the Ministry of University and Reasearch, during the three-year period, the amount could be modified.

Context of the research activity	
Motivation and objectives of the research in this field	Healthcare analytics is the process of analyzing current and historical healthcare data to predict trends, improve outreach, and better manage the spread of diseases. The field covers a broad range of data sources and related methodologies, and offers insights that complement the clinical and healthcare government experience. In fact, it can reveal paths to improvement in patient care quality, clinical data itself, diagnosis, and healthcare management. When combined with advanced statistical and Machine Learning methods, as well as data visualization tools, healthcare analytics help managers operate better by providing real-time information that can support decisions and deliver actionable insights.
Methods and techniques that will be developed and used to carry out the research	The research will focus on the design, development and application of novel statistical and machine learning methods to be applied to healthcare administrative data, as well as clinical registries and/or data arising from other electronic health record sources.It will cover techniques spanning from cutting edge statistical methodologies to novel and complex machine learning techniques in order to i) analyze and integrate information arising from eterogeneous sources of data; ii) support decision and scenario analyses; iii) monitor and evaluate the effectiveness of different policies; iv) develop policies evaluation strategies.Possible application domains are, among others: cardiovascular diseases, mental health, ageing and brain diseases, maternal and child health, pharmacoepidemiology and adherence to

	prescriptions/medications.
Educational objectives	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
Job opportunities	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.
Composition of the research group	1 Full Professors 1 Associated Professors 2 Assistant Professors 0 PhD Students
Name of the research directors	Prof. Emanuele Di Angelantonio (HT)

Contacts
Prof. Emanuele Di Angelantonio (HT) • E-mail: emanuele.diangelantonio@fht.org • Voice: +39 0230247157 • WWW: https://humantechnopole.it/en/people/emanuele-di-angelantonio/

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
List of Universities, Companies, Agencies and/or National or International Institutions that are cooperating in the research: • Center for Health Data Science (CHDS), Human Technopole Teaching assistanship (funding in recognition of supporting teaching activities by the PhD student): • There are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.

POLITECNICO DI MILANO

PhD in DATA ANALYTICS AND DECISION SCIENCES - 38th cycle

THEMATIC Research Field: DATA ANALYTICS FOR MULTI-OMIC DATA

Monthly net income of PhDscholarship (max 36 months)
€ 1300.0 In case of a change of the welfare rates or of changes of the scholarship minimum amount from the Ministry of University and Reasearch,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 is the medical framework for prevention and treatment that takes into account individual variations in genes, environment, and lifestyle. It employs individuals¿ unique genetic profile and DNA sequences (all sorts of omics data, i.e. genomics, proteomics, metabolomics, etc.), together with medical big data (i.e. biosignals, electronic health records, medical imaging), to determine their susceptibility to disease, the most suitable and individualized treatment, and the focused preventive strategies to adopt.From a methodological standpoint, precision medicine translates into a computational approach to functionally interpret omics and medical big data in their effect on complex phenotypic traits, to understand the genetic basis of disease etiology and develop effective biomarkers. Unfortunately, designing effective models with large-scale molecular and clinical data has been a non-trivial and seldom unsatisfactory endeavour.
Methods and techniques that will be developed and used to carry out the research	The research will focus on the development of methodologies that construct effective biological system complexity-aware representations of data, to enhanceand complement interpretable and robust statistical approaches to the analysis of complex multi-omics data arising from the integration of clinical data.It will cover techniques spanning from cutting edge statistical methodologies to novel and complex machine learning techniques in order to i) analyze and integrate information arising from eterogeneous sources of data; ii) early predict

	the endpoint of interest (survival, relapse, response to treatment); iii) support clinical decision making. Possible application domains are, among others: cardiovascular diseases, mental health, ageing and brain diseases, maternal and child health, pharmacoepidemiology and adherence to prescriptions/medications.
Educational objectives	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 from data itself, through the use of advanced data analytics techniques
Job opportunities	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.
Composition of the research group	1 Full Professors 1 Associated Professors 2 Assistant Professors 0 PhD Students
Name of the research directors	Prof. Emanuele Di Angelantonio (HT)

Contacts

Prof. Emanuele Di Angelantonio (HT)

- E-mail: emanuele.diangelantonio@fht.org
- Voice: +39 0230247157
- WWW: https://humantechnopole.it/en/people/emanuele-di-angelantonio/

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

List of Universities, Companies, Agencies and/or National or International Institutions that are cooperating in the research:

- Center for Health Data Science (CHDS), Human Technopole

Teaching assistanship (funding in recognition of supporting teaching activities by the PhD student):

- There are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.