**PhD IN APPLIED DATA SCIENCE AND ARTIFICIAL INTELLIGENCE OVERVIEW**

### IN BRIEF

**Lines of research**

<table>
<thead>
<tr>
<th>CURRICULUM: Industry 4.0, Smart Cities, Smart Transportation, and Natural Sciences</th>
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<tbody>
<tr>
<td>1 Foundations of machine learning and artificial intelligence. Neuro-symbolic computing and explainable artificial intelligence</td>
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<tr>
<td>2 Reinforcement Learning and control for Cyber-Physical Systems and industry 4.0</td>
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<td>3 Machine learning and statistical inference in natural sciences</td>
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<tr>
<td>4 HPC methods and algorithms for simulation and (big-) data analysis in physics</td>
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<tr>
<td>5 Computer vision and control for smart manufacturing, industry 4.0 and natural sciences</td>
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<tr>
<td>6 Mathematical, heuristic and evolutionary optimisation and applications to smart cities and smart transportation</td>
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<tr>
<td>7 Big data management and curation and HPC-based artificial intelligence</td>
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**CURRICULUM: Medicine, Life Sciences, and Environment**

| 1 Causal Inference methods from Observational Data in epidemiological research. |
| 2 Machine Learning for Healthcare: interpretability, explainability and transparency issues. |
| 3 Deriving Biomedical Knowledge from EHR (Electronic Health Records) |
| 4 Artificial Intelligence and Computer Vision for estimating biodiversity indexes: challenges and opportunities |
| 5 Aggregation of biodiversity data: standouts and protocols |

**CURRICULUM: Economy and society**

| 1 Statistical and computational methods in social sciences |
| 2 Statistical and computational methods in economics and finance |
| 3 Artificial intelligence in government and its potential applications from a public policy perspective |
| 4 Artificial intelligence and social media |
| 5 Artificial intelligence for disaster response |
| 6 Network analysis: methods and applications |
| 7 Public engagement activities and their impact on participants’ attitudes towards artificial intelligence |

**Administrative location**

University of Trieste

**Organizing Department**

- Department of Mathematics and Geosciences
- Department of Medicine, Surgery and Health Sciences
- Department of Physics
- Department of Engineering and Architecture

**Participating Departments**

- Department of Engineering and Architecture
### Department of Economic, Business, Mathematical and Statistical Sciences
### Department of Political and Social Sciences
### Department of Life Sciences

| **Duration** | 3 years |
| **Attendance abroad that entitles to a scholarship increase - min. max. of months for each PhD student (over 3 years)** | 0 - 18 |
| **Official language** | English |
| **Subject Areas** *(in alphabetical code order)* | 01 MATHEMATICS AND INFORMATICS  
02 PHYSICS  
05 BIOLOGY  
06 MEDICINE  
09 INDUSTRIAL AND INFORMATION ENGINEERING  
13 ECONOMICS AND STATISTICS  
14 POLITICAL AND SOCIAL SCIENCES |
| **Macro Research Fields** *(in alphabetical code order)* | 01/A MATHEMATICS  
01/B INFORMATICS  
02/B PHYSICS OF MATTER  
02/C ASTRONOMY, ASTROPHYSICS, EARTH AND PLANETARY PHYSICS  
05/A PLANT BIOLOGY  
06/M PUBLIC HEALTH  
09/G SYSTEMS ENGINEERING AND BIOENGINEERING  
09/H COMPUTER ENGINEERING  
13/D STATISTICS AND MATHEMATICAL METHODS FOR DECISIONS  
14/C SOCIOLOGY |
| **Scientific Disciplinary Sectors** *(in alphabetical code order)* | BIO/02 SYSTEMATIC BOTANY  
FIS/03 PHYSICS OF MATTER  
FIS/05 ASTRONOMY AND ASTROPHYSICS  
INF/01 INFORMATICS  
ING-INF/04 SYSTEMS AND CONTROL ENGINEERING  
ING-INF/05 INFORMATION PROCESSING SYSTEMS  
ING-INF/06 ELECTRONIC AND INFORMATICS BIOENGINEERING  
MAT/06 PROBABILITY AND STATISTICS  
MAT/09 OPERATIONS RESEARCH  
MED/01 MEDICAL STATISTICS  
SECS-S/01 STATISTICS  
SECS-S/05 SOCIAL STATISTICS  
SPS/07 GENERAL SOCIOLOGY |
| **Domain European Research Council** | PE PHYSICAL SCIENCES AND ENGINEERING  
LS LIFE SCIENCES  
SH SOCIAL SCIENCES AND HUMANITIES |
| **ERC Panels** | PE1 MATHEMATICS  
PE6 COMPUTER SCIENCE AND INFORMATICS |
WHO’S WHO

Chair
Prof. Francesco Pauli – Department of Economic, Business, Mathematical and Statistical Sciences - University of Trieste - phone 040 558 2518; email francesco.pauli@deams.units.it

Vice
Prof. Luca Bortolussi – Department of Mathematics and Geosciences – University of Trieste - phone 040 558.2630; email lbortolussi@units.it

PhD Academic Board
List of members

Web site
http://adsai.units.it/

Email
dottorato.adsai@units.it

Course description and objectives
The doctorate trains researchers with in-depth scientific preparation in the methodological basis of data science and artificial intelligence (computer science, mathematics, statistics) and its implications in various application domains. The application areas it is focused on are: medicine and life sciences, industry 4.0, society and economy, data driven science, with attention to the effects on the territory.

The teaching plan focuses in the first year on the foundations and applications of data science and AI, including some ethical and legal aspects, but also comprise courses on organizational aspects of research and analysis of the state of the art. PhD students will be made aware of the principles of research reproducibility and FAIR data. The teaching plan will be personalized on the basis of the previous study plan and the research topic pursued by the student. Scientific activity will develop in the second and third years, with a possible visiting period at research institutions of international importance.

An essential and qualifying aspect of the training is the multidisciplinary approach from a theoretical and experimental standpoint as well as the interaction with the relevant economic sectors.

The PhD program is aimed at training professionals in theoretical and applied research of excellent level on the international scene.

Job placement opportunities
PhDs in "Applied Data Science and Artificial Intelligence" will be able to undertake an academic path of teaching and research in the core areas of the doctorate and more generally contribute with the tools of data science and artificial intelligence in all research fields where they may be relevant.

Attention to application aspects, also in close connection with public and private subjects who operate in these fields, will make PhDs able to exploit the tools of data science and artificial intelligence in applied contexts on behalf of public or private organisms: companies, research organizations, public administrations.

Main cooperating international Universities and Research Institutions

1. University of Oxford, United Kingdom
2. Saarland University, Germany
3. University of Colorado (Anschutz Medical Campus), USA
4. Universidade NOVA de Lisboa, Portugal
5. Institute for Technology Assessment and Systems Analysis/Karlsruhe Institute of Technology (ITAS/KIT), Germany