

MASTER PROGRAMME IN DATA SCIENCE AND SCIENTIFIC COMPUTING – A JOINT EFFORT OF THE UNIVERSITIES OF TRIESTE, UDINE AND SISSA

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| 77 |

THE CHALLENGE

“Change has never happened this fast before, and it will never be this slow again” (Graeme Wood)

We live in a moment of unprecedented pace in scientific and technological change, fostered by the blossoming of the digital era. Continuously expanding computational power and the availability of large datasets, combined with technical and algorithmic innovations in information and communication technology (ICT), are acting as catalysers of innovation and accelerators of transformation in other scientific disciplines, in technology, in industry, and in practically all aspects of economics and of daily life. This context is posing an extreme stress in the job market: the speed of change in job profiles is impressive, and there is an overall decreasing trend of low qualification jobs, due to the automation of cognitive tasks part of the Industry 4.0 revolution. On the other hand, there is an increasing need of professional profiles skilled in informatics and with capabilities of analysing and making sense of the large amount of data produced every day. Professionals capable of working in multidisciplinary teams and of concretizing the promises of the Artificial Intelligence and Data Science revolution are highly requested (WEF, 2016).

Education institutions face the consequent challenge to renovate and modernize their programmes, trying to match the needs of the job market of this class of professionals. Updating the didactic offer, however, is never easy, due to internal resistances and lack of expertise

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in the emerging scientific areas. At the University of Trieste, in particular, researchers with competences in artificial intelligence (AI) and data science are spread among many departments (Engineering, Mathematics, Statistics and Economics, Physics), and none of them has enough critical mass to qualify and to develop a successful programme in this area. Furthermore, this fragmentation can be seen also at the level of the scientific system of Trieste, the European capital of Science in 2020 (ESOF 2020), and of its region, Friuli Venezia Giulia. Solving these challenges required a novel approach, combining all these fragmented competences and joining them into a strong faculty of Data Science.



THE SOLUTION

The starting point was a post-graduate specialization programme in High Performance Computing (HPC), with application in Scientific Computing, run by two top scientific institutions of the Trieste area: SISSA (International School for Advanced Studies), a post-graduate teaching school, and ICTP (International Centre for Theoretical Physics), a UN research institution aimed at diffusing scientific knowledge in Physics to third world countries. SISSA, in particular, offered their expertise in HPC to the Department of Mathematics and Geosciences of the University of Trieste, in order to expand the didactic offer of the programme in Applied Mathematics. The university saw in this offer the opportunity to join forces and design a novel master programme, focussed on Data Science and Scientific Computing, capable of training professionals with highly demanded skills. During the design phase, the Department of Mathematics, Informatics and Physics of the University of Udine was also involved,

to complement the expertise of the distributed faculty in some areas of computer science, together with scientists operating in the National Research Council on Material Sciences (CNR-IOM) and National Astrophysics Institute (INAF). The University of Trieste involved internally 5 departments: Mathematics and Geosciences, leader of the project, Engineering and Architecture, Economics, Business, Mathematical and Statistical Sciences, Physics and Chemical and Pharmaceutical Sciences.

In 2017 this cooperation led to the launching of the International Master Programme in Data Science and Scientific Computing, which scientific and didactic quality is certified by a strong faculty of professors and researches of the many institutions involved. This allowed the programme to have a broad offer of courses, and to train students not only in the computational, mathematical and statistical skills, that are the foundations of data science, but also in several possible application fields.

A challenge that had to be faced in the design phase, was the lack of a Bachelor programme as a natural source of students for this Master programme. This led to designing a programme accepting students with very different backgrounds, mostly with a scientific and technological one (mathematics, physics, engineering), but also computationally-minded students with a background in biology or economics.

Students studying in the Master programme in Data Science and Scientific Computing stay in Trieste, and have lectures mainly at the University of Trieste, but also in SISSA and ICTP, thus having a chance to be exposed to a different range of an international and stimulating research environment. In addition, also companies are involved by offering seminars and internships, in order to provide students with a better understanding of the challenges and opportunities in the area of their studies.



THE RESULTS

The Master programme in Data Science and Scientific Computing started its activities in October 2017. Surprisingly, even before having students, it attracted the interest and recognition of companies and institutions, both local and international. In particular, companies agreed to sponsor scholarships for students enrolling in the programme, and to offer sponsored students a tutoring activity during the first year of their studies and an internship during the second year. The reaction of companies was so positive, that in 2017/2018, all eligible students gained a scholarship. In terms of enrolment statistics, it is too early to make any judgement, particularly because the advertisement and the communication of the programme for the year 2017 started very late (mid July 2017). The earliest occasion to draw first conclusions will thus be the academic year 2018/2019. Nevertheless, the support offered by companies and institutions, as well as the actual need of skilled professionals in this area, are building our confidence of having an excellent product for highly motivated students capable of competing internationally.

| 80 |

CONCLUSION AND RECOMMENDATIONS

The main lesson learned in designing the international Master programme in Data Science and Scientific Computing has been discovering the power of networking between several institutions, making them cooperate on a common goal. The area of Trieste and Udine is rich in research institutions and of scientific skills. If the fragmentation intrinsic in the presence of multiple institutions will be overcome and cooperation around concrete projects will be built, it is possible to offer a highly skilled training and attract students from all around the world.



REFERENCES

WEF (World Economic Forum), The Future of Jobs, 2016, available at http://www3.weforum.org/docs/WEF_Future_of_Jobs.pdf



