ICT PHD

Research project for a PhD curriculum in ICT – Computer Engineering and Science

Tutor: Prof. Federica Mandreoli
(*) Italian Co-tutor: Dott. Riccardo Martoglia
(**) Foreign Co-tutor: Prof. Paolo Missier (Newcastle University -UK)

Proposed Title of the research: Data Analytics and Machine Learning for P4 medicine

Keywords: (5)
Big data, data analytics, machine learning, health data

Research objectives: --(max 10 rows)
Medical practice is evolving rapidly, away from the traditional but inefficient detect-and-cure approach, and towards a Preventive, Predictive, Personalised and Participative (P4) vision. This vision is increasingly data-driven, and is underpinned by many forms of "Big Health Data".
The main research objective of this PhD project is to contribute to the above ambitious goals with big data analytics and machine learning solutions for collections that include a broad variety of (longitudinal) data including genetics, electronic health records, patient reported outcomes, lifestyle indicators and wearables. The project is in collaboration with the Unit of Infection Diseases of the University Hospital Policlinico di Modena. The PhD candidate will have the opportunity to work with retrospective and prospective health data collections mainly in the context of infection diseases, also including COVID-19 data.

Proposed research activity -- (max 10 rows)
- Data cleaning techniques and application to clinical and self-generated datasets;
- Study of the state of the art of data mining and machine learning techniques in the field of medicine and people wellness;
- Study of Machine Learning solutions for P4 medicine;
- Model Interpretability and P4 medicine;
- AutoML for P4 medicine;
- Techniques for model evaluation and assessment;
- Standardization of new data-drive clinical scores.

Supporting research projects (and Department)
The PhD student will be hosted at the Department of Physics Informatics and Math. Prof. Mandreoli has active projects with Prof. Guaraldi and Prof. Missier. The project will use retrospective Electronic Health Data, mainly from Policlinico of Modena, prospective health data generated by IRB approved studies.

Possible connections with research groups, companies, universities.
The study will be conducted together with Prof. Giovanni Guaraldi (Dipartimento Chirurgico, Medico, Odontoiatrico e di Scienze Morfologiche con Interesse Trapiantologico, Oncologico e di Medicina Rigenerativa), physician of the Infection Disease Unit of Policlinico of Modena, and his research group.
The co-tutor Prof. Paolo Missier is a reader with the School of Computing at Newcastle University. Joint research activities are also currently active with the National Innovation Centre for Data (NICD -UK).

(*) optional
(**) optional/to be completed on the second year