PhD in Computer and Control Engineering

Research Title: Learning Analytics

Funded by	Comitato ICT

Supervisor	Laura Farinetti – laura.farinetti@polito.it

Contact	https://elite.polito.it/

| Context of the research activity | Learning Analytics is defined as the measurement, collection, analysis and reporting of data about learners and their contexts, with the purpose of understanding and optimizing learning in the environments in which it occurs.

The possibility to collect, analyze, categorize, integrate, mine large amounts of heterogeneous educational data coming from different sources (i.e. students' interaction with Learning Management Systems, learners' data, performance data, portfolios, surveys, statistics, …) has the chance to create an informed environment able to reinforce and personalize learning. This is a challenge that educational institutions have to face today, in any public or private sector, and at any level.

Learning analytics, in fact, can positively impact educational institutions at three main levels:
- Student level: personal performance in relation to learning goals, learning resources, and study habits of other peers.
- Curricula level: conceptual development, curricula integration, optimization and personalization.
- Organizational level: predictive modeling, discovery of patterns of success and failure. |
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Objectives	The PhD research will focus on the main technological challenges related to learning analytics, with techniques

borrowed from the data mining and the artificial intelligence domains.

Specifically, research activities will address the following issues:

- Reporting data: how to collect and summarize large sets of heterogeneous historical data coming from different sources.
- User modeling and profiling: how to model learner's knowledge, behavior, motivation, experience, satisfaction, and how to cluster users into similar groups.
- Analyzing trends: how to identify historical trends and correlations.
- Predictive analytics: how to predict future student behavior and performance, based on past patterns.

Research results will be applied and validated in a number of educational settings, with the objective to improve learning effectiveness by:

- Detecting and correcting undesirable learner behaviors.
- Identifying "at risk" students to prevent their drop out.
- Personalizing the learning process and recommending learning resources and/or actions.
- Increasing reflection and awareness by providing learning data overviews through data visualization tools.

Skills and competencies for the development of the activity	The candidate should have good programming skills, and good experience in problem solving, team working and communication. Multidisciplinary and self-organization attitudes are strongly welcome. Knowledge of data analytics, data visualization, machine learning and artificial intelligence are desirable but not strictly necessary.