POLITECNICO DI MILANO

PhD in INGEGNERIA GESTIONALE / MANAGEMENT ENGINEERING - 41st cycle

THEMATIC Research Field: ASSESSING THE RISK-PROBABILITY OF SCHOOLS AND CLASSES WITHIN SCHOOLS

Monthly net income of PhDscholarship (max 36 months)
1500.0 In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity	
Motivation and objectives of the research in this field	In this research, we develop a series of predictive models based on econometrics, statistics and machine learning approaches to identify the schools and classes at risk. By “school at risk” (or “class at risk”) we define those that have a high concentration of students who are likely to obtain low scores in INVALSI tests and/or to dropout during or after high school. The current research paves the way to develop predictive and analytic algorithms that can be replicated and adjusted for other countries for which similar data are available. In addition, we would like to build a research base about the interventions that have been tested and properly evaluated to raise the performance of classes and schools that were particularly struggling academically – in the spirit of evidence-based education. Specifically, we explore the following research questions, also testing corresponding hypotheses: - Can we predict schools and classes at risk, using advanced statistical and ML techniques and a variety of appropriate data? - Can we identify the main individual, class and school factors (indicators, variables) associated with higher risks of poor academic performance and dropout, since the early stages of education? - How much the various categories of data (school level, class level, individual) contribute to increase the power of prediction (measured though accuracy, precision, etc.) of schools and classes at-risk? - What are the main interventions and policies that have

	been tested as effective in improving the performance of classes and schools at risk?
Methods and techniques that will be developed and used to carry out the research	This research will be conducted in collaboration with INVALSI, the Italian Institute for the Evaluation of Education (Istituto nazionale per la valutazione del sistema educativo di istruzione e di formazione). INVALSI data will be one of the main source of variables used in the current research; they are basically standardized tests at grades 2, 5, 8, 10 and 13. A novel feature of our research is the integration between data obtained from INVALSI and from the Ministry of Education, highlighting how the indicators contained in different datasets might contribute to better identify schools and classes at risk. A list of potentially interesting data contained in the two datasets can be summarized as follows: - INVALSI data: individual characteristics of students (gender, age, citizenship, socioeconomic status, etc.); standardized test scores; average characteristics of students' body at school and class level; - Ministry of Education data: (few) teachers' characteristics; school principals' characteristics; schools' resources and projects. From a methodological standpoint, several predictive models will be developed, tested, and calibrated. In particular, we refer to basic logistic regressions and Machine Learning (ML) tools, like regression trees, random forests, Lasso regressions. All these algorithms will be adapted for the inclusion of multilevel modelling, to consider the nested nature of data – students within classes, within schools. All the analyses are conducted using microdata (i.e. data at the level of the single student), while the results are aggregated to perform analyses of classes and schools. Also, we will use OECD PISA data, from several waves.
Educational objectives	The educational outputs of the research will be: - Systematic literature review about the identification and analysis of schools and classes "at risk" of educational poverty/failure; - Developing a model for identifying schools and classes

	“at risk”, with an application to Italian primary, middle and high schools; - Systematic literature review about the effectiveness of interventions and policies targeted to schools and classes at risk.
Job opportunities	The research activity can lead to several job opportunities, such as (i) research experience within academic institutions (ad postdoc), (ii) research activity in national and international institutions (like OECD or INVALSI), (iii) research work for private foundations operating in the field (like Fondazione per la Scuola or Bolton Foundation for Education).
Composition of the research group	1 Full Professors 1 Associated Professors 1 Assistant Professors 1 PhD Students
Name of the research directors	Tommaso Agasisti

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Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents	--

Scholarship Increase for a period abroad	
Amount monthly	750.0 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
The PhD student will be involved in seminars, conferences and workshops in the field of statistics and economics of education. For the overall development of their capabilities, PhD candidates will work on sinergical projects to favour empirical data collection and network development for their career. Projects will give candidates the opportunity to work in groups (peers and other senior professors). If coherent with the development of their doctoral program, the PhD candidate will have the

opportunity to be involved in: teaching activities, tutoring to master students, tutoring to PhD candidates for administrative processes.

Funding for educational activities: 6.100,00 Euros for three years.