POLITECNICO DI MILANO

PhD in ARCHITETTURA, INGEGNERIA DELLE COSTRUZIONI E AMBIENTE COSTRUITO / ARCHITECTURE, BUILT ENVIRONMENT AND CONSTRUCTION ENGINEERING - 38th cycle

INTERDISCIPLINARY Research Field: NATURAL LANGUAGE PROCESSING ENABLED CONFORMITY ASSESSMENT OF CONSTRUCTION PROJECT (DIGITAL) DOCUMENTATION, TO SUPPORT DESIGN REVIEW AND TENDER PROCEDURES

Monthly net income of PhDscholarship (max 36 months)
€ 1275.0 In case of a change of the welfare rates or of changes of the scholarship minimum amount from the Ministry of University and Reasearch, during the three-year period, the amount could be modified.

Context of the research activity	
Motivation and objectives of the research in this field	Interdisciplinary PhD Grant The PhD research will be carried out in collaboration with research groups of the PhD programme in "**INFORMATION TECHNOLOGY**". See https://www.dottorato.polimi.it/?id=422&L=1 for further information. The research questions arise from the field of the Construction Project Management in Italian Public Works. Here the project manager is required to minimize the risks in delays, cost increases and reduced serviceability of a project, through a series of design checks, before tender and on the expected performances and serviceability of the realized works. In other terms, to assure the quality of the design. Such an activity has counterparts in many other legislative and practice contexts, may be classified as 'conformity assessment activity' and finds its best framework in the ISO/IEC 17000 standards. Italian Public Works regulation requires that this activity is performed by accredited Inspection Bodies, which shall operate objectively, transparently and thoroughly: the assessment process must be 'designed', 'validated', planned and declared to the parties involved in the inspection process

	and eventually, continuously improved. Before the start of the 'digital transformation' of the AECO Industry, intermediate and final conformity assessment were mainly based on the judgements of experts: the start of the practice of Validazione del Progetto, at the end of the nineties, was for sure able to improve the quality of every single Project, but without any measure of its overall effect on italian Public Works system and without any metrics of its effectiveness on each single case. This research stands on this belief: digitalization will not only make data available for this measure but also force every playing party toward a reasonable degree of automation and, so, to make their procedures well documented and controllable. This is of course a great challenge: not only for the high value of construction works, but for the complexity of the service they give to public/private parties. The research questions to be faced are the following: (1) Is it possible to make design review processes, automated and scalable? Is it possible to organize it as a set of automatable elementary checks, to be performed on digital design documents, scaled to the complexity of the case and extended to the design breadth? (2) Is it possible to start a collaborative culture of design conformity assessment and a Knowledge Management System able to collect all the design culture items produced in real projects, eliciting them from the sharable knowledge of product manufacturers, of contractors and designers, their mistakes and successes and of inspection bodies? (3) Is it possible to measure the improvement in the effectiveness and the efficiency of decision-making processes in Public Works?
Methods and techniques that will be developed and used to carry out the research	This research has two main references. One is the application field from where the research questions arise, that we have presented above: the conformity assessment practice in the AECO Industry. The other is the application of Natural Language Processing (NLP) technologies that we want to use (and to fine-tune for such a use) to give a practical answer to those questions.From the point of view of NPL, the main idea is to explore the feasibility of the translation of general issues in elementary executable commands, able to

	extract information and data from digital models, to assess their completeness and coherence (or, on the contrary, to identify incoherences or clashes) and to control every possible risk connected with a design choice: in terms of impacts on its construc-tability, its serviceability, its durability and it Life Cycle impact.
Educational objectives	We look for Master graduates in the wide field of Architecture, Building, Civil and Environmental Engineering, keen to be trained in the wide field of information technologies and their application in Building Information Model data analysis. We look also for Master graduates in the disciplines of Management Engineering or Information Technologies and Engineering, interested in the AECO industries and keen to be trained in this field's problems and practices. The selected student will gain his/her complementary knowledge on the needed subject in the first period of her/his career, while (s)he will be trained in Natural Language Processing applications. The training work will proceed, on real cases, developed in a strong synergy with Architectural and Engineering Design bodies, Inspection bodies and the responsible of their accreditation system. The results of the student research will be presented and reviewed at an international level, in research conferences and working groups.
Job opportunities	At the end of the doctoral path, the PhD Candidate will hold a deep knowledge about AECO digitalization issues and Natural Language Processing applications. Both are trend topics for academic research as well as for applied research and both are skills highly requested and whose request is growing and will grow in a close future. The systematic collaboration with other Research Centres, with Architectural and Engineering Design bodies and with Inspection Bodies will provide to the Candidate the relationships useful to give the right value to the research products as well as to the professional and academic figure of the candidate.
Composition of the research group	2 Full Professors 1 Associated Professors

	0 Assistant Professors 1 PhD Students
Name of the research directors	Profs. E. De Angelis (DABC), L. Baresi (DEIB)

Contacts
enrico.deangelis@polimi.it *luciano.baresi@polimi.it*

Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad	
Amount monthly	637.5 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

Additional support:

Budget for the research activity:
total amount Euro 5,197.62 per student
In detail:
- 1st year Euro 1,732.54
- 2nd year Euro 1,732.54
- 3rd year Euro 1,732.54

Interdisciplinary cooperation:
the PhD Candidate will benefit from initiatives organized by both PhD Programmes involved.

Additional information can be found in the Regulations for the 38th Cycle of ABC-PhD:
download is available at link:
https://beep.metid.polimi.it/web/abcphd/documenti-e-media

Additional information about ABC department and ABC-PhD programme:
available at link:
https://www.dabc.polimi.it/

Desk availability:

The ABC department provides non-permanent desks to be temporarily booked in common PhD rooms.