



PhD in ARCHITETTURA, INGEGNERIA DELLE COSTRUZIONI E AMBIENTE COSTRUITO / ARCHITECTURE, BUILT ENVIRONMENT AND CONSTRUCTION ENGINEERING - 40th cycle

PNRR 630 Research Field: AI-POWERED STEEL FABRICATION USING LASER CUTTING TECHNOLOGY

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	The PhD project aims to create AI-driven models for optimized fabrication solutions including laser cutting technology. AI's potential will be used to refine design and fabrication processes, ensuring resource conservation and cost-effectiveness.
Methods and techniques that will be developed and used to carry out the research	The candidate will gather relevant data from existing fabrication processes and materials (with specific attention to the laser cutting), and analyze it to understand the existing challenges and set benchmarks for AI-driven optimization. Based on the data analysis, the candidate will design and fine-tune machine learning algorithms tailored to predict and recommend optimal fabrication solutions. The candidate will evaluate the environmental impact of AI-optimized designs by focusing on aspects like material consumption, waste reduction, energy efficiency, and carbon footprint. The final product will assist decision-makers in choosing the cutting method that enables the fastest and highest quality cuts, and in optimizing cutting parameters according to the specific project requirements of the end-user. Throughout the research, various machine learning (ML) techniques will be investigated to enhance the framework's functionality: i) To guide designers in making minor adjustments to their



	<p>projects, such as modifying profile sizes and selecting optimal cutting techniques, to achieve the best outcomes in terms of speed, cost, and carbon emissions. ii) predicting the performance of different solutions, providing designers with valuable insights to optimize their decisions and improve overall project efficiency. The PhD project is co-funded by ADIGE and the Co-supervisor will be Mattia Vanin (ADIGE).</p>
Educational objectives	<p>Laser cutting process Hybrid machine learning and explainable AI techniques ML model development</p>
Job opportunities	<p>Italy has leading positions in construction and manufacturing worldwide. PhD students are often employed within the first year in national and international companies and academic and non-academic research institutions, engaged in innovation, research and technical development.</p>
Composition of the research group	<p>1 Full Professors 2 Associated Professors 0 Assistant Professors 1 PhD Students</p>
Name of the research directors	<p>Alper Kanyilmaz Barbara Previtali Daniele Loiacono</p>

Contacts	
<p>alper.kanyilmaz@polimi.it</p>	

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	750.0 €
By number of months	6

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	ADIGE
By number of months at the company	6
Institution or company where the	RWTH Aachen



candidate will spend the period abroad (name and brief description)	
By number of months abroad	6

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

Additional support:

Budget for the research activity (only for positions supported by scholarship):

total amount Euro 6114.50 per student

In detail:

- 1st year Euro 2038.16
- 2nd year Euro 2038.17
- 3rd year Euro 2038.17

Additional information about the organization and regulations of ABC-PhD programme can be found in the Regulations for the 40th Cycle of ABC-PhD:

download is available at link:

<https://www.dottorato.polimi.it/corsi-di-dottorato/architettura/architettura-ingegneria-delle-costruzioni-e-ambiente-costruito>

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.