



PhD in INGEGNERIA MECCANICA / MECHANICAL ENGINEERING - 39th cycle

PNRR 117 Research Field: INTEGRATED APPROACH TO SUPPORT THE DESIGN AND SOUND QUALITY ANALYSIS OF CONCERT GRAND PIANOS BASED ON STRUCTURAL AND VIBROACOUSTIC MODELLING, OBJECTIVE AND SUBJECTIVE TESTS, DATA SCIENCE AND MACHINE LEARNING TECHNIQUES

Monthly net income of PhDscholarship (max 36 months)
€ 1400.0
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	<p>Quality assessment is a crucial step when making musical instruments. The uncertainties and the subjectivity typical of perception-based testing need to be overcome in an industrial context, where production quality calls for a systematic and reliable way to support the design of products with stable and ever higher performance standards. In this context, Fazioli Pianoforti, a worldwide leading company in the production of grand and concert grand pianos, is continuously investing in R&D, seeking for innovative approaches and solutions to meet the expectations of more and more demanding artists and customers. The research program aims at defining, developing and implementing an integrated approach to support the design and sound quality analysis of concert grand pianos. The idea is to combine together structural and vibroacoustic modelling, objective and subjective tests, data science and machine learning techniques. The PhD scholarship is awarded by Fazioli Pianoforti S.p.A., in the framework of the research cooperation with Politecnico di Milano.</p>
Methods and techniques that will be developed and used to carry out the research	<ul style="list-style-type: none"> • Finite element structural dynamics modelling of the piano soundboard • Sound radiation simulation • Vibroacoustic testing



	<ul style="list-style-type: none"> • Sound quality analysis based on jury test execution and on the correlation with objective measurements • Machine learning approaches applied to the data base resulting from objective and subjective tests, to extract information and to identify the correlations between the data and the instrument structural features <p>The candidate shall contribute to the development of advanced data analysis and simulation tools. He/she will take part in the planning and execution of the experimental tests, to collect the necessary data.</p>
Educational objectives	<p>The candidate will acquire high-profile skills and will be dealing with both theoretical and experimental methodologies. He/she will become an expert in advanced vibroacoustic modelling and experimental testing, signal processing and machine learning techniques. The candidate is supposed to provide original and innovative contributions to the research project.</p>
Job opportunities	<p>Future job opportunities are primarily in the field of musical acoustics, especially with reference to the design, analysis, characterization and improvement of musical instruments. Besides this, job opportunities comprise national and international academic and non-academic institutions and organizations, engaged in innovation, research and technical development.</p> <p>Our last survey on MeccPhD Doctorates highlighted a 100% employment rate within the first year and a 35% higher salary, compared to Master of Science holders in the same field.</p>
Composition of the research group	<p>1 Full Professors 1 Associated Professors 0 Assistant Professors 1 PhD Students</p>
Name of the research directors	<p>Prof. Roberto Corradi, prof. Stefano Miccoli</p>

Contacts	
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For questions about scholarship/support please contact phd-dmec@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	700.0 €
By number of months	6

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	FAZIOLI PIANOFORTI S.p.A.
By number of months at the company	6
Institution or company where the candidate will spend the period abroad (name and brief description)	Institute of Sound and Vibration Research, University of Southampton
By number of months abroad	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
<p>Financial aid is available for all PhD candidates (purchase of study books and materials, funding for participation in courses, summer schools, workshops and conferences) for a total amount of euro 5.707,13.</p> <p>Teaching assistantship: availability of funding in recognition of supporting teaching activities by the PhD candidate. There are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.</p>