POLITECNICO DI MILANO

PhD in INGEGNERIA GESTIONALE / MANAGEMENT ENGINEERING - 40th cycle

PNRR 630 Research Field: DATA-DRIVEN ANALYSIS OF HUMAN ATTENTION AND ENGAGEMENT IN TOTAL AUDIO FORMATS: IMPLICATIONS FOR BUSINESS, EDUCATION, AND LEARNING PROCESSES

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 research aims to delve into the evolving role of audio formats as critical technologies in enhancing attention and learning processes. With the proliferation of audio content in various domains, understanding how these formats influence human engagement and cognitive functions has become imperative. The motivations behind this research are rooted in the growing reliance on audio media for business, education, and personal development. Audio formats, such as podcasts, digital radio, audiobooks, and voice assistants, are increasingly utilized for their convenience and ability to capture attention in a multitasking world. The primary objectives of this research are multifaceted. First, it seeks to comprehensively analyze the mechanisms through which audio formats impact attention, learning and recall. This involves exploring cognitive theories and employing a datadriven approach to measure engagement levels across different audio content. By leveraging advanced analytics, multimodal assessment and machine learning techniques, the research aims to identify patterns and factors that enhance or impede attention and learning in audio contexts. Second, the research intends to bridge the gap between theoretical insights and practical applications. In the business sector, understanding how audio can optimize customer engagement, drive more sustainable consumption and fostering marketing strategies is crucial.

	In educational settings, the findings can inform the design of more effective audio-based learning materials, catering to diverse learning preferences and enhancing overall educational outcomes. Ultimately, the research aspires to contribute to the development of best practices and guidelines for leveraging audio formats to maximize attention and learning. By doing so, it will provide valuable insights for content creators, educators, businesses, and policymakers, ensuring that audio technologies are harnessed effectively to meet the evolving needs of society.
Methods and techniques that will be developed and used to carry out the research	The research will be conducted with a multidisciplinary approach to integrating methodologies of cognitive neuroscience, experimental psychology, behavioral science, and data analytics in a comprehensive examination of the role of audio formats in attention and learning processes. A vital part of this research will embrace the applied neuroscience tools, including EEG. These techniques will give a means to objectively measure brain activity, either in determining the level of attention or how the brain engages with the audio content. In addition to the neuroscientific methods, the research will draw on traditional experimental psychology techniques. A series of laboratory experiments is planned, with a straightforward a priori set of hypotheses regarding the differential effect on attention and learning by different types of audio formats. Methods of recording include behavioral measures-response times and accuracy in task performance-as well as eye-tracking data for quantitative data on engagement and cognitive load. The experiments thus allow the factorization of audio features, from tone and pacing to complexity of content. Surveys and self-report questionnaires may be used in combination with objective measures, which reflect subjective experiences of engagement, enjoyment, and recall. Such tools will be necessary for understanding individual differences in response to audio content and identifying factors that would contribute to perceived effectiveness and satisfaction.

	Advanced data analytics and machine learning methodologies appropriate for analyses on the voluminous datasets from neuroscientific, behavioral, and survey data generated will be applied. Machine learning models will be adopted to identify predictors in attention and engagement in such a way that will enable the identification of guidelines for the personalization of recommendations for audio content. By triangulating data sources from neuroscientific, behavioral, and self-report measures, it is hoped that the research will provide solid and rich insights into mechanisms of audio engagement. Yet, overall, the multifaceted methodological approach is going to allow a very in-depth and nuanced investigation of the effects that audio formats have on cognitive processes, which hints at how this will relate to business, educational, and even personal development applications.
Educational objectives	Given its multidisciplinary nature, the PhD research proposed targets a number of educational objectives. First, interdisciplinary Knowledge Integration: know in detail the processes involved in cognitive neuroscience, experimental psychology, and behavioral science about attention and learning and joining them with managerial and consumer behavior dynamics. Methodologically, the research aims at developing strong skills in the use of neuroscientific techniques such as EEG, GSR, eye-tracking, and their working to measure brain activity and cognitive responses in audio formats. The program aims to develop expertise in experimental design, survey research and self-report measurements to document the subjective experience toward audio materials. The volume, variability and diversity of data asks for developing advanced data analytics skills, with a strong focus on AI and machine learning to integrate and process information from varied sources of data: neuroscientific, behavioral, and survey data. As a PhD, it aims at develop the ability to translate theoretical insights into practice advising on practical steps proper for content developers, educators, and policymakers, by fostering critical Thinking and problem-

	Solving: Enhance communication in science through writing papers, delivering research findings at scientific conferences, and further joining academic interdisciplinary talks. Learn how to work in a team with different individuals: marketers, psychologists, data scientists, etc. Learn more about ethics when performing studies with human participants, especially in neuroscientific research.
Job opportunities	Job opportunities may range in a broad space from academic research to business. If the academic research are quite obvious and typical of PhD programs, business job opportunities range widely. For instance: audio broadcasters and platform require content strategists, managers able to support and drive the structural transformation of the industry; marketing agencies are looking for professionals able to understand and assess the potential and the outcomes of total audio communication; more and more frequently companies are developing applied neuroscience practices and require technologists able to implement, manage and let it evolve consistently to business needs. Total audio and digital communication companies may benefit of advanced skills in the understanding of user behaviors in designing and delivering audio (but also partially-audio) content.
Composition of the research group	3 Full Professors 2 Associated Professors 1 Assistant Professors 4 PhD Students
Name of the research directors	Lucio Lamberti

Contacts
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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)	Federazione Concessionarie Pubblicitarie - Assoradio
By number of months at the company	6
Institution or company where the candidate will spend the period abroad (name and brief description)	Federazione Concessionarie Pubblicitarie - Assoradio
By number of months abroad	6

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

Educational activities, Teaching assistantship, Computer availability, Desk availability.

An involvement in B.Sc./M.Sc. level teaching is foreseen in order to strengthen academic communication skills. The candidate will work in departmental and interdepartmental labs to run their empirical research. Collaboration in open innovation projects with companies, besides the interaction with the funding body, will be encouraged along the PhD program in order to further strengthen the immediate application of scientific knowledge to the real world.

- Involvement in projects: "For the overall development of their capabilities, PhD candidates will work on sinergical projects to favour empiral data collection and network development for their career. Projects will give candidates the opportunity to work in group (peers and other senior professors)".
- Teaching and tutoring: "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".
- Italian knowledge (e.g. borsa co-finanziata da ente italiano): "The interaction with key stakeholders requires a fluent knowledge of the Italian language".

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