

Research Group

Acoustics, Vibration and multisensory Interactions – ACOUVI

Reference year: 2024
Scientific Coordinator: MAFFEI LUIGI / Full Professor/ Department of Architecture and Industrial Design (DADI) / University of Campania “Luigi Vanvitelli”
Group members: Members of the research group belonging to the Department of Architecture and Industrial Design / University of Campania “Luigi Vanvitelli” <i>Academic staff</i> MASULLO Massimiliano / Associate Professor IANNACE Gino / Associate Professor SIBILIO Sergio / Full Professor ROSATO Antonio / Full Professor CIAMPI Giovanni / Associate Professor SCORPIO Michelangelo / Assistant Professor CIERVO Antonio / Research Associate GALDERISI Adriana / Associate Professor PALMIERI Alice / Assistant Professor <i>Research Fellow / PhD Student</i> LI Jian / PhD Student SALAMONE Francesco / PhD Student BOUCHERIT Samiha / PhD Student ISTIANI Noor Fajrina Farah / PhD Student FATELA João Garrett / PhD Student CIOFFI Federico / PhD Student GRAVINA Nicola / PhD Student LODICO Dana / PhD Student CAPASSO Maria Alberto / PhD Student CARLEO Davide / PhD Student GARGIULO Martina / PhD Student SABET Parinaz / PhD Student TEIMORZADEH Ainoor / PhD Student MOKHTARI Niluofar / PhD Student ELYOUSSEF Mohammad / PhD Student

TUFANO Luigi / PhD Student
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JAMIL Maryam / PhD Student
FERRARA Corrado Vittorio / PhD Student
REA Giusy / PhD Student
LUSTRISSIMI Emiliano / PhD Student
PERROTTA Achille / PhD Student
MERCORI Rita / PhD Student
BASHIR Mirco / PhD Student

Additional members of the research group belonging to the Department of Psychology of the University of Campania “Luigi Vanvitelli”.

Academic staff

IACHINI Santa / Full Professor
RUGGIERO Gennaro / Full Professor
SENESE Vincenzo Paolo / Associate Professor
RUOTOLO Francesco / Assistant Professor
RAPUANO Mariachiara / Research Associate

Research Fellow / PhD Student

TOMA Roxana Adina / Research Fellow
IULIANO Sabrina / Research Fellow

Description of research lines:

- MULTISENSORY ENVIRONMENTAL IMPACT ASSESSMENT (EIA-SENSE)

The aim of this research line is the development of an innovative methodology for the environmental impact assessment of energy-saving projects, infrastructures and urban redesign/planning, the characterization and protection of the soundscape. The research includes the study and development of innovative and green acoustic materials, the development and application of vibro-acoustic techniques for environmental monitoring and noise mitigation, the acoustic modeling (indoor and outdoor), and the construction of immersive virtual reality environments.

The research deals with a highly innovative methodological approach to the problems of interactions between perceived sensory stimuli (e.g. acoustic, visual, thermal, tactile, olfactory) and the subjective assessment.

- PRODUCT SOUND QUALITY

This research activity deals with the study, development and application of product quality assessment methodologies, during the production, and from the point of view of the end user.

Industrial research addresses the issues of defects detection (fault diagnosis) at the end of the production lines using vibro-acoustic analysis techniques with the use of machine learning algorithms. The user-side research is instead oriented to the definition of new paradigms for the understanding, classification and design of sound quality (Sound Quality) of the final product (HVAC, Hybrid Electric Vehicles).

- URBAN SOUND PLANNING

The aim of this research line is the identification, characterization and conservation of quiet urban areas. The research, conducted through measurements and subjective / objective assessments in situ, aims to identify and characterize new spaces for the psycho-physical well-being of residents and visitors to historic city centres. The study proposes the development of new descriptive and communication models to the population.

- SAFETY, COMFORT AND PRODUCTIVITY

The research line deals with the problems related to the influence of physical environmental stimuli (acoustic, visual, tactile, olfactory, thermal) on the levels of safety, comfort and work performance of individuals in the industrial and service sectors. The research line uses the multisensory simulation of scenarios in hybrid mode (Virtual and Physical Reality) and the use of protocols and indicators for qualitative / quantitative assessment of subjective performance (e.g. physical, cognitive) as the main experimental tools.

- SUSTAINABLE ACOUSTIC METAMATERIALS

The aim of this research line is the design and characterization of new sustainable porous materials and acoustic metamaterials, to be employed separately or together, to be used as sound-absorbing and/or sound insulating panels able to absorb/reduce sound in the frequency range 50-5000 Hz. In order to obtain these purposes in a sustainable way, i.e., with low environmental impact and low embodied energy, metamaterials are particularly promising because their acoustic properties and operation frequency band do not depend specifically on the nature of the composing material, but on the geometric shape, size and space between the inclusions.

Relationships with other research groups of the University of Campania L. Vanvitelli during the last three years:

ENVIRONMENT INTERACTION AND MULTISENSORY VIRTUAL REALITY
Principal Investigator Prof.ssa IACHINI Santa

Participation in research projects during the last three years:

Title of project: Brain Virtual Interactivity Platform – BraVI

Principal Investigator: prof. Luigi Trojano

Title of the call for projects: PNR 2015-2020

Description of the research project's activities:

The innate ability of mankind to adapt to different environments and to environmental changes has become a crucial point for the advancements in Smart Design of Ambient Living which foresee a technological implementation of living environments to pursue well-being and safety of users. Recently, Neuroscience provides insights in the way we perceive the world around us and conversely, how it may affect our behavior and mood thus, Smart Architectural Design can be optimized by information derived from Neuroscience principles. The BraVI project stands at this crossroad between Smart Design of Ambient Living technology and Neuroscience. We will pursue the challenging concept of modifying living environments to match user requirements which are defined as mental, behavioral and emotional states. A multi-function integrated platform -the BraVI system- will be realized in which user states are detected and translated in changes of immersive virtual reality living environments, in a closed loop paradigm. The BraVI project targets area 12,

Technology for Ambient Living of the FP (PNR 2015-2020) and will specifically address working and domestic living ambient with the release of two prototypes (BraVI-Lite 1 and 2). The choice of Factory and Home where BraVI technology will operate, is in line with the European and National research and Innovation agenda. BraVI will prioritize safety and security in Factory, inclusion and active aging in Home scenarios. Nevertheless, the BraVI approach will lay the foundations for a new idea of Ambient Living design where the user is awarded with a central role in the identification of solutions for the real user centered re-design of ambient living, even beyond the specific target environments.

People: MAFFEI Luigi, MASULLO Massimiliano, ROSATO Antonio, SCORPIO Michelangelo

Partners: ASSING, ETT, Fondazione Santa Lucia, Istituto Italiano di Tecnologia, ECONA, Fondazione Neurone.

State of the project: Funded. closed. Duration: 30 months.

Submission/Start/End date of the project: -- / 01/02/2021 / 30/6/2023

Title of project: DEsign Solutions for Industry 4 REady processes - DESIRE

Responsabile Scientifico: prof. Francesco CAPUTO

Title of the call for projects: PNR 2015-2020

Description of the research project's activities:

The project DESIRE, proposed in the area of the Smart Factory specialization area and mainly aimed at the automotive industry, has the main focus of study the operational stations of the production lines and the application to a real context if a DIGITAL WORK STATION(DWS), in compliance with the guidelines of the industry's 4.0 manufacturing paradigm and aimed at increasing the efficiency of the production phases and the quality of the product and the working environment. To achieve this objective, DWS control and management tools, characterized by elements of evident originality and innovation, will be developed; these innovative and original tools enable the development, the control and the optimization of each workstations by showing the human resources employed, the relative saturation levels, the operations performed, the tools used and the materials and/or components there worked. On the basis of the DWS, they will be implemented methodologies for the dynamic logistics simulation, for the virtual real-time validation of the station line sides, for the training of group leaders in immersive virtual environments. All these objectives will be realized in order to receive and enhance the responses from the 'digital' analysis of new processes introduced within workstations; they will be introduced in the workflows tools and methods of Additive Manufacturing, to provide special tooling tools for the workers engaged in complex operations. The DWS will then be embedded in an Smart Factory digital ecosystem to build the DIGITAL SMART TWIN (DST) of the stations, developing new 3D design methodologies for buildings, integrating design lines and plant engineering techniques, valued by development of rapid design tools based on the use of new process design archetypes integrated with knowledge-based manufacturing rules. In this ecosystem, the DWS will become, through the DST, the testing environment for the Digital Workshops of our plants, maximizing the effectiveness and usefulness of the achieved results The DWS will then be supported by innovative simulation tools and methods focused on the resolution of quality-related issues for the product and the process and ultimately resolving the criticalities in the assembly operations management.

People: MAFFEI Luigi (Resp. Unità), MASULLO Massimiliano, CIAMPI Giovanni, PISACANE Nicola, ARGENZIANO Pasquale, AVELLA Alessandra

Partners: FCA ITALY S.p.A., FCA ITEM S.p.A., STEP SUD MARE S.r.l.

State of the project: Funded. closed. Duration: 30 months.

Submission/Start/End date of the project: -- / 30/09/2020 / 28/2/2023

Title of project: Development of noise perceptions model for a compact city environment with considerations of spatial openness and greenery

Principal Investigator: prof. CHAU Chi Kwan

Title of the call for projects: GRF Research Grant Council Hong Kong 2019

Description of the research project's activities:

Excessively high noise levels have become a nuisance for many city dwellers. This situation will worsen as two-thirds of humanity are expected to live in cities by 2050. Exposure to high noise levels not only causes annoyance, and impairs productivity, but also has adverse health effects. The traditional noise control approach of targeting noise level reduction, such as noise barrier installation, may not be effective or practical in urban areas of high density where space is limited. An alternative innovative approach is called for improving human noise perceptions, which take into account of audio and visual interactions. Some earlier attempts focused on understanding the complex effects of parallel visual sensory inputs on noise perceptions. Up to now, most were concerned with exploring the positive effect of greenery or other natural features on mitigating noise annoyances. Unfortunately, many city dwellers may not have views of greenery. Their views are quite often restricted by closely packed environment located close-by. Restricted views can lead to stress and feelings of oppressiveness among high-rise dwellers and even magnify noise perception considerably. Despite the drawbacks of exposure to views dominated by building facades, there is a clear lack of understanding of the effects of spatial openness on sound perception and noise-induced annoyance especially in the context of a compact city. This proposed project will explore how restricted views including views of opposing building façades separated from the viewer by only a small distance and those views obstructed by closely spaced high-rises can affect noise perceptions. It is also intended to reveal whether the effect of spatial openness of views outweighs the effects of greenery situated close to dwellings. Accordingly, the principal objective of the proposed study is to formulate models for predicting the annoyance response, caused by road traffic noise, felt by home dwellers who are exposed to restricted views in high dense, high-rise urban environment. Specifically, it is intended to relate noise annoyance directly to visual environmental factors such as spatial openness of views, greenery, built configurations, in addition to loudness, intermittencies and composition of road traffic noise. Multivariate models will be constructed to reveal the relative contributions among the visual environmental factors and road traffic noise factors (in terms of loudness, intermittency ratio and composition of noise types).

People: MASULLO Massimiliano (Local PI), MAFFEI Luigi, PASCALE Aniello

Partners: The Hong Kong Polytechnic University (PolyU)

State of the project: Funded. closed. Duration: 3 years.

Submission/Start/End date of the project: -- / 30/09/2019 / 29/9/2022

Title of project: Multisensory Investigation for ELderly-centred design of common living urban Environments

Principal Investigator: prof. MASULLO Massimiliano

Title of the call for projects: 2019 VALERE - Progetti Competitivi Intra-Ateneo

Description of the research project's activities:

The purpose of this research project is to identify and design combinations of restorative multisensory properties of the physic environment able to reduce stress, improve comfort, increase well-being, cognitive efficiency and health, in elderly. Modern urban and indoor living spaces are characterized by high demanding and stressful social physical environments that require a high reactivity and can negatively affect mental health (e.g. mood, anxiety disorders), especially of aged

people. Evidence from interdisciplinary research domains (architecture, engineering, cognitive neuroscience) has shown that the good quality of physical and social contexts can represent an important predictor of well-being, cognitive efficiency and longevity in ageing. Through a human-centred approach to urban and indoor design, we investigate the reactions of elderly people to basic multisensory stimuli (sound, lighting, color/textures, microclimate) and to complex virtual prototypes. The aim is the design of multisensory prototypal spaces (a residential center and an urban park) with the best restorative properties. User-centred design guidelines for decision-makers and designers will be outlined.

People: MASULLO Massimiliano (PI), MAFFEI Luigi, IACHINI Santa, RUGGIERO Gennaro, RUOTOLO Francesco, PASCALE Aniello, TOMA Roxana Adina, LI Jian, RAPUANO Mariachiara, GALDERISI Adriana, VIOLANO Antonella, CIOFFI Federico, PALMIERI Alice.

Partners: Department of PSYCHOLOGY (Univ. degli Studi della Campania “Luigi Vanvitelli”).

State of the project: Funded. closed. Duration: 2 years (extended duration of 12 months).

Submission/Start/End date of the project: -- / 02/12/2019 / 01/12/2022

Title of project: Theoretical modelling and experimental characterization of sustainable porous materials and acoustic metamaterials for noise control

Principal Investigator: prof. GARAI Massimo

Title of the call for projects: PRIN 2017

Description of the research project's activities:

The purpose of the research - which is highly interdisciplinary - is the design and characterization of new sustainable porous materials and acoustic metamaterials, to be employed separately or together, to be used as sound-absorbing and/or sound-insulating panels able to absorb/reduce sound in the frequency range 50-5000 Hz. In order to obtain these purposes in a sustainable way, i.e., with low environmental impact and low embodied energy, metamaterials are particularly promising because their acoustic properties and operation frequency band do not depend specifically on the nature of the composing material, but on the geometric shape, size and space between the inclusions. They also have the advantage that can be (partially) transparent, unlike conventional materials for acoustic insulation that are opaque, can have reduced thickness, high flexibility and can even allow the free flow of air through them. The operating range of a metamaterial can be extended with superposition of thin layers, each one working in a different frequency band. The materials will be modelled both theoretically and numerically through dedicated simulation codes, in order to evaluate their physical properties; prototypes will be then realized and tested in the labs of the research units participating to the Program. The actual sustainability of these materials will be verified through the Life Cycle Analysis approach, which allows assessing all the possible environmental impacts during the whole product life cycle.

People: IANNACE Gino (Local PI)

Partners: Università degli studi di Bologna; Università degli studi di Ferrara; Università degli Studi Roma Tre; Istituto Nazionale di Ricerca Metrologica

State of the project: Funded. closed. Duration: 3 years.

Submission/Start/End date of the project: -- / 15/09/2019 / 15/09/2022

Title of project: New movable systems for smart/co-working taking advantage of life quality, sustainability and energy efficiency- RESTANZA

Principal Investigator: dott. Antonio Ciervo

Title of the call for projects: Bando per il finanziamento di progetti di ricerca fondamentale ed applicata dedicato ai giovani Ricercatori – Università degli Studi della Campania “Luigi Vanvitelli”

Description of the research project’s activities:

The research project aims to design a Prefabricated Movable Building (PMB) for smart/co-working a renewable energy-based, self-sustaining in energy use, eco-friendly, modular, and flexible in set-up, and its performance will be analyzed while operating in a selected suitable small village of the Campania region (Italy). The PMB will be developed to optimize occupants’ well-being, energy performance, and integration of the indoor environment with outdoor architectural/historical/landscape elements via innovative design methods (immersive virtual reality and dynamic simulation models). The project aims at 1) promoting the exploitation of renewable energy and energy-efficient systems via innovative design methods, 2) reducing the environmental/ecological footprint associated with both building and transport sectors, 3) suggesting an alternative lifestyle combining tradition and modernity, 4) facilitating social/economic rebirth of small villages with significant regenerative potential. The project provides relevant environmental/social/territorial/economic impacts, together with significant results for engineers, architects, manufacturers of PMBs, the scientific community, and policymakers.

People: CIERVO Antonio (P.I.), ROSATO Antonio (Co-P.I.), CASTANÒ Francesca, MASULLO Massimiliano, MORELLI Maria Dolores, MARZOCCHI Raffaella, BOUCHERIT Samiha.

State of the project: Funded. Ongoing. Duration: 8 months.

Submission/Start/End date of the project: -- / 01/09/2023 / 30/04/2024

Title of project: Sustainable CondiTiOn Monitoring of wind turBines using sound sIgnals and machiNe lEarning techniques

Principal Investigator: dott. Luca FREDIANELLI, (Coordinatore scientifico) c/o Consiglio Nazionale delle Ricerche

Description of the research project’s activities:

Wind farms are located in poorly accessible areas, therefore any breakages of wind turbine components are not reported in good time. The project intends to develop a procedure for identifying wind turbine faults, carrying out on-site acoustic measurements, providing information in time for maintenance interventions.

People: IANNACE Gino (Resp. Local Unit).

Partners: Consiglio Nazionale delle Ricerche. Università degli Studi di FERRARA. Università degli Studi della Campania "Luigi Vanvitelli". Università degli Studi di PALERMO.

State of the project: Funded. Ongoing. Duration: 2 years.

Submission/Start/End date of the project: -- /15 september 2023 / 15 september 2025

Title of project: Bio-Acouis - Bio-Based solutions for improved acoustic applications (Research and Innovation Staff Exchange RISE - Call: HE-MSCA-SE-2021s)

Principal Investigator: Arif Akillilar- Tosunogullari Mob. San. Tic. A.S. - Turkey

Description of the research project’s activities:

Study of environmentally friendly materials and nanomaterials (PvP / gel) to be used in the applied acoustics sector.

People: IANNACE Gino (Resp. Local Unit).

Partners: Tosunogullari Mob. San. Tic. A.S.; Next Technology Tecno Tessile Società nazionale di ricerca; Necmettin Erbakan Üniversitesi TR; Università degli Studi della Campania Luigi

Vanvitelli; Kompetenzzentrum Holz GmbH; Kastamonu Entegre agac sanayi ve ticaret anonim sirket; SCS-controlsys srl; Vlaamse instelling voor technologisch onderzoek n.v.

State of the project: Funded. Ongoing. Duration: 3 years.

Submission/Start/End date of the project: -- / 15 January 2023 / 15 January 2026.

Scientific products during the last three years:

10 scientific publications in Class A journals and/or indexed in the Scopus/WoS databases:

- [1] MAFFEI, L., CIERVO, A., MARZOCCHI, A., MASULLO, M. (2023). Exploring the restorative benefits of work in smart working structures on vacations in small villages. *Frontiers of Psychology*, 14.
- [2] YANG, M., MASULLO, M. (2023). Combining Binaural Psychoacoustic Characteristics for Emotional Evaluations of Acoustic Environments. *Applied Acoustics*, 210, 109433.
- [3] ISTIANI, N.F.F., MASULLO, M., RUGGIERO, G., MAFFEI, L. (2023). The influence of multisensory indoor environment on the perception of orange juice. *Food Quality and Preference*, 112, 105026.
- [4] LI, J., MAFFEI, L., PASCALE, A., MASULLO, M. (2022). Effects of spatialized water-sound sequences for traffic noise masking on brain activities *Neural Effects of the Spatialisation of Water-Sounds Sequences on Masking Traffic Noise: a Psychophysical Study*. *J. Acoust. Soc. Am.* 152(1), 172-183.
- [5] CHUNG, W.K., LIN, M., CHAU, C.K., MASULLO, M., PASCALE, A., LEUNG, T.M., XU, M. (2022). On the study of the psychological effects of blocked views on dwellers in high dense urban environments, *Landscape and Urban Planning*, 221, 2022, 104379.
- [6] MASULLO, M., CIOFFI, F., LI, J., MAFFEI, L., CIAMPI, G., SIBILIO, S., SCORPIO, M. (2023). Urban Park lighting quality perception: an immersive virtual reality experiment. *Sustainability*, 15(3), 2069.
- [7] MASULLO, M., TOMA, R.A., MAFFEI, L. (2022). Effects of Industrial Noise on Physiological Responses. *Acoustics*, 4(3), 733-745.
- [8] MASULLO, M., IACHINI, T., MAFFEI, L., RAPUANO M., CIOFFI, F., RUOTOLO, F., (2021). A questionnaire investigating the emotional salience of sounds. *Applied Acoustics*, 182, November 2021, 108281
- [9] ROSATO, A., GUARINO, F., SIBILIO, S., ENTCHEV, E., MASULLO, M., MAFFEI, L. (2021). Healthy and faulty experimental performance of a typical HVAC system under Italian climatic conditions: artificial neural networks-based model and faults' impact assessment. *Energies*, 14, 5362.
- [10] MASULLO, M., YAMAUCHI, K., DAN, M., CIOFFI, F., MAFFEI, L. (2021). Intercultural Differences in the Perception of HVAC Sound Quality in Car Cabins: From Conventional to Electric Vehicles. *Applied Sciences*, 11(23), 11431.

Additional 10 scientific products:

- [11] RAPUANO, M., SARNO, M., RUOTOLO, F., RUGGIERO, G., MASULLO, M., MAFFEI, L., CIOFFI, F., IACHINI, T., (2023). Emotional Reactions to different indoor solutions: The Role of Age. *Buildings* 2023, 13, 1737.
- [12] FATELA, J.; MAFFEI, L., MASULLO, M. VORLANDER, M (2023). Real-world study cases for auralization validation: selection, measurements, and methods. *Forum Acusticum 2023, Torino, Italia, 11-15 September 2023.*

- [13] MAFFEI, L., MASULLO, M. (2023). Sens i-Lab: a key facility to expand the traditional approaches in experimental acoustics. NOISECON 2023. 15-18 May, Gran Rapids, MI, (USA).
- [14] SALAMONE, F., MASULLO, M., DANZA, L., SIBILIO, S. (2023). Effect of spatial proximity and human thermal plume on the design of a DIY human centred thermoigrometric monitoring system. Applied Science, 13(8), 4967.
- [15] RAPUANO, M., RUOTOLO, F., RUGGIERO, G., MASULLO, M., MAFFEI, L., GALDERISI, A., PALMIERI, A., IACHINI, T., (2022). Spaces for relaxing, spaces for recharging: How parks affect people's emotions, Journal of Environmental Psychology
- [16] MITREVSKA, M.J., MICKOVSKI, V., SAMARDZIOSKA, T., IANNACE, G. (2022). Experimental and Numerical Investigation of Sound Absorption Characteristics of Rebonded Polyurethane Foam, Applied Sciences, 12(24), 12936.
- [17] FIRAT, H.B., MAFFEI, L., MASULLO, M. (2021). 3D Sound Spatialization with Game Engines: The Virtual Acoustics Performance of Unreal Engine and Wwise. Virtual Reality
- [18] MASULLO, M., MAFFEI, L., PASCALE, A., SENESE, V.P., DE STEFANO, S., CHAU, C.K. (2021). Effects of Evocative Audio-Visual Installations on the Restorativeness in Urban Parks. Sustainability 2021, 13, 8328.
- [19] MASULLO, M., OZCEVIK BILEN, A., TOMA, R.A., AKIN GULER, G., MAFFEI, L., (2021). The Restorativeness of outdoor historical sites in urban areas: physical and perceptual correlations. Sustainability 2021, 13(10), 5603;
- [20] PUYANA-ROMERO V, MAFFEI L, BRAMBILLA G, NUÑEZ-SOLANO, D. (2021). Sound water masking to match a waterfront soundscape with the users' expectations: the case study of the Seafront in Naples Italy. Sustainability. 13, 371

Relationships with international and national Companies, Institutions, Research Centers, Universities during the last three years:

The EIA-SENSE research line:

- Collaboration with the Hong Kong Polytechnic University, Department of Building Services Engineering, Hong Kong (China), prof. C.K. CHAU for the activities of the project "Development of noise perception for compact city environment with considerations of spatial openness and greenery".

The PRODUCT SOUND QUALITY research line:

- Collaboration with Kyushu University, Department of Communication Design Science, Fukuoka (Japan), prof. K. YAMAUCHI, on the activities of the collaborative research project HVAC "Sound Quality inside cars cabins" and "Informational masking of HVAC noise in Electric Vehicles".

The URBAN SOUND PLANNING research line:

- Collaboration with the Anadolu University, Department of Architecture, Eskisehir (Turkey), prof. A. Ozcevik, on the activities of the collaborative research project "Quiet Places in Historical Centers";

The SAFETY, COMFORT AND PRODUCTIVITY research line:

- Collaboration with the Fundacion Universitaria San ANTONIO under the PON RI 2014-2020, Action 1.1 - Innovative PhD with industrial characterization. Supervisor Prof. Juan-Miguel NAVARRO RUIZ, Advanced Telecommunication Research Group (GRITA).

The SUSTAINABLE ACOUSTIC METAMATERIALS research line:

- Collaboration with the Università degli studi di Bologna; Università degli studi di Ferrara; Università degli Studi Roma Tre; Istituto Nazionale di Ricerca Metrologica under the PRIN 2017. Prof. Massimo GARAI, for the activities of the project “Theoretical modelling and experimental characterization of sustainable porous materials and acoustic metamaterials for noise control”

Collaborations with Consortia, Scarl or other Institutions participated by the University of Campania Luigi Vanvitelli during the last three years:

ENVIRONMENT INTERACTION AND MULTISENSORY VIRTUAL REALITY
 Principal Investigator Prof.ssa IACHINI Santa

ISI Web of Science Subject Categories:

- Acoustics;
- Architecture;
- Computer Science, Interdisciplinary Applications;
- Engineering, Multidisciplinary;
- Public, Environmental & Occupational Health;
- Ergonomics
- Computer Science, Artificial Intelligence;
- Multidisciplinary Sciences;
- Transportation;
- Urban Studies.

Scientific-Disciplinary Sectors:

- ING-IND/11
- ING-IND/10

Keywords:

- Noise;
- Acoustics;
- Environmental Impact Assessment;
- Psychoacoustics;
- Soundscape;
- Urban Sound Planning;
- Quiet Areas;
- Virtual Reality;
- Ergonomics;
- Sound Quality;
- Fault Diagnosis.

ERC Categories:

- PE6_12 Scientific computing, simulation and modelling tools
- PE6_9 Human computer interaction and interface, visualization
- PE8_14 Automotive and rail engineering; multi-/inter-modal transport engineering
- PE6_11 Machine learning, statistical data processing and applications using signal processing (e.g. speech, image, video)
- SH7_8 Land use and planning
- SH7_5 Sustainability sciences, environment and resources
- SH4_5 Attention, perception, action, consciousness
- SH7_9 Energy, transportation and mobility