

## Research Group

### Knowledge, valorisation, and digital communication of cultural heritage

**Reference year:**

2024

**Scientific Coordinator:**

ZERLENGA ORNELLA / Full Professor / DADI/ Università degli Studi della Campania Luigi Vanvitelli

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- DI NARDO, Iliaria / PhD student / DADI / Univ. of Campania “Luigi Vanvitelli”
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- FIORENTINO, Caterina Cristina / Associate Professor / DADI / Univ. of Campania “Luigi Vanvitelli”

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- SABATINO Michele / PhD student / DADI / Univ. of Campania “Luigi Vanvitelli”
- STRANO Giorgia / PhD student / DADI / Univ. of Campania “Luigi Vanvitelli”
- TABAKU Blerina / Professor / Polytechnic University of Tirana (Albania)
- TRONCONI Veronica / PhD student / Univ. of Urbino Carlo Bo
- ZERLENGA Ornella / Full professor / DADI / Univ. of Campania “Luigi Vanvitelli”

#### **Description of research lines:**

The research group, by a transdisciplinary nature, carries out a critical reflection on architecture, on the city, on the environment (material and intangible) and on industrial design, investigating disciplinary sources and cultural trends with attention to the themes of knowledge, shape, structure, innovation, representation, enhancement, and communication. In this sense, in relation to cultural heritage, the main research themes activated by the members of the group concern:

knowledge;

safety;

enhancement;

communication.

Knowledge: in this line of research, studies will be activated which find in the architectural and environmental survey at different scalar dimensions and for different operational and management purposes, a multiple tool of investigation through direct and indirect methodologies the photogrammetric one, from the drone survey to the use of the laser scanner, to the computer modeling aimed at interoperability (H-BIM). The investigations conducted through the graphic

analysis of the real (existing and / or planned), the geometric-configurative analysis of the architectural space, the analysis of iconographic documentary sources also belong to this line of research.

Enhancement: in this line of research, systemic studies will be activated aimed at enhancing the architectural and environmental heritage through processes identified in the context of cultural planning. In a synergistic way, the themes of enhancement and use will find correspondence in actions that experiment with new forms of access to knowledge as well as interaction, capable of qualifying environments in 'ecosystems of knowledge'. The enhancement actions may include event projects, sensory staging strategies (through the use of multimedia devices, augmented reality and setting up immersive environments), strategies for representing architecture and the environment (through the use of traditional tools visualization graphics and modeling implemented with the potential offered by virtual environments), processing in the form of visual data of information contents of databases and big data platforms.

Communication: in compliance with the new notion of 'accessibility to culture' typical of the knowledge society and in the opinion that the planning dimension of knowledge and communication also includes the experimentation of new forms of access to knowledge through personal experience, interaction and the emotional involvement of the users themselves, in this line of research, studies of a design nature will be activated aimed at defining communication strategies and hypotheses of narration of heritage, capable of identifying and strengthening its 'perceived value'. Both through the more traditional languages of visual communication and the most innovative multimedia forms of digital dissemination, the projects may include communication artifacts, exhibition itineraries, performances, video installations, pop up stores, editorial products, short films, aimed at the construction of a cross narrative media and dedicated to widespread users such as cultural tourism and/or ethical and public utility communication.

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

Acoustics, Vibration and multisensory Interactions -ACOUVI  
Advanced materials laboratory  
Energy Efficiency & Environment - E3  
Gems and Jewels: History and Design  
Organic design, on the synthesis of the form, a group as manifesto  
SENS i-Lab Laboratory  
Structural and sEismiC safety of strategic and relevant existing constrUctions buildings and bRidgEs  
Sustainable Industrial Design - SIDE  
The Memory of Sites. History and Preservation for promoting the environmental and architectural heritage (MemoS)

#### **Participation in research projects during the last three years:**

**Title of the project:** GESTione del rischio SISmico per la valorizzazione turistica dei centri storici dei Mezzogiorno – GENESIS (codice progetto ARS01\_00883)

**Scientific coordinator:** Prof. Enrico Spacone, Università degli Studi di Chieti-Pescara

**Program title:** Avviso del 13/07/2017 “Presentazione di progetti di ricerca industriale e sviluppo sperimentale nelle 12 aree di Specializzazione individuate dal PNR 2015-2020”

**Abstract:** The main objectives of the research concern the development of a computer platform for the collection of information on the historical-cultural heritage, aimed at the simulation of damage scenarios for the management of emergency situations (territorial scale); at the planning of interventions for the reduction of seismic risk (urban scale); at the development of structural behavior models for the evaluation of static safety and seismic vulnerability as well as the interventions that may be necessary according to the previous analysis (building scale).

**Involved persons:** Gianfranco De Matteis

**Partner institutions:** Proposed by Università degli Studi G. D’Annunzio di Chieti.

**Academic Partners:** Università degli Studi della Campania Luigi Vanvitelli, Università degli Studi dell’Aquila, Università degli Studi della Basilicata, Università degli Studi Mediterranea di Reggio Calabria, Università degli Studi di Enna Kore, Università Iuav di Venezia, Università degli Studi di Bergamo, Università di Pisa

**Industrial Partners:** Tab Consulting S.r.l. TAB Consulting, Asdea S.r.l. ASDEA, Zugaro Guido & C. S.r.l., Target Euro S.r.l., Kibernetes S.r.l., FIP Industriale S.P.A., PRO.GE.77 S.r.l., SISIA S.r.l. SISIA, BOVIAR S.r.l., Consorzio C.i.p.a.e. A R.l., BASF S.r.l., TELENIA S.r.l., Etna Hitech S.c.P.A., Fibre Net S.r.l.

**Statust:** Funded

**Submission date/Start/End of the project:** 09-11-2017/01-01-2023/30-06-2025.

**Project title:** Inaccessible religious architecture. A workflow of knowledge, ‘expanded’ usability and ‘inclusive’ accessibility (EX-IN\_AccessiBILITY)

**Scientific coordinator:** Vincenzo Cirillo

**Responsible for Research Units:** Antonella di Luggo (Unina), Alessandra Lardo (UniParthenope)

**Call title:** PRIN 2022

**Abstract:** The project proposes to investigate the religious architectural heritage of the city of Naples (Italy) to transform the condition of inaccessibility of some assets into a renewed accessibility, with the preparation of ‘expanded’ fruition systems (physical and virtual) capable of enhancing the user experience with multi-sensory input design. Through the definition of a theoretical framework of taxonomy of the inaccessibility of the investigated context, the project will identify scenarios that re-insert religious architectures in the circle of possible experiences in situ, determining a virtuous effect on the local economy and on the regeneration of the contexts of membership. In particular, the expected result is the encoding of a operational workflow for ‘inclusive’ accessibility and ‘expanded’ usability of religious architecture even during the implementation of safety measures (provisional works). Among the impacts of the research, there is the possibility of adopting the operational workflow for other classes of cultural heritage for the acquisition of future funding for enhancement interventions.

**Involved persons:** Vincenzo Cirillo, Ornella Zerlenga, Alessandra Cirafici, Piscitelli Manuela, Miele Riccardo, Antonella di Luggo, Alessandra Lardo.

**Status:** Funded

**Project start/end date:** September 2023 - September 2025

**Project title:** Shape and sTructure in mAsonry staiRcasES in Naples. Criteria for the definition of knowledge models for safeguard and local tradition enhancement (STARES)

**Scientific coordinator:** Vincenzo Cirillo

**Call title:** Bando di Ateneo per il finanziamento di progetti di ricerca fondamentale ed applicata dedicato ai giovani Ricercatori D.R. 509/2022

**Abstract:** STARES will investigate masonry staircases using inter-disciplinary state-of-art criteria, techniques, and tools for the preparation of knowledge models useful for critical analysis, recovery, and enhancement of the asset. The most recent European provisions on cultural heritage enhancement are giving main importance to (i) the safeguarding of the places identity values, (ii) the recovery of local traditions and, (iii) the virtualization of contexts and inclusive use. Within this context, STARES will focus on the masonry staircases of the Neapolitan 18th century located in residential palaces and based on renowned models designed by the architect Fernando Sanfelice: a built heritage of immense architectural and cultural value, which also contains a construction tradition to be known and recovered to safeguard it.

**Involved persons:** Vincenzo Cirillo, Corrado Chisari, Ornella Zerlenga

**Status:** Funded

**Project start/end date:** Septmebr 2023 - April 2024

**Title of the project:** Artificial Intelligence to assess the structural/seismic Damage to historic heritage in BIM environment (AIDaBIM)

**Scientific coordinator:** Claudia Casapulla

**Responsible of Research Unit:** Ornella Zerlenga (UniCampania), Claudia Casapulla (Unina)

**Program Title:** PRIN 2022 PNRR

**Abstract:** The project's purpose is to create a new digital tool for the semi-automatic assessment of damage in order to aid in the preservation and management of the built heritage, particularly masonry churches that have structural issues. This will be implemented through the use of advanced digital technologies, such as building information modelling (BIM) and artificial intelligence (AI). Additionally, a novel approach is put forth to digitise the process of the observed structural damage to churches and to establish quick, accurate assessments of the associated damage states. The generated data will be gathered in a database that can potentially be implemented in DaDO, an Italian Civil Protection platform of observed building damage.

**Involved persons:** Ornella Zerlenga, Antonella di Luggo, Pasquale Argenziano.

**Status:** Funded

**Project start/end date:** November 2023 – November 2025

**Title of the project:** Evaluation of structural vulnerability and innovative intervention methods for the protection of masonry historical constructions of Italian infrastructural heritage (CUP: B61B21005470007)

**Scientific coordinator:** Prof. Gianfranco De Matteis

**Program title:** Programma Operativo Nazionale Ricerca e Innovazione 2014-2020

**Abstract:** The research activities deal with the development of methodologies for the structural vulnerability assessment of historical masonry constructions. In particular, the methodologies refer to infrastructural constructions (bridges) and address the problem following both a large-scale and a single-construction approach. The activities entail: i. the development of methodologies for the structural vulnerability assessment at a large scale; ii. vulnerability assessment methodologies by means of Finite Element Models; iii. the proposal of innovative, low-invasive and reversible retrofitting techniques.

**Involved persons:** Mattia Zizi, Gianfranco De Matteis

**Partner institutions:** Fabre Consortium

**State of the project:** Positively evaluated/funded/ongoing

**Starting/closing date:** 01-01-2022/31-12-2024



**Project title:** Fashion Alive.

**Scientific coordinator:** Roberto Liberti

**Research Unit of Vanvitelli:** Ornella Cirillo, Chiara Scarpitti, Vincenzo Cirillo

**Call title:** European Commission CREA-CULT 2021 Coop1

**Abstract:** The FASHION ALIVE project promotes sustainable practices in the fashion industry, through the creation of events to involve a wider audience and raise awareness on this issue. The FASHION ALIVE Project approach is supported by three different partners: on the one hand, CREAMODITE (Spain), UMINHO (Portugal) and UNICAMPANIA (Italy) will conceptualize and experiment the creation of sustainable fashion methods, where each partner will work on a specific innovative methodology. In parallel, XSENTRIK (Austria) explores and envisions a digital and audiovisual strategy using technological tools (combination of video, 3D projection, video mapping software, sound, light and music created by artificial intelligence).

**Involved persons:** Alessandra Avella, Pasquale Argenziano, Vincenzo Cirillo, Lorenzo Capobianco, Alessandra Cirafici, Caterina Cristino Fiorentino, Gabriele Pontillo, Giulia Ceriani Sebregondi, Danila Jacazzi, Antonella Violano

**Partners:** Creamodite Asociacion para la constitucion y reestructuracion de espresas de moda. diseno y tecnologia (Madrid); Universidade do Minho (Lisboa); Università degli Studi della Campania Luigi Vanvitelli (Italy); Xsentrikarts platform for arts (Austria)

**Status:** finanziato

**Project submission/start/end date:** 2022/2024

**Title of the project:** Structural Assessment and development of innovative saFEguard Measures for hisTORical masONry towers\_SAFEMOTION

**Principal Investigator:** Prof. Gianfranco De Matteis

**Call title:** PRIN 2022-PNRR

**Description of the research activities of the project:** SAFE\_MOTION aims at developing innovative techniques and methods for investigation, assessment and retrofitting of historical masonry towers, in order to enhance their conservation, use, fruition and to extend their residual life. To reach the objective, complementary expertise of the research units will be provided, namely in the fields of dynamic monitoring, identification and damage assessment, numerical modelling, structure testing and retrofitting design.

**Involved Staff:** Giorgio Frunzio, Mariateresa Guadagnuolo, Corrado Chisari, Mattia Zizi, Luciana Di Gennaro

**Partner institutions:** University of Padova, University of Udine

**State of the project:** ongoing

**Submission date:** 30-11-2022/12-2023/11-2025

**Title of the project:** Inclusive Cultural Heritage in fragile areas for wider accessibility and knowledge dissemination

**Scientific coordinator:** Saverio D'Auria

**Responsible of Research Unit:** Luigi Corniello (UniCampania); Saverio D'Auria (Federico II).

**Program Title:** PRIN 2022 PNRR

**Abstract:** The research project "Inclusive Cultural Heritage in fragile areas for wider accessibility and knowledge dissemination" examines the theme of accessibility to cultural heritage, paying particular attention to the elements located in fragile areas from a social and territorial point of view. The project therefore aims to achieve a high level of "multiscalar information digitization" of cultural heritage through the development of a methodological process aimed at the transversality of knowledge that allows researchers and scholars, of different disciplines, to communicate and

interact on an information platform through the sharing (and interrogation) of the digital model of the object of study obtained through a highly reliable 3D survey from a morphometric and colorimetric point of view.

**Involved persons:** Luigi Corniello, Gennaro Pio Lento, Felicia Di Girolamo

**Status:** not funded

**Project submission/start/end date:** 2022

**Project title:** LOST\_Gothic Line. Gotico vs Barocco: alla ricerca dell'identità nascosta del Sud Italia.

**Scientific coordinator:** Mara Capone

Vanvitelli Research Unit Coordinator: Alessandra Avella

**Call title:** PRIN 2022 PNRR

**Abstract:** Starting from the Cultural Identity of Southern Italy, based on the common belonging to the Kingdom of Naples\Sicily, the "LOST\_Gothic Line" project aims to become a network capable of promoting experiences with Cultural Heritage, reinforcing the sense of belonging and improving human WELL-BEING. The objective will be achieved through: the use of 3D models, digital twins and visual images to disseminate cultural content, starting from architecture and art history research; the activation of processes for the involvement of all users, citizens, including the blind, tourists and scholars; the use of both digital media and physical models to go back to the past and rediscover the LOST identity. The "Gothic Line" is in many cases LOST because most of the buildings and urban contexts appear very different from their original appearance following transformations or destructions. Starting from the most important examples of Gothic Architecture in Naples up to the minor centers of Southern Italy, the Gothic Line will be drawn on the map, joining the strategic points, which are real places or places of memory. The research develops "GothA\_Gothic Algorithmic", an innovative parametric tool for the design of some prototypes connected to the Gothic Line brand in order to Promote the development of Creative Cultural Industries based on an innovative customized design process that could be developed in specific spin-offs university students.

**Involved persons:** Mara Capone, Alessandra Avella, Francesca Capano, Paola Vitolo, Andrea Pane, Fulvio Rino, Anna Alfieri, Francesco Bifulco, Saverio Carillo; PhD students: Riccardo Miele, Maria D'Uonno.

**Partner institutions:** Università della Campania "Luigi Vanvitelli", Università degli Studi di Napoli Federico II.

**Status:** not funded

**Project submission/start/end date:** November 2022

**Project title:** designIng real aNd virTual built EnviRonments For humAn Centered rEsearch (INTERFACE)

**Scientific coordinator:** Giovanni Ciampi

**Call title:** PRIN 2022 PNRR

**Abstract:** The goal of the project is to combine virtual reality and Human-Centered Living Labs, multi-sensory and multi-domain immersive virtual environments, monitoring the participants and the test environment. Currently there are no guidelines or standards for the design of these complex and environmental tests, highlighting the need to define the main objective and subjective factors to be considered and monitored. In this regard, the project aims to determine these criteria by comparing and analyzing objective and subjective data from real and virtual test environments. This data will be used to develop, calibrate and validate an immersive virtual model of the test environment. Then, participant feedback will be collected by questionnaire administration during a

case study in an immersive virtual environment. At the same time, their physiological responses will be monitored and measured through a series of wearable sensors. Comparison of data from real and virtual environments will allow to define key indicators.

**Involved persons:** Vincenzo Cirillo, Martina Gargiulo, Davide Carleo, Fabiana Guerriero, Salamone Francesco.

**Partners:** Consiglio Nazionale delle Ricerche italiano - Istituto per le Tecnologie della Costruzione (CNR-ITC).

**Status:** Not funded

**Project submission/start/end date:** November 2022

**Project title:** Geopolymers for Advanced Eco-Architecture: A Chemo-rheology and Thermo-kinetic investigation for the development of 3D Printable formulations - GEA

**Scientific coordinator:** dott.ssa Laura Ricciotti;

**Call title:** PRIN 2022 PNRR

**Abstract:** The GEA project deals with optimizing geopolymer (GP) formulations, through the alkaline activation of different kinds of aluminosilicate wastes, for their use as materials, in the 3D-printing of advanced housing units in sustainable buildings. The GEA project aims to develop an innovative strategy to overcome the main limits of a large-scale application of 3D printing of GP materials through a systemic and highly interdisciplinary approach. This innovative method allows the recycling and re-utilization of different kinds of waste, which would represent a significant contribution to sustainable development towards the adoption of the “zero waste” principle.

**Involved persons:** Ricciotti Laura, Aversa Raffaella, Iannace Gino, Franchino Rossella, Frettoloso Caterina, Pisacane Nicola; PhD student Salima Zerari

**Partner institutions:** Università degli Studi della Campania "Luigi Vanvitelli", Università degli Studi "G. d'Annunzio" CHIETI-PESCARA

**Status:** Funded

**Project submission/start/end date:** November 2022

**Project title:** Sacred architectures accessible/inaccessible: continuous architectural monitoring by HBIM + Digital Twins through modelling, analysis and multi sensors technologies. Knowledge, Fruition and Valorisation.

**Scientific coordinator:** Massimiliano Campi

**Responsible for Research Units:** Ornella Zerlenga (UniCampania); Paolo Belardi (UniPG); Stefano Brusaporci (UnivAQ); Riminesi Cristiano (CNR).

**Call title:** PRIN 2020

**Abstract:** The project aims to transform the condition of inaccessibility typical of some sacred architectures into accessibility, through processes of regeneration and valorisation so as to promote projects for both the physical and digital use, starting from a system of continuous monitoring of the risk factors and conditions of the context. The project will identify protocols for the construction of dynamic and constantly updated models, resulting in the codification of an operational workflow that allows for the acquisition, management and use of the asset to even be managed remotely.

**Involved persons:** Ornella Zerlenga, Paolo Giordano, Alessandra Cirafici, Manuela Piscitelli, Avella Alessandra, Pasquale Argenziano, Vincenzo Cirillo, Luigi Corniello, Alice Palmieri.

**Status:** not funded

**Project submission/start/end date:** January 2021



**Project title:** Sud Italia. Culture and entertainment branding strategies using ICT and social networks.

**Scientific coordinator:** Manuela Piscitelli

**Call title:** PRIN 2022 PNRR

**Abstract:** The research aim is to analyse and communicate the potential of the Southern Italian territory in order to disseminate it both to the local inhabitants to encourage identity processes and communities' 're-appropriation' of the territory, and to potential visitors and investors. The project proposes the adoption of a place marketing and communication strategy systemic approach, namely it intends to focus on the valorisation through constant communication of a widespread heritage, in which each piece can be related to others, also relying on a shared promotional action that favours the understanding of the heritage as a whole. In this direction, the creation of a brand for the Southern Italy and its visual identity is proposed, and the design of an integrated communication system for the Southern Italy, which, by using the potential of ICT and social media, will act as an open, implementable and participatory platform for the awareness, the valorisation, and the promotion of the Southern territories in all their material and immaterial components. To these ends, a web and social platform for the communication of thematic routes appropriately designed taking into account the strategic assets of the Southern Italy will be developed as output of the research.

**Involved persons:** Alessandra Cirafici, Barbara Masiello, Antonella Garofano, Massimiliano Campi, Alessandra Pagliano, Valeria Cera, Mara Gallo.

**Partners:** Università degli Studi di Napoli Federico II

**Status:** Not funded

**Project submission/start/end date:** November 2022

**Project title:** Designing with More-than-Human. Phygital interactions and artifacts for a transdisciplinary and post-anthropocentric manufacture. (De+Human)

**Scientific coordinator:** Chiara Scarpitti

**Call title:** Bando di Ateneo per il finanziamento di progetti di ricerca fondamentale ed applicata dedicato ai giovani Ricercatori D.R. 509/2022

**Abstract:** Description of the research project activities: Characterised by a dual nature – theoretical and applicative - the project aims at laboratory and transdisciplinary experimentation of processes and products on the borderline between design, digital technologies and nature, with a view to raising awareness of the most pressing issues related to multi-species coexistence and environmental ecosystems. Through international research mappings and philosophical speculations, the project aims to reshape the meaning of sustainable production within the postanthropocentric paradigm, discussing its domain and recontextualising objectives, technologies, aesthetics.

**Involved persons:** Alessandra Cirafici, Roberto Liberti, Alice Palmieri, Daniela Piscitelli, Patrizia Ranzo, Maria Antonietta Sbordone, Rosanna Veneziano. PhD students: Annarita Bianco, Noor Fajrina Farah Istiani, Giulio Giordano. Assegnista di Ricerca: Marzia Micelisopo.

**Status:** funded

**Project submission/start/end date:** 01.10.2022/12.12.2023

**Title of the project:** “Integrated PRocedure for assEssing and improVing the resiliENce of existing masonry bell Towers on a territorial scale” - PREVENT

**Scientific Coordinator:** Prof. Gianfranco De Matteis

**Call title:** VALERE 2019

**Description of the research activities of the project:** Enhancement and conservation of bell

towers, with a multidisciplinary and multilevel approach, developed through three main research lines: Knowledge and survey (Zerlenga); Control and monitoring (Sibilio); Structural assessment and preservation (De Matteis). Such research lines develop independently but are strongly interconnected to each other. They converge in the fourth cross-cutting research line, which defines the main objective and result of the whole research, namely: Preservation and valorisation of existing bell towers (All).

**Involved Staff:** Gianfranco De Matteis, Ornella Zerlenga, Sergio Sibilio, Corrado Chisari, Vincenzo Cirillo, Giovanni Ciampi, Daniela Cacace, Rosina Iaderosa, Giuseppina Iuliano, Mattia Zizi, Angelo Lavino, Yorgos Spanodimitriou, Riccardo Miele, Margherita Cicala

**Partners:** Intra-University project competition

**Project status:** finished

**Submission date/Start/End of the project:** 13-02-2019/02-12-2019/02-12-2022

**Project title:** PON AIM (Code AIM1879349-2)

**Scientific coordinator:** Prof. Arch. Ornella Zerlenga

**Call title:** Programma Operativo Nazionale Ricerca e Innovazione 2014-2020

**Abstract:** Definition of refunctionalisation, static-conservative and seismic improvement interventions, to be implemented on a large scale, based on effective, sustainable and innovative techniques and technologies, able to guarantee adequate performance levels, while respecting the historical and cultural value of the asset.

**Involved persons:** Corrado Chisari, Gianfranco De Matteis

**Status:** financed

**Project submission/start/end date:** 22-07-2019/21-07-2022

**Title of the project:** High-performance materials for sustainable structures

**Principal Investigator:** Prof. Vincenzo Piluso (University of Salerno)

**Call title:** PRIN 2022

**Description of the research activities of the project:** The resistance of the material and the related structural performances is no more sufficient in performance evaluation, as soon as other issues need to be included, such as those related to sustainability. In this research project, the attention is focused on the performance evaluation of stainless steel and aluminium alloys including cradle-to-gate and gate-to-site environmental performances, structural performances in terms of exhibited ultimate resistance and ductility, the resulting greenhouse emissions of structures as affected by the required safety levels and the life-cycle behaviour as affected by the corrosion resistance.

**Involved Staff:** Gianfranco De Matteis (Local Principal Investigator)

**Partner institutions:** University of Salerno (PI), University of Campania "Luigi Vanvitelli", University of Padova, University of Catania

**State of the project:** not funded

**Submission date/Start:** 27-03-2022.

**Title of the project:** DAMAGES - Damage effects Assessment on residual safety level of Masonry Arch bridGES

**Principal Investigator:** Prof. Paolo Zampieri (Università degli Studi di Padova)

**Call title:** PRIN 2022-PNRR

**Description of the research activities of the project:** The DAMAGES project aims to propose innovative solutions for the evaluation of existing masonry arch bridges subject to exceptional environmental actions through: (i) improving the understanding of the cause-effect processes that induce complex damage scenarios in masonry bridges; (ii) the definition of adequate constitutive

models for the description of the non-linear behavior of the masonry material that takes into account the pre-existing degradation, which will include probabilistic approaches to consider the non-deterministic nature of the mechanical properties of the constituents and the uncertainty in the distribution/location of the damage; (iii) to develop effective strategies for the assessment of masonry bridges damaged to the point of collapse to investigate the evolution of the level of safety. The interaction of different damage scenarios could induce an unconventional loss of strength and/or stability of the bridge, thus requiring innovative techniques to predict its ultimate condition. To address this challenge, a key aspect of DAMAGES will be the integration of advanced numerical strategies developed by probabilistic approaches aimed at estimating failure through the definition of appropriate fragility curves.

**Involved Staff:** Corrado Chisari (Local Principal Investigator), Roberto Serpieri

**Partner institutions:** University of Padova (PI), University of Perugia

State of the project: ongoing

**Submission date:** 30-11-2022/12-2023/11-2025

**Title of the project:** TRAILED-LAB: Un Laboratorio Mobile a Servizio dei Comuni del Cratere

**Principal Investigator:** Prof. Giuseppe Brando, University “G. d’Annunzio” of Chieti-Pescara

**Call title:** Avviso per la selezione di progetti di promozione della ricerca, del trasferimento tecnologico e della formazione universitaria da finanziare nelle regioni Lazio, Abruzzo, Umbria e Marche interessate dagli eventi sismici del 2016

**Description of the research activities of the project:** “TRAILED-LAB” is a new research centre integrating mobile facilities for in-situ measurements of materials, structures and infrastructures, with fixed standard facilities. TRAILED-LAB aims at providing an advanced instrument for supporting reconstruction and decision-making processes, for both assessments of recovery interventions for seismically damaged buildings and infrastructures and addressing the choices on the re-use of construction materials of collapsed buildings.

**Involved Staff:** Gianfranco De Matteis (Local Principal Investigator), Corrado Chisari, Mattia Zizi

**Partner institutions:** University “G. d’Annunzio” of Chieti-Pescara (PI), University of Camerino, National Institute of Geophysics and Vulcanology -INGV

State of the project: ongoing

**Submission date:** 25-02-2022/01-12-2023/30-11-2026

**Title of the project:** WRENCH - Whispers of Time: Heritage as Narratives of Climate-Change

**Principal Investigator:** Prof. Marco Armiero (Autonomous University of Barcelona)

**Call title:** Collaborative Research Action (CRA) - Climate & Cultural Heritage (CCH) 2023

**Description of the research activities of the project:** WRENCH aims to address the effects of climate change on tangible and intangible heritage, while broadening the understanding of heritage to include narratives, narratives, and ephemeral legacies. WRENCH envisions cultural heritage as both something at risk and something that can tell a story about the risk we are all taking. WRENCH has the dual objective of (a) developing a transdisciplinary methodology involving environmental sciences, engineering and humanities to investigate the impact of climate change on tangible and intangible heritage; (b) use heritage as a storytelling tool to improve awareness of climate change.

**Involved Staff:** Corrado Chisari (Local Principal Investigator), Gianfranco De Matteis, Michelangelo Scorpio, Sergio Sibilio

**Partner institutions:** Autonomous University of Barcelona (PI), Durham University, Orta Dogu Teknik Universitesi, Hidromod, Durham Castle, Diocesi di Ragusa - Chiesa Madre Duomo di San Giorgio, Consorzio “Coop4Art”

**State of the project:** approved

**Submission date:** 08-09-2023/--/--

**Project title:** Evaluation of structural vulnerability and innovative intervention methods for the protection of masonry historical constructions of Italian infrastructural heritage (CUP: B61B21005470007)

**Scientific coordinator:** Prof. Ing. Gianfranco De Matteis

**Call title:** Programma Operativo Nazionale Ricerca e Innovazione 2014-2020

**Abstract:** The research activities deal with the development of methodologies for the structural vulnerability assessment of historical masonry constructions. In particular, the methodologies refer to infrastructural constructions (bridges) and address the problem following both a large-scale and a single-construction approach. The activities entail: i. the development of methodologies for the structural vulnerability assessment at a large scale; ii. vulnerability assessment methodologies by means of Finite Element Models; iii. the proposal of innovative, low-invasive and reversible retrofitting techniques.

**Involved persons:** Mattia Zizi, Gianfranco De Matteis

**Partner institutions:** Fabre Consortium

**Status:** funded

**Project submission/start/end date:** 2021/01-01-2022/ 31-12-2024

**Project title:** Digital narratives for cultural heritage, in a perspective of audience development

**Scientific coordinator:** prof. Alessandra Cirafici

**Call title:** PON\_ 2014-2020 Ricerca e Innovazione - Ricercatori a tempo determinato di tipologia A. DM n.1062 del 10 agosto 2021. Azione IV.4 Innovazione

**Abstract:** the project intends to investigate fruition strategies to enrich the in-presence visit experience through the use of multisensory augmentation devices; to strengthen the remote visit experience by offering a synchronous mode that enriches the online dimension with an interactive experiential quality (onlife); proposing new formats for the elaboration of content in a design-for-all perspective that takes into account different abilities and makes the experience more interesting for all users; enabling small museums to access innovative technologies at reduced costs in order to enrich the visitor experience and attract new visitor segments.

**Involved persons:** Alessandra Cirafici

**Partner institutions:** Protom Group s.p.a.

**Status:** funded

**Project submission/start/end date:** 2021/01-01-2022/31-12-2024

**Project title:** DESIRE - DEsign Solutions for Industry 4 REady processes

**Scientific coordinator:** Dott. Pasquale Savino

Departmental Principal Investigator: Prof. Luigi Maffei

**Call title:** Avviso per la presentazione di progetti di ricerca industriale e sviluppo sperimentale nelle 12 Aree di specializzazione individuate dal PNR 2015-2020 - Ministero dell'Università e della Ricerca

**Abstract:** The Project aims to optimize production processes and improve logistics management, through the use of the most advanced ICT technologies that allow the virtualization of transformation processes, always placing at the center of everything the people who represent the human capital of our Smart Factories. DADI is involved in the "Integration between Building Information Modeling (BIM) Methodologies and Process Design" activities.

**Involved persons:** Proff. Luigi Maffei, Massimiliano Masullo, Nicola Pisacane, Alessandra Avella,

Pasquale Argenziano, Giovanni Ciampi.

**Partner institutions:** Stellantis/FCA ITALY S.p.A. (capofila), Università degli Studi della Campania "Luigi Vanvitelli" - Dipartimento di Ingegneria Industriale e dell'Informazione, Università degli Studi della Campania "Luigi Vanvitelli" - Dipartimento di Architettura e Disegno Industriale, Step Sud Mare SSM.

**Status:** funded

**Project submission/start/end date:** start September 2020/close February 2023

**Project title:** OPEN WORKING/SPACE FOR WORKING \_ Innovazione 4.0 per il design di arredi urbani adattabili e digitalizzati

Scientific coordinator: Alessandra Cirafici

**Call title:** PON\_ Dottorati Innovativi con caratterizzazione industriale a.a. 2020/2021 - CICLO 36

**Abstract:** The project intends to propose solutions to make public spaces more suitable for work in the new dynamic dimension, also in light of the Covid emergency which has made it possible to rediscover public open spaces as places of production, work, communication and meeting in which to remain rather than to pass.

**Involved persons:** ENSASE Ecole Nationale Superieure de Architecture de Saint Etienne, Master EPAM Espace Public et Ambiance; MATALCO s.r.l.

**Status:** not funded

**Project submission/start/end date:** 2020

**Title of the project:** PON AIM (Codice proposta attività AIM1879349-2)

**Scientific coordinator:** Luigi MAFFEI

**Call title:** Programma Operativo Nazionale Ricerca e Innovazione 2014-2020

**Abstract:** Definition of refunctional, static-conservative and seismic improvement interventions, to be implemented on a large scale, based on effective, sustainable and innovative techniques and technologies, which are able to guarantee adequate levels of performance, respecting the historical and cultural value of the asset.

**Involved persons:** Corrado Chisari, Gianfranco De Matteis

**Status:** funded

**Project submission/start/end date:** from 22/07/2019 to 21/07/2022

**Project title:** Dottorati di Ricerca Innovativi a caratterizzazione industriale, Architettura Disegno Industriale Beni Culturali (codice DOT1349530)

**Scientific coordinator:** Ornella ZERLENGA

**Call title:** Dottorati di Ricerca Innovativi a caratterizzazione industriale, Architettura Disegno Industriale Beni Culturali

**Abstract:** technologies and applications for the conservation, management and enhancement of cultural heritage.

**Involved persons:** Ornella Zerlenga, Carlos José Parra Costa, Margherita Cicala

**Partner institutions:** University of Cartagena, Spain

**Status:** positively evaluated / funded / ongoing

**Project submission/start/end date:** 2020/2023

Title of the project: Seismic safety of historical and monumental masonry buildings: assessment methodologies and retrofitting techniques for the structural enhancement (Scholarship n°3 – DOT1349530, Project ID: B25D18000010006)

Scientific Coordinator: Prof. Gianfranco De Matteis



Call title: Nation-al Operational Program ESF-ESFR Research and Innovation (PON RI 2014-2020), Action I.1 related to Innovative Industrial Ph.D.

Description of the research activities of the project: The project aims at an in-depth knowledge of the behaviour of masonry structures, in order to propose adequate intervention criteria aimed at seismic improvement and retrofitting of the existing heritage, respecting the requirements of reversibility, cost-effectiveness and material compatibility.

Involved Staff: Gianfranco De Matteis, Mattia Zizi

Partners: UM, Università del Minho, Portugal, EDIL Cam® Sistemi Srl

Project status: finished

Start/End of the project: 2018-2021

### Scientific products during the last three years:

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

- [1] PALMIERI, A. (2023). Midjourney experimentation: representing Nature on a macro scale. In: *Scires-it*, vol. 13 Issue 1, pp. 181-188.
- [2] PISCITELLI, M. (2022). From 3D scanning to Virtual Tours for the fruition of Architectural Heritage. The Church of Santa Maria della Purità. In: *Scires-it*, vol. 12 Issue 2, pp. 55-68.
- [3] ZIZI, M., CHISARI, C., DE MATTEIS, G., (2023). Effects of pre-existing damage on vertical load-bearing capacity of masonry arch bridges. *Engineering Structures* 300:117205. DOI:10.1016/j.engstruct.2023.117205.
- [4] ZERLENGA, O., CIRILLO, V., CICALA, M. (2023). Drawing, Shapes and Parametric Design of Rod and Node Architectural Structures. *Nexus Netw J* 25 (Suppl 1), 303–311 (2023). <https://doi.org/10.1007/s00004-023-00722-3>
- [5] ZERLENGA, O., CIRILLO, V. (2023). Guarino Guarini y el proyecto de escaleras en los tratados italianos. *Informes De La Construcción*, 75(572), e517. <https://doi.org/10.3989/ic.6420>
- [6] ZERLENGA, O., CIRILLO, V. (2022). The Main Staircase of Palazzo Spinelli di Laurino in Naples. Function, Shape, Geometry. In Ródenas-López, M.A., Calvo-López, J., Salcedo-Galera, M. (Eds), *Architectural Graphics. EGA 2022. Springer Series in Design and Innovation* (pp. 405-414). Cham: Springer. ISBN: 978-3-031-04632-2.
- [7] RICCIOTTI, L., APICELLA, A., PERROTTA, V., AVERSA, R. (2023). Geopolymer Materials for Bone Tissue Applications: Recent Advances and Future Perspectives. In *Polymers*, 15 (5), art. no. 1087.
- [8] AVELLA A., PISACANE N., ARGENZIANO P. (2022). The Ager Nolanus Table from De Nola Treatise as prototype of modern cartography. *Territorio*, p. 164-175, ISSN: 1825-8689.
- [9] GILOTTA F., CARAFA V., MORPURGO G., RIZZO C., CIRAFICI A., AVELLA A., ARGENZIANO P., PATRIZIANO T., MICOZZI M., GALIFFA F., LUCCHETTI L., BENTZ M., BECK D., BIRKNER F., BRIESACK C., KLUGE P., LANG M., COEN A., ZINNI M. (2022). Researches at the Monte Abatone necropolis (Cerveteri). *Archeologia e Calcolatori*, p. 135-152, ISSN 1120-6861, e-ISSN 2385-1953.
- [10] CORNIELLO L. (2021). 3d modeling and visualization of architecture and landscape, *Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci.*, XLVI-4/W5-2021, 159-166, <https://doi.org/10.5194/isprs-archives-XLVI-4-W5-2021-159-2021>, 2021

*Additional 10 scientific products:*

- [1] CIRAFICI, A., ZERLENGA, O. (2023) (a cura di) *Nuove frontiere nel Disegno | New frontiers*

*in Drawing*. DADI\_PRESS, ISBN: 978-88-85556-24-9, pp. 1-360.

[2] CIRAFCI, A., MELILLO, L. (2023) (a cura di) *I saperi di Eumachia al Museo Archeologico Nazionale di Napoli. Antichi tessuti, nuovi racconti*. TORINO: Hapax Editore, ISBN: 979-12-80188-15-1, pp 1-238

[3] PALMIERI, A. (2023). Coloured Patterns: Designing Urban Spaces Through Chromatic Abstractions. In: Villa, D., Zuccoli, F. (a cura di) *Proceedings of the 3rd International and Interdisciplinary Conference on Image and Imagination. IMG 2021*. Lecture Notes in Networks and Systems, pp. 1059-1068. [Codice Scopus: 2-s2.0-85152623270]

[4] PISACANE, N., ARGENZIANO, P., AVELLA, A. (2023). Gems Geometry: From Raw Structure to Precious Stone. In: AA.VV.. (a cura di): Liang-Yee Cheng, *Lecture Notes on Data Engineering and Communications Technologies - ICGG 2022 - Proceedings of the 20th International Conference on Geometry and Graphics. LECTURE NOTES ON DATA ENGINEERING AND COMMUNICATIONS TECHNOLOGIES*, vol. 146, p. 497-508, Cham:Springer, ISBN: 978-3-031-13587-3, ISSN: 2367-4512, doi: 10.1007/978-3-031-13588-0

[5] PISACANE, N. ARGENZIANO, P., AVELLA, A. (2023). Modeling of Gemstone from the Encyclopedie. Geometric Analysis and Morphological Problems. In M. Cannella, A. Garozzo, S. Morena (a cura di), *Transitions. Proceedings of the 44th International Conference of Representation Disciplines Teachers*, pp. 1874-1895. Franco Angeli.

[6] PISCITELLI, M. (2022). Il carattere come motivo decorativo, dai capilettera al lettering. In: AA. VV. (a cura di): Cicalò E., Savini F., Trizio I., *Linguaggi Grafici. Decorazione*. Alghero: Publica, pp. 70-93, ISBN: 9788899586294.

[7] ZERLENGA, O., DE MATTEIS, G., SIBILIO, S., CIAMPI, G., CIRILLO, V., MIELE, R., SPANODIMITRIOU, Y., & IADEROSA, R. (2022). Open-source procedure for UAV-based photogrammetry and infrared thermography survey of masonry bell towers. In S. Parrinello, S. Barba, A. Dell'Amico & A. di Filippo (a cura di) *D-SITE, Drones-Systems of Information on cultural hEritage. For a spatial and social investigation*. Vol II (pp. 412-421). Pavia: Pavia University Press. ISBN: 978-88-6952-159-1.

[8] CIRILLO, V. (2021). *Feste settecentesche a Napoli. Disegni e progetti per l'architettura effimera | Eighteenth-century celebrations in Naples. Drawings and designs for ephemeral architecture*. Napoli: La scuola di Pitagora. ISBN: 978-88-6542-836-8.

[9] ZERLENGA, O., IADEROSA, R., CIRILLO, V. (2021). Once upon a time there were fireworks. The new nocturnal drones light shows. In *Img Journal*, n. 4, pp. 402-425. DOI: <http://dx.doi.org/10.6092/issn.2724-2463/12628>

[10] CIRILLO, V., CICALA, M. (2021). Redrawing the future of naples' bell towers. The 'PREVENT' project. In: Ruth Pino Suárez, Norena Martín Dorta (eds), *Redibujando el futuro de la Expresión Gráfica aplicada a la edificación*. Valencia: Tirant humanidades, pp. 293-309. ISBN 978-84-18656-93-4.

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

*Research activity with the University of:*

Anhalt University Hochschule Dessau (Germany);

Central Technical Archive of Construction in Tirana (Albania);

Departamento de Arquitectura y Tecnología de la Edificación, Cartagena (Spain);

Escuela Técnica Superior de Arquitectura de Madrid;

Imperial College London (UK);

Politecnico di Milano;  
Polytechnic University of Madrid;  
Polytechnic University of Tirana, Faculty of Architecture (Albania);  
Polytechnic University of Tirana, Faculty of Civil Engineering (Albania);  
Sapienza University of Rome;  
Universidad de Alcalá Facultad, Escuela Técnica Superior de Arquitectura. Departamento de Arquitectura, Alcalá de Henares (Spain);  
Universidad Politécnica de Cartagena, Escuela Técnica Superior de Arquitectura y Edificación;  
Universidade de Lisboa, Faculdade de Arquitetura. Departamento de Artes, Humanidades and Ciências Sociais, Lisboa (Portugal);  
University of Catania;  
University of Padova  
University of Udine;  
University of Salerno;  
University of Trieste;  
Universitat de les Illes Balears (UIB), Higher Polytechnic School (Spain)  
University of Applied Sciences, Hochschule Koblenz (Germany)

*Agreement for research activities with:*

ReLUIIS (Network of University Laboratories of Earthquake Engineering) in the field of Vulnerability and Seismic Risk, for the support of activities of management technical emergency and related to seismic prevention programs, for the knowledge development and assistance in the drafting of technical standards. (Department of Civil Defense). ReLUIIS-DPC Project 2019-2021 and ReLUIIS-DPC 2022-2025, with particular reference to: WP2 (Inventory of existing structural and building types- CARTIS); WP4 (Risk maps and Seismic damage scenarios- MARS); WP12 (Regulatory contributions related to. Civil and industrial steel and steel-concrete composite constructions). Scientific responsible: Prof. Gianfranco De Matteis.

*Memorandum of Understanding with:*

Agrorinasce (2023);  
Centro La Tenda Onlus (2023);  
Unicef Campania (2023)  
NAPOLICREATIVA (2023)  
Riserva Naturale Oasi WWF Cratere degli Astroni (2023)  
I Municipalità di Napoli (2023)  
IACC - International Association of Color (2023)  
8° Reggimento Bersaglieri – Caserta. Manifestazione Flik-Flok (2023)  
Aeronautica Militare di Caserta – Scuola specialisti – Visual identity project of the exhibition entitled Il Volo come visione ed esperienza. Fra Tecnologia e Arte (Daniela Piscitelli, Ornella Zerlenga, Vincenzo Cirillo, Roberta Angari).  
Reggia di Caserta e Unicompania DADI for Celebrazioni Vanvitelliane 1773-2023 – Visual identity project by Daniela Piscitelli, Ornella Zerlenga e Roberta Angari.  
Archivio Piero Bottoni - DASTU - Dipartimento di Architettura e Studi Urbani, Politecnico di Milano (2022);  
PACT - Parco Archeologico di Cerveteri e Tarquinia;  
VIII Municipality of Naples (2017\_in progress);  
Ministry of Grace and Justice for survey and documentation of the Nisida Prison (2017 in

progress);

Community Foundation of the Historic Center of Naples for the enhancement project of the bell tower of Santa Chiara (2018\_in progress);

Morra Foundation for cultural dissemination: Cassano Ayerbo d'Aragona palace (2018\_realized);

The school of Pythagoras for editorial training (2018\_ongoing);

Experimental Leather Station and Polytechnic of Leather;

San Gennaro Community Foundation Onlus (2019\_ongoing);

Protom Group Spa (2019\_in progress);

Virto 360 (2019\_ongoing);

Sunto Srl (2019\_ongoing);

Province of Caserta (2019\_ongoing);

Nolana Area Agency - Local development agency of the municipalities of the Nolana area (2020);

MonasterY Santa Maria In Gerusalemme - Clarisse Cappuccine called "Le Trentatré" (2019\_in progress);

La Contea Nolana Association (2020);

MU.S.A. Association (2020);

Festa dei Gigli Foundation (2020);

ITS BACT Foundation - Innovative Technologies for Cultural Heritage and Activities and Tourism (2020);

MiBAC Historical - Archaeological Museum of Nola (2020);

Morra Foundation - Dafna Gallery- Intragallery:

Voi siete qui / Vico Pero / Giacomo Leopardi (2020-2021)

*Joint research with:*

Animal Day Naples Association for Animal Rights Days at the PAN, Palazzo delle Arti in Naples;  
Central Tyrrhenian Sea Port System Authority for the study of the coastline from the eastern industrial area and the former General Warehouses;

Municipality of Sorrento for the study of the cemetery complex of San Renato;

Ministry of the Environment for the Plastic free campaign: graphic design of the brand, registered by the University of Campania 'Vanvitelli' (2019\_realized);

ReLUIS (Network of University Laboratories of Seismic Engineering) on Vulnerability and Seismic Risk, to support technical emergency management activities and related to seismic prevention programs, for the development of knowledge and assistance in the drafting of standards technical (Department of Civil Protection). ReLUIS-DPC 2019-2021 project, with particular reference to: WP2 (Inventory of existing structural and building typologies - CARTIS); WP4 (Risk maps and seismic damage scenarios - MARS); WP12 (Regulatory contributions relating to civil and industrial constructions of steel and steel-concrete compounds);

Fundação Cultursintra FP, Quinta da Regaleira, Sintra, Portugal for the relief of underground and epigeal architecture in the Quinta da Regaleira.

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

Fabre Consortium "Research consortium for evaluation and monitoring of bridges, viaducts and other structures"

LICEO ARTISTICO, COREUTICO E MUSICALE - "Filippo Palizzi" Napoli

**ISI Web of Science Subject Categories:**

- Architecture
- Communication
- Construction & Building Technology
- Engineering, Civil
- Engineering, Mechanical
- Engineering, Multidisciplinary
- Humanities, Multidisciplinary
- Materials Science, Characterization & Testing
- Materials Science,
- Composites
- Remote Sensing

**Scientific-Disciplinary Sectors:**

- ICAR/08 – Scienza delle costruzioni
- ICAR/09 – Tecnica delle costruzioni
- ICAR/13 – Disegno industriale
- ICAR/17 – Disegno
- ICAR/19 – Restauro
- ING-IND/11 – Fisica tecnica ambientale
- ING-IND/22 – Scienza e tecnologia dei materiali

**Keywords:**

- graphic analysis
- audiovisual communication
- terrestrial and aerial photogrammetry
- GIS / Geographic Information Systems
- H-BIM / Building Information Modeling for Cultural Heritage
- digital narratives for the enhancement of cultural heritage
- graphic design
- representation of architecture and the environment
- Digital and integrated survey of architecture and the environment
- visualization and modeling

**ERC Categories:**

- PE8\_10 Manufacturing engineering and industrial design
- PE8\_11 Environmental engineering, e.g. sustainable design, waste and water treatment, recycling,
- regeneration or recovery of compounds, carbon capture & storage
- PE8\_3 Civil engineering, architecture, offshore construction, lightweight construction, geotechnics
- SH1\_10 Management; strategy; organisational behaviour
- SH3\_12 Communication and information, networks, media



- SH5\_4 Visual and performing arts, film, design and architecture
- SH5\_6 History of art and architecture, arts-based research
- SH5\_7 Museums, exhibitions, conservation and restoration
- SH5\_8 Cultural studies, cultural identities and memories, cultural heritage
- SH5\_12 Computational modelling and digitisation in the cultural sphere