

## Research Group

### The System. Architectures and infrastructures for digitization

**Reference year:**

2024

**Scientific Coordinator:**

PITZALIS EFISIO / Full Professor / Department of Architecture and Industrial Design (DADI / Università degli Studi della Campania “Luigi Vanvitelli”

**Group members:**

*DADI / University of Campania Luigi Vanvitelli components:*

PITZALIS Efisio / Full professor  
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GELVI Maria / Associate Professor  
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BONANNO Barbara / PhD  
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SCAGLIARINI Noemi / PhD candidate  
ZANCHETTA Marcella / PhD candidate  
PETINO Maria Teresa / PhD candidate  
AHMED Kaihoul / PhD candidate  
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COVIELLO Giorgia / A5 student

*Group members belonging to other related offices in the network:*

CALABRESE Federico / Associate professor / Faculdade de Arquitetura da UFBA  
CECE Alessandro / Associate Professor / Department of Architecture, Xi'an Jiaotong-Liverpool University  
CRUZ PINTO Jorge / Associate professor / Lisbon School of Architecture / Universidade de Lisboa  
GHANIMEH Ali Abu/ Full professor / College of Engineering, University of Jordan  
POPOVIC LARSEN Olga / Full professor / Institute of Architecture and Technology / Royal Danish Academy of Fine Arts

STELLA Antonello / Associate Professor / Dipartimento di Architettura / Univ. degli Studi di Ferrara

**Description of research lines:**

- ARCHITECTURE FOR DIGITALIZATION

The transition from the analog to the digital system makes it necessary to build a series of physical systems that are fundamental for the functioning of the services connected to the new communication channels. The shift to smart work imposed to an even greater extent by the current global pandemic has highlighted a structural deficiency that is far from being faced with huge resources to invest in the general development of the country. Infrastructural systems, production districts, and logistic networks represent only a part of functions that are progressively integrated within the contemporary city. The latter is no longer exclusively an urban artifact composed of solids and voids, but an articulated whole fed by interconnected flows, both physical and virtual, thanks to which the inhabited space is constantly updated. This line of research focuses on the study of the architectures and infrastructures necessary to translate this passage and give substance to the phenomenon of the digital revolution.

- THE LANGUAGE OF THE FACTORY

The research line is focused on the study of twentieth-century architecture whose focus is concentrated on the themes of the industrial sector. From the factory of the "heroic" period of the Modern to the spatial experiments of the 1960s, whose renewal is based on the post-CIAM vision, it is possible to trace a path from which the typological paradigms of architecture for mechanized production emerge. The industry is configured as a strategic node of design experimentation that transversally affects an important part of the national territory. The project proposals and the cases carried out make-up an important typological atlas and at the same time act as a generative arsenal for the configuration of innovative industries, commercial or distribution spaces, data centers, or CEDs, through which it is possible to identify some architectural models to support the digitization of our country.

- INNOVATIVE STRUCTURAL SYSTEM

The history of architecture has always been linked to new technical and scientific acquisitions. The most up-to-date developments in the structural field refer to the macro-sector of timber structures, through which a new and constantly updated language is proposed. This line of research addresses the theme of architecture for the industry of the future with specific attention to structures and the efficiency of materials. Gridshell, Reciprocal Frames, and Tensegrities are just some of the systems driving the ongoing space revolution. Against this background of the investigation, attention is focused on both next-generation functions and on possible welfare or emergency implications.

- IMPACT OF THE DIGITAL INFRASTRUCTURE ON THE CONTEMPORARY CITY

The contributions related to the impact that these new structures have on the city, on man, and on the economy converge in this line of research. The need to build these structures near large urban centers or within the semi-peripheral belt, especially in reference to seamless and densely populated urban fabrics, arises from an analysis that takes into account the various urban aspects, architectural and economic. Similarly, there is a need to consider the adaptive reuse of the huge existing building stock in reference to innovative functions such as data centers, logistics hubs, or new activities based on total human-machine interaction or support for digital services.

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

*- SINO-ITALIAN URBAN REGENERATION HUB*

Scientific manager: Alessandro Cece

Participants: Ernesto d'Alfonso, Antonella Contin, Laura Daglio, Pasquale Mei, Alessandra Casu, Gianluca Cioffi, Giovanni Santamaria, Fei Chen, Yunqing Xu;

Reference laboratory: Design School XJTLU

*- The establishment of the Sino-Italian Urban Regeneration HUB stems from the recognition of a precise market need expressed by the Italian design industry and the potentiality offered by the context of the Chinese urban construction sector. The HUB offers at the DES School an opportunity to explore the topic of urban regeneration in contemporary China. After the rapid growth of the last two decades, China's spatial, urban, and architectural development is at a crucial stage. A renewed awareness and sensitivity to issues of sustainability and land consumption are ushering in a phase that calls for new strategies to understand the urban territory and re-signify the physical environment.*

*It is with these assumptions that the Sino-Italian Urban Regeneration HUB finds its mission, promoting the Italian morpho-typological approach, known worldwide for its ability to work in a multi-scalar and meta-historical way, as a cutting-edge research methodology and design practice. This represents an opportunity to advance scientific knowledge and promote innovation in Urban Regeneration, exploring the mutual influences of Chinese and Italian cultures.*

*The HUB, with the support of engineering, architecture, and economic consulting organizations, connects academia with the public and private sectors. It focuses on research into new urban design tactics and advances in architectural technologies. In this way, it aims to usher in a new urban strategy, reflecting the changing paradigms of the new sensibility that is the seed of the Chinese urbanity, uniting past, present, and future.*

*- Hydraulic, Environmental and Maritime Infrastructure Optimization and Smart Water Network  
- Ottimizzazione delle infrastrutture idrauliche, ambientali e marittime e Reti idriche Intelligenti*

Scientific manager: Michele DI NATALE

Participants: Armando DI NARDO; Dino MUSMARRA; Daniela RUBERTI; Marco Vigliotti; Caterina ERAMO; Stefania DI RONZA; Immacolata BORTONE; Carlo GIUDICIANNI; Giovanni Francesco SANTONASTASO; Simeone CHIANESE

Reference laboratory: Laboratorio di Idraulica e Idraulica Marittima

*- Innovative Technologies for Environment Protection from Pollution and Sustainable Resource Use - Tecnologie innovative per la protezione dell'ambiente dall'inquinamento e l'utilizzo sostenibile delle risorse – InnoTEP*

Scientific manager: Dino MUSMARRA

Participants: Michele DI NATALE, Sante CAPASSO; Nicola SANNOLO; Andrea BUONDONNO; Adriana ROSSI; Maria Laura MASTELLONE; Armando DI NARDO; Pasquale IOVINO; Stefano SALVESTRINI; Simeone CHIANESE; Amedeo LANCIA; Evangelos Vasileios HRISTOFOROU; Marina PRISCIANDARO; Alessandro ERTO; Mauro CAPOCELLI;

Immacolata BORTONE; Antonio MOLINO; Despina KARATZA; Giovanni Francesco SANTONASTASO; Davide SCAMARDELLA; Carmen DE CRESCENZO; Christos KONSTANTOPOULOS; Angela IOVINE; Antonia SCAMARDELLA; Angelo FENTI; Sanjeet MEHATIYA

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

1) Project title: RE.LAND - RECOMPOSING LANDSCAPE OF THREE DECONTAMINATED SITES IN CAMPANIA

Scientific Responsible: Efisio Pitzalis

Title of the call: University call for the financing of competitive projects

Description of the research activities of the project: Campania Felix (Terra di Lavoro) was represented in the eighteenth-century descriptions of Goethe and Galanti as the plain between Naples and Caserta characterized by particularly fertile soils and of great historical and landscape interest. The quality of the landscape of the Campania plain remains more or less intact even in the most recent descriptions by A. Sestini (1963) for the Touring Club.

In the last 50 years, the unplanned and abusive expansion of the city and the use of land for the transfer of waste to legal and illegal landfills have altered its nature and environmental balance. In July 2015, a report by the Istituto Superiore di Sanità proves the connection between the increase in tumor pathologies and spills, even and especially in children up to 14 years of age. The research project aims to redesign, "restore" and recompose the reclaimed landscape, enhancing its quality in some sample areas identified by regional plans and already undergoing reclamation.

Personnel involved: Efisio Pitzalis, Cherubino Gambardella, Marino Borrelli, Luca Molinari, Fabrizia Ippolito, Luigi Guerriero, Sergio Rinaldi, Francesco Costanzo, Gianluca Cioffi, Francesco Pio Arcella (PhD), Barbara Bonanno (PhD), Annarita Zarrillo (PhD).

Project status: positively evaluated but not funded

Project submission date: 12 February 2019

2) Project title: NEW RESIDENTIAL MODELS. POST-PANDEMIC LIVING

Scientific Responsible: Efisio Pitzalis

Title of the call: SPECIAL SUPPLEMENTARY FUND FOR RESEARCH (FISR), Directorial Decree n. 562 of 05.05.2020

Description of the research activities of the project: Covid-19 has forced millions of people into forced isolation in their homes for several months. The major concern that derives from this is represented by the uncertain predictability of a future wave of infections with a corresponding resumption of the rules for social distancing. The lockdown period has highlighted the inadequacy of many spaces for residential use, both in terms of single cells and as regards collective building complexes. In the immediate future, it is necessary to rethink not only the single accommodation but above all the entire building for residential use.

We urgently need to rethink the type of collective housing and some public functions connected to it, with a view to imagining an autonomous housing system in view of a new period of forced

confinement. The research focuses on a residential type where housing becomes part of a housing system designed to be modified in a short time and according to the new provisions for containing the health emergency from Covid-19.

Personnel involved: Efisio Pitzalis, Gianluca Cioffi, Marco Russo, Francesco Pio Arcella (PhD), Barbara Bonanno (PhD), Annarita Zarrillo (PhD).

Partner institutions: National Cancer Institute G. Pascale Foundation (Paolo Antonio Ascierio)

Project status: positively evaluated but not funded;

Project submission date: June 26, 2020

### 3) Project title: DISABILITY, EXPERIENCE, AND ARCHITECTURE: TOWARDS SPORT AND LEISURE INCLUSIVE BUILDINGS

Scientific Responsible: Popovic Larsen, Olga

Partner Institutions: The Royal Danish Academy of Fine Arts, Innovation Fund Denmark, FORCE4 ARCHITECTS A / S.

Personnel involved: Kajita, Masashi, Cassi, Roberta

Date: 01/10/2018 → 31/03/2022

### 4) Project title: NORDIC WOOD FOR GOOD

Scientific Responsible: Popovic Larsen, Olga

Description of project research activities: Nordic Wood for Good seeks to develop a knowledge base and process with the aim of exploring the design potential of waste wood from the Nordic region forest industry.

Partner institutions: The Royal Danish Academy of Fine Arts, NEXT and Uddannelser of Byggeriet.

Personnel involved: Browne, Xan, Crocetti, Roberto, Huges, Mark, Manum, Bendik, Aalto, Pasi, Martin, Alison Grace.

Date: 1/11/2019 → 31/01/2020

### 5) Project title: MODI - MODelling the Immaterial: architectures and infrastructures for the digitalization

Scientific Responsible: Russo, Marco

Description of project research activities: The digital transition represents an important challenge for our country in the coming years. On this topic, the PNRR has allocated the 27% of the resources to this sector. The current pandemic has accelerated this development, embracing several fields and activities, such as industry (3.0-4.0) or agriculture (vertical farm). Although information travels on cables, physical structures are increasingly necessary to meet the growing demand for these services, considered the cores of the future 'Power City' from the scientific community. The remote work, or a possible future hybrid form, has highlighted a structural deficiency that must be addressed with huge resources to invest in the country's general development. All administrative services, schools, public transport structures, infrastructural systems, production districts and logistic networks represent only a part of the functions that are progressively integrated within the contemporary city, taking up the concept of 'usine verte' (green factory) developed by Le Corbusier for an Olivetti computer center in the 1930s. The latter

becomes a system powered by interconnected physical and virtual flows, thanks to which the inhabited space is constantly modified.

The research project focuses on studying the architectures and infrastructures necessary to support this technological transition and give a sustainable and integrated response to the phenomenon of the digital revolution with a original study dedicated to the Italian heritage of IT or ICT, in a wider perspective. The achievement of the 'Gigabit society' planned for 2025, one of the new objectives supported by Europe through the Connecting Europe Broadband Fund (CEBF), represents only the first step towards the digital transition and the modification of the environment in which we work and live.

Personnel involved: Group of reserch members;

Partner institutions: Faculdade de Arquitetura da UFBA (ref.: Prof. Arch. Federico Calabrese); Department of Architecture, Xi'an Jiaotong-Liverpool University (ref.: Prof. Arch. Alessandro Cece); Lisbon School of Architecture / Universidade de Lisboa (ref.: Prof. Arch. Jorge Cruz Pinto), College of Engineering, University of Jordan (ref.: Ali Abu Ghanimeh); Institute of Architecture and Technology / Royal Danish Academy of Fine Arts (ref.: Olga POPOVIC LARSEN); Dipartimento di Architettura / Univ. degli Studi di Ferrara (ref. Prof. Arch. Antonello Stella).

Project status: *in evaluation*;

Submission: 26 december 2021;

Date: 48 months (4 years).

6) Title of the project: 4H - Healthy, Human-centered and High-efficient co-living-working Homes

Scientific responsible: Sibilio, Sergio

Descrizione delle attività di ricerca del progetto: The global health emergency caused by the spread of COVID-19 has impacted people's lifestyles and changed their perception and use of home and districts: while relationships and places of sociality have been affected by requiring greater attention to social physical distancing, new needs and communication paradigms have emerged. Office working and teaching have faced this situation with widespread homeworking that has reduced the negative impact of the lock-down limiting people-to-people relationships to virtual communication.

Personnel involved: Group of reserch members;

Project status: *in corso di valutazione*

Submission: 31 march 2022

Date: 24 months (2 years)

### **Scientific products of the last three years:**

*Scientific publications on Class A journals and/or indexed in the Scopus/WoS databases:*

[1] PITZALIS E, "Ecco un altro pezzo del mondo di Carlo", in *U+D*, vol 16, 2021, pp. 152-154, ISSN: 2612-3754;

[2] PITZALIS E, HANSSSEN G, RUSSO M, Places of knowlodge in a pedagogical prespective, in "Abitare la Terra", vol. 50, 2019, pp. 82-83, ISSN: 1592-8608;

- [3] CIOFFI G., Centuria medical and wellness park, pp.56-57. In ABITARE LA TERRA – 2021, ISSN:2531-789X vol. 6
- [4] CIOFFI G., Design experiments for the Domitian coast masterplan, in ABITARE LA TERRA - 2020, pp.50-51, ISSN:1592-8608 vol. 4 (52)
- [5] GAMBARDELLA CH, V. House, in “Area”, n. 172, Settembre/Ottobre 2020, ISSN 0394-0055, 2020;
- [6] GAMBARDELLA CH, Napoli Onirica, in “Abitare”, n. 597, Settembre 2020, ISSN 0001-3218, 2020;
- [7] MOLINARI L, Dialogo sulla resistenza, in “Area”, n. 167, Novembre 2019, pp.42-49, ISSN 0394-0055;
- [8] STELLA A, Cantina sociale cooperativa Pitigliano, Grosseto, Italia. Rinnovare l’immagine della tradizione, in “The Plan”, n. 121, Aprile 2020, ISSN 1720-6553;
- [9] PITZALIS E, RUSSO M, SCAGLIARINI N, The talking garden. Distant dialogue with San Lorenzo ad Septimum, in (a cura di): C Gambardella, World Heritage and Ecological Transition. ARCHITECTURE HERITAGE AND DESIGN, Gangemi, Roma, 2022, pp. 497-506, ISBN: 978-88-492-4530-1, Napoli-Capri, 8 - 9 - 10 September 2022;
- [10] RUSSO M, Experiencing places of worship. In “XX International Forum Le Vie dei Mercanti World Heritage and Ecological Transition, Design for Health. ARCHITECTURE HERITAGE AND DESIGN”, Gangemi, Roma, pp. 303-312, ISBN: 978-88-492-4530-1;

*Additional scientific products:*

- [1] PITZALIS E, Something Beautiful in Babylon, in F. Visconti (a cura di), Napoli inclusiva, Thymos Books, Napoli 2020, pp. 26-27, ISBN 9788832072037;
- [2] CIOFFI G., ProArch 4 |DESIGN RESEARCH LANGUAGES Architectural design as research product and possible communication tools. pp.103-106. In Progetto architettonico ai tempi del Covid-19 – 2020- ISBN:9791280379009
- [3] PITZALIS E, Architettura come opera aperta, DADI\_PRESS, Aversa, 2022, ISBN 978-88-85556-19-5;
- [4] CIOFFI G., Sperimentazioni e progetti di architettura, Libria, Melfi, 2022, ISBN 978-88-6764-297-7;
- [5] RUSSO M, VIKINGESKIBSHALLEN. Il museo delle navi vichinghe di Erik Christian Sørensen | Erik Christian Sørensen’s Viking Ship Museum, Libria, Melfi, ISBN: 978-88-6764-292-2;
- [6] STELLA A, From the global city to the city by parts. A reflection on the meaning of the contemporary city starting from the case of Pristina, in Besnik A., L. Rossi (a cura di), OMB Series. Observatory of the Mediterranean Basin, Polis Press, Tirana 2019, ISBN 978-9928-4563-0-4;
- [7] PITZALIS E, Architettura come opera aperta, DADI\_PRESS, Aversa, ISBN ;

- [8] DE SOUZA BIERRENBACH AC, CALABRESE F, *Between Lower City and Upper City: Carnival House at Salvador de Bahia*, in “Compasses”, n. 31, Luglio 2019, pp. 102-109, ISSN 2409-3823;
- [9] CIOFFI G, CECE A, *Design experiments for the Domitian coast masterplan*, in C. Gambardella (a cura di), *Architecture heritage and design*, Gangemi, Roma 2020, pp. 1182- 1191, ISBN 9788849239379;
- [10] ZARRILLO A., FERLA P., POPOVIC LARSEN O., CASTRIOTTO C., BROWNE X., MINUTOLO V., *New Digital Technologies Applied to Architectural Design using Big Data Analysis*, in “International Journal on Emerging Technologies”, 11(4), 2020, pp. 240–246, ISSN 0975-8364.

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

Project title: ADAPTIVE SURFACES IN ARCHITECTURE: MODELING AND EXPERIMENTATION ON PHYSICAL MODELS.

UniCampania scientific director: Efsio Pitzalis  
Scientific director of the Danish Academy: Olga Popovic Larsen  
PhD student: Annarita Zarrillo  
Year: 2020

Research Project: During the year 2020 a collaborative relationship began with the Institute of Architecture and Technology of the Royal Danish Academy in Copenhagen. This relationship has resulted in a doctoral project in line with the research conducted by this group. The doctorate in question is carried out in co-supervision between Professor Efsio Pitzalis and Professor Olga Popovic Larsen. The project focuses on the development of an innovative structural typology that makes the construction process simpler, faster, and more sustainable. These characteristics are obtained by studying the entire production process, from prefabrication with laser cutting machines to dry assembly on site. The research deals with the possible application areas of the system under examination, placing itself on the long line of kinetic and adaptable architectures. Starting from the studies of Yona Friedmann and the Archigram group, passing through the inventions of Richard Buckminster Fuller and Frei Otto, a historical path is outlined that has adaptivity as its watchword.

Project title: DISABILITY, EXPERIENCE, AND ARCHITECTURE: TOWARDS INCLUSIVE SPORT AND LEISURE BUILDINGS

Scientific Responsible: Popovic Larsen, Olga  
Partner institutions: The Royal Danish Academy of Fine Arts, Innovation Fund Denmark, FORCE4 ARCHITECTS A / S.  
Personnel involved: Kajita, Masashi, Cassi, Roberta  
Dates: 01/10/2018 → 31/03/2022

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

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**ISI Web of Science Subject Categories:**

1. Architecture;
2. Materials Science, Paper & Wood;
3. Green & Sustainable Science & Technology;
4. Construction & Building Technology;
5. Materials Science, Composites;
6. Industrial;
7. Urban Studies;
8. Regional & Urban Planning;
9. History;
10. Economics.

**Scientific-Disciplinary Sectors:**

- ICAR/14
- ICAR/12
- ICAR/10
- ICAR/11
- ICAR/18
- ICAR/17
- ICAR/20
- ICAR/21
- SECS-P/08
- ING-IND/22
- ING-IND/17

**Keywords:**

- Architecture
- Innovative structures
- Adaptable buildings
- Digitization
- New materials
- Industry 5.0
- Urban planning
- Logistics
- Digital infrastructure
- Recycled wood
- Structural optimization

**ERC Categories:**

- PE8\_3 - Civil engineering, Architecture;
- PE8\_9 - Production technology, process engineering
- PE8\_10 - Industrial design

- PE8\_11 - Sustainable design
- PE8\_12 - Lightweight construction, textile technology
- PE8\_8 - Materials engineering;
- SH5\_6 - History of art and architecture, arts-based research;
- SH2\_9 Urban, regional and rural studies