Francesco Laccone

Curriculum Vitae et Studiorum

Personal Information

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Work Address	ISTI - Institute of Information Science and Technologies "A. Faedo" CNR - National Research Council of Italy via Giuseppe Moruzzi 1, Pisa 56124, Italy
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Research Statement

I am Post-Doctoral Researcher at the ISTI - CNR in Pisa and Adjunct Professor at the University of Pisa. My research focuses on Structural Design and Architectural Geometry, which is an interdisciplinary topic that aims to design, model, optimize, and manufacture complex free-form architectures through the tight collaboration and the synergy of several disciplines, such as differential geometry, algorithmic mathematics, computer graphics, engineering and industrial practice. My main research contributions are published in top-ranked international journals and presented at the most important conferences of the fields of structural and architectural design and computer graphics as well.

Based on my experience, research in Architecture and Building/Structural Engineering need to address two main challenges in current times: (i) material efficiency, and (ii) effective collaboration between the many disciplines involved in the architectural design process. The approach I pursue for the first is based on material knowledge, awareness of structural schemes and identification of possible optimization procedures that aim to reduce the material usage in buildings and their components, thus making them lighter and less energy-intensive. Concerning the second, in my experience, geometry processing and computer science offer innovative methods and procedures to manage the complexity and constraints of architectural design processes, while mediating among different specialties by providing common language. The deriving advancement constitutes the starting point for performance-based design automation and digital fabrication. Indeed, nowadays advanced fabrication technologies not only constitute the chance to fill the gap with respect to other productive sectors in terms of quality, efficiency and economy, but they can also expand the space of possible solutions and lead to the extreme customization that architecture needs.

Summary

Current Position

01/05/2020–ongoing **Postdoctoral Researcher**, *Assegno di Ricerca Post-Dottorale*.
Visual Computing Lab, ISTI - CNR, Pisa
via Giuseppe Moruzzi 1, Pisa 56124, Italy
Project: "Computational Methods for the Architectural Design" ("Metodi Computazionali per Design Architetturale")
Supervisor: Dr. Luigi Malomo
Protocol ISTI-CNR n. 0001136/2020 of 28/04/2020 (conferment)
Protocol ISTI-CNR n. 0001440/2021 of 20/04/2021 (renewal)
Protocol ISTI-CNR n. 0001213/2022 of 20/04/2022 (renewal)
- *Main duties*: developing and managing research on architectural/structural design assisted by algorithms, on automation in construction and digital fabrication; studying computer graphics methods and evaluate their applicability in architecture; collaborating on developing and writing new research proposals; disseminating research (to the research community and to the general public); support and tutoring for MSc thesis.
- *Main achievements*: developing programming skills (C++) and knowledge on geometry processing; exhibition at Venice Biennale; ISTI Young Researcher Award

28/01/2020–ongoing **Adjunct professor**, *Professore a Contratto*.
Department of Energy, Systems, Territory and Construction Engineering, University of Pisa
Largo Lucio Lazzarino, 56122, Pisa
Course: Progetto di Strutture Speciali (Design of Special Structures, yearly),
Master of Architecture and Building Engineering (dual-degree), University of Pisa
Course Program: `shorturl.at/oyOX9` (a.y. 2021/2022); `shorturl.at/gtyz0` (a.y. 2020/2021); `shorturl.at/oxGT1` (a.y. 2019/2020)
Protocol University of Pisa n. 0003915/2022 of 09/09/2022 (a.y. 2022/2023)
Protocol University of Pisa n. 0004563/2021 of 14/09/2021 (a.y. 2021/2022)
Protocol University of Pisa n. 0004281/2020 of 12/10/2020 (a.y. 2020/2021)
Protocol University of Pisa n. 0000392/2020 of 28/01/2020 (a.y. 2019/2020)
- *Main duties*: teaching on computational design methods and parametric design, on developing automated pipelines for the architectural and structural design of complex structures and for digital fabrication, on Architectural Geometry (research-based inter-disciplinary field that combines architecture, engineering, and computer graphics); on the design of special structures (e.g. shells and grid shells, tall buildings, bending-active structures, tensegrity and reciprocal frames); studio tutoring for developing year projects; tutoring for MSc thesis.
- *Main achievements*: course co-organization and co-administration, developing learning-by-doing examples inspired by actual-built architecture, presentation skills in presence and online mode (due to pandemic), assisting and motivating students.

Previous Research Position

01/09/2021–30/06/2022 **Research Collaborator**, *Borsa di Ricerca*.
Department of Civil and Industrial Engineering, University of Pisa
Largo Lucio Lazzarino, 56122, Pisa
Project: "Modellazione numerica del comportamento dinamico del dispositivo antisismico TROCKSISD nonché assistenza alla sperimentazione sul prodotto soggetto ad impulsi dinamici" (10 months)
Supervisor: Prof. Maurizio Froli
Protocol University of Pisa n. 0004413/2021 of 31/08/2021 (conferment)
- *Main duties*: experimental design and testing of a large scale prototype of a new isolation device based on smooth rocking to protect vulnerable slender structures (such as statues); implementation of a representative numerical model.
- *Main achievements*: design of large-scale structural tests in static and dynamic condition, experimental data analysis, definition of analytical and numerical models based on the results.

01/11/2018– 30/04/2020 **Research Fellow**, *Assegno di Ricerca Professionalizzante*.
Visual Computing Lab, ISTI - CNR, Pisa
via Giuseppe Moruzzi 1, Pisa 56124, Italy
Project: "Progettazione ottimizzata di strutture architettoniche" within the PRIN project "D-Surf"
Supervisor: Dr. Luigi Malomo
Protocol ISTI-CNR n. 0003898/2018 (conferment)
Protocol ISTI-CNR n. 0003518/2019 (renewal)
- *Main duties*: developing and managing research on structural optimization of shells (e.g. glass shells, bending-active shells); studying Architectural Geometry methods; disseminating research (even to the general public).
- *Main achievements*: developing programming skills (MATLAB) and knowledge on geometry processing and on digital fabrication methods; Best Ph.D. Thesis Award of the University of Pisa; First Prize at IASS 2019; Short Term Mobility to UTS Sydney.

12/03/2019– 31/12/2019 **Research Collaborator**, *Borsa di Ricerca*.
Department of Energy, Systems, Territory and Construction Engineering,
University of Pisa
Largo Lucio Lazzarino, 56122, Pisa
Project: TROCKSISD" funded by the University of Pisa "Dimostratori Tecnologici"
Supervisor: Prof. Maurizio Froli
Protocol University of Pisa n. 0001927/2019 (conferment)
- *Main duties*: experimental design and test execution; developing research on small scale and large scale prototypes; studying dynamic behavior of friction and viscous damped seismic isolators; developing geometrical and computational models.
- *Main achievements*: knowledge on structural dynamics of isolation systems and coupled systems, programming skills, acquisition and post-processing of experimental data.

01/11/2015– 11/03/2019 **Ph.D. Student**.
Department of Energy, Systems, Territory and Construction Engineering,
University of Pisa
Largo Lucio Lazzarino, 56122, Pisa
Supervisors: Prof. Maurizio Froli (University of Pisa), Dr. Paolo Cignoni (ISTI - CNR)
- *Main duties*: state-of-the-art knowledge acquisition, conceptualization, developing and managing of own research, design experimental setups, testing.
- *Main achievements*: research planning, managing and assessment, WIBE Prize.

01/10/2017– 31/10/2018 **Volunteer Collaborator**.
Visual Computing Lab, ISTI - CNR, Pisa
via Giuseppe Moruzzi 1, Pisa 56124, Italy
- *Main duties*: developing computational pipelines for supporting the PhD thesis work.
- *Main achievements*: Computational design methods knowledge, programming skills (MATLAB).

Education

01/11/2015– 11/03/2019 **Ph.D. in Structural Engineering (ICAR/09).**
Department of Energy, Systems, Territory and Construction Engineering,
University of Pisa
Thesis title: *Reinforced and post-tensioned structural glass shells: Concept, morphogenesis and analysis*
Supervisors: Prof. Maurizio Froli, Dr. Paolo Cignoni
Grade: Ph.D. cum laude
Abstract: Glass shells are fascinating objects from both the aesthetic and structural engineering point of view, but are practically difficult to realize, and have a low safety level. This work explores a new structural concept for triangulated glass shells, in which the glass panels are both reinforced and post-tensioned. The net formed by the reinforcements constitutes a redundancy barrier to avoid global collapse in case of glass cracking. Thus, glass is prevented from carrying tensile stresses. The design is assisted by a novel algorithm for the automatic segmentation of the geometry of the shell and the derivation of the optimal cables distribution with respective pre-loads. The results are confirmed through global and local nonlinear analysis and experimental tests.

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2017 **PhD+ programme. Research, valorization, innovation and entrepreneurial mindset.**
University of Pisa
Interactive lectures combined with coaching and mentoring activities, given by top-level experts in innovation and technology transfer. PhD+ is one of the best practice of training in research valorisation, innovation and entrepreneurship, also recognized by the Network of Design for Resilient Entrepreneurship, within the ENDuRE European project.

2015 **Executive Master in Project Management.**
QUEC Quality Evolution Consulting srl (now QFORMA Business School)
(Agenzia accreditata Regione Toscana Cod. LUO272)
with a grant provided by the University of Pisa
Project management, time management, risk management, quality management, cost management, human resources, communication management, European projects, procurement, MS Project
Master Diploma: 21/11/2015, code num. 15M01

2011-2014 **MSc in Building-Structural Engingeering (LM-24).**
Department of Civil and Industrial Engineering
University of Pisa
Grade: 110/110 with hons (Magna cum laude)

2013-2014 **Science and technology of fire safety design and prevention (120 hours).**
Department Civil and Industrial Engineering
University of Pisa
Certificate: "Attestato di superamento dell'esame equipollente al Corso base di specializzazione in prevenzione incendi", 21/07/2014, prot. num. 3103/2014

2007-2011 **BSc in Building Engingeering.**
Department of Civil and Industrial Engineering
University of Pisa
Grade: 109/110

2009-2010 **Occupational Safety and Health Administration (OHSA) in building and construction sector (120 hours).**
Department Civil and Industrial Engineering
University of Pisa
Certificate: "Attestato di superamento dell'esame equipollente al corso di formazione per la sicurezza del lavoro nel settore edile (ai sensi dell'art. 98 comma 2 e 4 del decreto legislativo 9 aprile 2008, n.81 e ss.mm.ii e delibera del Senato Accademico n.44 del 13/1/2009"
Periodic training (40 hours) Certificate: Prot. num. 0001310/2016

Research Periods Abroad

2020 **University of Technology Sydney**, hosted by: Dr. Nico Pietroni, Senior Lecturer at the UTS School of Software; 10/02/2020-29/02/2020; as per invitation letter of Dr. Pietroni dated 8/09/2019; funding: CNR Short Term Mobility 2019 (Prot. CNR n. 0071741/2019 of 17/10/2019).

2017 **TU Delft**, hosted by: Dr. ir. Christian Louter, Assistant Professor of Structural Glass Design, TU Delft, Faculty of Architecture and the Built Environment (A+BE), Department of Architectural Engineering and Technology (AE+T); first period: 10/01/2017-14/04/2017; second period: 01/06/2017-30/09/2017, as per invitation letters of Dr. Louter dated 7/12/2016 (invitation) and 13/01/2017 (extension).

Grants

January 2020 - February 2020 **Short Term Mobility (STM) 2019 (21 days).**
on competitive call for CNR employees,
funded by: CNR - Consiglio Nazionale delle Ricerche
Prot. CNR n. 0071741/2019 of 17/10/2019

[redacted]

November 2015 – October 2018 **36 months Ph.D. scholarship.**
on competitive public exam,
funded by: Department of Energy, Systems, Territory and Construction Engineering, University of Pisa

June 2017 – September 2017 **Erasmus+ traineeship mobility for PhD students (4 months).**
funded by: University of Pisa

2015 **Scholarship for the Executive Master in Project Management**.
merit grant on call for University of Pisa postgraduates, funded by: University of Pisa

2007-2013 **University Scholarship.**
funded by: Azienda della Regione Toscana per il Diritto allo Studio Universitario

Awards

2020 **Young Research Award "Matteo Dellepiane" (Beginner) of ISTI - CNR** (togheter with other 2 young researchers), awarded to ISTI staff researchers less than 32 years old for a distinct contribute to the Institute activity with their scientific production

2019 **Best Ph.D. Thesis Award of the University of Pisa (2019)** together with other 13 theses (Dec. Rettorale, Protocol n. 123832, 19.11.2019)

2019 **First Prize at the Competition and Exhibition of innovative lightweight structures** organized by the IASS Working Group 21 within the FORM and FORCE, joint international conference of IASS Symposium 2019 and Structural Membranes 2019 with the *FlexMaps Pavilion*, a 4x4 meters CNC-milled plywood structure (Barcelona, Spain, 7-11/10/2019)

2017 **Merit Award WIBE Prize 2017 edition** (World Innovation in Bridge Engineering) with the contribution: Froli M., Laccone F., Natali A. *"The TVTδ "rainbow" bridge: a new technique for long-spanned, highly transparent footbridges"* (Award ceremony at IABSE Symposium in Guimarães, Portugal, 26/03/2019, award given by the President of the Portuguese Republic Marcelo Rebelo de Sousa)

Exhibitions

04/02-02/03/2022 and 17/03/2022-ongoing **FlexMaps Pavilion, at the Comune di Pisa**: 4x4 meters CNC-milled bending-active plywood structure (with Cignoni P., Malomo L., Pietroni N., Ponchio F., Callieri M., Alderighi T., Muntoni A.), first installation at the hall of Palazzo Gambacorti, second installation at the Arsenali Medicei, Pisa

22/05-21/11-2021 **FlexMaps Pavilion meta-material computational design, at the 17th International Architecture Exhibition, La Biennale di Venezia "How will we live together?"** curated by Hashim Sarkis, Italian Pavilion "Resilient Communities" curated by Alessandro Melis, Vittorio Giorgini's exhibition curated by Marco Del Francia: 4x4 meters CNC-milled bending-active plywood structure (with Cignoni P., Malomo L., Pietroni N., Ponchio F., Callieri M., Alderighi T., Muntoni A.), Biennale Catalogue: Melis A., Medas B., Pievani T., *Catalogo del Padiglione Italia «Comunità Resilienti» alla Biennale Architettura 2021. Catalogo della mostra (Vol. 1/b)*, D Editore, ISBN 8894830683, `shorturl.at/bnwFY`

24/02/2020-10/08/2020 **FlexMaps 2.0, at the UTS Faculty of Architecture + UTS School of Engineering and IT**: anticlastic CNC-milled bending-active plywood structure fabricated during the STM (with Cignoni P., Malomo L., Pietroni N., Schork T., Voorderhake D., Wang L., Gonsalves N.), `shorturl.at/huwAY`

18-20/10/2019 **FlexMaps Pavilion, at the Maker Faire in Rome**: 4x4 meters CNC-milled bending-active plywood structure (with Cignoni P., Malomo L., Pietroni N., Ponchio F., Callieri M., Alderighi T.), `shorturl.at/hjqK1`

7-11/10/2019 **FlexMaps Pavilion, at the Competition and Exhibition of innovative lightweight structures** organized by the IASS Working Group 21 within the FORM and FORCE conference, Barcelona: 4x4 meters CNC-milled bending-active plywood structure (with Cignoni P., Malomo L., Pietroni N., Ponchio F., Callieri M., Alderighi T., Pingi P.), `shorturl.at/brAU2`

Research Projects participation

1/11/2018–30/04/2020 **PRIN 2015: "D-Surf: Scalable Computational Methods for 3D Printing Surfaces" (2017 - 2020), grant no. 2015B8TRFM CUP B52F15000470005, funded by: Ministry of Education, Universities and Research; amount: €456,500 (€67,936 for ISTI - CNR)**, Associated with the position: Research Fellow ISTI - CNR.

The project investigates multi-scale algorithm for the design of surface patterns of given mechanical and aesthetic properties, whose results are experimentally evaluated. The main objective is to provide new methods for design and digital fabrication (i.e. for using CNC machines, 3D printers etc.). My main research contribution concerns a method for generating glass shell structures with post-tensioned cables, starting from a generic quasi-membrane surface. The contribution has been developed during the Research Fellow period and is included in the Computer Graphics Forum paper (2019).

12/03/2019–31/12/2019 **Bando Dimostratori Tecnologici 2018: "Tribological ROCKing Seismic ISolation Device (TROCKSISD)"; Conferment Prot. University of Pisa 4889/2019; funded by: University of Pisa; amount: €42,000.00**, Associated with the position: Research Collaborator University of Pisa.

The project concerns the theoretical and experimental study of an seismic isolation device that protects artifacts or in general slender structures. The project required engineering and prototyping of a large scale device (1.8x1.8x1.5 m), its experimental testing and subsequent calibration of representative models. The idea has been validated and patented. My contribution in this project consisted in conceptualizing and writing the research proposal, research work (in 2019) and dissemination. The main outcomes are published in the CompDyn proceedings (2019), Engineering Structures (2019), and recently in the J. of Earthquake Engineering.

30/10/2015–16/01/2017 **University Research Projects PRA2016: "Territorial emergencies: protection of urban areas and infrastructures from extreme climate events"; project ID: PRA_2016_14; funded by: University of Pisa; amount: €40,500.00**, Associated with the position: Ph.D. Student.

This project promoted collective research across multi-disciplinary teams of the University of Pisa. As consequence of extreme climatic events, such as repeated and intensive rainstorms over small areas, significant failures and disruptions affected constructions of historical value. The project addresses causes and possible mitigation actions from the viewpoint of hydraulics, hydraulic constructions, health and environmental engineering, structural engineering, energy engineering and landscape design for preventive purposes. My contribution concerns the structural design, optimization and fabrication of shelters for archaeological and valuable sites and is included in the book chapter (2018).

Bibliometric Info

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Scopus ID 57194570621

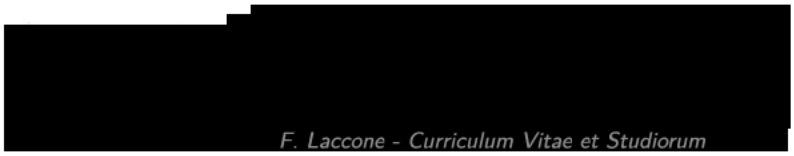
Google Scholar H-index: 6; Citations: 97

Elsevier Scopus H-index: 6; Citations: 65

Pubblications

International journal papers

2022 Laccone F., Gaudioso D., Malomo L., Cignoni P., Froli M. *Vorogrid: A static-aware variable-density Voronoi mesh to design the tube structure tessellation of tall buildings*, in Computer-Aided Civil and Infrastructure Engineering, John Wiley & Sons; DOI:10.1111/mice.12912



2022 Laccone F., Malomo L., Callieri M., Alderighi T., Muntoni A., Ponchio F., Pietroni N., Cignoni P. *Design and construction of a bending-active plywood structure: the Flexmaps Pavilion*, in Journal of the International Association for Shell and Spatial Structures, v. 63, pp. 98–114, IASS-Madrid; DOI:10.20898/j.iass.2022.007

2022 Manolas I., Laccone F., Cherchi G., Malomo L., Cignoni P. *Automated Generation of Flat Tileable Patterns and 3d Reduced Model Simulation*, in Computers and Graphics, v. 106, pp. 141–151 Elsevier; DOI: 10.1016/j.cag.2022.05.020

2021 Giresini L., Puppio M.L., Laccone F., Froli M. *Experimental and numerical investigation on a passive control system for the mitigation of vibrations on SDOF and MDOF structures: mini Tribological ROCKing Seismic Isolation Device*, in Journal of Earthquake Engineering, Taylor & Francis Group; DOI:10.1080/13632469.2021.1964646

2021 Laccone F., Malomo L., Pietroni N., Cignoni P., Schork T. *Integrated computational framework for the design and fabrication of bending-active structures made from flat sheet material*, in Structures, v. 34 pp. 979-994, Elsevier; DOI: 10.1016/j.istruc.2021.08.004

2021 Laccone F., Casali A., Sodano M., Froli M. *Morphogenesis of a bundled tall building: Biomimetic, structural, and wind-energy design of a multi-core-outrigger system combined with diagrid*, in The Structural Design of Tall and Special Buildings, v. 30, 6, e1839, John Wiley & Sons; DOI: 10.1002/tal.1839

2020 Laccone F., Froli M. *Conceptual design and FEM structural response of a suspended glass sphere made of reinforced curved polygonal panels*, in Glass Structures & Engineering, Springer; DOI: 10.1007/s40940-020-00130-w

2020 Laccone F., Malomo L., Pérez J., Pietroni N., Ponchio F., Bickel B., Cignoni P. *A bending-active twisted-arch plywood structure: computational design and fabrication of the FlexMaps Pavilion*, in SN Applied Sciences, Springer Nature; DOI: 10.1007/s42452-020-03305-w

2020 Froli M., Laccone F. Natali A. *TVTδ Concept for Long-Span Glass–Steel Footbridges*, in Journal of Bridge Engineering, 25.1: 04019117, American Society of Civil Engineers; DOI: 10.1061/(ASCE)BE.1943-5592.0001514

2020 Laccone F., Louter C., and Froli M. *Glass-steel triangulated structures: parametric nonlinear FE analysis of in-plane and out-of-plane structural response of triangular laminated glass panels*, in Journal of Architectural Engineering, American Society of Civil Engineers. DOI: 10.1061/(ASCE)AE.1943-5568.0000374

2019 Laccone, F. Malomo L., Froli, M., Cignoni P., Pietroni N. *Automatic Design of Cable-Tensioned Glass Shells*, in Computer Graphics Forum, John Wiley & Sons; DOI: 10.1111/cgf.13801

2019 Froli M., Giresini L., Laccone F. *Dynamics of a new seismic isolation device based on tribological smooth rocking (TROCKSISD)*, in Engineering Structures, 193, pp. 154-169, Elsevier; DOI: 10.1016/j.engstruct.2019.05.014

2018 Froli M., Laccone F. *HYGLASS: Design Proposal for an Integrated Multifunctional Hybrid Glass-Steel Structure*, in International Journal of Structural Glass and Advanced Materials Research, Vol. 2, Issue 1, 15-21, Science Publications; DOI: 10.3844/sgamrsp.2018.15.21

2018 Froli M., Laccone F. *Static concept for long span and high-rise glass structures*, in Journal of Architectural Engineering, ASCE, Vol. 24, Issue 1, American Society of Civil Engineers; DOI: 10.1061/(ASCE)AE.1943-5568.0000285

2017 Froli M., Laccone F. *Experimental static and dynamic tests on a large-scale free-form Voronoi grid shell mock-up in comparison with finite-element method results*, in International Journal of Advanced Structural Engineering, Springer; DOI: 10.1007/s40091-017-0166-9

2017 Froli M., Laccone F., Maesano D. *The TVT glass pavilion: theoretical study on a highly transparent building made with long-spanned TVT portals braced with hybrid glass-steel panels*, in Buildings, 7(2), 50, MDPI; DOI: 10.3390/buildings7020050

2017 Corio E., Laccone F., Pietroni N., Cignoni P. & Froli M.*Conception And Parametric Design Workflow For A Timber Large-Spanned Reversible Grid Shell To Shelter The Archaeological Site Of The Roman Shipwrecks In Pisa*, in International Journal of Computational Methods and Experimental Measurements, Vol. 5, No. 4, pp. 551-561, WIT Press; DOI: 10.2495/CMEM-V0-N0-1-11

Conference paper contributions

2022 Laccone F., Manolas I., Malomo L., Cignoni P. *Exploratory study on a segmented shell made of recycled-HDPE plastic*, Proceedings of the IASS Annual Symposium 2020/21 and the 7th International Conference on Spatial Structures 'Inspiring the Next Generation', 23 – 27 August 2021, Guilford, UK, S.A. Behnejad, G.A.R. Parke and O.A. Samavati (eds.)

2020 Laccone F., Malomo L., Pietroni N., Froli M., Cignoni P. *Automated Design and Analysis of Reinforced and Post-Tensioned Glass Shells*, Challenging Glass Conference Proceedings, v. 7, sep. 2020. ISSN 2589-8019. DOI: 10.7480/cgc.7.4496

2019 Laccone F., Malomo L., Froli M., Cignoni P., Pietroni N. *Concept and cable-tensioning optimization of post-tensioned shells made of structural glass*, Form And Forces Proceedings

2019 Laccone F., Malomo L., Pérez J., Pietroni N., Ponchio F., Bickel B., Cignoni P. *FlexMaps Pavilion: a twisted arc made of mesostructured flat flexible panels*, Form And Forces Proceedings

2019 Froli M., Giresini L., Laccone F. *A new seismic isolation device based on tribological smooth rocking (TROCKSISD)*, CompDyn, M. Papadrakakis, M. Fragiadakis (eds.)

2018 Froli M., Laccone F. *Hybrid GLAss-Steel Stele (HYGLASS): preliminary mechanical study on a smart tetrahelical cantilevering tall structure*, Challenging Glass Conference 6, Vol. 6, 611-616; DOI: 10.7480/cgc.6.2181

Book chapters

2018 Froli M., Laccone F. *Methods to protect the archaeological sites against extreme climatic events*, in Sassu M. (a cura di), *Territorial Emergencies: protection of urban areas and infrastructures from extreme climate events*, Pisa University Press; ISBN: 9788867418169

Technical Reports

2022 Favilli A., Giorgi D., Laccone F., Malomo L., and Cignoni P., *Statics-aware 3D gridshells: a differential approach towards shape optimization*, ISTI Technical reports, ID 469638.

2022 Favilli A., Giorgi D., Laccone F., Malomo L., and Cignoni P., *Geometric deep learning for statics-aware 3D gridshells*, ISTI Technical reports, ID 469641.

Monographs/PhD Thesis

2019 Laccone F. *Reinforced and post-tensioned structural glass shells: Concept, morphogenesis and analysis*, PhD Thesis, University of Pisa, DOI:10.13131/unipi/etd/03062019-163928

Patents

2019 Sassu M., Giresini L., Puppio M.L., Laccone F. *Teca involucro per l'esposizione ed il trasporto di manufatti di pregio (Case for the display and transport of valuable artifacts)*, Reference: 102019000012108, 17/07/2019, Italian Patent

2019 Froli M., Giresini L., Laccone F. *Dispositivo per proteggere manufatti, in particolare opere d'arte, da azioni sismiche e fenomeni vibratori in genere (Device for the protection of artifacts, in particular art works, from seismic actions and vibrations)*, Applicant: University of Pisa; Reference: 102019000005478, 09/04/2019, Italian Patent

2017 Froli M., Laccone F. *Nodo strutturale per il collegamento di elementi di involucro edilizio, e struttura reticolare comprendente detto nodo (Reticular structure with nodes, rods and panels)*, Applicant: University of Pisa; Reference: WO2018234965A1 (IT 102017000069255), 21/06/2017, Italian Patent

Conference talks

2021 *Exploratory study on a segmented shell made of recycled-HDPE plastic*, at the IASS Annual Symposium 2020/21 and the 7th International Conference on Spatial Structures 'Inspiring the Next Generation', 23 – 27 August 2021 (moved online due to pandemic)

2020 *FlexMaps 2.0: bending active structures with optimized spiral mesostructures*, at 1st International Workshop for Shell and Spatial Structures, 25-26/06/2020 (moved online due to pandemic)

2019 *Automatic Design of Cable-Tensioned Glass Shells*, at Pacific Graphics 2019, Seoul, Korea 14-17/10/2019

2019 *FlexMaps Pavilion: a twisted arc made of mesostructured flat flexible panels*, at Form And Forces, joint International Conference (IASS Symposium 2019 and Structural Membranes 2019), Barcelona, Spain, 7-10/10/2019

2019 *Concept and cable-tensioning optimization of post-tensioned shells made of structural glass*, at Form And Forces, joint International Conference (IASS Symposium 2019 and Structural Membranes 2019), Barcelona, Spain, 7-10/10/2019

2019 *A new seismic isolation device based on tribological smooth rocking (TROCKSISD)*, at CompDyn, 7th ECCOMAS Thematic Conference on Computational Methods in Structural Dynamics and Earthquake Engineering, Crete, Greece, 24–26/06/2019

2018 *Hybrid GLAss-Steel Stele (HYGLASS): preliminary mechanical study on a smart tetrahelical cantilevering tall structure*, at Challenging Glass Conference 6, 17-18/05/2018, TU Delft (The Netherlands)

2017 *HYGLASS: design proposal for an integrated multifuntional hybrid glass-steel structure*, at DCEE, 6th International Workshop on Design in Civil and Environmental Engineering, 9-11/11/2017, University of Cagliari

Invited talks

2019 *Geometric & Structural Optimization: 3 case studies*, at Università degli Studi di Roma "Tor Vergata" - DICII, invited by: Dr. Ilaria Giannetti and Dr. Andrea Micheletti, Rome, 15/11/2019

2018 *Theoretical Dynamics of a new Seismic Insulation Device based on Tribological Rocking*, at 3rd International Workshop on Traditional and Innovative Approaches in Seismic Design, University of Minho, Guimarães (Portugal), 26/04-28/04/2018

2016 *TVT, Travi Vitree Tensegrity: travi modulari segmentate in vetro armato precompresso per strutture a grande luce*, at XXXI Convegno Nazionale ATIV (Associazione Tecnici Italiani del Vetro), Parma, 21/10/2016

2016 *Conception and design of hybrid, high-rise and long spanned glass structures*, at 1st International Workshop on Traditional and Innovative Approaches in Seismic Design, Vorhoelzer Forum, TUM Main Campus, Munich (Germany), 31/03- 03/04/2016

Dissemination talks

2021 *Architetture del futuro: leggerezza, forma e algoritmi*, at Bright Tech Talk 2021, Pisa, 24/09/2021

International Association Membership

2016-ongoing IASS International Association for Shell and Spatial Structures (N. 44814106)

Editorial Activities

2021-ongoing Member of the Editorial Board of Springer Nature Applied Sciences, Springer

2021-ongoing Review Editor on the Editorial Board of Sustainable Design and Construction (specialty section of Frontiers in Built Environment)

Reviewer of Journal Papers/Scientific works

2020-22 Engineering Structures, Elsevier

2022 Mechanics Research Communications, Elsevier

2022 Architecture, MDPI

2022 Journal of Applied and Computational Mechanics, Shahid Chamran University of Ahvaz

2022 Shape Modeling International (SMI 2022), papers published in a special issue of Computers and Graphics, Elsevier

2021 Thesis Award Committee for the EG-Italy Thesis Award at Smart Tools and Applications in Graphics (STAG) 2021

2021 Construction Material, MDPI

2022-21 Applied Sciences, MDPI

2021 Structures, Elsevier

2020-2021 Journal of Bionic Engineering, Springer Nature

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2020-2021 Materials, MDPI

2020 International Journal of Architectural Computing, SAGE Publishing

2020 Designs, MDPI

2020 GMP 2020: International Conference on Geometric Modeling and Processing (GMP) 2020, papers published in a special issue of Computer-Aided Geometric Design (CAGD, Elsevier)

Software development

2019-ongoing Double-Layer Grid Shell, at ISTI - CNR. C++ software that creates and optimizes a double layer grid shell, starting from a continuous shell that is submitted to high bending deformation.

2017-2019 Tension Minimizer, at ISTI - CNR. MATLAB software based on the method published in Computer Graphics Forum (2019) that optimizes the number and position of post-tensioned cables over a segmented glass shell in order to minimize its tension.

Organizing Committee

2019 Seminar: "Structural Glass Research at TU Delft", Speaker: Dr. ir. Christian Louter; Aula Magna Pacinotti, School of Engineering, 12/03/2019

2018 Seminar: "TVT. Genesi ed evoluzione di una tecnica costruttiva in sistema ibrido precompresso vetro-acciaio"; Speaker: Prof. M. Froli; Aula Magna "Ulisse Dini"; School of Engineering, 18/06/2018

2016 Seminar: "HYGLASS - smart tetrahelicoidal HYbrid GLAss-Steel Stele"; Speakers: Prof. P. Ferragina, Prof. M Ceraolo, Prof. M. Froli, Prof. R. Giglioli, Prof. F. Leccese, Prof. R. Saletti; Aula Magna "Ulisse Dini"; School of Engineering, 14/10/2016

2016 Seminar: "Introduction to parametric modeling"; Speaker: A. Marsala; Aula PN8; School of Engineering, 20/05/2016

Teaching and studio tutoring

2020-ongoing Adjunct professor (Professore a contratto) of "Design of Special Structures" within the dual-degree MSc Course in Architecture and Building Engineering (chair: Prof. Ing. M. Froli), University of Pisa, contract Num. Prot. 0000392/2020 for the a.y. 2019/2020 (20 hours), 0004281/2020 for the a.y. 2020/2021 (54 hours), 0004563/2021 for the a.y. 2021/2022 (54 hours), 0003915/2022 for the a.y. 2022/2023 (54 hours)

2019-ongoing Subject Expert, Exam Committee Member and Assistant to the Chair (Cultore della Materia) of "Structural Design" (chair: Prof. Ing. M. Froli) for the MSc Course in Civil Engineering, University of Pisa, Num. Prot. 108/2019, Num. Prot. 2430/2022

2015-2018 Teaching Assistant of "Design of Special Structures" (chair: Prof. Ing. M. Froli), within the MSc Course in Civil Engineering and Architecture, University of Pisa, Num. Prot. 0006527/2018 (30 hours), funded by: Fondo Giovani; Num. Prot. 0004221/2017 (15 hours), funded by: Fondo Giovani; Num. Prot. 0003645/2015 (20 hours), funded by: Fondo Giovani

2016-2019 Teaching Assistant of "Structural Design - Steel Design and basis of Earthquake Engineering" (Tecnica delle Costruzioni, chair: Prof. Ing. M. Froli), within the MSc Course in Civil Engineering, University of Pisa, Num. Prot. 0000401/2019 (30 hours), funded by: Fondo Giovani; Num. Prot. 0003295/2018 (30 hours), funded by: Fondo Giovani; Num. Prot. 0003563/2017 (20 hours), funded by: Fondo Giovani

2016-2017 Guest Lecturer of Structural Glass Design (3 hours on 19/05/2016, and 3 hours on 17/05/2017) within the MSc Course of Energy Engineering (invited by: Dr. Ing. L. Giresini), University of Pisa

2017 Studio Tutor for the "Glass Technoledge Course" within the MSc in Civil Engineering and MSc in Architecture (Prof. Ir. R. Nijsse, Dr. Ir. F. Veer, Dr. Ir. C. Louter), TU Delft (during the research abroad period)

2016-2017 Teaching Assistant of "Structural Design - Concrete design and basis of design" (Tecnica delle Costruzioni, chair: Prof. Ing. M. Froli) within the MSc Course in Civil Engineering, University of Pisa, Num. Prot. 0003988/2016 (20 hours), funded by: Fondo Giovani

MSc thesis supervision

ongoing Leonard Mouchantef, *Nonlinear analysis and digital fabrication of space frame structures* (tentative title), MSc Structural and Building Engineering, University of Pisa, URN: to appear

ongoing Sandro Menicagli, *Automated design of segmented concrete shells* (tentative title), MSc in Architecture and Building Engineering, University of Pisa, URN: to appear

ongoing Dario Del Seppia, *Design for reuse of a multi-disciplinary sport arena* (tentative title), MSc in Architecture and Building Engineering, University of Pisa, URN: to appear

ongoing Elena Scandurra, *Computational Design of 2D tileable patterns for Metamaterial definition* (tentative title), MSc Mathematics, University of Pisa, URN: to appear

2022 Andrea Favilli, *Statics-aware optimization of grid shells with Deep Learning*, MSc Mathematics, University of Pisa, URN: etd-04222022-102508

2020 Domenico Gaudioso, *La tassellazione di voronoi negli esoscheletri degli edifici alti*, MSc Structural and Building Engineering, University of Pisa, URN: etd-11052020-121938

2020 Mohamed Abdelmagid Daba, *Parametric optimization and experimental tests of a new seismic isolation device TROCKSISD*, MSc Structural-Building Engineering, University of Pisa, URN: etd-06022020-224941

2020 Enrico Valentino Tagliaboschi, *HexBox Canopy: a Rapid Assembly Segmented Timber Shell with Wedge Joints*, MSc in Architecture and Building Engineering, University of Pisa, URN: etd-01212020-112950

2019 Alberto Lazzeri, *Digital topological optimization process of a spatial truss node*, MSc Structural and Building Engineering, University of Pisa (in collaboration with ARUP), URN: etd-09062019-114146

2019 Tommaso Fancelli, *Comportamento strutturale statico e dinamico di una grande sfera sospesa in sistema ibrido vetro-acciaio*, MSc Structural-Building Engineering, University of Pisa, URN: etd-04082019-192352

2019 Matteo Tomellini, *Comportamento dinamico dell'isolatore sismico TROCKSISD*, MSc Structural-Building Engineering, University of Pisa, URN: etd-03222019-104525

2018 Lorenzo Lazzaroni, *Structural design and experimental validation of an innovative hybrid lightweight sandwich glass panel*, MSc in Civil Engineering, University of Pisa, URN: etd-10232018-131135

2018 Alberto Casali, *Digital Biomimetic Morphogenesis of a High-Rise Building with respect to Wind Energy Production*, MSc in Architecture and Building Engineering, University of Pisa, URN: etd-09212018-095252

2018 Marco Sodano, *Digital Biomimetic Morphogenesis of a High-Rise Building with respect to Structural Shaping Optimization*, MSc in Architecture and Building Engineering, University of Pisa, URN: etd-09212018-102332

2018 Enrique Vagelli Saldana Vila, *Indagine teorica sul comportamento dinamico di un nuovo dispositivo di isolamento sismico per rocking*, MSc in Civil Engineering, University of Pisa, URN: etd-02082018-154228

2017 Özhan Topçu, *Kinetic Thin Glass Façade*, MSc in Building Technology, TU Delft, `http://resolver.tudelft.nl/uuid:77099af6-9d82-4d24-95e9-919fac11d0e8`

2017 Luca Guidi, *Sulla progettazione di una stele multifunzionale a struttura ibrida vetro-acciaio e geometria tetraelicoidale*, MSc in Civil Engineering, University of Pisa, URN: etd-02092017-093306

2016 Elena Corio, *An innovative sail-shaped shelter for the Ancient Ships Archaeological Site of Pisa*, MSc in Architecture and Building Engineering, University of Pisa, URN: etd-11212016-151530

(winner of the Eurographics Italian Chapter Best Thesis Award 2017)

2016 Marco Pellegrino, *Morphogenesis of a Toroidal Skywalk. Development, design and optimization*, MSc in Civil Engineering, University of Pisa, URN: etd-11162016-214517

2016 Agnese Natali, *Passerella pedonale di luce 30 m in struttura ibrida presollecitata vetro – acciaio. Studio di fattibilità*, MSc in Civil Engineering, University of Pisa, URN: etd-04142016-115929

(part of the winner team of the WIBE Prize 2017 edition Merit Award)

Professional Certifications

2014 **Professional qualification as Civil and Environmental Engineer.**
Section A, Albo degli Ingegneri
Enrolment in the professional register as Civil Engineer
Examination at: University of Pisa
Largo Lucio Lazzarino, 56122, Pisa
Diploma: certificate n. 20142769715

2014 **Professional qualification as Fire Risk Manager (Professionista Antincendio) according to the Ministry of Intern.**
Examination at: Collegio dei periti industriali e dei periti laureati della provincia di Pisa
via G.Ferraris n.21, Loc.Ospedaletto, 56121 Pisa
Diploma: "Attestato di frequenza e di profitto", 12/10/2014 con autorizzazione Min. Int. prot. n. 00113134 del 7/11/2014

2010 **Professional qualification as Safety Manager.**
Examination at: University of Pisa
Largo Lucio Lazzarino, 56122, Pisa
Diploma: "Attestato di superamento dell'esame equipollente Organizzazione e sicurezza del cantiere", 29/11/2010

Professional Experience

2021 **Structural and Architectural Design FlexMaps Pavilion.**
ISTI CNR, via Moruzzi 1, Pisa 56124, Italy
Protocol ISTI-CNR n. 0001526/2021 (assignment)
Structural and architectural design of the FlexMaps Pavilion for the Exposition at The Architecture Biennale of Venice 2021, as per Structural analysis report (Relazione di calcolo strutturale), May 17, 2021

2019 **Design Consultant for a Greenhouse.**
Giuseppe Capodanno, via T. Bandettini 291, 55100 Lucca (private owner)
Architectural and structural design of greenhouse made of structural glass located in Lucca.

2017 **Structural and FEM modelling Consultant for A.P.E.S. Pisa.**
Azienda Pisana Edilizia Sociale - Società consortile per azioni (A.P.E.S.) Via E. Fermi, 4 - 56126 Pisa
in collaboration with Associated Engineers LEM Associati – Via Micali n.22 – 57125 Livorno
Structural design and advanced modelling of a steel-concrete 7-stories tall building located in Pisa.

Dicember 2014-September 2015 **Design Engineer at FUKSAS Architecture.**
Fuksas Architecture srl, piazza del Monte di Pietà 30, 00186 Roma
Main activity: detailed design within the project "Beverly Center Renovation" for a shopping mall in Los Angeles, USA

Dicember 2014-September 2015 **Freelance Design Engineer.**
Preliminary and detailed design of a house in Infesta, Paredes De Coura (Minho, Portugal)
in collaboration with Arch. Tiago Sousa, rua Oliveira Monteiro 170-3° ESQ IRT. Porto (Portugal)

2014-2015 **Design Engineer - collaborator.**
Arch. Mimmo Rossi, via Cairoli n.134, Celenza Valfortore (FG)
Competition inviting ideas on *Riqualificazione della struttura comunale collocata al livello inferiore del belvedere di piazza Malice* of the Municipality of Celenza Valfortore (FG)

Technical skills

Advanced 2D and 3D design and modelling, editing, visualization and rendering softwares: Autocad, 3D Studio Max, Revit, Rhinoceros, Grasshopper, MeshLab, Meshmixer

Advanced Graphic design softwares: Adobe Illustrator, Photoshop, Indesign

Advanced FEM softwares: SAP2000, Strand7, ANSYS

Advanced Office suite, LaTeX

Advanced Programming in MATLAB

Good	Digital fabrication techniques, Experimental testing on structures
Good	Programming in C++, Mathcad, Mathematica
Basic	Phyton, GIS softwares: QGIS, ArcGIS

Personal and professional attitudes

- Team work attitude in multicultural environment, developed during the education path and professional activities;

- Independence and ability to manage work packages and meet deadlines;

- Teaching, presenting;

- Design and planning of experimental tests and preparation of specimens, developed at the Structural Laboratory of the University of Pisa ("Laboratorio Ufficiale per le Esperienze sui materiali da costruzione").

Languages

Italian	Native	
English	Advanced	*C1*
French	Basic	*A1*

Referees

Dr. Paolo Cignoni.
Visual Computing Lab, ISTI - CNR, via G. Moruzzi 1, 56124, Pisa
tel. +39 050 3152926; paolo.cignoni@isti.cnr.it

Prof. Ing. Maurizio Froli.
University of Pisa, Largo Lucio Lazzarino 1, 56126 Pisa
tel. +39 050 2218220; m.froli@ing.unipi.it

Dr. Nico Pietroni.
University of Technology Sydney, Building 11, 81, Broadway, Ultimo NSW 2007
nico.pietroni@uts.edu.au

I hereby authorize the use of my personal details solely for circulation in relation to the Italian Legislative Decree n.196/2003.

Pisa, September 21, 2022

Signature Francesco Laccone

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(*) ai sensi dell'art. 15, comma 1 della Legge 12/11/2011, n. 183 le certificazioni rilasciate dalla P.A. in ordine a stati, qualità personali e fatti sono valide e utilizzabili solo nei rapporti tra privati; nei rapporti con gli Organi della Pubblica Amministrazione e i gestori di pubblici servizi, i certificati sono sempre sostituiti dalle dichiarazioni sostitutive di certificazione o dall'atto di notorietà di cui agli artt. 46 e 47 del DPR 445/2000

N.B:

1) Datare e sottoscrivere tutte le pagine che compongono la dichiarazione.

2) Allegare alla dichiarazione la fotocopia di un documento di identità personale, in corso di validità.

3) Le informazioni fornite con la dichiarazione sostitutiva devono essere identificate correttamente con i singoli elementi di riferimento (esempio: data, protocollo, titolo pubblicazione ecc…).

4) Il CNR, ai sensi dell'art. 71 e per gli effetti degli artt. 75 e 76 del D.P.R. 445 del 28/12/2000 e successive modifiche ed integrazioni, effettua il controllo sulla veridicità delle dichiarazioni sostitutive.

5) La normativa sulle dichiarazioni sostitutive si applica ai cittadini italiani e dell'Unione Europea.

6) I cittadini di Stati non appartenenti all'Unione, regolarmente soggiornanti in Italia, possono utilizzare le dichiarazioni sostitutive di cui agli artt. 46 e 47 del D.P.R. 445 del 28.12.2000 limitatamente agli stati, alla qualità personali e ai fatti certificabili o attestabili da parte di soggetti pubblici italiani, fatte salve le speciali disposizioni contenute nelle leggi e nei regolamenti concernenti la disciplina dell'immigrazione e la condizione dello straniero.
Al di fuori dei casi sopradetti, i cittadini di Stati non appartenenti all'Unione autorizzati a soggiornare nel territorio dello Stato possono utilizzare le dichiarazioni sostitutive nei casi in cui la produzione delle stesse avvenga in applicazione di convenzioni internazionali fra l'Italia e il Paese di provenienza del dichiarante.

21/09/2022

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