University Academic Curriculum Vitae

Personal information Name: Francesca Condorelli

Education since leaving school
- **Master Degree in Building Engineering-Architecture** (A.A. 2015/16), Five years according to the European directive 85/384/CEE, University of Salerno. Final dissertation: An experimental algorithm for the evaluation of the error propagation in image-based survey - the case of study of the San Salvador Chapel in Ubeda, Spain.
- **PhD in Architectural and Landscape Heritage** (A.A. 2020/2021), Politecnico di Torino. Thesis: Photogrammetry and Deep Learning to improve Cultural Heritage records: extracting 3D metric information from historical images.

Present appointment
- Title of appointment: **Assistant Professor (RTDa)**
- Start of appointment: July 2022
- Employer (University, research institute, status of university / institute): Free University of Bozen
- Brief description of responsibilities:
  Research project: Digital Bozen and Brixen. Documentation, valorization and educational processes for heritage. Development of innovative methodologies for the integration of digital technologies for heritage (tangible and intangible) and aesthetic education, with a focus on the historical and artistic heritage South Tyrol.

  Courses:

  - Pedagogia e didattica dell'arte con particolare attenzione alla fascia di età (0)-2-7 (lab.)

  - Media Education - Design in Virtual Environments for Communication

  Bachelor in Communication Sciences and Culture Thesis Supervisor:

  - "Creatvity and percepton in the co-creaton of art with AI" by Sabine Platter (2024)
  - "The Impact of Social Media Algorithms: The Relationship between Algorithm-Driven Content, User Consumption and Addiction on Social Media" by Sabrina Kofler (2024)
  - "Between AI Innovation and Misinformation. A Comparative Analysis of the Social Impact of AI-generated Fake News on the Credibility of News Sources in South Tyrol and Globally" by Samira Tirler (2024)

Professional experience

From / to	Job title	Name of academic Institution	Academic level	responsibilities
02-07/2022	**Post-Doctoral Researcher**	Friedrich Schiller University Jena, Germany JUNIORPROFESSUR FÜR DIGITAL HUMANITIES MIT SCHWERPUNKT BILD- UND OBJEKTDATEN	Post Doc Researcher	In **Jena4D** an existing browser application for mobile devices (https://4dcity.org) will be extended to a participatory knowledge platform for a 4D representation of the entire city of Jena. This software application already enables a **virtual 3D impression of the historic city** based on photographs as well as **virtual**

				city tours and access to knowledge assets from open source platforms such as Wikipedia. In Jena4D, this application is now extended by a **crowdsourcing functionality**. Citizens can compile historical photographs, anecdotes and stories as well as create digital city tours and thus jointly create a public digital 4D history book for tourists, contemporary witnesses and subsequent generations. In this way, Jena4D pursues the goal of improving the visibility of the city and the library as well as the awareness of city history
05/2021-04/2022	**Post-Doctoral Researcher**	University of Padua, Cultural Heritage Department, Italy	Post Doc Researcher	**Photogrammetric survey** and **VR virtual tour** creation during the Italian Archaeological Mission in Gortys (Crete), the archaeological excavation in Nora (Italy) and Museo Civico and Cappella Scrovegni in Padua.
06-08/2019	**Visiting Research Fellow**	Tokyo Institute of Technology, Japan	PhD Candidate	Research activities: collecting and processing archives images of lost **Cultural Heritage**, metric survey, **teaching** at seminar and workshop on **photogrammetry** for architecture.
10/2016-09/2017	**Research Fellow**	University IUAV of Venice and University of Padova, Italy	Researcher	Research project: the Interdisciplinary and InterUniversity research project is entitled "TU-Cult - Cultural tourism knows no crisis: innovative strategies for the rehabilitation, preservation and multi-level accessibility of artistic and architectural Heritage for the improvement of intelligent fruition - Data communication operations for cultural and tourism purposes". The aim was the acquisition, processing and communication of data related to **cultural heritage** through ICT solutions of two representative monuments of the city of Padova: the church of Santa Maria dei Servi (XIV century) and the Basilica of Santa Giustina (XI century). In particular the project, in

				collaboration between academic research and **business partner DrawLight S.r.l**., consisted in data communication for **cultural and touristic promotion** and consists in design of apps for multimedia devices, interactive systems for web, applications for virtual and augmented reality and high technological content installations for immersive experience. Research activities: **laser scanning, photogrammetry, AR and VR apps development.**
02-07/2017	**Action Researcher**	DrawLight S.r.l., Padova, Italy	Researcher	Research activities in a **company**: VR database creation, AR and VR apps development.
05-09/2016	**Guest Researcher**	Fondazione Bruno Kessler – FBK, Trento, Italy	Post Graduation	Research project: automatic classification of LiDAR data in a GIS environment for feature detection and extraction of information store into a 3D spatial database for **valorization of Archaeological Medieval Silver Mining Ecomuseum.** Following a preliminary agreement with the Superintendence of the Autonomous Province of Trento (Dr. F. Marzatico) and the Argentario Ecomuseo (Dr L. Casagrande), who provided the data and the information necessary, the project tackled issues related to 3D data generation, classification, semantic enrichment and visualization and used the plateau area of Mount Calisio, close to the city of Trento, as case study. This area is of great interest for the presence of biodiversity-rich environments but particularly important as cultural and historical site as there are traces left from World War I as well as ancient silver mines which date back to the Middle Ages (XI-XII cent. AD) and experienced intense mining activities during that period. Documentation, valorization and

				communication needs are extremely important for such area. It was proceeded with the creation of a georeferenced database of the more important ancient mines accesses, a 3D GIS of the area and finally 3D surveys and virtual reconstruction of some ancient mining sites.
06-09/2014	**Erasmus Placement**	Laboratorio de Arqueología y Arquitectura de la Ciudad - LAAC, Granada, Spain	Master Degree	Research project: training activities carried out with Prof. Arch. Antonio Almagro Gorbea. The purpose was to acquire notable skills in **architectural photogrammetry** using stereo plotting digital system as well as photo blocks bundle adjustment. The case of study was the San Salvador Chapel in Ubeda, a 16th century Renaissance masterpiece of architecture included in a site inscribed in World Heritage List. The project of survey consisted in field work taking measurement and modeling the hypothetical original form of the object surveyed, studying the history and analyzing the characteristic of this architecture and similar buildings from the same period.

Awards

- **Premio dei** Premi by Presidente della Repubblica Italiana (December 2023)
- **Premio Nazionale dell'Innovazione** by PNICube (December 2022)
- **Best 100 Innovators in Italy** by Startupitalia (December 2022)
- **The ISPRS Foundation (TIF) Travel Grant Award** by The ISPRS Foundation (June 2022)
- **Best Italian Scientist Under35** and **Industria 4.0 Award** by GiovedìScienza (June 2021)
- Author selected as **cover story** by the editor in ISPRS Int. J. Geo-Inf., Volume 9, Issue 5 (May 2020)
- **Best Paper Oral Presentation Award** at 27th CIPA Symposium 2019 in Avila, Spain (September 2019)
- Finalist at **Young Author Award** of SIFET Conference in Venice, Italy (June 2019)

Experience in academic teaching

- **Teaching Assistant** at Politecnico di Torino, Italy (3 year, 2018-2021): Master Course in Architecture for Restoration and Valorization of Cultural Heritage: GIS and modelling for Cultural Heritage. (report as attached)
- Tokyo Institute of Technology, Japan (3 months, 2019): **teaching at seminar and workshop** on photogrammetry for architecture.
- **Master thesis supervision in Drawing (ICAR/17)**: "Una proposta di "Image-based e Additive Manufacturing" applicata allo studio della Sacra Capilla del Salvador di Úbeda", Candidate: Francesco de Lauro, Supervisor: prof. Salvatore Barba, Co-Supervisor: Francesca Condorelli

Organizing Committee	• **EARTH2023 - Digital Environment for Education Arts and Heritage**, Brixen, 2023 • **UID PhD Summer School – Applied Games for Heritage Education,** Brixen, 2023 • **ARTEDU – Educating in art / The art of educating Congress**, Brixen, 2022 • **UNFORESEEN PATHS #1 - Transcending boundaries and Sharing critical approaches to Architectural Heritage,** Stefania Stellacci (Iscte) & Francesca Condorelli
Other academic responsibilities	• **Europeana Network Association (ENA) Council Member** since Jan 2022.
Journal Reviewer	☐ Remote Sensing MDPI ☐ Scientific Report ☐ ISPRS International Journal of Geo-Information MDPI ☐ Heritage MDPI ☐ Buildings MDPI ☐ Applied Sciences MDPI ☐ Journal of Imaging MDPI ☐ ELCVIA ☐ DisegnareCom ☐ AISU ☐ 3EXP ☐ Explora UID
Memberships	CIPA ESACH ISPRS EUROPEANA Tech Community UID ReUSO Young Professionals Community – YPC
Courses and Workshop	☐ Copernicus Mooc, European Space Agency (2020) ☐ Photography for 3D modelling of Cultural Heritage, Tutorial at CIPA Conference 2019, Avila, Spain (2019) ☐ Introduction to Deep Learning and Tensorflow, CINECA, Roma, Italy (2018) ☐ Introduction to Python programming, CINECA, Roma, Italy (2018) ☐ Introduction to Scientific and Technical Computing in C, CINECA, Roma, Italy (2018) ☐ 14a School of Computer Graphics for Cultural Heritage, CINECA, Bologna, Italy (2018) ☐ Summer School: Cities Cultural Heritage and Digital Humanities, Politecnico di Torino, Italy (2018) ☐ Course of MicMac, Politecnico di Torino, Italy (2018) ☐ Course of Unity at DrawLight S.r.l., Padova, Italy (2017) ☐ OS: Linux and Microsoft
ICT Skills	☐ High-Performance Computing ☐ Programming Languages: Python

Machine Learning and Neural networks (TensorFlow)

 Software for photogrammetry (MicMac. Colmap, LPS, Metashape, 3DF, Zephyr Orthoware, Poivilliers)

 NeRF and Gaussian Splatting 3D

 Software for apps creation for VR/AR experience (Unity)

 Software for Virtual Tour (Kuula)

 Software for 3D modelling (Scene, Blender, CloudCompare, MeshLab)

 Software for analysis of geographic data (QGIS and GRASS)

Publications

2024

 *****Condorelli**. F., Luigini, A.: NeRF-driven algorithms applied on 360 images for 3D modelling of heritage in virtual environment, Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci (In press).

This study aims to fill a gap in existing research by focusing on the application of Neural Radiance Fields (NeRF) algorithms to cultural heritage case studies using equirectangular image data captured with 360° cameras. The main objective is to evaluate and compare the performance of various NeRF algorithms applied to equirectangular images, shedding light on their suitability for cultural heritage preservation. the experiments were carried out on the case study of the library of the seminar in Brixen (Italy). By evaluating the effectiveness of NeRF in combination with conventional photogrammetric methods, the research highlights NeRF's competence in capturing complex details and addressing the challenges encountered in fast and expeditious 3D reconstruction of heritage. The positive results manifest in precise reconstructions, affirming the potential of NeRF in promoting the accuracy and fidelity of 3D models. Despite the computational demands, the study supports further exploration of NeRF-based algorithms, highlighting advantages and some limitations.

 Basso, A., *****Condorelli**. F., Giordano, A., Morena, S., Perticarini, M.: Evolution of rendering based on radiance fields. The Palermo case study for a comparison between NeRF and Gaussian Splatting, Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci (In press).

In recent years there has been a rapid diffusion of new digitization methodologies based on radiance fields and the implementation of new rendering processes and learning systems based on neural networks. The article focuses on these new tools and how they can be used for the knowledge and dissemination of Cultural Heritage. A case study is then described regarding the video acquisition of a noble chapel of the Cemetery of Santa Maria dei Rotoli in Palermo to promote knowledge of 'fragile' artefacts, exposed to the risk of radical transformation or degradation, and thus protecting their conservation. The research aims to compare the first results obtained through the NeRF and Gaussian Splatting methodology which constitute the current state of the art of this type of processing; both the source algorithms (Nerfacto and 3D Gaussian Splatting) and the Luma AI web app were used, and data management was studied using third-party software such as Blender 3D, Unreal Engine 5.0 and the playcanvas game engine. The results obtained with this case study are of particular interest, above all for the processing of data useful for the visualization of heritage starting from unconventional acquisitions.

 Nicastro, G., Luigini, A., *****Condorelli**. F.: Stampa 3D e fruizione aptica per la

valorizzazione del patrimonio culturale abruzzese: il caso studio dei tabernacoli lignei dei frati marangoni tra XVII e XVIII sec, DAI Congress (In press).

The study presented here is aimed at using low cost technologies and tools for the digitalization and 3D prototyping of wooden tabernacles present in the Abruzzo area. The aim of the research is to define a workflow of economic and replicable work aimed at the creation of physical replicas of valuable artifacts such as wooden tabernacles of marangoni monks: through the combined use of acquisitions sfm, 3D modeling and FDM printing was intended to create a 3D printing reproduction suitable for haptic fruition thus favoring an autonomous, easy and safe experience of cultural heritage by a wider and inclusive category of users.

 __Condorelli__, F.: Rapid and low cost 3D model creation using NeRF for heritage videogames, REAACH-ID Congress (In press).

This research endeavors to contribute to the valorization of South Tyrol's rich cultural heritage by employing innovative methods in the development of interactive video games for heritage education. The focus of this research is on using fast and low-cost tools, specifically Neural Radiance Fields (NeRF), for the reconstruction of cultural heritage settings. NeRF is a powerful technique that leverages artificial intelligence-based algorithms for 3D modeling. The study concentrates on processing 360-degree images using NeRF to obtain 3D reconstructions of cultural heritage and aims to show strengths and weaknesses of applying this technique to this type of context.

 __Condorelli__, F., Higuchi, R., Murata, K., Ota, E., Takeda, K.: Unveiling the Byzantine Churches of Laconia Region in Greece: Exploring Landscape Perception Through Visualization, Visualizing Landscape Congress (In press).

This research deals with the topographical relationships surrounding Byzantine churches across three sites in Laconia, employing advanced survey techniques such as aerial photogrammetry and drones. The topological context, azimuth orientation, and network of natural resources are critical elements informing the analysis of these structures within the broader landscape. This interdisciplinary and technology-driven approach promises to open new dimensions in understanding the symbiotic relationship between Byzantine churches and their landscape. High-fidelity digital replicas, generated through survey techniques and advanced visualization tools, offer a virtual platform to explore the intricate details of these structures and their temporal evolution. This innovative approach allows researchers to bridge temporal gaps and examine the churches' current state within the broader environment.

 __Condorelli__, F.: Image-based and AR application to unveil hidden heritage: digitizing the Turris Babel in the illustration Athanasius Kircher's Archontologia, EARTH Congress (In press).

The objective of this research is to unveil the contents of the illustration of the Turris Babel in Athanasius Kircher's Archontologia, a heritage hidden both to scholars and tourists. By synergistically applying artificial intelligence, photogrammetry, and 3D modeling a conjectural architectural entity, the Tower of Babel, is materialized. The fruition of an augmented reality application culminates in the visualization of the model, engendering immersive and accessible experiences for diverse audiences, while concurrently promoting the widespread dissemination of research outcomes. The initial phase of this study is concerned with the reconstruction of the Turris Babel undertaking advanced photogrammetric techniques in conjunction with state-of-the-art 3D modeling methodologies, the second phase centers on the development of an augmented reality application, engineered to facilitate public access to and navigation of the 3D tower model.

analysis and assessment through the extraction of metric information from historical images.

 ☐ *__Condorelli__, F., Nicastro, G., Luigini, A..: The digitisation of Brixen for heritage education, 3EXP Congress (In press).

 This paper reports on the experiences of the EARTH_LAB laboratory of the Free University of Bozen/Bolzano, which has been working for years in the field of architectural representation and digitization of heritage with the aim of creating educational paths for art education, both in schools and museums. In particular, past and present projects of virtual and augmented reality for heritage education will be presented, with a focus on the enhancement of South Tyrol, especially the city of Brixen. A workflow for making the urban environment digital with the goal of developing interactive environments for heritage education and teaching will be presented. Specifically, the first phase concerns the acquisition of urban data of the historic center of Brixen with architectural survey campaigns of monuments and urban heritage that have been selected using 3D laser scanners, drones, 360° HDR photos. After the second phase of data processing, the third one consists of the production of navigable models of the heritage that are used for the construction of educational paths through VR and AR navigation for the realization of enhancement projects dedicated mainly to citizens but also to tourists.

2023

 ☐ *__Condorelli__, F.: Representing lost cultural heritage. Photogrammetry and artificial intelligence applied on historical images, Digital landscapes / Paesaggi digitali | 5, Aracne, Roma 2023, ISBN 979-12-218-0992-3.

 This book aims to give an analysis and assessment through the extraction of metric information from historical images and to experiment with its potentialities in the heritage field with the aim of valorising historical iconographical documentation. This documentation has been produced for many other purposes but actually contains something very valuable for Cultural Heritage: data and information. Specifically, the work explores how to extract and use dimensional data from historical images for documenting monuments, buildings and groups of buildings that no longer exist or were transformed over time.

 ☐ *__Condorelli__, F.: Image retrieval for 3D modelling of architecture using AI and photogrammetry, Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XLVIII-M-2-2023, 441–446, https://doi.org/10.5194/isprs-archives-XLVIII-M-2-2023-441-2023, 2023.

 This research is intended to provide an initial solution to the problem of finding images for processing by photogrammetry in special cases where these do not exist. An overview of existing artificial intelligence-based algorithms that enable the extension of source image dataset is reported. In particular, this research focused on the use of prompt-to-image systems for obtaining images to be used in reconstruction and then in the next step of 3D modelling. Thus, the combined use of these three techniques, AI, photogrammetry, and modelling allowed the creation of a model of a building that never existed except in the collective imagination, which is the tower of Babel. In particular, the case study chosen is the illustration in Kircher book present in the library of the Brixen seminary that is closed to the public and for which it was necessary to create a tool to enhance the value and knowledge of this heritage for external users. Therefore, the creation of an augmented reality app enabled the visualization of the model created by offering possibilities for immersive experiences and dissemination of the research to a wide audience.

Luigini, A., Tramelli, B., *__Condorelli__*, F., Nicastro, G., Basso, A.: Three experiences of imagin(g) heritage, IMG23. 4th INTERNATIONAL AND INTERDISCIPLINARY CONFERENCE ON IMAGES AND IMAGINATION, Publica, https://www.publicapress.it/index.php/book/img23/, 2023.

The contribution aims to share the interdisciplinary research approach of the EARTH - laboratory for digital environment for Education ARTs and Heritage of the Free University of Bozen/Bolzano by describing some research projects developed or under development in recent years. The projects presented concern: a) the prototype development of an applied game for heritage education, tested and validated; b) the development of an augmented version of an eighteenth-century book; c) the digital fabrication of a model of an eighteenth-century wooden tabernacle for double haptic and visual fruition, through an AR app.

 __Condorelli__, F., Luigini, A., Tramelli, B., Nicastro, G.: Drawing and Artificial Intelligence: Theoretical Statementsand Experimental Practicefor a Shared Poiesis, 44th international conference of representation disciplines teachers congress of Unione Italiana per il Disegno; Proceedings 2023https://doi.org/10.3280/oa-1016-c426, 2023.

The pervasiveness of digital technologies is fostering a rapid development of the set of technologies that fall within the Artificial Intalligence (AI) designation, and how many of the digital technological innovations have a major impact on the production of images and drawings. Studying how creativity interfaces with an AI system endowed with considerable autonomy in the production of an image is critical to understanding how the author must operate to govern the tool and guide its poiesis. The paper proposes a theoretical contextualization of the phenomenon of text-to-image applications in the landscape of art history and image production, closely linked with an explication of how such applications work, and then verifies their potential in the field of visual storytelling.

 __Condorelli__, F., Nicastro, G., Luigini, A..: Virtual experiences using digital technologies for South Tyrol heritage education, In: Münster, S., Pattee, A., Kröber, C., Niebling, F. (eds) Research and Education in Urban History in the Age of Digital Libraries. UHDL 2023. Communications in Computer and Information Science, vol 1853. Springer, Cham. https://doi.org/10.1007/978-3-031-38871-2_14, 2023.

This paper reports on the experiences of the EARTH_LAB of Free University of Bozen-Bolzano that has been working in the field of digitization of heritage for years with the aim of realizing educational paths, both in schools and museums, of art education and the study of graphic and visual sciences in the field of architectural representation, education and visual studies. In particular past and present projects about virtual and augmented reality for heritage education will be presented with a particular focus on the enhancement of South Tyrol heritage, especially of the two cities of Brixen and Bozen. A workflow will be presented to make digital the urban environment with the aim to develop digital services for heritage education and didactics. In particular the first step concerns the acquisition of urban data of the historical centers of Brixen and Bozen with architectural survey campaigns of the monuments and urban heritage that have been selected using 3D laser scanner, drones, 360° HDR photos. After the second step of data processing, the third steps consists in the production of navigable models of the heritage stored in an extensive digital catalogue of the heritage that could be used for different purposes such as simple visualization, geometric study, static verifications, protection. In particular there are used for the construction of educational paths through VR and AR navigation for implementing enhancement projects dedicated mainly to citizens but also to tourists. Moreover, the same models are used for the design and implementation of the serious game for heritage education in schools and the high degree of interdisciplinarity (scholars of graphic science, digital heritage, interaction design, art history, pedagogy and psychology are involved in

the research) provide the project with a wide scope of application and accuracy of the design process.

 *__Condorelli__, F., Luigini, A., Tramelli, B.: Digital Turris Babel. Augmented release of Athanasius Kircher's Archontologia, In: Giordano, A., Russo, M., Spallone, R. (eds) Beyond Digital Representation. Digital Innovations in Architecture, Engineering and Construction. Springer, Cham. https://doi.org/10.1007/978-3-031-36155-5_6, 2023.

The aim of this project is to show scholars and tourists what they cannot see because it is enclosed within the pages of the Athanasius Kircher's Archontologia. This was done thanks to the implementation of a workflow divided into two parts. The first part concerns the reconstruction of the model of the Turris Babel. This represents the most challenging part of the entire pipeline as it involves creating a model of an imagined architecture that never existed. By combining advanced photogrammetry and 3D modelling techniques, the model was created from the images in the text and compared with other designs of the tower. The second part of the workflow is the design of an augmented reality app to make the model of the tower navigable in 3D and available to the public.

 *__Condorelli__, F. and Morena, S.: Integration of 3D modelling with photogrammetry applied on historical images for cultural heritage. VITRUVIO - International Journal of Architectural Technology and Sustainability. https://doi.org/10.4995/vitruvioijats.2023.18831

The recovery of past architecture through 3D modelling is an important challenge today to the preservation of heritage. Decisive support for the interpretation of architecture can certainly come from historical images and old photographs that fix a portion of space at a specific time, keeping it unchanged over the years. This acquisition is decisive for studying architectures of the past that can be reinterpreted and analysed. Photos, in fact, capture the advance of time and the life of a building at a precise historical moment, becoming essential documents for the study and knowledge of heritage. An additional advantage is when these old images can be processed through Structure for Motion procedures and, the results obtained, used as support for a 3D model of buildings that no longer exist. The work shows an interesting pipeline applied to the Caltanissetta Centrale Station and the possibility of "recovering", even if virtually, a phase of its architectural evolution through the integration of photogrammetry from historical images and 3D modelling. The case study is an opportunity to analyse the procedure still under development, as well as to identify the main difficulties encountered in this process and possible future developments.

 *__Condorelli__, F.: La documentazione del patrimonio culturale perduto mediante fotogrammetria e intelligenza artificiale, Mimesis.Jasd, 2(1), 72–83. https://doi.org/10.56205/mim.2-1.5

This research aims to give an analysis and assessment through the extraction of metricinformation from historical images and to experiment with its potentialities in the heritage fi eldwith the aim of valorising historical iconographical documentation. In particular the paperdeals with photogrammetry applied to historical images. A classifi cation and a state of the artof historical archives material considering their possible use in metric documentation and thussuitable for photogrammetry is performed. A photogrammetric workfl ow is proposed to processhistorical images and the maximum metric quality level reachable by the photogrammetricprocessing is investigated. Two case studies in Paris were chosen: the UNESCO HeritageTour Saint Jacques and the pavilions of Les Halles of the architect Victor Baltard. The twostudies represent different situations of heritage because the tower was transformed over timebut still exists and the pavilions were destroyed in 1971. Thus, it is possible to compare thedifferent results obtained from

the implementation of the workfl ow to the two case studies.

2022

 *__*Condorelli__*, F. and Bonetto, J.: 3D digitalization and visualization of archaeological artifacts with the use of photogrammetry and virtual reality system, Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XLVIII-2/W1-2022, 51–57, https://doi.org/10.5194/isprs-archives-XLVIII-2-W1-2022-51-2022, 2022.

Digital technologies are increasingly being used in the field of archaeology to provide three-dimensional metric information to scholars and help them in the process of understanding and interpreting the site under investigation. Among different surveying methods certainly photogrammetry has many advantages being a low cost, reliable and fast technique, but most importantly it allows the creation of realistic and interactive 3D models that can be viewed and interpreted by a wider audience. This certainly makes the enjoyment of sites easier and makes data accessible from anywhere. This study shows three particularly significant case studies in the archaeological field where photogrammetry has served as support. These case studies are representative of specific situations in which archaeology requires digitization of artefacts. The first one concerns the Temple of Apollo in Gortyn (Crete, Greece), the second one is the ancient city of Nora (Sardinia, Italy) and the third one is the Museo Civico of Eremitani in Padua (Italy). The paper explains how 3D metric surveying has served for the representation and analysis of stratigraphic sections of buildings in the case of the Gortyn site, for the creation of virtual tours of archaeological sites in the case of Nora, and for the documentation and visualization of small artifacts in the case of the Museo Civico of Eremitani by highlighting potentials and criticalities of the method.

 *__*Condorelli__*, F., Stellacci, S.: Remote survey of traditional dwellings using advanced photogrammetry integrated with archival data: the case of Lisbon, Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XLIII-B2-2022, 893–899, https://doi.org/10.5194/isprs-archives-XLIII-B2-2022-893-2022, 2022.

The application of advanced photogrammetry and the integration of cross-sourced maps of historic cityscapes contribute to a thorough understanding of our surrounding, enabling the comparison between present physical layout/use of the built environment and its changes over time. Remote surveys integrated with the analysis of building dossiers, stored in municipal archives, and onsite surveys are carried out in this work for providing insight into a traditional building typology in Portugal, which is so far overlooked in heritage studies. Two examples of humble multi-family dwellings with overhanging timber-framed façades (16th century) are virtually reconstructed using structure-from-Motion (SfM) of selected historic photographs. During a first phase, a photogrammetric reconstruction of the state of the buildings, as conceived originally, was implemented by reconstructing two parts (due to the number of images available for each case study), and then a metric evaluation of the models was conducted comparing past and current state of the buildings. This research shows the importance of integrating distinct tools and databases to foster truly tourists' perception of authenticity in cultural heritage sites and towards a more sensitive heritage management. Potential interactive applications capable of increasing the visibility and impact of these virtual reconstructions, such as GIS data enrichment or digital travel apps, are also briefly discussed.

2021

 *__*Condorelli__*, F., Pescarmona, G., Ricci, Y.: Photogrammetry and medieval architecture. Using black and white analogic photographs for reconstructing the foundations of the lost rood screen at Santa Croce, Florence, Int. Arch. Photogramm. Remote Sens. Spatial Inf.

Sci., XLVI-M-1-2021, 141–146, https://doi.org/10.5194/isprs-archives-XLVI-M-1-2021-141-2021, 2021. <u>Presented as oral presentation</u> at CIPA Congress 2021, Beijing, China (August 2021).

In this research paper photogrammetric techniques have been successfully applied to historic black and white analogic photographs to convey previously inaccessible architectural and archaeological information. The chosen case study for this paper is the Franciscan Basilica of Santa Croce in Florence, Italy. A photogrammetric algorithm has been implemented over a series of b/w negatives portraying the archaeological excavations carried out in the years 1967–1969, after the traumatic flood of the river Arno in 1966 that severely damaged the city centre of Florence and, particularly, the Santa Croce monumental site. The final aim of this operation is to provide solid evidence for the virtual reconstruction of the lost rood screen of the basilica of Santa Croce, the current subject of the PhD research of one of the Authors (Giovanni Pescarmona) at the University of Florence. The foundations that were uncovered during the archaeological excavation in the '60s are one of the most important hints towards a convincing retro-planning of the structure. Using advanced photogrammetric techniques, and combining them with LIDAR scanning, it is possible to uncover new datasets that were previously inaccessible for scholars, opening new paths of research. This interdisciplinary approach, combining traditional art-historical research methods and state-of-the-art computational tools, tries to bridge the gap between areas of research that still do not communicate enough with each other, defining new frameworks in the field of Digital Art History.

 *__Condorelli__, F., Rinaudo, F., Salvadore, F., Tagliaventi, S.: A comparison between 3D reconstruction using NeRF Neural Network and SfM algorithms on historical images, Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XLIII-B2-2021, 565–570, https://doi.org/10.5194/isprs-archives-XLIII-B2-2021-565-2021, 2021. <u>Presented as oral presentation</u> at ISPRS Congress 2020, Nice (June 2021).

In this research, an innovative comparison between 3D reconstructions obtained by means of Artificial Intelligence, in particular NeRF Neural Networks, and by Structure-from-Motion (SfM) and Multi-View-Stereo (MVS) open-source algorithms is proposed. The 3D reconstruction comparison is performed on two test cases, one of cultural interest, one useful only for technical discussion. It is known that the approaches are traditionally used with different objectives and in different contexts but they can however also be used with similar purpose, i.e., 3D reconstruction. In particular, we were interested in evaluating how NeRF reconstructions are accurate from a metric point of view and how the models obtained from the application of NeRF differ from the model obtained from the classical photogrammetry. By analyzing the results in the considered test cases, we show how NeRF networks, although computationally demanding, can be an interesting alternative or complementary methodology, especially in cases where classical photogrammetric techniques do not allow satisfactory results to be achieved. It is therefore suggested to expand efforts in this direction by exploiting, for example, the numerous improvement proposals of the original NeRF network.

2020

 __Condorelli__, F.: Processing historical photographs and film footage with Photogrammetry and Artificial Intelligence for Cultural Heritage documentation and virtual reconstruction, ELCVIA. Electronic Letters on Computer Vision and Image Analysis, Vol. 19 No. 2 (2020): Special Issue on Recent PhD Thesis Dissemination, 11-16, https://doi.org/10.5565/rev/elcvia.1323, 2020.

The specific objective of this thesis is to offer an excursion through the metric potentialities of different data available in historical archives, by considering the essential role of photogrammetry. The aim is to explore how metric information about buildings which

no longer exist or transformed over time could be extracted from old photographs and videos of different quality, for their 3D virtual reconstruction analysing the material stored in historical archives to support researchers and experts in historical research of Cultural Heritage. In order to process these data and to obtain metrically certified results, a modification of the algorithms of the standard photogrammetric pipeline was necessary. This purpose was achieved with the use of open-source Structure-from-Motion algorithms and the creation of a specific benchmark to compare the results. Besides the processing of historical photograph, photogrammetry is combined with Artificial Intelligence to improve ways to search for architectural heritage in video material and to reduce the effort of manually examining them by the operator in the archive in terms of efficiency and time.

☐ *__Condorelli__, F., Rinaudo, F., Salvadore, F., Tagliaventi, S.: A match-moving method combining AI and SfM algorithms in historical film footage, Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XLIII-B2-2020, 813–820, https://doi.org/10.5194/isprs-archives-XLIII-B2-2020-813-2020, 2020. <u>Presented as oral presentation</u> at ISPRS Congress 2020, Nice (September 2020).

Searching for suitable material for photogrammetry is a key part in the documentation of Cultural Heritage. Photogrammetry can be used to produce a metrically certified 3D model. Material contained in historical film footage archives is especially useful for documentation when the heritage has been lost. In this research an innovative match-moving method is proposed that aims to exploit Artificial Intelligence and SfM algorithms to identify the frames extracted from a film footage in which the lost monument appears and that are suitable to be processed with photogrammetry for its 3D reconstruction. First of all the identification and tracking of the heritage in the videos was performed training an object detection Neural Network. Then the frames detected were automatically extracted with the coordinates of the bounding boxes that contain the monument. The camera motions were identified by selecting only the shots taken from multiple points of view of the same scene and analysing the evolution of the bounding boxes position over time. A further check of the material was necessary to select only sequences and to eliminate single frames and images from different historic periods. After this process, only the correct frames were automatically selected and processed with photogrammetry and the quality of the obtained 3D model was assessed. The method experimented in this research represents a powerful tool in the field of Cultural Heritage because it makes the selection of suitable material for photogrammetry automatic. Moreover it offers important insights that could be extended to other sectors.

☐ *__Condorelli__, F., Rinaudo, F., Salvadore, F., Tagliaventi, S.: A Neural Networks Approach to Detecting Lost Heritage in Historical Video, ISPRS Int. J. Geo-Inf. 2020, 9(5), 297; https://doi.org/10.3390/ijgi9050297. <u>Editor's choice and cover story</u> (May 2020).

Documenting Cultural Heritage through the extraction of 3D measures with photogrammetry is fundamental for the conservation of the memory of the past. However, when the heritage has been lost the only way to recover this information is the use of historical images from archives. The aim of this study is to experiment with new ways to search for architectural heritage in video material and to save the effort of the operator in the archive in terms of efficiency and time. A workflow is proposed to automatically detect lost heritage in film footage using Deep Learning to find suitable images to process with photogrammetry for its 3D virtual reconstruction. The performance of the network was tested on two case studies considering different architectural scenarios, the Tour Saint Jacques which still exists for the tuning of the networks, and Les Halles to test the algorithms on a real case of an architecture which has been destroyed. Despite the poor quantity and low quality of the historical images available for the training of the network, it has been demonstrated that, with few frames, it was possible to reach the same results in terms of performance of a network trained on a large dataset. Moreover, with the introduction of new metrics based on time intervals the measure of the real time saving in

terms of human effort was achieved. These findings represent an important innovation in the documentation of destroyed monuments and open new ways to recover information about the past.

2019

☐ *__*Condorelli__*, F., Higuchi, R., Nasu, S., Rinaudo, F., and Sugawara, H.: Improving performance of feature extraction in SfM algorithms for 3D sparse point cloud, Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XLII-2/W17, 101–106, https://doi.org/10.5194/isprs-archives-XLII-2-W17-101-2019, 2019. Presented as poster presentation at LowCost 3D 2019 in Strasbourg, France (December 2019).

The use of Structure-from-Motion algorithms is a common practice to obtain a rapid photogrammetric reconstruction. However, the performance of these algorithms is limited by the fact that in some conditions the resulting point clouds present low density. This is the case when processing materials from historical archives, such as photographs and videos, which generates only sparse point clouds due to the lack of necessary information in the photogrammetric reconstruction. This paper explores ways to improve the performance of open source SfM algorithms in order to guarantee the presence of strategic feature points in the resulting point cloud, even if sparse. To reach this objective, a photogrammetric workflow is proposed to process historical images. The first part of the workflow presents a method that allows the manual selection of feature points during the photogrammetric process. The second part evaluates the metric quality of the reconstruction on the basis of a comparison with a point cloud that has a different density from the sparse point cloud. The workflow was applied to two different case studies. Transformations of wall paintings of the Karanlık church in Cappadocia were analysed thanks to the comparison of 3D model resulting from archive photographs and a recent survey. Then a comparison was performed between the state of the Komise building in Japan, before and after restoration. The findings show that the method applied allows the metric scale and evaluation of the model also in bad condition and when only low-density point clouds are available. Moreover, this tool should be of great use for both art and architecture historians and geomatics experts, to study the evolution of Cultural Heritage.

☐ *__*Condorelli__*, F. and Rinaudo, F.: Processing historical film footage with Photogrammetry and Machine Learning for Cultural Heritage documentation. In MM '19: 2019 ACM Multimedia Conference Proceedings, October 2019, Nice, France. ACM, NY, USA, https://doi.org/10.1145/3347317.3357248. Presented as oral presentation at SUMAC 2019 workshop on Structuring and Understanding of Multimedia heritAge Contents in Nice, France (October 2019).

Historical film footages in many cases represent the only remaining traces of Cultural Heritage that has been lost or changed over time. Photogrammetry is a powerful technique to document the heritage transformations, but its implementation is technically challenging due to the difficulty in finding the historical data suitable to be process. This paper aims to examine the possibility to extract metric information of historic buildings from historical film footage for their 3D virtual reconstruction. In order to make automatic the research of a specific monument to document, in the first part of the study an algorithm for the detection of architectural heritage in historical film footage was developed using Machine Learning. This algorithm allowed the identification of the frames in which the monument appeared and their processing with photogrammetry. In the second part, with the implementation of open source Structure-from-Motion algorithms, the 3D virtual reconstruction of the monument and its metric information were obtained. The results were compared with a benchmark for evaluate the metric quality of the model, according to specific camera motion. This research, analysing the metric potentialities of historical film footage, provides fundamental support to documentation of Cultural Heritage, creating tools useful for both

geomatics and historians.

Publications <u>about</u> the applicant

☐ **_Condorelli_**, F. and Maiwald, F.: From image and film archives to 3D reconstruction. Time Machine 2019. <u>Presented as oral presentation</u> at UHDL 2019 : CIPA Workshop on Research and Education in Urban History in the Age of Digital Libraries in Dresden, Germany (October 2019).

This paper outlines the increasing interest within the field of Cultural Heritage and associated with that, a rising use of interdisciplinary collaborations, digital tools, and automatic workflows. Libraries, archives and repositories provide nowadays a lot of digital data and consequently problems like varying data quality and licensing issues arise. The work focuses on an automatic processing of archival data using machine learning and photogrammetric workflows. Especially, two case studies using historical video material of Paris and historical image material of Dresden are presented.

☐ ***_*Condorelli_***, F., Rinaudo, F., Salvadore, F., and Tagliaventi, S.: Architectural Heritage recognition in historical film footage using Neural Networks, Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XLII-2/W15, 343–350, https://doi.org/10.5194/isprs-archives-XLII-2-W15-343-2019, 2019. <u>Presented as oral presentation and awarded as best paper</u> at 27th CIPA Symposium 2019 in Avila, Spain (September 2019).

Researching historical archives for material suitable for photogrammetry is essential for the documentation and 3D reconstruction of Cultural Heritage, especially when this heritage has been lost or transformed over time. This research presents an innovative workflow which combines the photogrammetric procedure with Machine Learning for the processing of historical film footage. A Neural Network is trained to automatically detect frames in which architectural heritage appears. These frames are subsequently processed using photogrammetry and finally the resulting model is assessed for metric quality. This paper proposes best practises in training and validation on a Cultural Heritage asset. The algorithm was tested through a case study of the Tour Saint Jacques in Paris for which an entirely new dataset was created. The findings are encouraging both in terms of saving human effort and of improvement of the photogrammetric survey pipeline. This new tool can help researchers to better manage and organize historical information.

☐ *****_Condorelli_***, F. and Rinaudo, F.: Benchmark of metric quality assessment in photogrammetric reconstruction for historical film footage, Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XLII-2/W11, 443-448, https://doi.org/10.5194/isprsarchives-XLII-2-W11-443-2019, 2019. <u>Presented as poster presentation</u> at GEORES 2019 Conference in Milan, Italy (May 2019).

Quality assessment in photogrammetric processing is fundamental to obtain metric information and to reconstruct 3D models of Cultural Heritage, especially when it has been lost or changed over time. The determination of metric precision is technically challenging when dealing with historical films and videos that in many cases represent the only remaining traces of this heritage, which is useful for architectural, archaeological and restoration studies. This paper examines the suitability of existing photogrammetric software to evaluate the maximum possible metric accuracy for processing videos shot with fixed camera motions. In order to evaluate the metric quality obtained processing historical film footage with photogrammetric techniques, a benchmark was created on a new video dataset with the aim of reproducing the camera motions in which old video were shot. Three different camera motions were considered: Up/Down Motion-Tilting, Left/Right Motion-Trucking and Rolling Motion-Panning. The methodology was experimented on Valentino Castle in Turin, a monument inscribed in the UNESCO World Heritage List. Data were processed with the implementation of open source Structure-from-Motion algorithms

and the results were analysed for the evaluation of metric quality. Results show the different maximum precision assessments according to the different typologies of camera motion. This research provides fundamental support to historical studies on Cultural Heritage, creating a sharing standard with zero-cost data and tools useful for both geomatics and restorers.

☐ Casagrande, L., Straßburger, M., **_Condorelli_**, F., Roat, G., Thaler, F., Scoz, J.: Medieval silver mining on the Monte Calisio plateau (Trentino – Italy). Les métaux précieux en Méditerranée médiévale, 67-80, 2019.

The Monte Calisio plateau, north-east of the city of Trento (Italy), contains a deposit of silver-rich galena intensively mined during the Middle Ages. The work of the miners was regulated by a specific law, dating back to the beginning of the XIIIth century: it is the so called Liber the Postis Montis Arzentarie, contained in the Codex Wangianus and wrote by the Prince-Bishop of Trento Federico Vanga. It seems that the silver was used for the local mint. The archaeological evidences are impressive: thousand of pinges on the surface, tens of shafts and kilometers of galleries underground, where the traces of the hand-made excavation are very clear (above all pick toolmarks). Since 2013 the Ecomuseo Argentario and the University of Munich (Ludwig-Maximilians-Universität München) are carrying on a project called "Archaeology of the Mons Argentarius" in order to document and understand the medieval mining context and the miners life. The ancient mines were explored and measured and some charcoal samples were taken (C-14 analyses have revealed that they date back to the XI-XIII centuries). A detailed survey on the surface allowed to find some structures such as walls, buildings and channels. Upon agreement of the local Cultural Heritage Department (Soprintendenza ai Beni culturali della Provincia autonoma di Trento) a small excavation was made in 2015 that confirmed the archaeological potential of the area: dark layers containing charcoal, medieval pottery and smithing slags were found in the middle of the mining area.

2018

☐ **_*Condorelli_**, F. and Rinaudo, F.: Cultural Heritage reconstruction from historical photographs and videos, Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XLII-2, 259-265, https://doi.org/10.5194/isprs-archives-XLII-2-259-2018, 2018. Presented as poster presentation at ISPRS Technical Commission II Symposium 2018 in Riva del Garda, Italy (June 2018).

Historical archives save invaluable treasures and play a critical role in the conservation of Cultural Heritage. Old photographs and videos, which have survived over time and stored in these archives, preserve traces of architecture and urban transformation and, in many cases, are the only evidence of buildings that no longer exist. They are a precious source of enormous informative potential in Cultural Heritage documentation and save invaluable treasures. Thanks to photogrammetric techniques it is possible to extract metric information from these sources useful for 3D virtual reconstructions of monuments and historic buildings. This paper explores the ways to search for, classify and group historical data by considering their possible use in metric documentation and aims to provide an overview of criticality and open issues of the methodologies that could be used to process these data. A practical example is described and presented as a case study. The video "Torino 1928", an old movie dating from the 1930s, was processed for reconstructing the temporary pavilions of the "Exposition" held in Turin in 1928. Despite the initial concerns relating to processing this kind of data, the experimental methodology used in this research has allowed to reach a quality of results of acceptable standard.

2017

◻ Bortot, C., Boscaro, C., Cecchini, C., **_Condorelli_**, F., Cundari, M. R., Palma, V., Panarotto, F., Siviero, L.: TU-CULT. Architectural revelations in the Churches of Santa Giustina and Santa Maria dei Servi in Padova, UID Conference 2017 - TERRITORI e FRONTIERE della RAPPRESENTAZIONE, 14th-16th of September 2017, Napoli, Italy.

This paper show the results of the research project entitled TU-CULT, which has the purpose to acquire, store, process and disseminate data regarding two monuments of the city of Padua: the church of S. Maria dei Servi and the Basilica of S. Giustina. Following the theme of the hidden architecture and its multimedia revelation, the research aims to support the creation of innovative multilevel uses of the cultural heritage, dealing with specific topics in the field of survey, 3D processing, interactive data archiving and visualization, and accessibility of the good.

◻ Barba, S., **_Condorelli,_** F.: A first proposal of an algorithm for the evaluation of the error in the photogrammetric restitution, in Immersive high-resolution photographs for Cultural Heritage (Curator: Adriana Rossi) Editor: Libreriauniversitaria.it Edizioni – Webster srl Via V.S. Breda 26, 35010 Limena (PD). 2017.

Errors cannot be controlled, they are usually uncertain in nature and cannot be completely eliminated. Due to these intrinsic characteristics, errors have always fascinated philosophers, writers, psychologists, scientists and mathematicians who have developed theories, studies and research on this topic despite the complexity of its nature. The errors considered in this paper were taken from an architectural survey and concern in particular, the implementation of image-based techniques. The experimentation with these techniques was carried out in collaboration with Prof. Antonio Almagro Gorbea's Laboratorio de Arqueología y Arquitectura de la Ciudad in Granada (Spain). The case study was the Holy Chapel of the Saviour in Úbeda (Spain), a superb example of urban renaissance architecture, which was declared World Heritage by UNESCO in 2003. It was in the context of these activities that the idea of developing of an algorithm for the evaluation of error propagation generated in image-based and range-based survey techniques was conceived. In the topographic field there is an established and consolidated treatise on the theory of errors (or measurements) closely related to probabilistic and statistical studies; but for image-based and range-based survey, there are few references in the literature about this topic. In particular, it is interesting to note how errors are generated during the survey process and how and to what extent they influence the measurements. It is banal to observe empirically that with the use of advanced photogrammetric paradigms there is a greater nominal control of these errors. However, the use of pipelines that provide for the implementation of several software environments in series or in parallel, if not controlled, can lead to the generation of serious uncertainties. In this proposal, the evaluation and interpretation of data by the operator - in a subjective but not arbitrary way – is considered particularly important. The mathematical approach adopted incorporates the uncertainty in the description of the information, by defining, through Fuzzy logic, a degree of reliability and belonging for the photogrammetric techniques (in the case study, compared to laser scanners). According to this hypothesis, and after examining the phases of the process, a report on the hardware tools used in the survey case was compiled, , then, w the analysis of software, was classified according to whether it was intended for indirect data processing or graphic restitution. Subsequently, after a study of the types of errors that can be generated in each single step and from each individual instrument, the relative weights were outlined and assigned (according to what was previously highlighted), for a final estimate of the error. thus, after determination of the propagation, a test of the algorithm by a three-dimensional comparison was performed with the aim of analytically validating the proposed approach according to the convergence of the first results returned.

Articles published by others in magazines, etc. about the applicant or his/her projects:

- **Premio Nazionale dell'Innovazione** 2022:

StartupItalia Open Summit SIOS22 Winter Edition - Talk: "Pensa globalmente, agisci localmente - Diventare rilevanti per la propria comunità, facendo impresa": https://www.youtube.com/watch?v=0C2a49WZF_o&t=5079s

https://www.repubblica.it/tecnologia/2022/12/05/news/archygram-377560023/?ref=RHRM-BG-I0-P4-S1-T1

https://startupitalia.eu/le-nostre-liste-100-e-piu-innovatrici-e-innovatori-che-hanno-fatto-la-differenza-nel-2022-e-che-sono-pronti-a-farla-nel-2023

- **Europeana Council Member** 2022:

https://pro.europeana.eu/post/professionals-in-focus-francesca-condorelli

https://pro.europeana.eu/post/europeana-network-association-welcomes-its-27-new-members-councillors

- **TOP10 Best Italian Scientist Under35** 2021 and **GiovedìScienza Award** 2021:

https://www.ilmattino.it/innovazione/news/salerno_francesca_condorelli_premio_industria_4_0-6002816.html

https://www.fondazionecrt.it/news/2021-gioved%C3%AC-scienza.html

https://www.salernonotizie.it/2021/06/04/la-salernitana-francesca-condorelli-vince-il-premio-industria-4-0-di-giovediscienza/

https://www.cilentonotizie.it/dettaglio/45279/giovediscienza--la-salernitana-francesca-condorelli-si-aggiudica-il-premio-industria-40/

http://www.napolicittasolidale.it/portal/news/10606-premio-gioved%C3%ACscienza,-la-salernitana-condorelli-in-finale.html

http://www.comunicati.net/comunicati/societa_civile/varie/712458.html

http://www.italynews.it/attualita/2021/06/02/competizione-finale-del-premio-nazionale-giovediscienza-98586.html

https://www.torinotoday.it/social/giovediscienza-2021-premi-torino-piemonte.html

- Presentation at Biennale Tecnologia, Politecnico di Torino 2020

https://www.youtube.com/watch?v=_vSggBxFvEo

- Presentation at Ada Lovelace Day "Con l'informatica si può...ogni giorno", GiovedìScienza 2021

https://www.youtube.com/watch?v=TsIerG3k6Mw

https://www.facebook.com/watch/?v=301380698136409

Presentation and Keynote Speaker	

- **Oral Presentation** at REAAH - ID Symposium (October 2023)
- **Oral Presentation** at UID Congress, Palermo (September 2023)
- **Oral Presentation** at CIPA Congress, Florence (June 2023)
- **Oral Presentation** at EARTH Congress, Brixen (June 223)
- **Invited Inspirational Speaker** at ISWEEK, Milan (May 2023)
- **Keynote Speaker** at 1 Workshop on Photogrammetry organized by Nagoya University (Japan) in Wien (March 2023)
- **Oral Presentation** at UHDL Workshop, Munich (March 2023)
- **Invited Speaker** at StartupItalia Open Summit SIOS22 Winter Edition - Talk: "Pensa globalmente, agisci localmente - Diventare rilevanti per la propria comunità, facendo impresa", Università Bocconi, Milano (December 2022)

- **Invited Speaker** at Milano Finanza Digital Week, Milano (December 2022)
- **Demo** at Ai confini della realtà virtuale, Mille e una Scienza, Bolzano (November 2022)
- **Oral Presentation** at ReUSO Congress, Porto (November 2022)
- **Oral Presentation** at REAAH - ID Symposium (October 2022)
- **Poster Presentation** at ISPRS Congress 2022, Nice (June 2022)
- **Keynote Speaker** at UNFORESEEN PATHS - Transcending boundaries and Sharing critical approaches to Architectural Heritage, Stefania Stellacci & Francesca Condorelli (April 2022)
- **Keynote Speaker** at Ada Lovelace Day "Con l'informatica si può...ogni giorno", GiovedìScienza (October 2021)
- **Keynote Speaker** at International SummerSchool 2021 "Digital strategies for Endangered Cultural Heritage: Forthcoming INTERSPECIES", Università di Pavia (September 2021)
- **Keynote Speaker** at Biennale della Tecnologia, Pillole di Tecnologia, Politecnico di Torino (November 2020)
- **Oral presentation** at ISPRS Congress 2020, Nice (June 2021)
- **Oral presentation** at ISPRS Congress 2020, Nice (September 2020)
- **Poster presentation** at LowCost 3D 2019 in Strasbourg, France (December 2019)
- **Oral presentation** at SUMAC 2019 workshop on Structuring and Understanding of Multimedia heritAge Contents in Nice, France (October 2019)
- **Oral presentation** at UHDL 2019 : CIPA Workshop on Research and Education in Urban History in the Age of Digital Libraries in Dresden, Germany (October 2019)
- **Oral presentation** and awarded as **best paper** at 27th CIPA Symposium 2019 in Avila, Spain (September 2019)
- **Poster presentation** at GEORES 2019 Conference in Milan, Italy (May 2019)
- **Poster presentation** at ISPRS Technical Commission II Symposium 2018 in Riva del Garda, Italy (June 2018)

Third Mission & Awards

- Founder of a **startup** Archygram srl:

  ☐ Premio dei Premi, Presidente della Repubblica Italiana, 2023
  ☐ 2031 Award, Italian Tech Week, 2023
  ☐ PNI | PREMIO SPECIALE Search On -We Make Future, 2023
  ☐ One to Zero Challenge, Eni Plenitude, 2023
  ☐ Premio Nazione dell'Innovazione, PNICube, 2022
  ☐ TOP100 Innovators in Italy, StartupItalia, 2022
  ☐ StartCup - ICT & Services Award, Regione Lombardia, 2022
  ☐ Borsa della Ricerca 2022, Fondazione Emblema, 2022
  ☐ Challenge 2050, Rotary Club Distretto 2050, 2022
  ☐ Lifebility Award 2022, Lions Club, 2022
  ☐ Premio Marzotto 2031 - Speciale FlashArt, 2021
  ☐ Switch2Product, Polihub, 2021

- **Innovation For Change**, Politecnico di Torino, CDI, Itay & CERN, Geneve (2018): Developed by Collège des Ingénieurs Italia, Politecnico di Torino and CERN Ideasquare in 2016, Innovation 4 Change has become the leading Italian innovation project, based on the collaboration with companies, institutions and non-profit organizations. During this intensive, 5-month programme, the participants develop innovative and scalable business ideas and practical solutions to respond to the important challenges presented by the partners, that are always related to social, economic and environmental problems of today. In particular my project of a startup focused on the creation of innovative device to help elder people to use technology.

Language competence   Italian: Proficient
English: Proficient (First Certificate of English, Cambridge, C1 Unibz)
German: Basic (A1 Certificate Unibz)
Spanish: Intermediate