



FRANCESCO IOLI

Geomatics Researcher at CNR IRPI

PhD in Geoinformatics

Post-doctoral researcher at the **Research Institute for Geo-Hydrological Protection IRPI** at CNR (Italy), specialising in **photogrammetry and geoinformatics for environmental monitoring**. My research bridges the gap between traditional photogrammetry and modern computer vision, focusing on deep learning-based image matching and automated 3D reconstruction pipelines.

I have experience in multi-scale 4D monitoring, ranging from **low-cost terrestrial sensors** for high-frequency glacier dynamics to **satellite multi-view stereo** for regional mass balance studies (developed at University of Zurich).

I have strong coding skills and experience with HPC for processing large-scale geospatial data. As a strong advocate for open science, I actively develop open-source tools. My background includes field expertise as a certified UAV pilot and topographer.

PERSONAL DETAILS

- Turin, Italy
- 03/09/1995
- 0000-0001-7429-891X
- francescoioli@cnr.it
- github.com/franioli
- [francesco-ioli](https://www.linkedin.com/in/francesco-ioli/)
- Google Scholar
- H-Index: 12

LANGUAGES

- Italian (Native)
- English C1 (IELTS 2019)

PROGRAMMING

- Python ★★★★
- Matlab ★★★★
- C++ ★★★★
- Bash/Shell ★★★★

PHOTOGRAMMETRY & LIDAR

- Agisoft Metashape
- Photomodeler
- CloudCompare
- COLMAP MicMac
- OpenMVG ODM

TOOLS

- PyTorch

► DEGREE

- 2021 – **PhD Environmental and Infrastructure Engineering**
Politecnico di Milano, Milan, Italy
Major in Geoinformatics. **PhD Thesis:** *Multi-temporal and Multi-scale photogrammetry for Alpine Glacier Monitoring*. Grade: Cum Laude.
I developed an image-based system with low-cost stereo cameras for short-term 4D glacier monitoring. I developed a software pipeline for daily 3D reconstruction with extreme-wide baseline between the stereo cameras using deep learning feature matching. I contributed to **Deep-Image-Matching**, a multi-view image matching library with deep learning for SfM. I applied UAV photogrammetry for structural health assessment, including automated crack detection on concrete bridges, and cultural heritage documentation.

► CURRENT EMPLOYMENT

- 06/2025 – **Post-doctoral Researcher**
CNR IRPI, Turin, Italy
Research on photogrammetry and 3D reconstruction pipelines for geo-hydrological hazard monitoring. Development of automated processing workflows for UAV and satellite imagery.

► PREVIOUS WORK EXPERIENCE

- 07/2025 – **External consultant (20%)**
University of Zurich, Dept. of Geography, Zurich, Switzerland
I completed the development of automated pipelines for regional-to-global-scale DEM reconstruction using satellite multi-view stereo, with applications in glacier mass balance studies. for Glambie-2 Glacier Mass Balance Intercomparison Exercise submission....Leveraged HPC clusters (Slurm) for large-scale multi-view stereo processing.

- 10/2024 – 06/2025 **Post-doctoral Researcher**
University of Zurich, Dept. of Geography, Zurich, Switzerland
I developed automated pipelines for large-scale DEM reconstruction using satellite multi-view stereo, with applications in glacier mass balance studies.

- 2022 **Topographic technical consultant (part-time)**
Prof. Alberto Bianchi
Topographic consultant for the Technical Consultant of Office and Part (CTU) R.G. 717/2019

- 2022 **Topographic technician (part-time)**
Gini Telecom
UAV surveys for telecommunication antennas

► EDUCATION AND TRAINING



OTHER SOFTWARE



OPERATING SYSTEMS



INFRASTRUCTURE



HOBBIES



04/2022 - 07/2022	Visiting PhD student University of Twente, ITC (NL) Development of a deep learning wide-baseline stereo matching workflow for 4D monitoring of an alpine glacier with low-cost time-lapse cameras. [Paper] [Code]
18 - 24/ 09/2022	Summer School of Alpine Research University of Innsbruck, Obergurgl (AT) I participated in the Summer School <i>Close Range Sensing Techniques in Alpine Terrain</i> organized by Innsbruck University with ISPRS support. [Proceedings]
09/2019 - 02/2020	Visiting student for MSc Thesis ETH Zürich, VAW (CH) <i>Evaluation of Airborne Image Velocimetry approaches with low-cost UAVs in riverine environments.</i> Supervisors: Prof. Livio Pinto, Dr. Martin Detert [Thesis] [Paper]
2020	Internship Politecnico di Milano, Dept. of Civil and Environmental Engineering I learnt how to design and carry out topographic and UAV photogrammetric surveys for infrastructure and land monitoring. I learnt basics of AutoCAD for technical drawing from 3D point clouds. I obtained the A1/A3 and A2 UAV licenses with permission for flying in critical scenarios.
2019	Erasmus Exchange Aalto University, Helsinki, Finland Courses in remote sensing, GIS, and environmental engineering.
2017 - 2020	MSc Environmental Engineering Politecnico di Milano, Milan, Italy Major in Land Monitoring. Thesis on UAV photogrammetry for glacier monitoring. Grade: 110L/110.
2014 - 2017	BSc Environmental Engineering Politecnico di Milano, Milan, Italy Thesis on UAV snowpack surveys on Belvedere glacier. Grade: 102/110.

► RESEARCH FUNDING AND GRANTS

►MENTION TO CARIPLO PROJECT

► RESEARCH OUTPUTS

- **Total number of publications:** 24 (Source: Scopus).
- **Metrics:** H-index: 12, Total Citations: 272+ (as of Feb 2026).
- **Open Science:** 100% of recent research outputs (2020–2025) are available via Open Access (DOI links provided below).

Selected Publications (10 most significant):

- Gaspari, F., F. Barbieri, R. Fascia, **Ioli, F.**, L. Pinto, and F. Migliaccio (2025). "Strategies for Glacier Retreat Communication with 3D Geovisualization and Open Data Sharing". In: *ISPRS Int. J. Geo-Inf* 14.2, p. 75. [10.3390/ijgi14020075](https://doi.org/10.3390/ijgi14020075).
- **Ioli, F.**, N. Dematteis, D. Giordan, F. Nex, and L. Pinto (2024). "Deep Learning Low-cost Photogrammetry for 4D Short-term Glacier Dynamics Monitoring". In: *PFG – Journal of Photogrammetry, Remote Sensing and Geoinformation Science*. [10.1007/s41064-023-00272-w](https://doi.org/10.1007/s41064-023-00272-w).
- Morelli, L., G. Perda, **Ioli, F.**, P. Trybała, A. Sterpin, S. Rigon, N. Sutherland, M. Medici, F. Remondino, and A. Vitti (2024). "Co-registering Laser Scanning Point Clouds and Photogrammetric Images with Deep Learning Multi-Modal Matching". In: *Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci.*, XLVIII-2/W8-2024, pp. 335–342. [10.5194/isprs-archives-XLVIII-2-W8-2024-335-2024](https://doi.org/10.5194/isprs-archives-XLVIII-2-W8-2024-335-2024).
- Morelli, L., **Ioli, F.**, F. Maiwald, G. Mazzacca, F. Menna, and F. Remondino (2024). "Deep-Image-Matching: a Toolbox for Multi-view Image Matching of Complex Scenarios". In: *Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci.*, XLVIII-2/W4-2024, pp. 309–316. [10.5194/isprs-archives-XLVIII-2-W4-2024-309-2024](https://doi.org/10.5194/isprs-archives-XLVIII-2-W4-2024-309-2024).
- Gaspari, F., F. Barbieri, R. Fascia, **Ioli, F.**, and L. Pinto (2024). "An Open-Source Web Platform for 3D Documentation and Storytelling of Hidden Cultural Heritage". In: *Heritage* 7.2, pp. 517–536. [10.3390/heritage7020025](https://doi.org/10.3390/heritage7020025).
- Morelli, L., **Ioli, F.**, R. Beber, F. Menna, et al. (2023). "COLMAP-SLAM: a Framework for Visual Odometry". In: *Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci.*, XLVIII-1/W1-2023, pp. 317–324. [10.5194/isprs-archives-XLVIII-1-W1-2023-317-2023](https://doi.org/10.5194/isprs-archives-XLVIII-1-W1-2023-317-2023).

- **Ioli, F.**, A. Bianchi, A. Cina, C. De Michele, et al. (2022). "Mid-Term Monitoring of Glacier's Variations with UAVs: The Example of the Belvedere Glacier". In: *Remote Sensing* 14, p. 28. [10.3390/rs14010028](https://doi.org/10.3390/rs14010028).
- **Ioli, F.**, A. Pinto, and L. Pinto (2022). "UAV-Photogrammetry for Metric Evaluation of Concrete Bridge Cracks". In: *Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci.*, XLIII-B2-2022, pp. 1025–1032. [10.5194/isprs-archives-XLIII-B2-2022-1025-2022](https://doi.org/10.5194/isprs-archives-XLIII-B2-2022-1025-2022).
- Gaspari, F., **Ioli, F.**, F. Barbieri, E. Belcore, and L. Pinto (2022). "INTEGRATION OF UAV-LIDAR AND UAV-PHOTOGRAFMETRY FOR INFRASTRUCTURE MONITORING AND BRIDGE ASSESSMENT". In: *Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci.*, XLIII-B2-2022, pp. 995–1002. [10.5194/isprs-archives-XLIII-B2-2022-995-2022](https://doi.org/10.5194/isprs-archives-XLIII-B2-2022-995-2022).
- De Gaetani, C. I., **Ioli, F.**, and L. Pinto (2021). "Aerial and UAV Images for Photogrammetric Analysis of Belvedere Glacier Evolution in the Period 1977–2019". In: *Remote Sensing* 13, p. 3787. [10.3390/rs13183787](https://doi.org/10.3390/rs13183787).

For complete publication list, see [Scopus profile: scopus.com/authid/detail.uri?authorId=57219022961](#)

Software, Datasets & Infrastructure:

- **Deep-Image-Matching** (Core Contributor): Toolbox for multi-view image matching with traditional and deep learning algorithms. [\[GitHub\]](#) [\[Paper\]](#)
- **ICEPy4D** (Lead Developer): Open-source Python toolkit for 4D glacier monitoring using Deep Learning photogrammetry. [\[GitHub\]](#) [\[Paper\]](#)
- **Belvedere Glacier Open Data & Web-GIS Platform**: Curated dataset (Zenodo DOI: [10.5281/zenodo.10817029](https://doi.org/10.5281/zenodo.10817029)) and interactive web platform for glacier documentation and storytelling. [\[Web-app\]](#)
- **Satellite Multi-View Stereo Pipeline**: Automated HPC workflow (Slurm) for regional-scale DEM reconstruction from satellite imagery, with applications in glacier mass balance (University of Zurich & CNR IRPI).
- **COLMAP-SLAM Framework** (Core contributor): Visual odometry system for real-time photogrammetric positioning. [\[GitHub\]](#) [\[Paper\]](#)

PhD Thesis:

- **PhD Thesis** (2024): *Multi-temporal and Multi-scale photogrammetry for Alpine Glacier Monitoring*. Politecnico di Milano. Grade: Cum Laude. [\[Handle\]](#)

► RESEARCH SUPERVISION AND LEADERSHIP EXPERIENCE

2024 - present	PhD Co-supervisor Co-supervision of PhD candidates	University of Zurich & CNR IRPI
2019 - 2024	MSc Thesis Co-supervisor Supervised 6 Master's theses in Environmental and Land Planning Engineering: ➤ L. Cerina (2024): Very-High Resolution Satellite Stereo Images for Alpine Glacier Monitoring. Supervisor: prof. L. Pinto. ➤ S. Bonora (2024): Progettazione e implementazione di un database georeferenziato per il monitoraggio del Ghiacciaio del Belvedere. Supervisor: prof. F. Migliaccio. ➤ I. Pincolini (2022): Digital Image Correlation for ice flow velocity estimation: a case study on the Belvedere Glacier with UAV orthophotos. Supervisor: prof. L. Pinto. ➤ F. Barbieri (2021): Monitoraggio di aree alpine inaccessibili con fotogrammetria UAV low-cost. Supervisor: prof. L. Pinto. ➤ A. Pinto (2021): Tecniche fotogrammetriche da drone per la ricostruzione metrica di fessure su ponti in calcestruzzo. Supervisor: prof. L. Pinto. ➤ F. Ferrario (2020): Triangolazione aerea assistita da DGPS in fotogrammetria da UAV: sperimentazione di una soluzione a basso costo per il DJI Matrice 210 V2. Supervisor: prof. L. Pinto.	Politecnico di Milano , Milan, Italy

► TEACHING MERITS

2020 - 2024	Teaching Assistant Provided academic support and laboratory tutoring for MSc and BSc courses: <i>Photogrammetry and UAV surveying</i> (MSc): Fall 2024 <i>Trattamento delle Osservazioni</i> (Statistics) (BSc): Fall 2020, 2021, 2022, 2023 <i>Sistemi Informativi Territoriali</i> (GIS) (BSc): Spring 2020, 2021 <i>Tecniche di rilievo e modellazione 3D per l'architettura</i> (3D Modelling for Architecture) (BSc): Spring 2020, 2021, 2022.	Politecnico di Milano , Milan, Italy
2021 - 2025	Tutor in Summer Schools <i>Design and Execution of Topographic Surveys for Land Monitoring</i> @ Belvedere Glacier aimed at introducing BSc and MSc students to topographic fieldwork in mountain environments.	Politecnico di Milano , Belvedere Glacier, Macugnaga, Italy
2024	Open Data Day 2024 Awarded for the Open Data Day 2024 mini-grant for the organization of the webinar Mapping Climate Change in 4D: Belvedere Glacier's Open Geo Data for Education and Research [Event Report]	Open Knowledge Foundation

► AWARDS AND HONOURS

- Marie Curie Seal of Excellence – MSCA Postdoctoral Fellowship 2024 (score: 92.8) and 2025 (score: 95.4)
- Winner of the prize for young researchers *Premio Giovani 2023 – Sezione Ricerca* organized by the Italian Society of Photogrammetry and Topography SIFET during the congress *65° Convegno Nazionale SIFET*, with the contribution *Monitoraggio 4D ad alta frequenza di ghiacciai alpini tramite camere time-lapse a basso costo e Deep Learning Structure-from-Motion*.
- Finalist in the [EGU2024 Photo Competition](#)

► OTHER KEY ACADEMIC MERITS**Presentations in Scientific Conferences**

- 2025: EGU General Assembly, Vienna (Oral) [\[Abstract\]](#); Alpine Glaciology Meeting, Innsbruck (Poster).
- 2024: EGU General Assembly, Vienna (Oral) [\[Abstract\]](#).
- 2023: ISPRS Geospatial Week, Cairo (Oral); EGU General Assembly, Vienna (Oral); VGC, Dresden (Oral); SIFET Congress, Arezzo (Oral); GeoAI, Turin (Oral).
- 2022: EGU General Assembly, Vienna (Oral); ISPRS Congress, Nice (Poster).

Memberships & Peer Review

- Reviewer for: *ISPRS Journal of Photogrammetry and Remote Sensing, Remote Sensing, The Cryosphere*.
- Member of: EGU (European Geosciences Union), SIFET (Italian Society of Photogrammetry and Topography).

► ADDITIONAL INFORMATION

- UAS License: EASA A2 Open Category with Critical Scenario authorization
- Driver's license: B
- Professional qualification: Italian *Esame di Stato* for civil and environmental engineers

According to EU Regulation 679/2016, I consent to the processing of my personal data.