ECBI 2024. The SUNRISE Summer School. General report.

Abstract

The SUNRISE Summer School (Seashore and UNderwater documentation of aRchaeological herItage palimpSests and Environment) was organized by the Politecnico di Torino in collaboration with the Italian Society of Photogrammetry and Topography (SIFET) and supported by the International Society of Photogrammetry and Remote Sensing (ISPRS) and CIPA HD.

The summer school took place in the municipality of Porto Cesareo (LE - Italy) from September 8 to 14, 2024, and involved 24 students – architects, engineers, archaeologists, and marine ecologists from Europe, the United States, Latin America, and Asia. Throughout the entire duration of the school, the students were guided by 23 tutors, ensuring an almost one-to-one student-tutor ratio.

The school offered theoretical activities with lectures and fieldwork, applying a learning-by-doing teaching approach. Two sites were the focus of the fieldwork: Torre Chianca (a 16th-century defensive building) and the Roman marble columns (a submerged archaeological site). Both sites are part of the protected marine area of Porto Cesareo.

Field data collection was supported by representatives from various companies: Images, Microgeo, Stonex, Pix4D, Geomax, Leica, Dynatech, and 3DTarget (the companies were also sponsors of the initiative), who demonstrated the latest technologies for integrated multi-sensor surveying of cultural heritage, such as drones, terrestrial and aerial laser scanners, and mobile mapping systems.

Full report

The school have reached its second edition in 2024. The first edition was held between the 3rd and the 9th of September 2022, while the second edition took place between the 8th and 14th of September 2024. The focus of the second edition was again on the documentation of both emerged and submerged cultural heritage, specifically archaeological heritage, with the primary aim of connecting the needs of the different stakeholders involved in the study, safeguarding and dissemination of heritage, with the idea of making them communicating together to define a common language.

The second edition saw the participation of 24 students—architects, engineers, archaeologists, and marine ecologists—from Europe, the United States, Latin America, and Asia.

The 24 participants were selected by the school's scientific committee among 53 applications received and have diverse backgrounds: Master's students, PhD candidates, research fellows, researchers, etc.

Guiding the participants throughout the entire training program were 23 tutors, chosen with the goal of ensuring a near one-to-one student-mentor ratio (Fig. 1).

Fig. 1. Tutors and students of the second edition of the SUNRISE summer school

The educational and research activities were coordinated by Filiberto Chiabrando and Lorenzo Teppati Losè, with support from Andrea Lingua, Elisabetta Colucci, and Francesca Matrone, and collaboration from tutors Beatrice Tanduo, Alessandra Spadaro and Paolo Maschio from the Geomatics for Cultural Heritage Laboratory of the Department of Architecture and Design-DAD and the Geomatics Lab of the Department of Environmental, Land, and Infrastructure Engineering-DIATI; Caterina Balletti, Francesco Guerra, Paolo Venier; Andrea Martino and Enrico Breggion from IUAV of Venice; Giuseppe Furfaro from SIFET; Erica Nocerino, Fabio Menna, and Alessio Calantropio from the University of Sassari; Domenico Visintini from the University of Udine; Alessandro Capra from the University of Modena/Reggio Emilia; Rita Auriemma, Luigi Culuccia, Cristiano Alfonso from the University of Salento; and Dominique Rissolo from the University of California, San Diego.

As in the first edition of the school, the initiative was structured to facilitate participants' learning through a hands-on, learning-by-doing approach, with a predominance of practical activities over theoretical ones. More details on the first edition can be found in a dedicated publication [1] and on the dedicated website (https://www.sunrisesummerschool.com/2022-edition/).

To maximize the effectiveness of the lectures, they were structured according to the participants' backgrounds, aiming to create a new, shared educational and learning environment. The lectures were not solely focused on presenting different geomatics techniques and their application in the field but specifically emphasized their contribution to the documentation of coastal heritage (both emerged and submerged). Additionally, they explored how derived metric products can be effectively used for its study, management, preservation, and dissemination.

After an overview of the possibilities and limitations of digital documentation approaches, several specific techniques were briefly examined, starting from traditional topographic methods (such as GNSS and Total Station), moving through terrestrial, aerial, and underwater photogrammetry, and also including both static and mobile range-based techniques.

The lectures were not concentrated into a single dedicated day but were distributed throughout the week. Two half-days were dedicated to field data acquisition (Fig. 2), while two full days were devoted to data processing by the students with the support of tutors. On the final day of the school, the individual groups presented the results of the activities carried out during the week.

Fig. 2. Some images of the field activities (underwater and terrestrial)

As already mentioned, Learning by Doing approach was adopted to foster a major effort from both participants and tutors in a pragmatic approach: only 20% of the time was dedicated to frontal lectures while the remaining 80% was spent in the on-site field acquisition, data processing, and interpretation, report preparation by the participants supervised from the tutors. The lectures proposed to the participants of the summer school were held by recognized researchers and Professors who are also actively involved both in the ISPRS and SIFET societies and were organized to provide a general overview of the most up-to-date methodologies that can be deployed for the documentation of the coastal heritage. The lectures were not only dedicated to the presentation of different geomatics techniques and their deployment in the field, but a specific focus was on the contribution in the field of coastal heritage documentation and how the derived metric products can be effectively used for its study, management, safeguard, and dissemination. After a general overview of the possibilities offered by digital documentation approaches and their limitations, several specific techniques were briefly reviewed starting from traditional topographic techniques

(such as GNSS and Total Station), moving towards terrestrial, aerial, and underwater photogrammetry, and also range-based techniques such as Terrestrial Laser scanning. Finally, different issues connected with the management and interpretation of 3D data were tackled and discussed. The organization of the lecture was derived from the experience gained in the first edition of the summer schools and the feedback received from the post-event survey of the participants. An overview of the programme and organisation of the summer school is reported in Fig. 3.

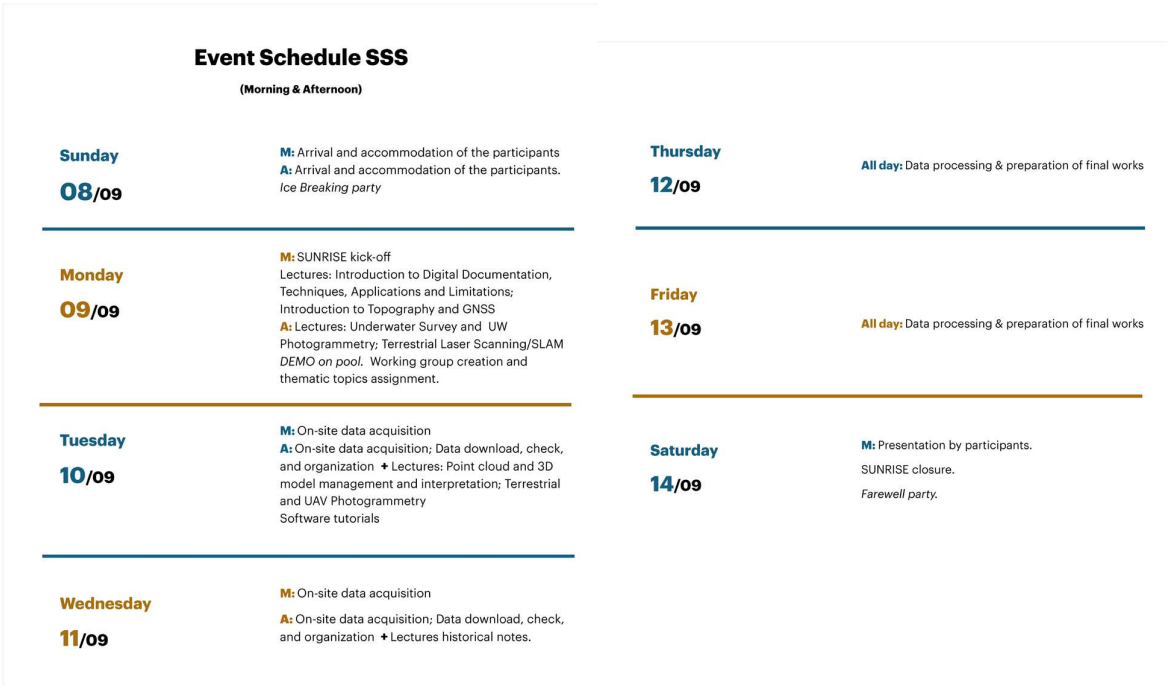


Fig. 3. Short programme of the summer school.

The selected archaeological sites for the second edition were of particular interest; participants worked on two sites in the Porto Cesareo area (Puglia, Italy): Torre Chianca (a terrestrial site) and the Roman columns located on the seabed in front of Torre Chianca (an underwater site). Both sites are set in extraordinary natural and historical environments, as the area has been a National Marine Park since 1997. Torre Chianca (Fig. 3), also known as Torre di Santo Stefano, is now a seaside destination along the Porto Cesareo coastline. It stands not only as a historical symbol but also features a beautiful beach. Located midway between Porto Cesareo and Torre Lapillo along the Ionian Sea coast, the tower was built as part of the defensive system against Saracen invasions between 1527 and 1598. It has a square plan, with a base supporting a 15.60-meter structure and a total height of 18 meters. The tower was designed to communicate with both Torre Cesarea and Torre di San Tommaso. Its exterior lacks access stairs. During World War II, the tower was used as a military base by Italian soldiers. After the armistice, it became a target for German pilots based in Leverano, who dropped concrete bombs, causing damage that is still visible today. Today, the fortress has been repurposed as a Marine Turtle Rescue Center, playing a crucial role in the conservation of the region's marine wildlife.

The five monolithic Roman-era columns are located in the waters surrounding the tower. They are part of the remains of a Roman *navis lapidaria*, which was transporting five monumental cipollino marble columns and a marble block. These materials originated from the quarries of Karystos on the island of Euboea, Greece. The columns, measuring 8.5–8.8 meters in length and weighing a total of 78 tons, lie at a depth of 4.5 meters within the Porto Cesareo Marine Protected Area (Italy). The ship ran aground due to its draft (3 meters) exceeding the site's depth, considering that at the time, sea levels were approximately 3 meters lower than today (Fig. 3).

Fig. 4. Torre Chianca (left) and the roman marble columns (right)

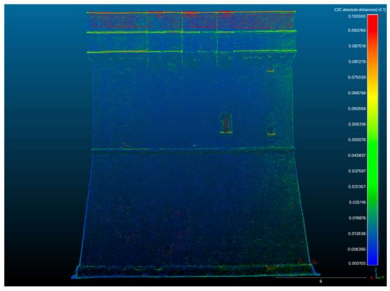
The second edition of the summer school, as well as the first one, also aimed to connect the needs of the various stakeholders involved in the study, preservation, and dissemination of heritage, fostering communication with the goal of defining a shared language. For this reason, the connection with the local communities and the entities involved in the management and protection of these heritage sites was crucial. Nevertheless, this edition incorporated feedback and suggestions from participants of the first edition to further enhance the learning experience and the overall school organisation.

Throughout the organisation of the school's activities, it was crucial to the involvement of the young communities of the international societies such as the CIPA Emerging Professional and the ISPRS Student Consortium. These communities helped us in sponsoring and promoting the summer school. Moreover, a slot in the programme was also booked for the presentation of the ISPRS Student Consortium thanks to the remote availability of its representatives.

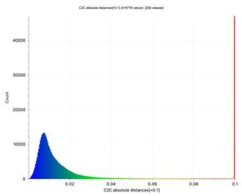
After the theoretical lectures and the field acquisition, two days were dedicated to data processing. Different student groups explored various tools, techniques, and topics, and some groups focused on analyzing the differences between products derived from various techniques, while others focused on how survey data could enhance the understanding of the studied artefacts. Additionally, some groups worked on designing merchandising based on 3D models obtained from the survey or developing new architectural solutions to optimize the use of unused spaces within the tower, always based on the metric survey data. Examples from the participants' presentations are shown in Fig. 4.

More information on the school are available on the website: **https://www.sunrisesummerschool.com/**

FURTHER ELABORATION #1

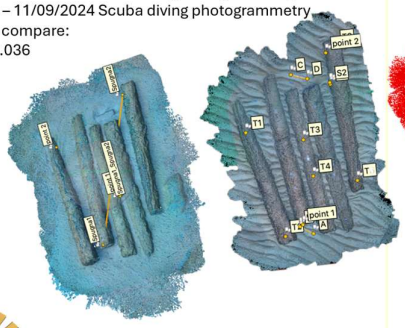


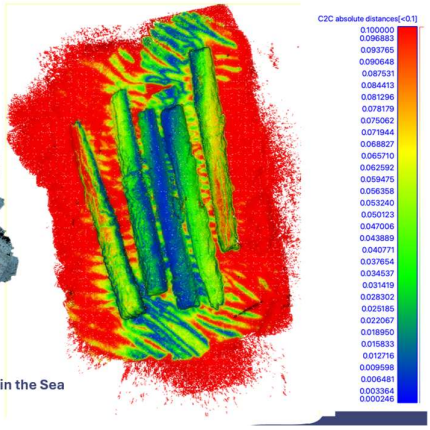
C2C ABSOLUTE DISTANCE (<0.1)
TLS - UAV
EAST WALL



Secrets of the sea
Scott McAvoy, Tobia Furlan, Matteo Massolini, Maria Cabarcas, Federica Gerla

GoPro – 09/09/2024 Free diving photogrammetry
GoPro – 11/09/2024 Scuba diving photogrammetry
Cloud compare:
RMS 0.036





Clouds in the Air, Clouds on the Land, and Clouds in the Sea
Eva, Shahriar, Francesco, Vanda, Loren

Building orthophoto from Terrestrial and UAV photogrammetry

East side

South side

West side

North side

Online model

Team 3
Valeria Longhi, Alberto Bonora, Andrea Sattin, Giovanni Poli
Tutors: Lorenzo Teppati Losè, Elisabetta Colucci, Dominique Rissolo

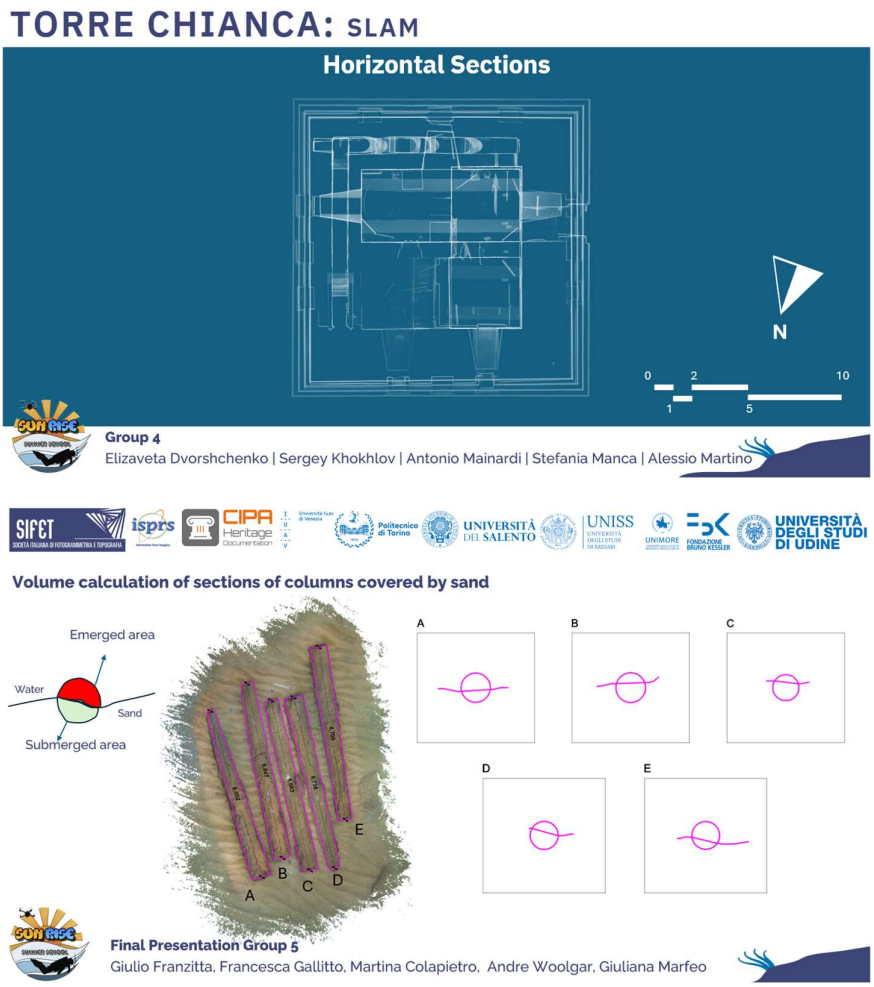


Fig. 5. Some examples extracted from the participants' final presentations