HERITAGE

THE HERITAGE MANAGEMENT ORGANIZATION

Executive Leadership Development in Heritage Management Workshops

Digital Tools for Cultural Heritage Management

Dates: 12 May - 18 June 2025

Hybrid Training Program

(In person & Online)

12 May - 6 June: Online Training Program

8 - 18 June: Field School in Nafplio, Greece

General introduction and installation: 12 May 2025

GIS (online): 12-23 May 2025

PHOTOGRAMMETRY (online): 26 May - 4 June 2025

LASER SCANNING (online): 6 June 2025

PHOTOGRAMMETRY & LASER SCANNING (on site): 8-18 June 2025

Summer School Director:

Dr Evangelos Kyriakidis | Director, HERITAGE

Summer School Instructor:

Dr Cornelis Stal | Lecturer/Researcher HOGENT, HERITAGE Digital

A. Introduction

Digital Tools for acquiring, processing, managing and analyzing spatial data are crucial for sustainable management of cultural heritage and allow a better understanding of the objects under study. Laser scanning, photogrammetry, topography and GIS are important tools to facilitate this complex management process. The Heritage Management Organization, in close collaboration with HOGENT (Belgium) has organized three integrated and consecutive specialist courses on various topics in geomatics to help heritage managers in their work:

- GIS
- Photogrammetry and images-based 3D modelling
- Laser scanning

The theoretical aspects will be delivered online, and on-site tasks will be organized asynchronously to obtain practical skills. In addition, we offer participants the opportunity to practice their newly aquired knowledge of digital tools with -in person support from the instructor. This option to practice Photogrammetry and Laser Scanning in the field is available for those who are able to travel to Greece.

The field school will be organized in collaboration with the municipality of Nafplio, Greece, and aims to document some of the city's the most historically significant structures. The field school will serve as the education arm of a larger HERITΛGE research project in collaboration with HOGENT, ETH Zurich, Leica and other partners aiming to create and promote applications for the use of 3D documentation for heritage management. Among others, our goal is to create applications for 3D recording of heritage sites for conservation purposes. Research is also conducted on methodologies and techniques to speed up the digitization of sites, such as the development of techniques to map conservation needs of sites on the 3D plan, techniques and software that will help photography and laser scanning to work faster and more efficiently together, and better and more efficient ways to present different types in an online format.

B. Course Objectives

This summer school will introduce students to a broad range of 3D recording and mapping techniques, as well as methodologies to use and analyze spatial data. Participants will be provided with hands-on instruction in these methods with hands-on demos and exercises. Geographic Information Systems will be used to acquire, manage and integrate spatial data for management and analysis purposes and to publish the resulting data in cartographic deliverables, . As a participant, you will work on provided data, but you will also record your own artifact, architectural remains, … using online spatial data and image-based 3D modelling. These data will be processed in appropriate software. Finally, laser scanning data will be provided by the instructors, but point cloud processing will be elaborated based on the image-based 3D modeling. Participants should be able to work in the digitization of any site following this work.

The summer school comprises of three specialist courses:

- General introduction and installation
- GIS
- Photogrammetry and image-based 3D modelling
- Terrestrial laser scanning
- Q&A for full-program participants

Lectures, demonstrations, and tutorials will be provided live. In addition, multiple days will be reserved for individual field work, data processing, and other exercises within the different courses.

One can attend the whole summer school or anyone of these specialist courses as standalone training. Please get in touch with info@heritagemanagement.org for further information and arrangements on booking the specialist courses individually.

C. Prerequisites

Sessions are primarily organized online via asynchronous pre-recorded sessions and live streams, together with materials and exercises offered via our eLearning platform. Practical sessions, Q&A meetings, and moments for discussion and debate are also scheduled. As a participant, you will directly implement the newly obtained skills by using them during the course on your own cultural heritage projects, if you attend the courses online, or additionally on a cultural site of Nafplio, if you participate in the field work in Greece.

A laptop, internet connection with sufficient and stable band width, and a digital camera (SLR camera, compact camera, or a smartphone) will be the starting point to record data of artifacts, properly orient them to one another in virtual space, and georeference the data collected to ultimately create a computer-generated representation of your study area, accompanied by contextual spatial data analysis results. These skills are essential in heritage management for any

restoration, documentation, or visualization project but are transferable to a wide array of applications from real estate, geography, geology, and architecture. A terrestrial laser scanner will be used during the field work in Greece. The entire program is offered in English.

D. Grading Matrix

All students will be marked on a percentage basis as follows:

- 20%: Terrestrial laser scanning: presentation of a processed point cloud in a browser-based environment, provided with a technical report on the data acquisition and processing;
- 20%: GIS: GIS-based map and report-based acquisition, management and analysis of spatial data;
- 20%: Photogrammetry and image-based 3D modelling: presentation of an image-based 3D model and orthophoto plan, provided with a technical report on the data acquisition and processing;
- 40%: Integrated project with a GIS model, image-based 3D model, point clouds, … and a project report handed in one month after the end of the summer school (3000-4000 words).

For those only taking part in some sections of the field school the grading will be adjusted to include only those sections you participate in.

E. Instructor

Dr Cornelis Stal is Manager of HERITΛGE-Digital and is Lecturer at the Ghent University College (Department of Real Estate and Land Surveying), and Visiting Professor at the Ghent University (Department of Geography) with a significant experience in the field of the combination, processing and quality analysis of airborne and terrestrial laser scanning and photogrammetry for 3D modeling. His special interests lie in the (automatic) generation of geometric, radiometric and semantic rich 3D models, derived from irregular point sets and other spatial data sets. Both laser scanning and photogrammetry, as well as geo-IT (GI-systems, GI-programming, GI-management) are important pillars of his research. Other research opportunities have allowed him to build additional expertise in geomatics applications for bathymetric modeling. As an employee of the Department of Geography (Ghent University), he has played a significant role in the maritime SBO project SEARCH (Archaeological Heritage at the North Sea) and CREST (Climate Resilience Coast). As well as the analysis of GNSS data from tidal buoys, he worked on the development of processing algorithms for tunnel measurements using laser scanning. Currently, he has a special focus on the digital 3D documentation of cultural heritage. Given his expertise in heritage modeling, he manages the Heritage Management Organization Digital program, where he participates in multiple research projects and summer schools.

F. Description of the Specialist Courses

Specialist course 1: GIS

During the last century, an enormous amount of data, such as overview inventories, detailed stone plans, conservation monitoring records, buildings and landscape surveys, etc., has been recorded on cultural heritage sites all over the world. When these data are combined with spatial data, through GIS, heritage managers are able to solve complex problems. This specialist course covers the use of GIS in cultural heritage management using open source software. Important aspects of the transformation of manuscript plans to a full geographical database will be discussed and demonstrated, followed by hands-on implementation of these techniques. Furthermore, the use of GIS for cartographic purposes will be expounded upon. After this course, the participant will be able to undertake a large variety of spatial challenges in a heritage management environment.

Specialist course 2: Photogrammetry and images-based 3D modelling

3D models, orthophotos or point clouds are indispensable tools for the documentation and monitoring of our heritage and allow a better understanding of the objects under research. The construction of these products is based on various concepts in photography, photogrammetry and computer vision, which are available via easy-to-use software and generally available hardware. During this specialist course, various techniques will be addressed and demonstrated during lectures and hands-on field work. Participants will get familiar with various digital tools (photography, photogrammetry, 3D modelling and model referencing, 360° photography, and vectorization by covering the entire workflow from image acquisition via data processing to model publishing. After this workshop, participants will be able to apply these techniques in a wide range of applications (heritage management, archaeology, curatorial work etc.), concerning the various parameters for high quality 3D models and orthophotos.

Specialist course 3: Terrestrial laser scanning

Terrestrial laser scanning offers a fast and accurate methodology to generate dense geometrical representations of objects. This specialist course aims to get a thorough understanding of the principles of terrestrial laser scanning and best-practice application of this technique for the acquisition of point clouds. Based on on-site measurements and intensive practical sessions, participants will obtain necessary experience to apply this technique in their own field work and research. The focus of this course is put on the creation of applications for 3D recording of archaeological sites for conservation purposes. Research is also conducted on procedures and techniques to optimize the acquisition and to generate deliverables covering heritage sites. Among others, these deliverables are conventional maps, 3D models and online visualizations.

G. Course schedule and topics

Initial start-up

- Overview of HERITΛGE, project, objectives and organization of the specialist courses
- Social event and virtual ice breaker

Specialist course 1: GIS

- Participant welcome and installation SC1
- Introduction to GIS, QGIS, data styling
- Geo-referencing, data generation, use of web-services
- Labels, data queries, publishing maps
- Combining data, geo-processing
- GIS and 3D

Specialist course 2: Photogrammetry and images-based 3D modelling

- Participant welcome and installation SC2
- Introduction to photography, photogrammetry, image-based 3D reconstruction
- Introduction to referenced 3D modelling (topography, processing workflow)
- Publishing 3D models (online, offline)
- Integrating image-based models in GIS
- Presentations and discussion. End of SC2.

Specialist course 3: Terrestrial laser scanning

- Participant welcome and installation SC3
- Introduction to terrestrial laser scanning
- Demonstration of the terrestrial laser scanner, field preparation, point cloud registration, data registration
- Introduction to point cloud data filtering and data management
- IData deliverables and publishing point clouds

Specialist course 4: Field work → combination of photogrammetry and TLS

- Presentations and discussions. End of SC3. End of summer school.

H. Disclaimer - Please Read Carefully

VENUE

Tolo was strategically selected as the central location for the summer school program, providing an optimal balance of accessibility, affordability, and cultural immersion. This charming seaside village, just 12 km (about 7.5 miles) from Nafplio, offers unique advantages for participants, both academically and experientially.

- Tolo's proximity to historical sites, makes it a prime location for hands-on fieldwork.
- As a smaller, more tranquil village compared to larger tourist hubs, Tolo offers affordable accommodation and living costs, ensuring an accessible program for participants.
- Its manageable size reduces transportation complexities, keeping logistics efficient and cost-effective.
- Tolo's vibrant local culture, with traditional tavernas, small shops, and summer festivities, enriches the program experience beyond the classroom.

TRAVEL

Tolo is located in the Peloponnese region, in the southwest of Greece. To reach Tolo, you should first arrive in Nafplio. From either Athens International Airport or Kalamata International Airport, you can choose from several transportation options to reach your final destination, the village of Tolo in Peloponnese

From Athens to Nafplio:

Bus (4h20m):

- X93: Airport to Kifissos Intercity Bus Terminal - (KTEL Kifissou, Liosion 216, Athina 104 45)

Taxi (3h6m)

Car (2h2m)

From Kalamata to Nafplio:

Bus (3h10m):

- Airport to Kalamata (KTEL Messinias)
- Kamalata to KTEL Argolidas (KTEL Argolidas, limited service!)

Car (1h40m)

You can find more info: https://www.rome2rio.com/map/Athens-Airport-ATH/Nafplio-Greece

From Nafplio to Tolo:

Bus (20–25 minutes):

- Regular buses operate between Nafplio and Tolo, especially during the summer months.

Car (15–20 minutes)

Taxi (15 minutes)

ACCOMMODATION & FOOD

You can stay at a recommended local hotel in either a single room or a shared (same-sex) three or four-bed room in the village of Tolo. Light lunches or dinners can be arranged at local taverns, offering meals at reasonable prices. Food in Greece is rich in vegetables and fruits. Some diets may be accommodated but not all. Please consult with the project administrator if you have special dietary needs.

WEATHER CONDITIONS

Field work involves physical work outdoors. You should be aware that conditions in the field are different from those you experience in your home, dorms or college town. This program operates at a typical archaeological survey despite it taking place in a city. During the day, temperatures under the shadow fluctuate between 70-90 °F. However, under the sun they may reach 80-120 °F. Humidity is relatively medium and some mosquitoes and/or flies may be close to the area. In order to be protected from sunburn and/or insects you will not be allowed to work in shorts or tank tops and you will have to be responsible to avoid dehydration, sunburns and sunstrokes. If you have any medical concerns, please consult with your doctor. For all other concerns, please consult with the project director – as appropriate. HERITΛGE does not provide travel, board, or accommodation, but can advise you on the most convenient and affordable accommodation and transport options.

I. Selected Bibliography

General readings

- Grussenmeyer, P., Landes, T., Voegtle, T., & Ringle, K. (2008). Comparison methods of terrestrial laser scanning, photogrammetry and tacheometry data for recording of cultural heritage buildings. International Archives of Photogrammetry, Remote Sensing and Spatial Information Sciences, 37(B5), 213-218.
- Maeyer, P., ... & van de Put, W. (2014). Integrating geomatics in archaeological research at the site of Thorikos (Greece). Journal of Archaeological Science, 45, 112-125.
- Remondino, F. (2011). Heritage recording and 3D modeling with photogrammetry and 3D scanning. Remote Sensing, 3(6), 1104-1138.
- Stal, C., Van Liefferinge, K., De Reu, J., Docter, R., Dierkens, G., De Maeyer, P., ... & van de Put, W. (2014). Integrating geomatics in archaeological research at the site of Thorikos (Greece). Journal of Archaeological Science, 45, 112-125.
- Stal, C., Covataru, C., Müller, J., Parnic, V., Ignat, T., Hofmann, R., & Lazar, C. (2022). Supporting Long-Term Archaeological Research in Southern Romania Chalcolithic Sites Using Multi-Platform UAV Mapping. Drones, 6(10), 277.
- Stylianidis, E. & Remondino, F. (2016). 3D Recording, Documentation and Management of Cultural Heritage. Dunbeath (UK): Whittles Publishing
- Yastikli, N. (2007). Documentation of cultural heritage using digital photogrammetry and laser scanning. Journal of Cultural Heritage, 8(4), 423-427.

GIS

- D'Urso, M. G., Corsi, E., Nemeti, S., & Germani, M. (2017). From Excavation to web: a GIS for archaeology. International Archives of the Photogrammetry, Remote Sensing & Spatial Information Sciences, 42(5), 219-226.
- Gillings, M. & Wise, A. (2009). GIS: guide to good practice. Archaeology Data Service / Digital Antiquity. Archaeology Data Service (http://guides.archaeologydataservice.ac.uk).
- Huisman, O. & De By, R. (2009). Principles of Geographic Information Systems. International Institute for Geo-Information Sciences and Earth Observation. Enschede, the Netherlands

Photogrammetry and image-based 3D modelling

- Barnes, A. (2009). Close-Range Photogrammetry: A Guide to Good Practice. Archaeology Data Service / Digital Antiquity. Archaeology Data Service (http://guides.archaeologydataservice.ac.uk).
- Historic England 2017 Photogrammetric Applications for Cultural Heritage. Guidance for Good Practice. Swindon. Historic England (https://historicengland.org.uk).

- Verhoeven, G. (2011). Taking computer vision aloft–archaeological three-dimensional reconstructions from aerial photographs with photoscan. Archaeological prospection, 18(1), 67-73.
- Yilmaz, H. M., Yakar, M., Gulec, S. A., & Dulgerler, O. N. (2007). Importance of digital close-range photogrammetry in documentation of cultural heritage. Journal of Cultural Heritage, 8(4), 428-433.

Terrestial laser scanning

- Historic England 2018 3D Laser Scanning for Heritage: Advice and Guidance on the Use of Laser Scanning in Archaeology and Architecture. Swindon. Historic England. (https://historicengland.org.uk).
- Lerma, J. L., Navarro, S., Cabrelles, M., & Villaverde, V. (2010). Terrestrial laser scanning and close range photogrammetry for 3D archaeological documentation: the Upper Palaeolithic Cave of Parpalló as a case study. Journal of Archaeological Science, 37(3), 499-507.
- Payne, A. (2009). Laser scanning for archaeology: a guide to good practice. Archaeology Data Service / Digital Antiquity. Archaeology Data Service (http://guides.archaeologydataservice.ac.uk).Only scholarship holders are accepted to this workshop. Partial scholarships cover the majority of the tuition fees, except for participants' contribution. For details, contact us at info@heritagemanagement.org.
- Benefactors' scholarships of the Heritage Management Organization for participation will be available for qualified candidates (excluding airfare/travel and hotel expenses).

To apply for this workshop please:

1. Fill in and submit the Executive Leadership Program in Heritage Management Application Form. Please complete the application process by submitting your CV, a personal statement (describing your current project that will benefit from this training) and **a** reference letter (which may come in separately by your referee at their earliest convenience).
2. A reasonable proficiency in spoken and written English is required to attend the course.
3. Shortlisted applicants will be asked to participate in a personal (oral) interview.

After approval of their application file, participants will receive an official letter outlining in detail the conditions of participation. Heritage Management Organization Membership comes with participation in any our Organization's Executive Leadership in Heritage Management Workshops.

Spaces for this workshop are limited, so please apply early.

Deadline for Applications: 13 April 2025

For questions regarding the application process and the administrative aspects of the course, contact us at info@heritagemanagement.org.