

## Guest Editorial Preface

# Special Issue of Computational Methods in Heritage Science

George Pavlidis, Athena-Research and Innovation Center in Information Communication and Knowledge Technologies, Greece

Cultural heritage is the repository of humanity's identity, a qualitative measure of peoples' progress in time. Cultural heritage is immensely rich in diversity, which reflects the richness of human civilization through the ages. It is, apparently, a deep source of knowledge, which it inherently encodes. In all its forms, tangible or intangible, cultural heritage has been recognized as a precious entity and significant efforts and funds have been allocated to its preservation, interpretation and safeguarding. Several sciences have contributed over the recent decades to this end. This contribution was so intense that the borders among sciences and the arts in this sector started to blur, formulating a domain referenced as 'Heritage Science'. This domain corresponds to a broad field of research and development that emerged to address multiple complex cultural heritage research questions with significant innovations. Such innovations have been focused on multiple facets, including digitization, documentation, analysis, description, interpretation, dissemination, reproduction, education, storytelling, sustainability and management.

Informatics has, arguably, a considerable effect on all domains of science, and has irreversibly transformed the way we experience the world. Apart from the broad term 'Heritage Science', other terms like 'Cultural Informatics', 'Digital Heritage' or 'Digital Humanities' have also been coined to express the bridging of informatics (and other exact sciences) with cultural heritage and the humanities in general, typically being used interchangeably, although with fundamentally different meanings. In addition, each of those terms has a dual, as it can be read from the side of the informatics or the side of the humanities, as either the application of informatics or a new form of human creation. For example, 'Digital Heritage' can either be the 'heritage of the digital creation' or the 'application of digital technologies in cultural heritage'. This book takes the second view and focuses on advancements of digital technologies and scientific applications that serve the study and preservation of cultural heritage.

There are today a vast number of innovative applications in Heritage Science, spanning the whole spectrum of challenges from digital documentation, optical 3D documentation, digital reconstruction and visualization of cultural heritage data, to applications like virtual exhibitions and museums, Virtual Reality, Augmented and Mixed Reality applications, gamification, game-based learning and serious games, narratives and storytelling, Natural Language Processing techniques, knowledge modeling and representation, language and lexical resources, Web/mobile/social networking and tourism applications, scientific tools for comparative study and academic training, digital archives, metadata, international standards and interoperability, big-data, open-data approaches and intellectual property rights, just to name the most prominent. The bibliography on those innovations is steadily growing and the advances are significant.

The success stories in the merging of multiple disciplines in Heritage Science creates an excitement; and the pleasant excitement is growing at the academic society, as a healthy community develops by an increasing number of researchers and students who have shown interest in this merging and started a long cross-disciplinary discussion. Nevertheless, this is not a surprise to those who observe closely the technological achievements coming from the use of Artificial Intelligence, who find it only natural to employ these techniques for the advancement of cultural heritage studies.

This special issue of the *International Journal of International Journal of Art, Culture and Design Technologies* (IJACDT) contains four original research papers. These papers cover diverse aspects of computational methods in heritage science, ranging from linguistics and chemistry to digital applications and artificial intelligence. Each of these papers has undergone full double-blind peer review, prior to being selected for this special issue.

The paper “Relations Among MOCAP and Textual Data of Motion Verbs: A Distance Calculation Perspective” is a study on language and action that tries to shed light on their conceptual correspondence in terms of embodiment. This study examined the linguistic phenomenon of lexical aspect/Aktionsart in connection with the joint angles and time, by collecting and annotating data concerning the usage of a set of Modern Greek verbs, along with motion data for those verbs. The study established a quantitative link between actions and verbs revealing a strong connection between certain types of language data, lower limb motion and time.

The paper “A Study of Various Types of Natural Marble Towards Their Use in Cultural Applications” investigates whether natural marble could be used for dosimetric purposes in cultural applications, such as dating or authenticity test of ancient marble objects, through an integrated experimental approach. To this end, the paper presents how the researchers examined by means of micro-X ray fluorescence spectroscopy, stereoscopic microscopy, thermoluminescence (TL) and optically stimulated luminescence (OSL) respectively, the chemical composition, structure/morphology and luminescence properties of 11 different types of natural marble of different origin.

The paper “Digital Forensic Investigation of the Xiyu Pagoda Lighthouse” provides an update of a lighthouse heritage experiential education project conducted by Run Run Shaw Library, City University of Hong Kong, aiming to encourage students to conduct research by leveraging digital technology and archival collections, and hence connect themselves with the communities. Beyond demonstrating how technology and humanities are intertwined, the aim of this article is to illustrate how librarians may actively disseminate knowledge through connecting students with archival collections.

The paper “Cultural Intelligence-Investigation of Different Systems for Heritage Sustainable Preservation” discusses how an intelligent decision-making mechanism, combined with multi-criteria assessment, is required to lead to compatible and sustainable decision-making concerning conservation works. The paper focuses on different relevant artificial intelligent systems including UTASTAR methodology based on linear regression, unsupervised non-linear classifiers (feed-forward neural networks) and clustering methodologies (Fuzzy c – means algorithm).

*George Pavlidis*  
*Guest Editor*  
*IJACDT*