

# VIPERC 2019: Visual Pattern Extraction and Recognition for Cultural Heritage Understanding

Alessia Amelio<sup>1</sup>, Marijana Čosović<sup>2</sup>, Ivo Rumenov Draganov<sup>3</sup>, Radmila Janković<sup>4</sup>, Katerina Kabassi<sup>5</sup>, Dejan Tanikić<sup>6</sup>

<sup>1</sup> University of Calabria, DIMES, 87036 Rende, Italy

<sup>2</sup> University of East Sarajevo, Faculty of Electrical Engineering, 71126 Lukavica, East Sarajevo, Bosnia and Herzegovina

<sup>3</sup> Technical University of Sofia, Faculty of Telecommunications, 1756 Sofia, Bulgaria

<sup>4</sup> Mathematical Institute of the Serbian Academy of Sciences and Arts, 11000 Belgrade, Serbia

<sup>5</sup> Ionian University, 491 00 Kerkira, Greece

<sup>6</sup> University of Belgrade, Technical Faculty in Bor, 19210 Bor, Serbia

**Abstract.** Nowadays, the cultural heritage understanding has become invaluable for a better analysis of history and traditions worldwide. In the last years, machine learning, intelligent systems and statistical analysis played a key role in the extraction, analysis and identification of patterns from visual data in different real-life aspects. In this context, the main goal of the *1st International Workshop on Visual Pattern Extraction and Recognition for Cultural Heritage Understanding (VIPERC 2019)* was presenting the advancement in visual pattern extraction, analysis and recognition aiming to preserve the cultural heritage. The event was organised as an international research forum by the University of Calabria, the University of East Sarajevo, the Technical University of Sofia, the Mathematical Institute of the Serbian Academy of Sciences and Arts, the Ionian University and the University of Belgrade.

**Keywords:** Cultural heritage · Pattern recognition · Visual computing.

## 1 Background and Goals

The cultural heritage represents an invaluable source of knowledge for a depth investigation of history and tradition. It can include archaeological sites and finds, historical monuments, manuscripts and documents, photographs, films, artistic works (paintings, decorative objects, sculptures, etc.), and other different elements of artistic, archaeological or historical value. In order to preserve historical treasures, different sensors have been used for producing large amount of visual data, which can be effectively processed for the extraction of useful information.

In the last years, machine learning, intelligent systems and statistical analysis have become popular for the extraction, analysis and identification of patterns from visual data in different real-life scenarios.

In this context, the main goal of the *1st International Workshop on Visual Pattern Extraction and Recognition for Cultural Heritage Understanding* (VIPERC 2019) was presenting the advancement of the state-of-the-art in statistical and data mining tools, as well as the introduction of innovative and intelligent systems for visual pattern extraction, analysis and recognition aiming to preserve the cultural heritage. Hence, it combined multiple aspects deriving from different research areas such as Computer Vision, Pattern Recognition, Artificial Intelligence, Software Engineering, Archaeometry and History.

## 2 Topics

The topics of interest of VIPERC 2019 included, but were not limited to:

- Pattern extraction and recognition in historical documents,
- Statistical methods for historical language recognition,
- Intelligent systems for art restoration,
- Archiving and searching methods for cultural heritage multimedia data,
- Information retrieval in cultural heritage images,
- Content-based image retrieval for cultural heritage,
- Feature extraction from cultural heritage multimedia data,
- Classification, similarity and segmentation of cultural heritage images,
- Augmented and virtual reality systems,
- 3D reconstruction and model processing,
- Machine learning for document classification of cultural heritage,
- Graph-based methods for cultural heritage multimedia data,
- Nature-inspired algorithms for historical multimedia data,
- Deep learning applied to cultural heritage images, videos and documents,
- Hardware-based solutions for image analysis in cultural heritage.

## 3 Outcomes

VIPERC 2019 was co-located with the *15th Italian Research Conference on Digital Libraries* (IRCDL 2019). The workshop was held in the afternoon of 30 January 2019 at the National Research Council of Italy (CNR) Area in Pisa, Italy.

The workshop received 15 submissions. Each submission was reviewed by at least 2 scholars of the Scientific Committee. The reviewers for each paper were selected from different institutions than the authors' institutions. Also, the reviewers should not be involved in co-authorship with the paper's authors. Each paper was evaluated according to: (i) clarity, (ii) relevance of the topic, (iii) adopted methodology. The only papers with at least 2 acceptance scores, and any reject score, were definitively accepted.

In the end, a total number of 12 papers were included in the book of Proceedings: 2 short papers and 10 full papers. The peer reviewing process was performed using EasyChair.

The program schedule of VIPERC 2019 included two sessions of 6 accepted papers each, authored by 32 research scholars from 6 different countries and multiple institutions from each country:

- Italy,
- Bosnia and Herzegovina,
- France,
- Greece,
- Serbia,
- Bulgaria.

Also, VIPERC 2019 hosted a total number of 30 participants.

The workshop was co-sponsored by the OpenAIRE-Advance<sup>7</sup> project within the EC-H2020 grant 777541.

## 4 Committee

The scientific relevance of the workshop is assured by an international Organising Committee which includes 6 research scholars from 5 different countries worldwide (Italy, Bosnia and Herzegovina, Bulgaria, Serbia and Greece), and an international Scientific Committee which includes 33 research scholars from 11 different countries worldwide (Greece, Bulgaria, Turkey, Serbia, Macedonia, South Africa, Bosnia and Herzegovina, China, Pakistan, Spain, Italy) and widely recognised as experts in cultural heritage, pattern recognition, data analysis, artificial intelligence and visual computing.

### Organising Committee

- Alessia Amelio, Ph.D. research fellow & contract professor, Italy
- Marijana Čosović, Ph.D. assistant professor, Bosnia and Herzegovina
- Ivo Rumenov Draganov, Ph.D. associate professor, Bulgaria
- Radmila Janković, Ph.D. student, Serbia
- Katerina Kabassi, Ph.D. associate professor & Dean of the Department of Environment, Ionian University, Greece
- Dejan Tanikić, Ph.D. associate professor & Vice Dean for Science and International Cooperation, Technical Faculty in Bor, University of Belgrade, Serbia

### Scientific Committee

- Efthimios Alepis, University of Piraeus, Greece
- Svetlin Antonov, Technical University of Sofia, Bulgaria

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<sup>7</sup> <https://www.openaire.eu/advance/>

- Gazi Erkan Bostanci, Ankara University, Turkey
- Ivo Dochev, Technical University of Sofia, Bulgaria
- Žárko Čojbašić, University of Niš, Serbia
- Vladimir Despotović, University of Belgrade, Serbia
- Lilyana Docheva, Technical University of Sofia, Bulgaria
- Branislav Gerazov, Ss Cyril and Methodius University in Skopje, Macedonia
- Dustin van der Haar, University of Johannesburg, South Africa
- Emina Junuz, Dzemal Bijedic University, Bosnia and Herzegovina
- Tomislav Kartalov, Ss Cyril and Methodius University in Skopje, Macedonia
- Vassilis Komianos, Ionian University, Greece
- Lyubomir Laskov, Technical University of Sofia, Bulgaria
- Miodrag Manić, University of Niš, Serbia
- Emmanouel Maravelakis, TEI of Crete, Greece
- Zoran Miljković, University of Belgrade, Serbia
- Zoran Miliwojević, College of Applied Technical Sciences, Serbia
- Phivos Mylonas, Ionian University, Greece
- Nikolay Neshov, Technical University of Sofia, Bulgaria
- Slobodan Obradović, Information Technology School, Serbia
- Konstantinos Oikonomou, Dean of the Ionian university, Greece
- Iyiola Emmanuel Olatunji, The Chinese University of Hong Kong, China
- Zulfiqar Ali Ranjha, Nat. Univ. of Computer & Emerging Science, Pakistan
- Rebeca Daz Redondo, Universidade de Vigo, Spain
- Umar Shoaib, University of Gujrat, Pakistan
- Miroslav Trajanović, University of Niš, Serbia
- George Tsihrintzis, University of Piraeus, Greece
- Pierangelo Veltri, University of Calabria, Italy
- Ana Fernández Vilas, Universidade de Vigo, Spain
- Maria Virvou, University of Piraeus, Greece
- Eugenio Vocaturo, University of Calabria, Italy
- Spyros Vosinakis, Aegean University, Greece
- Ester Zumpano, University of Calabria, Italy

## 5 Program

**14:00 - 15:00** Registration and Welcome

**15:00 - 16:30**, Chair: Alessia Amelio

*Architectural Heritage: 3D Documentation and Structural Monitoring Using UAV*,  
Danila Germanese, Maria Antonietta Pascali, Andrea Berton, Giuseppe Riccardo  
Leone, Davide Moroni, Bushra Jalil and Marco Tampucci

*Classification Methods in Cultural Heritage*, Marijana Čosović, Alessia Amelio  
and Emina Junuz

*Use of a Knowledge Patterns-Based Tool for Dealing With the “Narrative Meaning” of Complex Iconographic Cultural Heritage Items*, Gian Piero Zarri

*Cultural Heritage Digitalization in BiH: State-of-the-Art Review and Future Trends*, Belma Ramic-Brkić, Marijana Ćosović and Selma Rizvić

*Natural Interaction in Augmented Reality Context*, John Aliprantis, Markos Konstantakis, Rozalia Nikopoulou, Phivos Mylonas and George Caridakis

*Context Incorporation in Cultural Path Recommendation Using Topic Modelling*, Konstantinos Michalakis, Georgios Alexandridis, George Caridakis and Phivos Mylonas

**16:30 - 16:50** Coffee break

**16:50 - 18:20**, Chair: Marijana Ćosović

*Exploring Leonardo Da Vinci’s Mona Lisa by Visual Computing: a Review*, Alessia Amelio

*Augmented Reality for the Enhancement of Archaeological Heritage: a Calabrian Experience*, Anna Berlino, Luciano Caroprese, Antonio La Marca, Eugenio Vocaturo and Ester Zumpano

*Educational Games for Cultural Heritage*, Eugenio Vocaturo, Ester Zumpano, Luciano Caroprese, Saverio Mario Pagliuso and Divina Lappano

*A Prototype System for Automatic Design of Virtual Exhibitions Integrating Cultural Assets From Public Repositories*, Vasileios Komianos and Konstantinos Oikonomou

*Classifying Cultural Heritage Images by Using Decision Tree Classifiers in WEKA*, Radmila Janković

*2D DT-CWT CBIR With Adaptive Selection of the Decomposition Level*, Ivo Draganov and Stella Vetova

**18:20 - 18:30** Closing

## **6 Acknowledgments**

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