Full-time postdoctoral position in Machine Learning and Computer Vision for patterns identification on ceramic shards

University of Orléans, France

Deadline for application: **November 20th, 2021**

Context

A corpus of nearly 38,000 ceramic shards excavated in north of Orléans indicates a site for massive production of domestic ceramics during the High Middle Ages (6th-11th centuries). The potters used to sign their production with a relief decoration stamped with a wooden wheel engraved by hand with an approximate repetitive decoration. The analysis of the typology of decorations allows the archaeologists to specify the chronology and the diffusion map of the productions. The research project, REMIA, funded by the Centre-Val de Loire region, aims to provide archaeologists with a new automatic classification tool based on the patterns stamped by potters, by matching the decorations with matrices using artificial intelligence methods. This project involves the Laboratoire d'Informatique Fondamental d'Orléans (LIFO) and the PRISME laboratory of the University of Orléans, as well as the Fédération Archéologique du Loiret.

Scientific issues

A Web application has been developed to facilitate the storage and manipulation of a multimedia database from digitized shards: excavation site, vase typology, characterization of the pattern, images, 3D scan,... A first thesis has allowed the development of an automatic processing chain to extract the relief pattern of the digitized shards and to propose a classification in different categories [1-3]. These results must be confirmed on a larger corpus. In the continuity, an important step remains to achieve an effective correspondence between the patterns and "their" matrix, to link a production, a set of vases, to the same workshop, even to the same potter. But this association is made particularly complex by the variability of the curvatures or textures of the vases, by the rapid gesture of the potter applying the wheel in the fresh earth leaving approximate patterns, or by the state of conservation of the shards. The scientific objective is to develop advanced image processing and machine learning methods to allow an automatic association of patterns from the same matrix. The proposed method will have to be sufficiently generic to be transposable to similar decorations discovered on other excavation sites in Europe and thus offer the chronological dimension desired by archaeologists for the analysis of the diffusion of ceramic productions.

To achieve this objective, the expected missions / deliverables are:
- To manage the digitization of shards to increase the corpus (in collaboration with archaeologists),
- To make a detailed bibliographical study of AI methods (deep learning, clustering, ranking) applied to the classification of patterns,
- To develop and test AI methods suitable for the automatic identification of relief decorations from a single matrix,
- To validate these methods on a large corpus of patterns, analyze and report the results,
- To write and submit two papers to promote the work in leading international journals in computer science, AI and archaeology,
- To help open the project towards international collaborations for a European project proposal.

References :
[1] T. Debroutelle, S. Treuillet, A. Chetouani, M. Exbrayat, L. Martin, S. Jesset, Automatic Classification of Ceramic Sherds with Relief Motifs, J. Electron. Imaging 26(2), 2017.
[2] T., Chetouani A., Debroutelle T., Treuillet S., Martin L., Exbrayat M., and Jesset S. Classification of Ceramic Shards Based on Convolutional Neural Network, IEEE Int. Conf on Image Processing, 1038-1042, 2018.
[3] A. Chetouani, S. Treuillet, M. Exbrayat, S. Jesset, Classification of engraved pottery sherds mixing deep-learning features by compact bilinear pooling, Pattern Recognition Letters,Vol.131, 2020.

Profile

- You hold a PhD in Engineering, Computer Science or other relevant scientific domains. Your previous research contains scientific contributions in the field of image processing, vision and/or machine learning.
- You are skilled in programming in Python and/or C++ and have experience with open source image processing and machine learning libraries.
- You act with attention to quality, integrity, creativity and cooperation.
- You can speak and write fluently in English; knowledge of French is not necessary but appreciated.

What we offer ?

- A 15-month full-time contract as a postdoctoral researcher ; the planned start date is 1st January 2022 or as soon as possible after that date.
- You will do most of your work on Orleans Campus in a dynamic and stimulating working environment. Lab will provide you with a high performance computing machine, scanner, and ceramic material.
- Gross monthly salary : 2600 euros

Want to apply ?

- You can apply up to **November 20th, 2021** (by midnight Paris time) by sending your CV, cover letter and list of publications, as well as 2 contacts for recommendation to sylvie.treuillet@univ-orleans.fr and matthieu.exbrayat@univ-orleans.fr.
- The selection committee will review all of the applications as soon as possible after the application deadline. As soon as a decision has been made, we will inform you about the next steps in the selection procedure.