

Realistic Datasets For Robust Evaluation of Fresco Reconstruction Algorithms

November 28, 2023

Problem statement: This internship is part of a research project focusing on the problem of recovering the optimal spatial organization of a damaged support from its original elements (see Figure 1). Main applications include the reconstruction of artworks in cultural heritage restoration and archaeology. This is highly motivated by the restoration of damaged paintings during earthquakes as well as the discovery of mosaics or frescoes from excavations (e.g. Pompeii). Recently, [1] proposed a simulated dataset that has been used by a number of reconstruction algorithms [2] to evaluate their performance when fresco models are available. This dataset deals with (i) a very large set of fragments (typically many thousands), (ii) highly variable characteristics of fragments, (iii) irregularly shaped and eroded fragments, (iv) spurious fragments and (v) missing fragments. Nevertheless, this dataset still lacks of archaeological ambition and thus appear as a limitation for evaluating reconstruction algorithms in close realistic conditions.



Figure 1: Example of an ideal fresco reconstruction (top left) from both fresco model (top right) and a collection of fragment images (bottom). Only a subset of the set of available fragments are represented for convenience.

Objectives: The aim is to produce a new publicly available dataset based on [1] that will serve as a basis for evaluating reconstruction algorithms in a forthcoming international challenge. The student will consider realistic degradations that can occur on fresco models and/or fragments (color fading, noise, scratches, holes, variable erosion, etc.). In particular, degradations taking into account the different evolutions of distinct color pigments depending on their chemical composition as well as the support and the varnish kind will be investigated. This work will be in close collaboration with an italian partner at the University of Pavia.

Prerequisites: A candidate at master level (or equivalent) with a good mathematical and image processing background as well as good programming skills. Knowledge in optimization is preferred but not mandatory.

Duration/salary: From 4 to 6 months / About 530 euros per month.

Ph.D. continuation: Possible.

Location: The internship will take place in the SATIE lab at Gif-sur-yvette (30 minutes from Paris).

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References

- [1] P. Dondi, L. Lombardi, and A. Setti. DAFNE: A dataset of fresco fragments for digital anastlylosis. Pattern Recognition Letters (PRL), 138:631–637, 2020.
- [2] N. Lermé, S. Le Hégarat-Masclé, B. Zhang, and E. Aldea. Fast and efficient reconstruction of digitized frescoes. Pattern Recognition Letters (PRL), 138:417–423, 2020.