Additional material: An automatic approach for the classification of ancient clay statuettes based on heads features recognition

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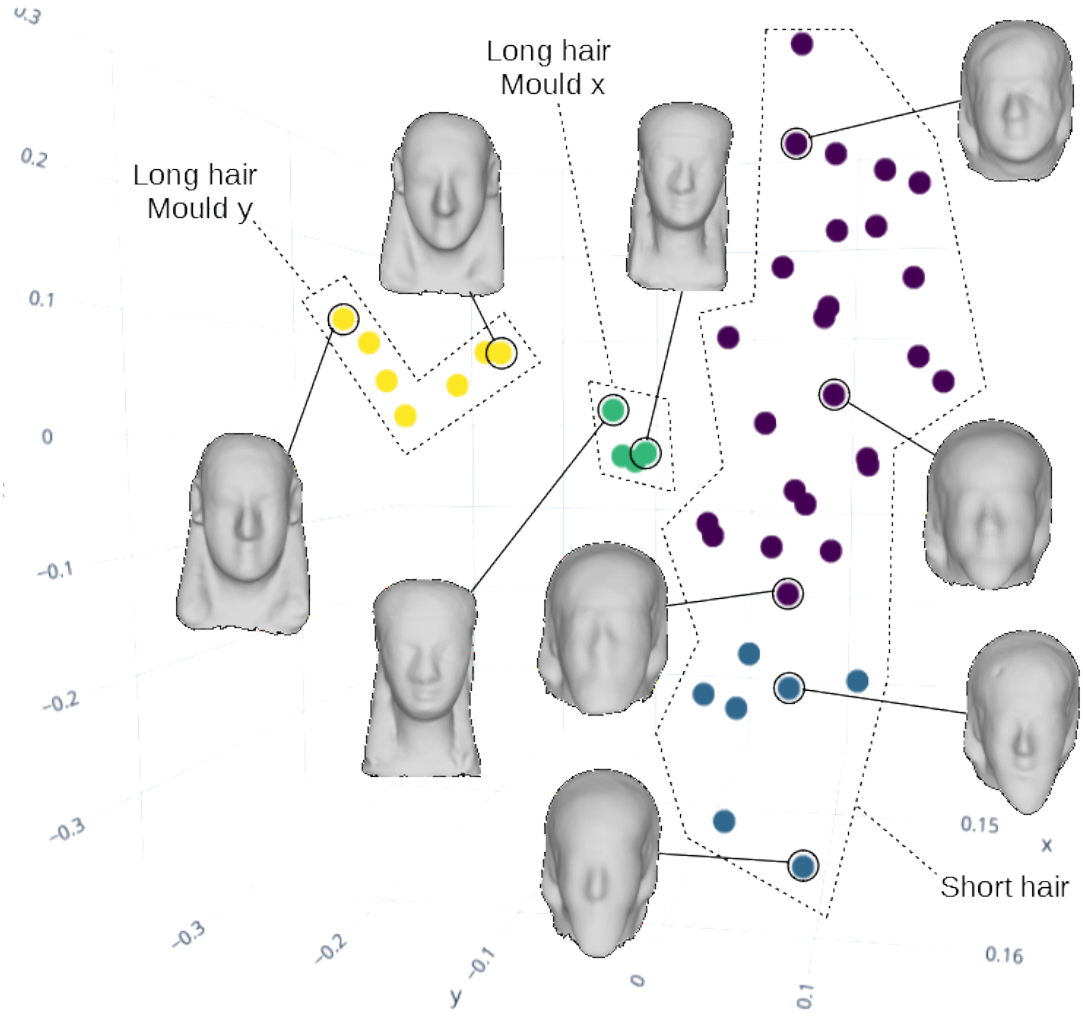

Figure 1: *Results of the clustering on the subset of moulded faces, with the knn-ε threshold (k = 9). As can be seen, the clustering highlights the two distinct sub-classes of the "long hair" faces (yellow and green clusters) that we associated to two different moulds, named x and y. The "short hair" class is further divided into two sub-classes, but the separation is not very pronounced. For this reason, we analysed this class in more detail in the other experiments.*

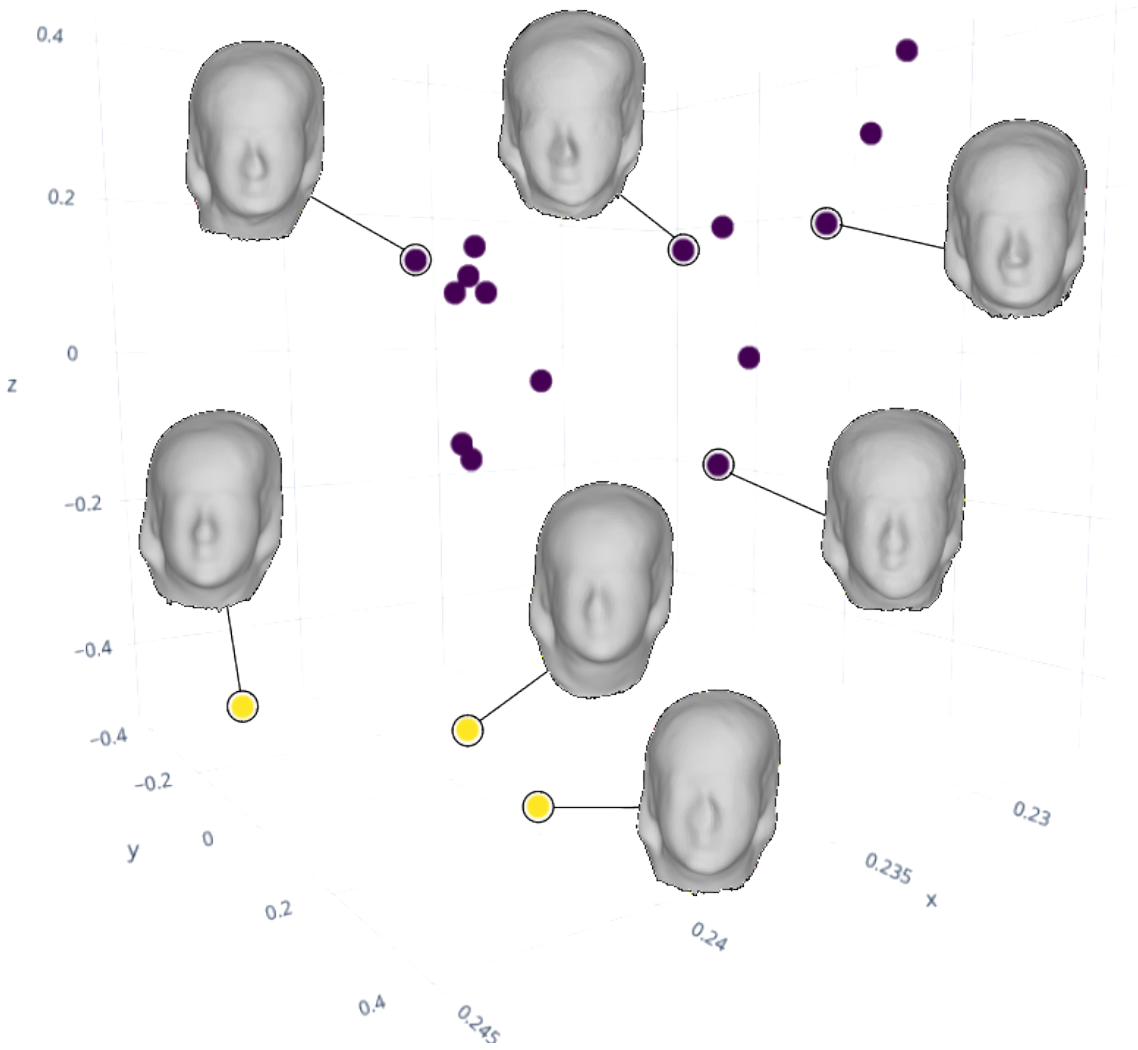

Figure 2: *Results of the analysis on the subset of "short hair" faces that do not have a beard, with the knn-ε threshold (k = 9). Even if DBSCAN divides them into two classes, only a further quantitative comparison among the faces could clarify if these deviations, rather than indicating different moulds, could be due to mould degradation, different pressure on the clay, or degradation of the artefacts.*

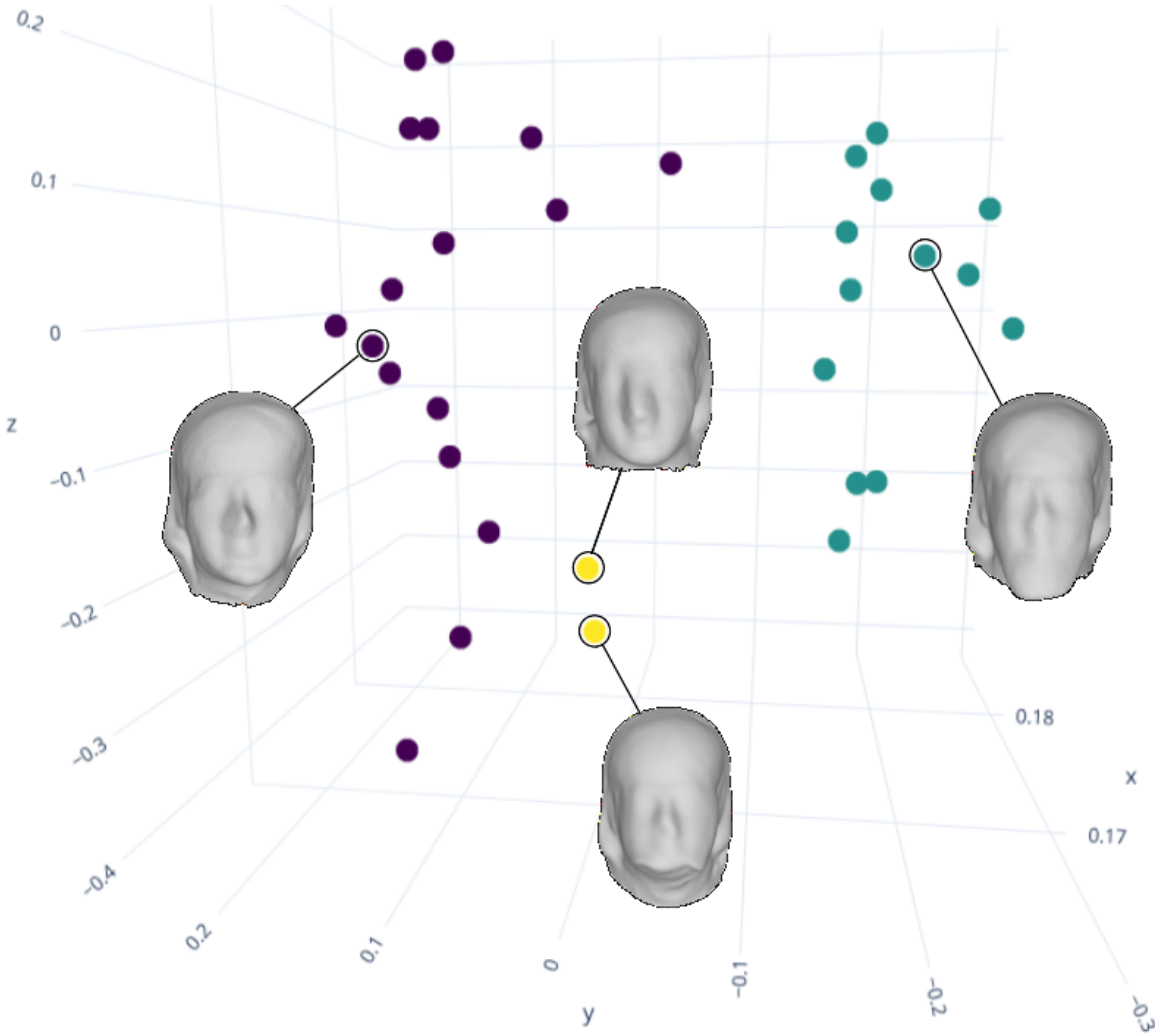

Figure 3: *Results of the analysis of the subset of "short hair" faces after removing the beard from the faces that have it, with the knn-ε threshold (k = 9). As can be seen, the clustering more or less correctly identify bearded from non-bearded faces, with the sole exception of the two faces in the yellow class. The reduction of the analysed surface given by the beards removal can, however, force the cropped faces to be classified into a new group, so we removed the corresponding part (i.e., the chin) from the faces that do not have a beard to see if the results are nearly similar.*

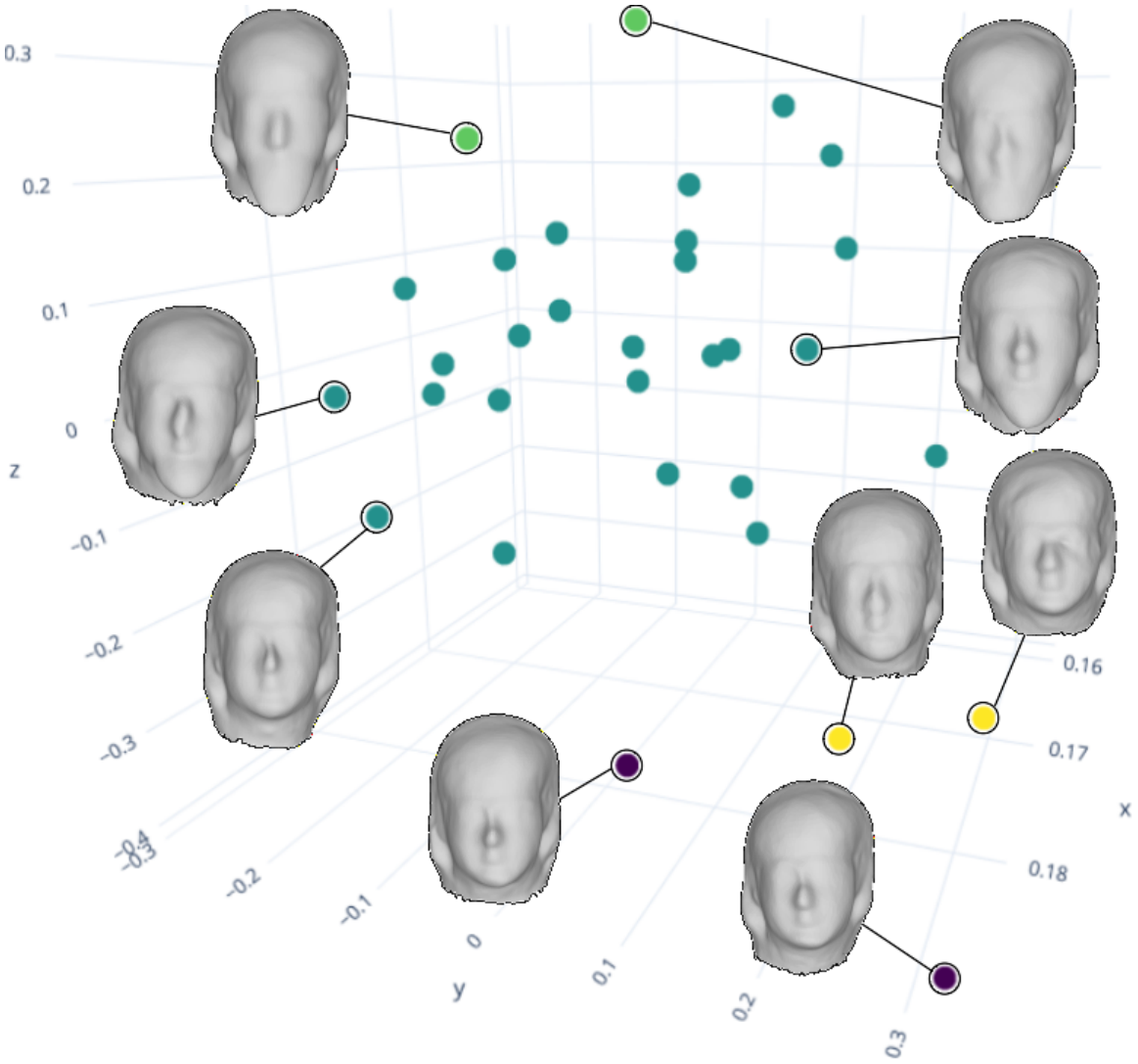

Figure 4: *Results of the analysis of the subset of "short hair" faces after removing the beard from the faces that have it and the chin from the remaining ones, with the knn-ε threshold (k = 9). As can be seen, the results of the third experiment do not show definite subdivisions in further classes. The two small clusters can be a result of the confusion possibly introduced by the erosion and/or by different pressure on the material during the production.*

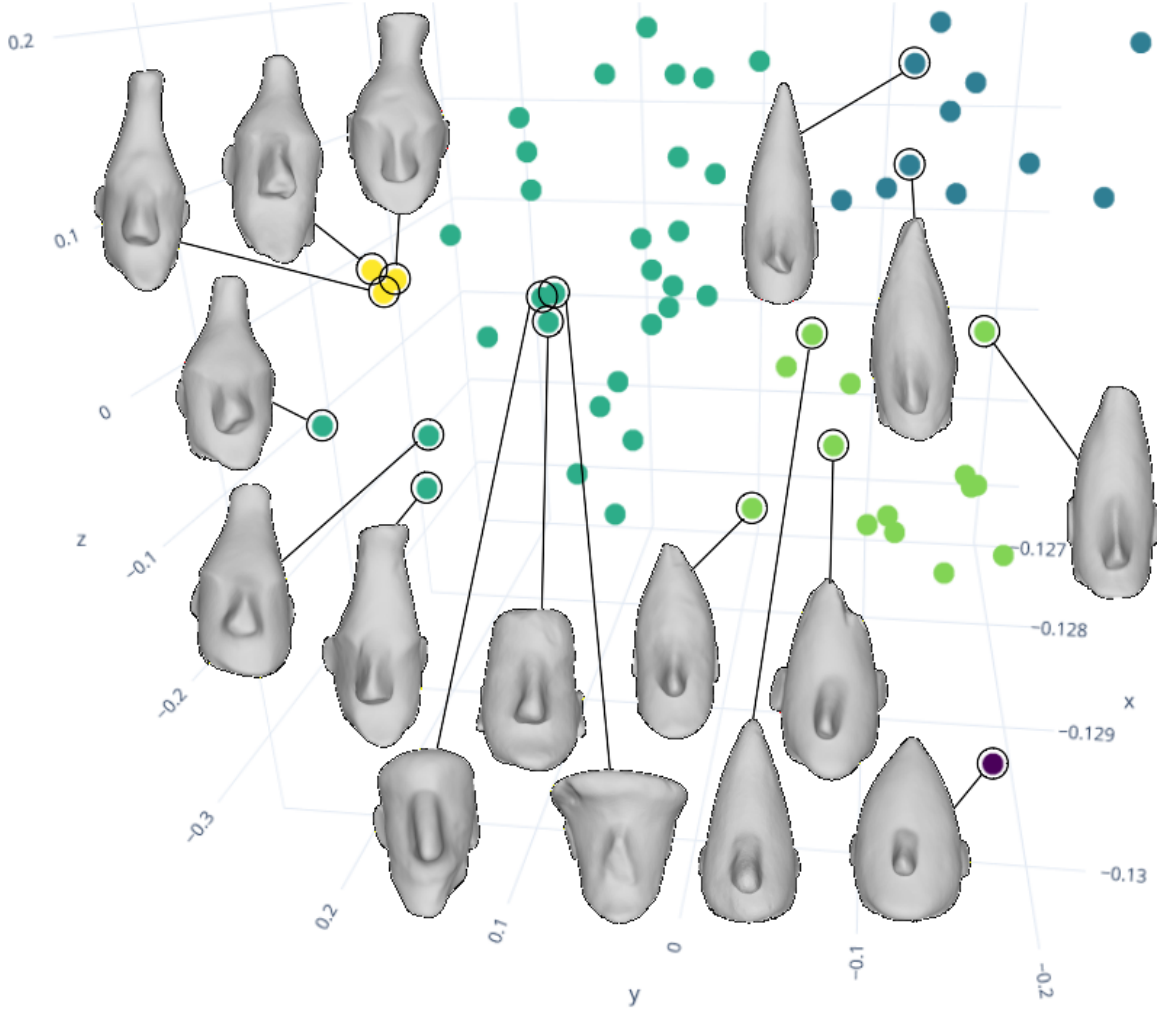

Figure 5: *Results of the analysis of the handmade heads, with the knn-ε threshold (k = 10). As can be seen, the classification of these heads is not precise: indeed, many pretty similar heads have been clustered in different clusters, while vice-versa many very different heads are classified in the same way.*