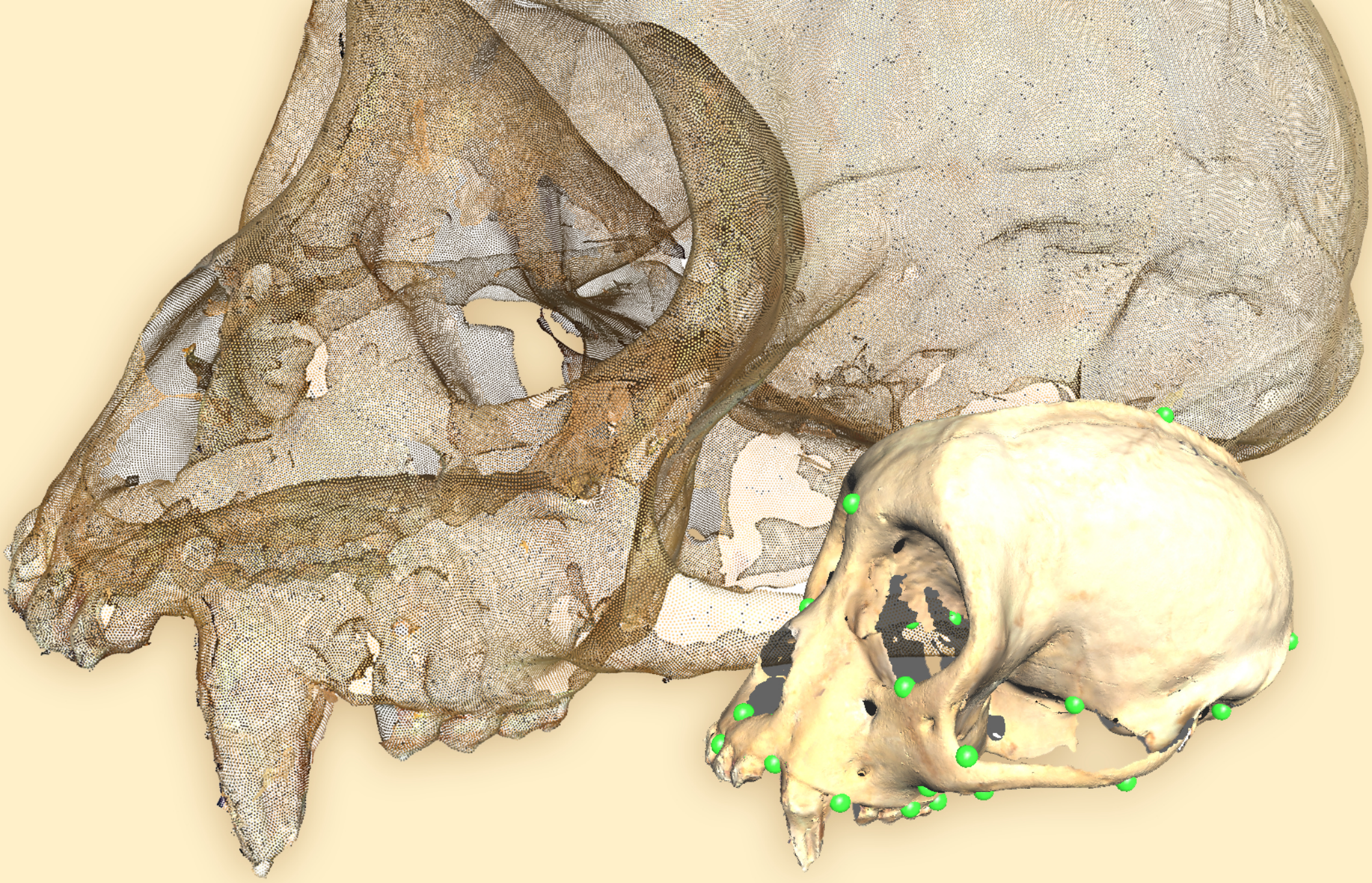

A Landmark-free Method for Three-Dimensional Shape Analysis

The tools and techniques used in shape analysis aim to transform the physical shape of an object into a concise set of numerical data for mathematical modeling and statistical analysis. The advent of landmark-based morphometrics opened new avenues of research in this area, but these methods are not without drawbacks. The time investment required of trained individuals to accurately landmark a data set is significant, and the reliance on readily-identifiable physical features can limit research, especially when investigating smooth or featureless surfaces.

In this talk, we present a new method, based upon and extending the Iterative Closest Point algorithm, to perform this transformation for data obtained from high-resolution scanning technology. This method uses surface scans, instead of landmarks, to calculate a shape difference metric analogous to Procrustes distance and perform superimposition. We also explore some new ways this data can be used; for example, we can calculate an averaged surface directly and visualize point-wise shape information over this surface. We demonstrate the method on a set of primate skulls and compare the results of the new methodology with traditional geometric morphometric analysis.

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