Papers Sorted by Topics

1. Skulls and Missing Data (both)
   1. Gunz et al 2009 Remake Skull
      1. **Principles for the virtual reconstruction of hominin crania**
         1. This article discusses different ways of reconstructing a hominin skull. While each of these ways involves using a “reference specimen,” the author suggests that comparing the partial specimen to each of the complete specimens individually can be used to generalize what the actual result is.
   2. Gunz et al 2004 Human Crania
      1. **COMPUTER AIDED RECONSTRUCTION OF HUMAN CRANIA**
      2. D
   3. Couette et al 2010 Missing Data
      1. **3D geometric morphometrics and missing-data. Can extant taxa give clues for the analysis of fossil primates?**
      2. S
   4. Neeser et al 2009 comparison
      1. **Comparing the Accuracy and Precision of Three Techniques Used for Estimating Missing Landmarks when Reconstructing Fossil Hominin Crania**
      2. This
2. Just Missing Data
   1. Clavel et al 2014 Testing Algos
      1. **Missing Data Estimation in Morphometrics: How Much is Too Much?**
      2. This paper “evaluates the relative performances of seven multiple imputation (MI) techniques” and finds “Fully Conditional Specification and Expectation–Maximization algorithms provide the best compromises between imputation accuracy and coverage probability.”
   2. Brown et al 2012 Missing Data
      1. **Testing of the Effect of Missing Data Estimation and Distribution in Morphometric Multivariate Data Analyses**
      2. Three artificially-incomplete data sets were derived from a complete data set in order to learn how the manner in which the data is missing affects its estimation. The data points were removed specifically to simulate different biases which could reasonable occur in the data.
   3. Arbour et\_al 2014 Incomplete Specimens
      1. **Incomplete specimens in geometric morphometric analyses**
      2. This article compares 4 different data estimate techniques (Baysian PCA, regression, thin plate spline and mean substitution, all via single imputation), and compares their effectiveness to estimate landmark location among 5 varied species. While for some species one method worked better than others, in all cases estimation was preferable to leaving out incomplete data, except in the most extreme cases.
   4. Danoliv et al 2012 Estimators
      1. **Robust Estimation of Multivariate Location and Scatter in the Presence of Missing Data**
      2. This paper describes a new method of data estimation which takes into account missing data and outlier data, and provides an algorithm to produce these estimator values \*\*\*\*\*\*\*\*\*
   5. Schafer et al 2002 Missing Data
      1. **Missing Data: Our View of the State of the Art**
      2. TBD. Probably not important to us.
   6. Ju et al 2004 Shape Mesh
      1. **Applying Mesh Conformation on Shape Analysis with Missing Data**
      2. Unimportant article. Using an arbitrary 3D object as a reference model, this team sought to figure out a way to map each point of this reverence model to another 3D object which contained some missing data. Examples they gave were transforming a sphere into the shape of a partial box, or filling a fragmented scan of a human body using a model human.
   7. Astrom et al 2007 Point Corr
      1. **Automatic feature point correspondences and shape analysis with missing data and outliers using MDL**
      2. Unimportant article. This paper discusses “automatic landmark selection and correspondence determination from a discrete set of landmarks.” It tries to generate a set of landmarks for geomorphic analysis, and then tries to fit these landmarks to a face? Unimportant article
3. Fourier Analysis
   1. Bocxlaer et al 2010 comparison
      1. **Comparison of morphometric techniques for shapes with few homologous landmarks based on machine-learning approaches to biological discrimination**
      2. This articles compares the Landmark Analysis, Semi-landmark Analysis, and Elliptical Fourier analysis when few (<15) landmarks are known. It uses the machine learning algorithm of support vector machines to classify species. EFA was better over all, but Semi-landmark analysis is better at capturing small nuances of the curves.
   2. Iwata et al 2014 Rice Fourier
      1. **Genomic Prediction of Biological Shape: Elliptic Fourier Analysis and Kernel Partial Least Squares (PLS) Regression Applied to Grain Shape Prediction in Rice**
      2. This article describes describes 4 different methods to create a model that predicts the Elliptical Fourier constants of different species of rice. These predictions were made using “genomic-wide single-nucleotide polymorphism markers” (common genetic characteristics?).
   3. Carlo et al 2011 Skeleton
      1. **Quantifying Complex Shapes: Elliptical Fourier Analysis of Octocoral Sclerites**
      2. This paper discusses using the Elliptical Fourier constants in order to classify Sclerites. When comparing a single specimen to *averaged* colonies, rather than single specimens of these colonies, it classified correctly around 90% of the time.
   4. Claude 2013 tooth
      1. **Log-shape ratios, Procrustes superimposition, elliptic Fourier analysis: three worked examples in R**
      2. This paper discusses the use of log-shape ratio, Procrustes coordinate data, and Elliptical Fourier coefficients in species identification. Fourier analysis only correctly identified 66% of the time, while using Procrustes coordinates and log-shape ratios yielded a near perfect classification
   5. Rolhf et al 1984 mosquite fourier
      1. **A Comparison of Fourier Methods for the Description of Wing Shape in Mosquitoes**
      2. Methods for quantifying the wing shape of mosquitoes were discussed. This paper is notable for its pioneering use of EFA.
4. History of Geometric Morphometrics (literature reviews)
   1. Adams et al 2004 GeoMorph Hist
      1. **Geometric morphometrics: ten years of progress following the ‘revolution’**
      2. This article discusses the history of morphometric analysis, including the different trends and methodologies used over time. Traditional morphometrics uses linear distances and ratios to quantify shapes. Discusses landmarks, sliding semilandmarks landmarks, generalized Procrustes (space) analysis, uses in phylogenics
   2. Slice 2007 GM History
      1. **Geometric Morphometrics**
      2. Discusses geo-morph history as it pertains to anthropology and anatomy, lists common methods they use
   3. Adams et al 2012 History2
      1. **A field comes of age: geometric morphometrics in the 21st century**
      2. Overview of geo-morphometrics; discusses 4 steps to an analysis, discusses semilandmarks, use of symmetry for missing data and symmetry analysis, methods of visualizing biological allometry,
5. Landmarks
   1. Bookstein 1989 Thin Plate Spline
      1. **Principal Warps: Thin-Plate Splines and the Decomposition of Deformations**
      2. This paper discusses the mathematics behind the Thin-Plate Spline interpolation technique of properly quantifying curves between two landmarks.
   2. Gunz et al 2005 Semi-landmarks 3D
      1. **Semilandmarks in Three Dimensions**
      2. This paper discusses how to apply the concept of the Thin-Plate Spline in three dimensions so as to eliminate “deficient” landmarks, such as “widest point” from the data set
   3. Bookstein 1997 Semi 2D Alg
      1. **Landmark methods for forms without landmarks: morphometrics of group differences in outline shape**
      2. This paper discusses how to use the Thin-Plate Spline in TWO dimensions in order to properly space semilandmark curves.
   4. Rohlf et al 1990 Procrustes Sliding
      1. **Extensions of the Procrustes Method for the Optimal Superimposition of Landmarks**
      2. This paper discusses mathematics behind Procrustes superimposition,

Literature Review

**Summary and importance of preliminarily-found research articles**

Article Title: **Automatic feature point correspondences and shape analysis with missing data and outliers using MDL**

Summary:

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Relevance to us:

1. This paper is not very relevant to us because it discusses methods for automatically selecting landmarks, while in our problem we already have the landmarks.

Article Title: **Geometric morphometrics: ten years**

**of progress following the ‘revolution’**

Summary:

Article Title: **Principles for the virtual reconstruction of hominin crania**

Summary:

Releveance:

1. While not ideal, this method could be used to generate what the

Article Title: **Semilandmarks: a method for quantifying curves and surfaces**

Summary:

This article discusses semilandmarks: what they are, how to “choose” them, and how they can be used to fill in missing data. While are landmarks are used to denote homologous points, semilandmarks are used to denote homologous *curves*. Semilandmarks are spaced according to either the Procrustes superimposition or the thin-plate spline (TPS) deformation, both method have

Relevance to us:

1. If we want to use geometric morphometrics, this clarifies what landmarks and semilandmarks are, as well as gives method(s) for placing semilandmarks