E-learningový kurz

Modern quantitative methods
and shape analysis in archaeology

Applications of statistics and morphometrics

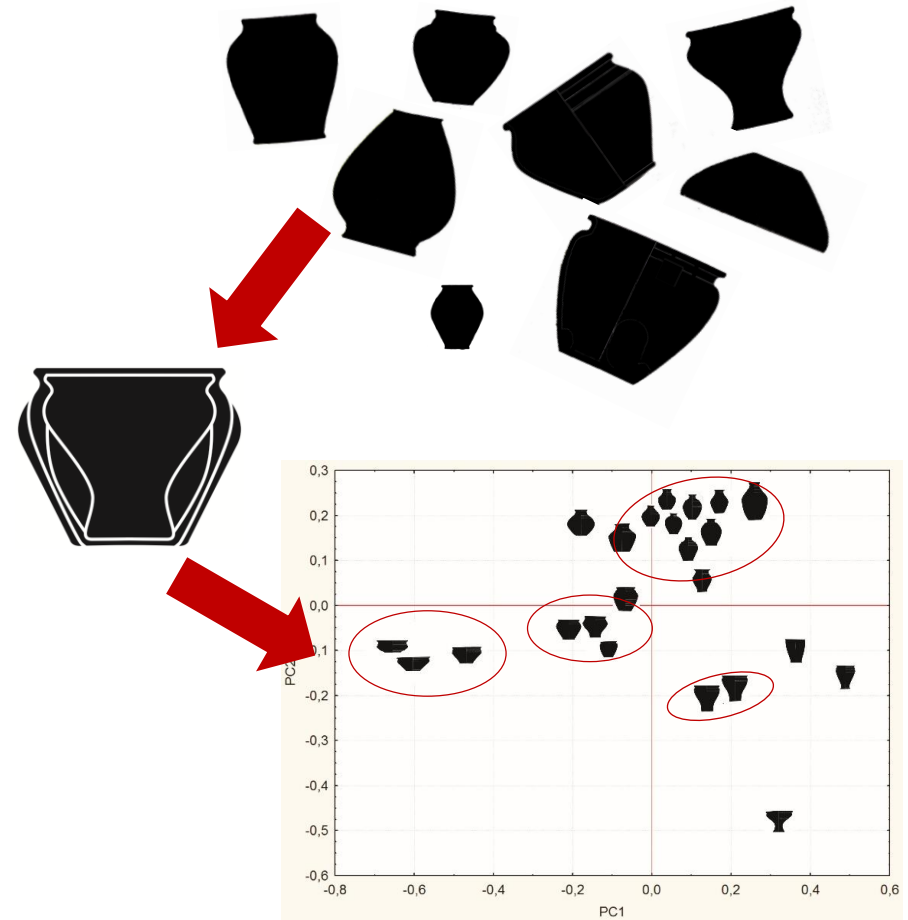Brief overview of methods used for shape information treatment

1) Data collection

2) Standardisation

(position, size and orientation)

3) Calculation of shape variables

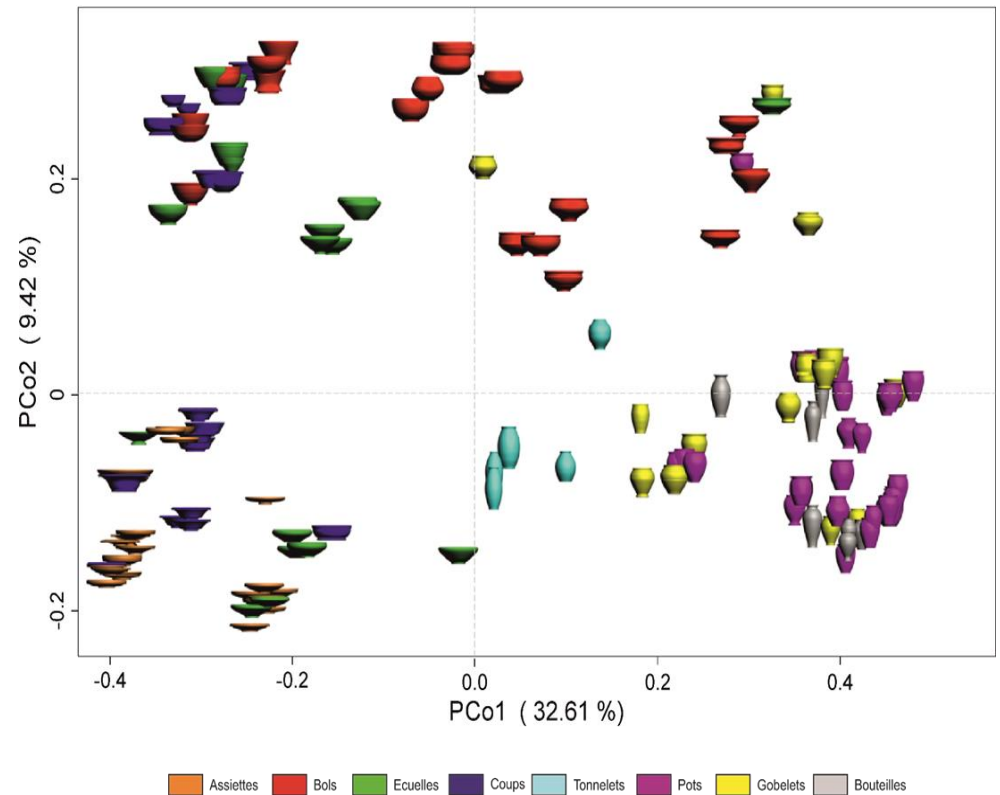**4) Data treatment and visualisation**

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Visualise all artefacts in the morphospace

Methods
Principal Component Analysis (PCA)
Principal Coordinate Analysis (PCoA)
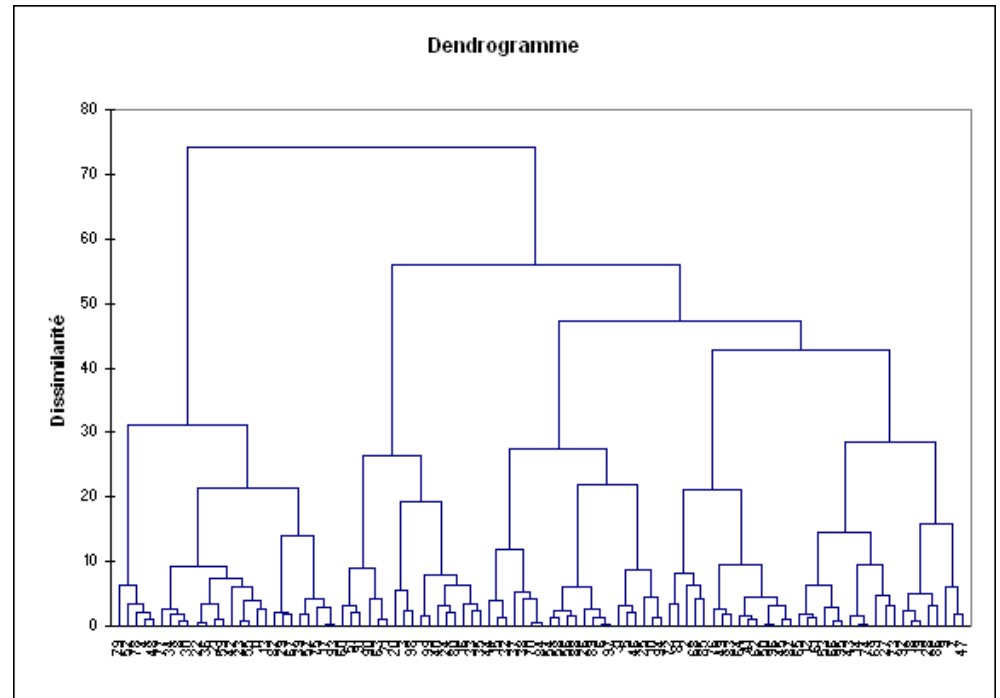Multidimensional Scaling (MDS)

Wilczek et al. 2014

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Visualise all artefacts in the morphospace

Methods

Principal Component Analysis (PCA)

Principal Coordinate Analysis (PCoA)

Multidimensional Scaling (MDS)

3D

Wilczek et al. 2014

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Create classifications

Methods
Hierarchical Cluster Analysis (HCA)
Model-based CA

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Create classifications

Methods
Hierarchical Cluster Analysis (HCA)
Model-based CA

ward

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Create classifications

Methods
Hierarchical Cluster Analysis (HCA)
Model-based CA

Create classifications

Methods
Hierarchical Cluster Analysis (HCA)
Model-based CA

Check differences between groups

Methods
Canonical Variates analysis (CVA)
Linear Discriminant Analysis (LDA)
Model-based DA
MANOVA, PERMANOVA
Goodall's F-test

LDA (Atlantic vs Oriental)

```
              Df Hotelling-Lawley approx F num Df den Df    Pr(>F)
GR2.groups     1           2.3211   11.605     41    205 < 2.2e-16 ***
Residuals    245
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Wilczek et al. 2015

Check differences between groups
Predict the class of the new object

Methods
Canonical Variates analysis (CVA)
Linear Discriminant Analysis (LDA)
Model-based DA
MANOVA, PERMANOVA
Goodall's F-test

LDA (Atlantic vs Oriental)

0.80 – blue
0.20 – red
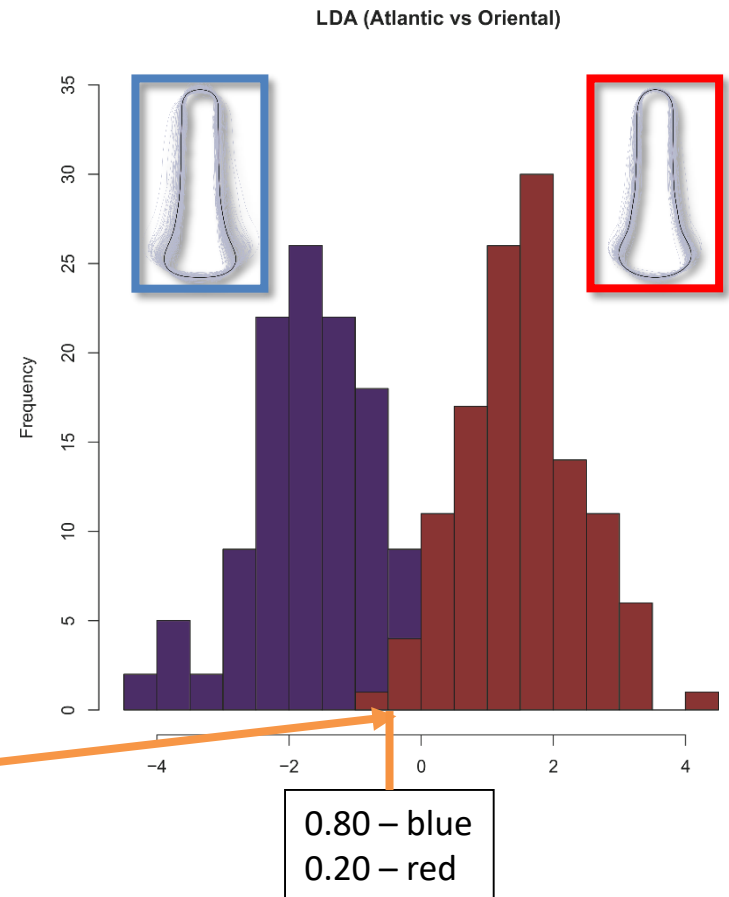
Check differences between groups

Visualizer differences between groups

Methods

Canonical Variates analysis (CVA)

Linear Discriminant Analysis (LDA)

Model-based DA

MANOVA

Visualizer the meanshape of groups

EFA-HS-e
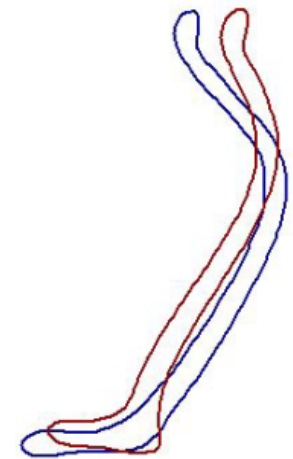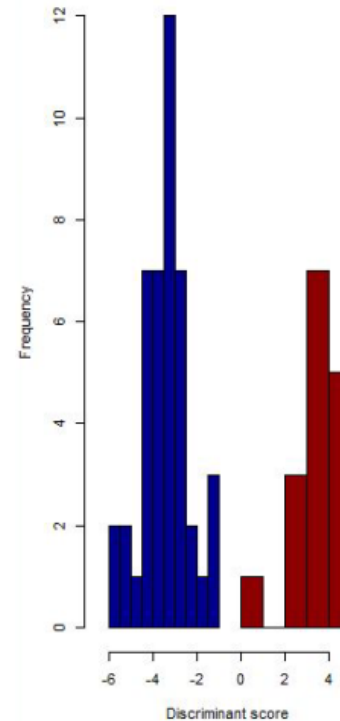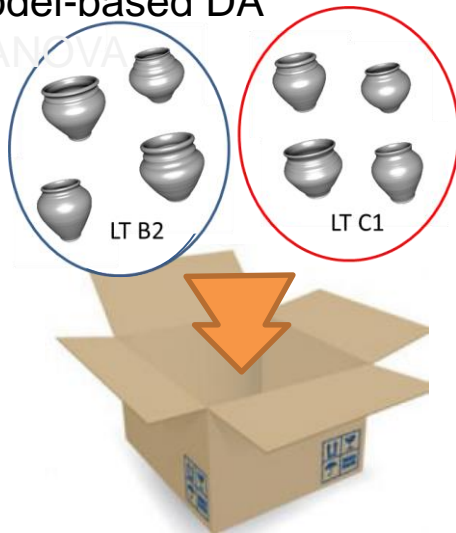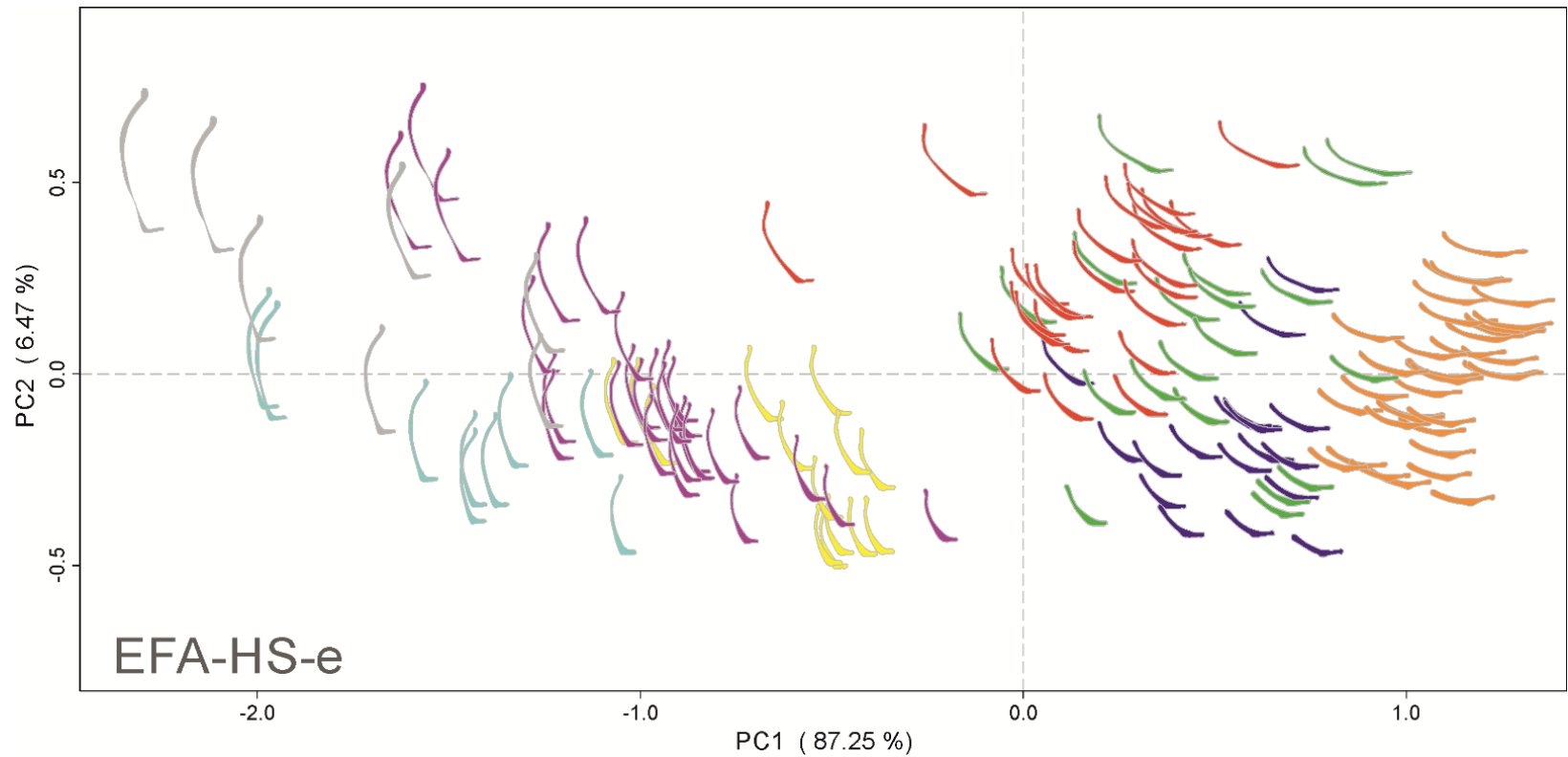
Visualizer the meanshape of groups

Meanshape of *Tonnelets* Meanshape of *Bouteilles* Meanshape of *Pots* Meanshape of *Gobelets*
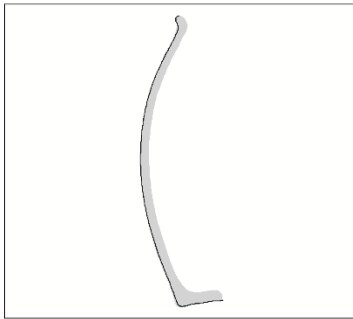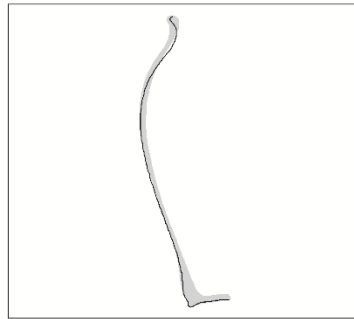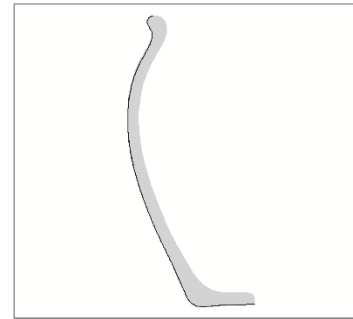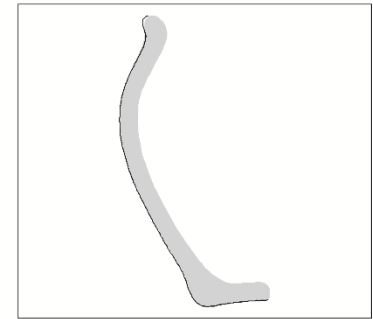
Meanshape of *Assiettes* Meanshape of *Coups* Meanshape of *Ecuelles* Meanshape of *Bols*
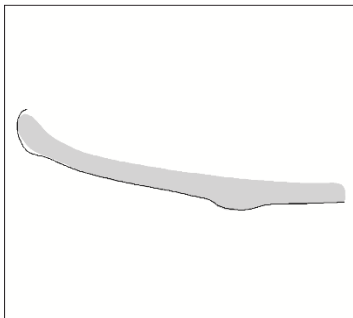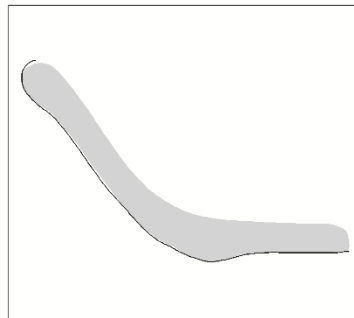
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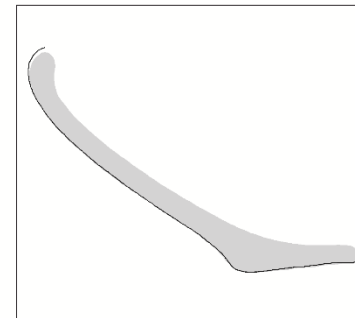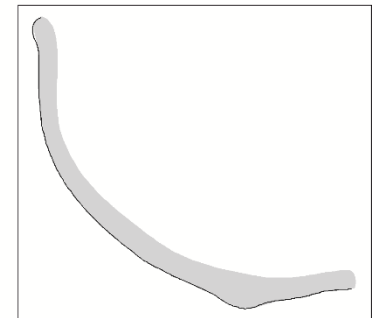
Visualizer no matter which individual in the morphospace

Wilczek et al. 2015
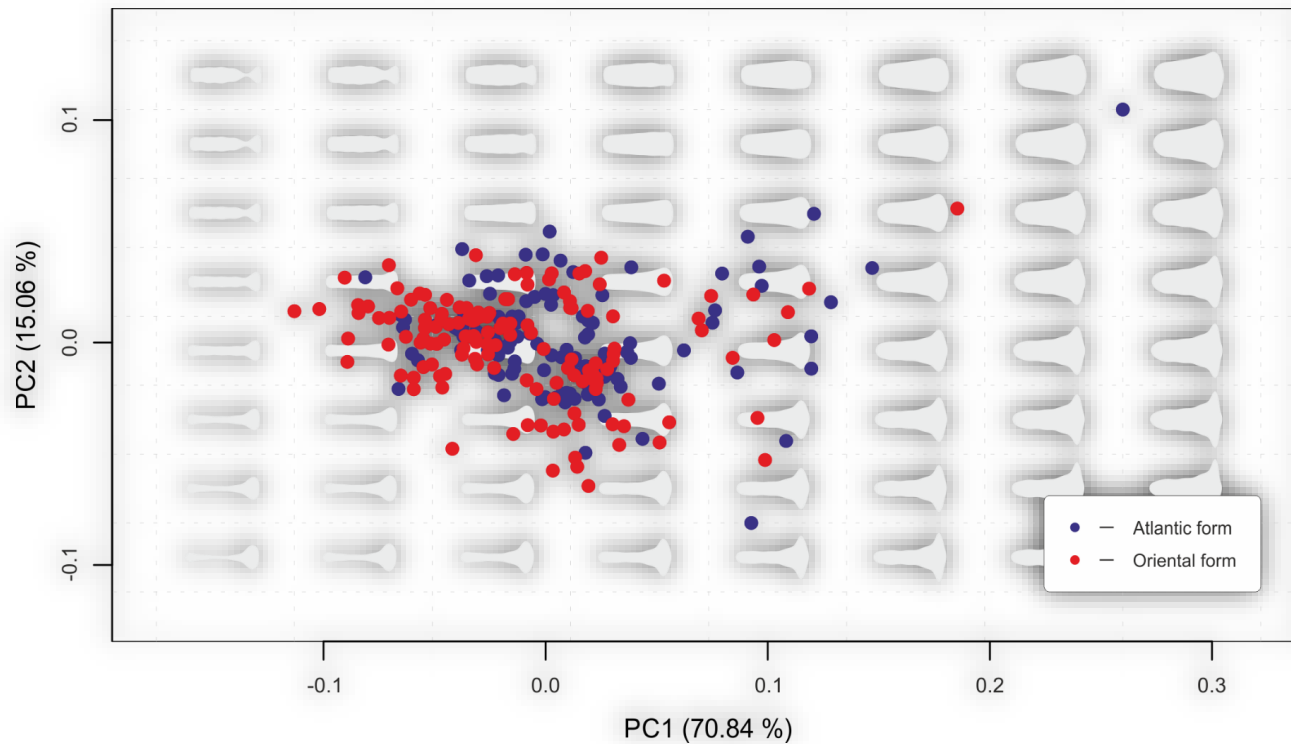
Estimate shape diversity of groups (e.g. for standardisation of the production)
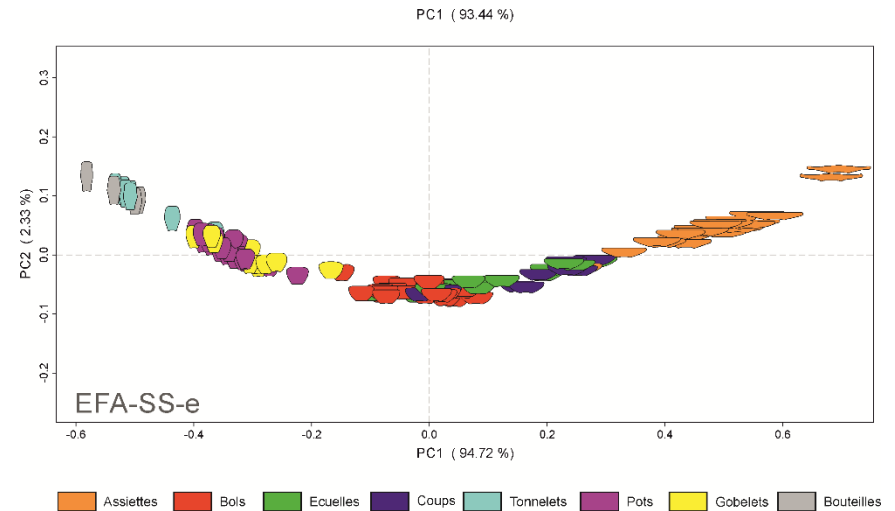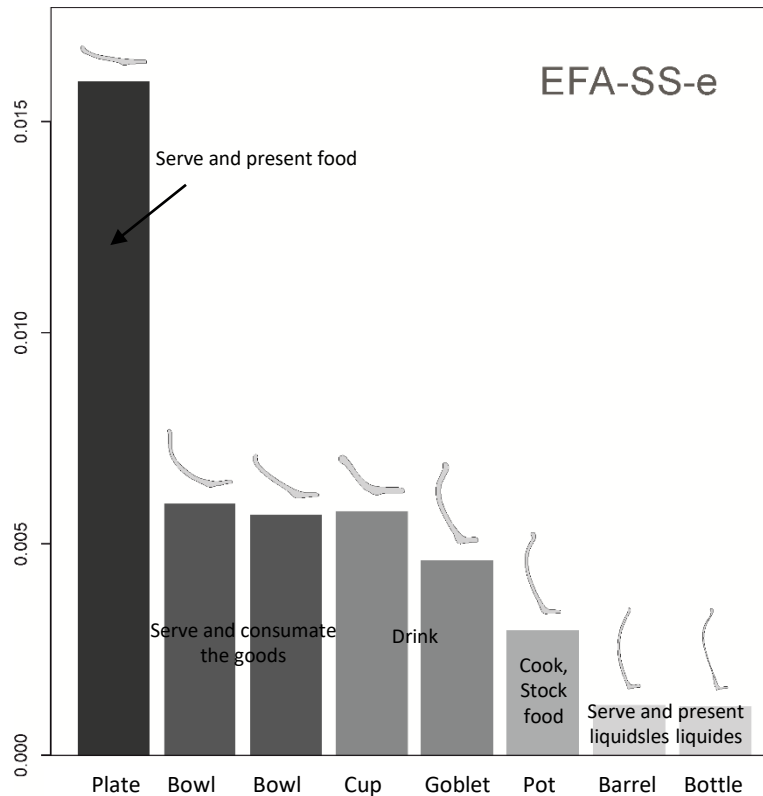
Identify the best analogy for a fragment and classify it

308 vessels (Moravia)

The best fit

More probable   Less probable
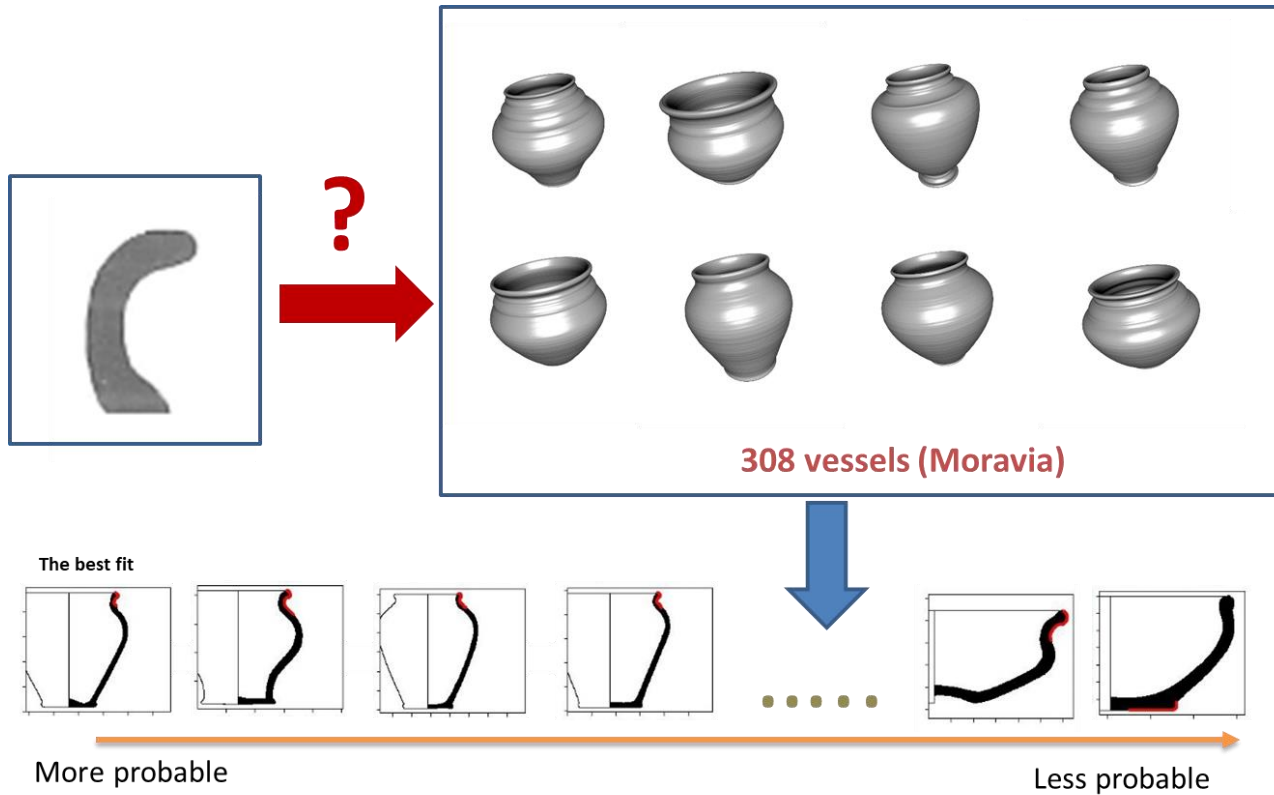
Test and visualisation of the relationship between shape and any continuous variable (size/centroid size, time, …):

Methods:
Regression
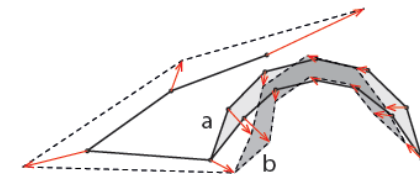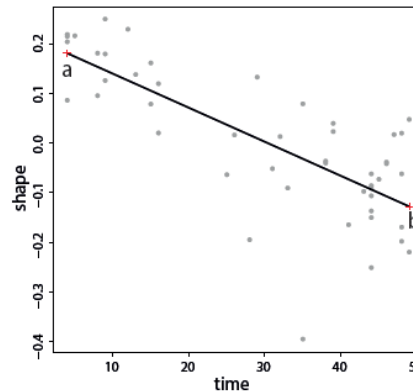
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- Wilczek, J., Monna, F., Barral, P., Burlet, L., Chateau, C., Navarro, N., 2014. Morphometrics of Second Iron Age ceramics - strengths, weaknesses, and comparison with traditional typology. J. Archaeol. Sci. 50, 39–50.
- Wilczek, J., Monna, F., Gabillot, M., Navarro, N., Rusch, L., Chateau, C., 2015. Unsupervised model-based clustering for typological classification of Middle Bronze Age flanged axes. J. Archaeol. Sci. - Rep. 3, 381–391.

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Evropské strukturální a investiční fondy
Operační program Výzkum, vývoj a vzdělávání

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