# Statistical Geometry Processing
## Winter Term 2011/2012

### Assignment Sheet #6: Fitting your Handwriting to Stuff

**Author:** Michael Wand
**Contact:** mwand@mpi-inf.mpg.de

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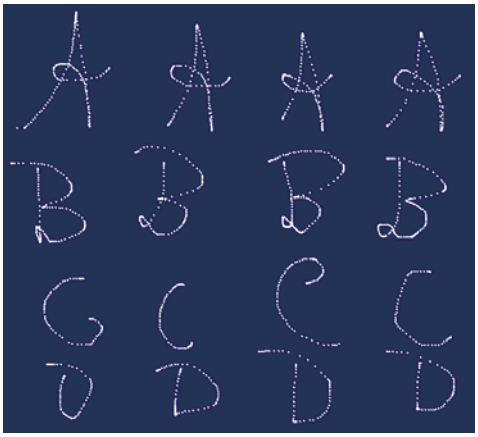
Reuse the code from the last Assignment (No. 5, The Space of Your Handwriting) and build a PCA model for 3-4 different hand-written characters. Use the training technique that worked best in your experiments to create a PCA space.



Using this model, solve the following assignments:

### Assignment 6.1: Character recognition from curves (practice) (score: 50%)

Given a new curve you have not seen in your training set, try to match it to the learned subspaces. Based on the techniques from the previous assignment, develop an algorithm for finding an estimate of suitable correspondences. After that, use the learned Gaussian model to estimate which character fits best.

**Hint:** The trained model is low-dimensional. For the remaining dimensions, you can assume a uniform Gaussian distribution with small variance (user parameter). Furthermore, assume that the model is translation invariant (rotation invariance is more difficult and should be omitted).

### Assignment 6.2: Character recognition from point clouds (practice) (score: 50%)

Solve the same problem as in Assignment 6.1, but now assuming a different input: The input should be an unstructured set of points, omitting the linear structure. Develop a deformable ICP algorithm that brings a character drawn from your model into alignment with the point cloud. Rather than elastic deformation, use the learned shape space for shape variations.

In this model, it is possible to align to partial data (just delete some points), or to data with random outlier points, if the data model is formulated accordingly. How could this be achieved (explain in the tutorial course)? **Optional:** Implement a robust model (practice).

**Hint:** Proceed in two steps. (1) Correspondences can be obtained by nearest neighbors, given a coarse alignment. (2) Knowing correspondences, how can the model parameter (translation, coordinates in PCA subspace) be estimated? (this is very similar to 6.1)