1163-49-38 **Hossein Dabirian**, **Jiwen He**, **Robert Azencott** and **Andreas Mang*** (andreas@math.uh.edu), Philip Guthrie Hoffman Hall, 3551 Cullen Blvd, Room 614, Houston, TX 77204. *Statistical Analysis of Shapes and Shape Deformations in 3D.* Preliminary report.

We present research on statistical analysis on infinite-dimensional shape spaces for classification and clustering of 3D-shapes and shape deformations. Our ultimate goal is to provide computational methods that allow us to automatically discriminate between clinically distinct patients groups through the lens of anatomical shape variability. In a Riemannian setting, we can express the similarity between two shapes s_0, s_1, in terms of an energy minimizing diffeomorphism y such that $y(s_0) = s_1$. We use an optimal control formulation, in which the diffeomorphism y is parameterized by a smooth, time-dependent velocity field v (the control variable of our problem). After computing an optimal $v^\star$ and the associated $y^\star$, we derive the strain distribution of $y^\star$ as well as a Hilbert norm of $v^\star$ to characterize the dissimilarities between s_0 and s_1. Using these features, as well as standard anatomic measurements, we implement machine learning techniques to achieve the automatic classification of shapes extracted from cardiac imaging (mitral valves, to be precise). (Received July 24, 2020)