Statistical geometric model of organ's shapes for Computational Medicine

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How can we use computational tools to help clinicians in their daily practice? To develop the personalization of therapies, to aid the diagnosis? Are we sure that we can trust the results of the algorithms? These are core questions in personalized computational medicine.

In this context, the goal of my research at Stanford is to create a generative statistical model of a given organ's shape for personalized computational medicine. Keeping in mind the potential clinical applications, special care will be given to the rigorous mathematical definition of its utilization's limits.

Such a project requires a synergy between differential geometry, statistics, image computing and medicine. At Stanford, I will collaborate with Pr. Susan Holmes mostly on the statistics part. Pr. Holmes is well known for her applications of nonparametric multivariate methods for biological data, which make her a dreamed mentor.

One application of this project is personalized computational assistance for surgery. We will test it on images of pelvis for fracture reduction. However, we expect this work to be general enough to laid the rigorous foundations in reliable computational medicine. Applications thus extend to the help for clinical trial, diagnosis and any personalized assistance.