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Title:

Mapping Statistical Patterns in Medical Images via Diffeomorphisms

Abstract:

Computer vision (CV) is often applied to industrial production, security or military applications. The medical domain provides a fertile alternative area for CV research where one's work can aid in understanding patterns of disease, improving diagnosis and treatment outcome. One may also address questions in basic science such as: How might the human brain have evolved from its ancestral form? How do patterns of genetic expression affect growth or disease? What shape changes or biometrics characterize different diseases? What is natural human variation? Furthermore, medical CV allows one to combine elegant mathematical formulations with valuable applications.

This talk will discuss a body of methods based on the diffeomorphism group of volume-preserving deformations. This group enables us to define a metric distance in the space of shape change. We will show the usefulness of this metric for characterizing shape and appearance transformations between images and populations of images. We will then discuss applications to basic medical science of the brain along with some interesting results.