A primary goal of Computational Anatomy is the statistical analysis of anatomical variability. Large Deformation Diffeomorphic transformations have been shown to accommodate the geometric variability but performing statistics of Diffeomorphic transformations remains a challenge. I will start with the simple concept of defining the “Average Anatomy” and then extend this to the study of regression and co-variation of anatomical shape with independent variables. The motivation is to model the inherent relation between anatomical shape and clinical measures and evaluate its statistical significance. We use Partial Least Squares for the multivariate statistical analysis of the deformation momenta under the Large Deformation Diffeomorphic framework. The statistical methodology extracts pertinent directions in the momenta space and the clinical response space in terms of latent variables. We report the results of this analysis on subjects from the ADNI database.