

Statistical Modeling of Functional Mapping for Multiple Longitudinal Traits: Structured Antedependence Model and Wavelet Dimensionality Reduction

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Abstract:

Quantitative traits usually undergo developmental changes during ontogeny. A new theoretical framework for mapping quantitative traits of developmental nature, called functional mapping, has been founded in which the effect of gene action on the developmental patterns can be assessed. Functional mapping incorporates fundamental principles of biological processes through mathematical functions into a mixture model-based mapping framework and, therefore, can enhance the biological relevance of a mapping model. In this talk, we will present a novel model that extends the concept of functional mapping to mapping multiple developmentally correlated traits. We present a series of statistical models for structuring the residual covariance matrix based on the structured antedependence model for different traits measured at a multitude of time points. A statistical model based on wavelet dimensionality reduction approaches has been derived to reduce the dimension of the data, correspondingly, increase the tractability of our models. Simulation studies as well as examples from mouse and poplar tree will be demonstrated to validate our models.