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Chemometric regression techniques as emerging, powerful tools in genetic association studies

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HIGHLIGHTS

- Applications of some chemometric techniques to genetic epidemiology
- Advantages of chemometric techniques over conventional techniques
- Role of chemometrics in the future of genetic association studies

ABSTRACT

The field of chemometrics has its origin in chemistry and has been widely applied to the evaluation of analytical chemical data and quantitative structure-activity relationships. Chemometric techniques apply statistical and algorithmic methods to extract information from analytical multivariate data, including fused, heterogeneous data. These techniques are now widely applied across fields as varied as food technology, environmental chemistry, process control, medical diagnostics, and metabolomics. In the mid-1980s, cross-disciplinary interaction between genetics and epidemiology led to the emergence of genetic epidemiology as a new discipline. Chemometric techniques are extremely appropriate for, and have been widely applied to, this discipline. Here, we present a broad review of the application of chemometric techniques to the fields of genetic epidemiology and statistical genetics. We also consider some future directions. We focus on chemometrics-based regression methodologies in genetic association studies.

Keywords:

Chemometrics

Genetic epidemiology

Genome-wide association studies

Multivariate data

Multivariate regression technique

Partial least squares

Principal-component regression

Ridge regression

Single-nucleotide polymorphism

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