Statistical methods in genetics and chemometrics

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Lectures

- **Statistics in toxicology II (testing) (WiSe 2021/22)**
  - Friday 9-12, online or in M/E 21
- **Statistical methods in genetics (bioinformatics) (WiSe 2021/22)**
  - Tuesday 8-10 and Thursday 12-14, online or in M/E 21
Statistics in toxicology I: Topics

- Modeling of relationships between dose and response
  - Parametric models
  - Model selection, model averaging
- Estimation of alert concentrations from
  - genetic data (gene expression)
  - classical assays (cytotoxicity)
Statistics in toxicology II: Topics

- Proof of hazard using multiple comparisons with negative control
  - Multiple testing
  - Tests for normally distributed endpoints and for proportions
- Trend tests
  - Analysis of long-term effects in cancer studies
  - Survival analysis, tests for survival endpoint
- Analysis of effects in mutagenicity assays
  - Mixture distributions, EM algorithm
- Dose-finding in Phase I clinical trials
Statistical methods in genetics (bioinformatics)

Traditional medicine

Patient group with same diagnosis and same treatment

Personalized medicine

Drug effective, non-toxic

Drug not effective, non-toxic

Drug toxic
Statistics in genetics (bioinformatics): Topics

- **Sequence analysis**
  - Sequence modeling: Markov chains and Markov processes
  - Sequence alignments, phylogeny

- **Analysis of omics data (expression data)**
  - Preprocessing, normalization
  - Classification (cluster analysis, discriminant analysis, ...)
  - Finding "active" genes, variable selection
  - Biological interpretation (combination of different data types, networks, toxicology...)
  - Time series

- **Disease progression**

- **Proteomics**