Statistical methods in genetics and chemometrics

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Lectures

- **Statistics in toxicology II (testing) (WiSe 2022/23)**
  - Tuesday 8-10 (and Thursday 12-14), in presence and online
- **Statistical methods in genetics (bioinformatics) (SoSe 2023)**
  - Tuesday 8-10 and Thursday 12-14, in presence and online
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**