High dimensional statistics in cancer research

Maik Kschischo

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Research interests

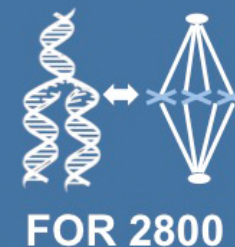## Data analysis and modelling

- Statistical und ML models
- Mechanistic models

Mathematical and statistical methods

- Dynamic models and model uncertainty
- Statistical causal models in high dimensions

Cancer biology/medicine

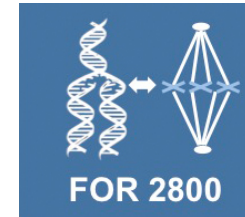- Genome instability
- Replication stress

FOR 2800

Current projects

![DFG Deutsche Forschungsgemeinschaft]

Structural error estimation in dynamic systems

- **Dominik Kahl**, PhD student
- **Andreas Weber**, Universität Bonn
- See Dominik's talk
- Collaborators:
  - Holger Fröhlich (Bonn), Benjamin Engelhardt (Abbvie)
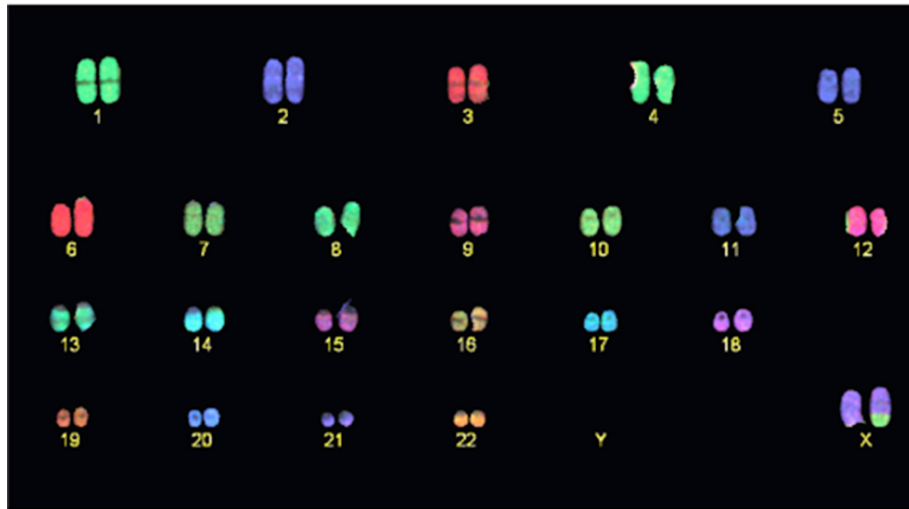
FOR 2800:

„Chromosome Instability: Cross-talk of DNA replication stress and mitotic dysfunction"
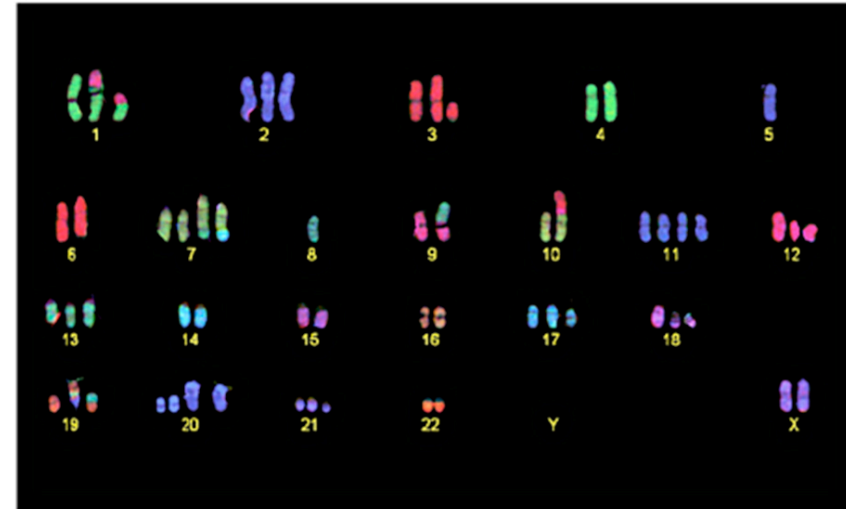
- DFG research unit
- 8 groups from Göttingen, Kaiserslautern, Heidelberg and Koblenz
- Start in 2018

Chromosomal instability (CIN) and aneuploidy in cancer cells

46 (intact) chromosomes in healthy human cell

59 (rearranged) chromosomes in colorectal cancer cell

- How does CIN arise?
- How can aneuploid cells survive and proliferate?
  (Endesfelder et al. , Cancer Res. 2014)
- Link to replication stress? (Burrel et al., Nature, 2013)
- **Can modelling and data analysis help answering these questions?**

Sample specific pathway scoring using principal curves

Autodegradation of Cdh1 by Cdh1:APC/C pathway
Prinicipal curve and W-CIN score
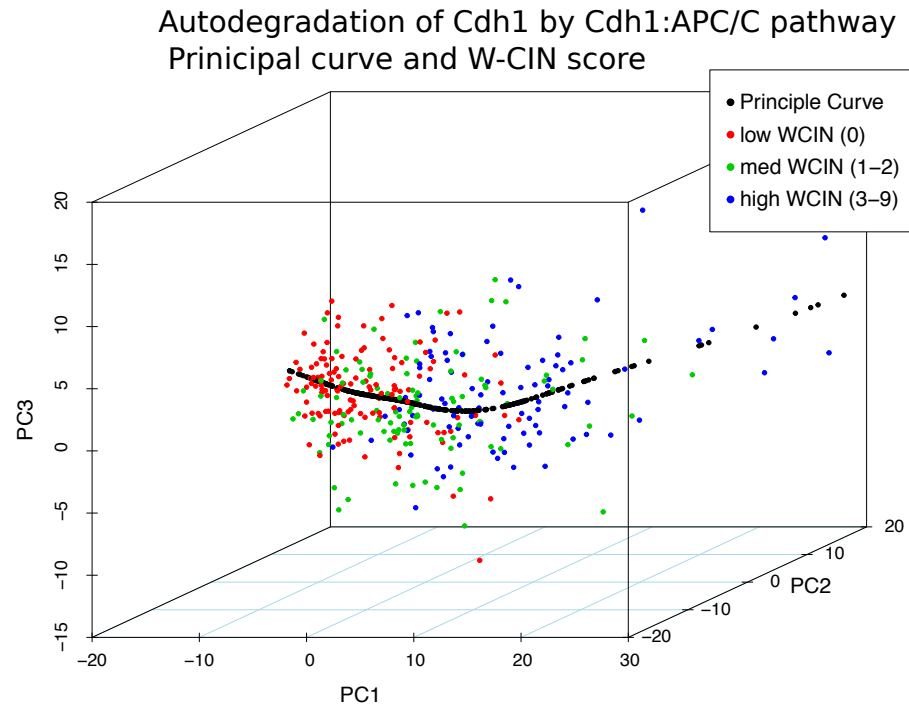
- Data: TCGA colon adenocarcinoma

- Pathifier: Assigns a sample specific pathway score

  Drier et al., PNAS, 2013

Analysis by Jan-Eric Boekenkamp

Custering of sample specific pathway deregulation scores reveals link between CIN and replication stress
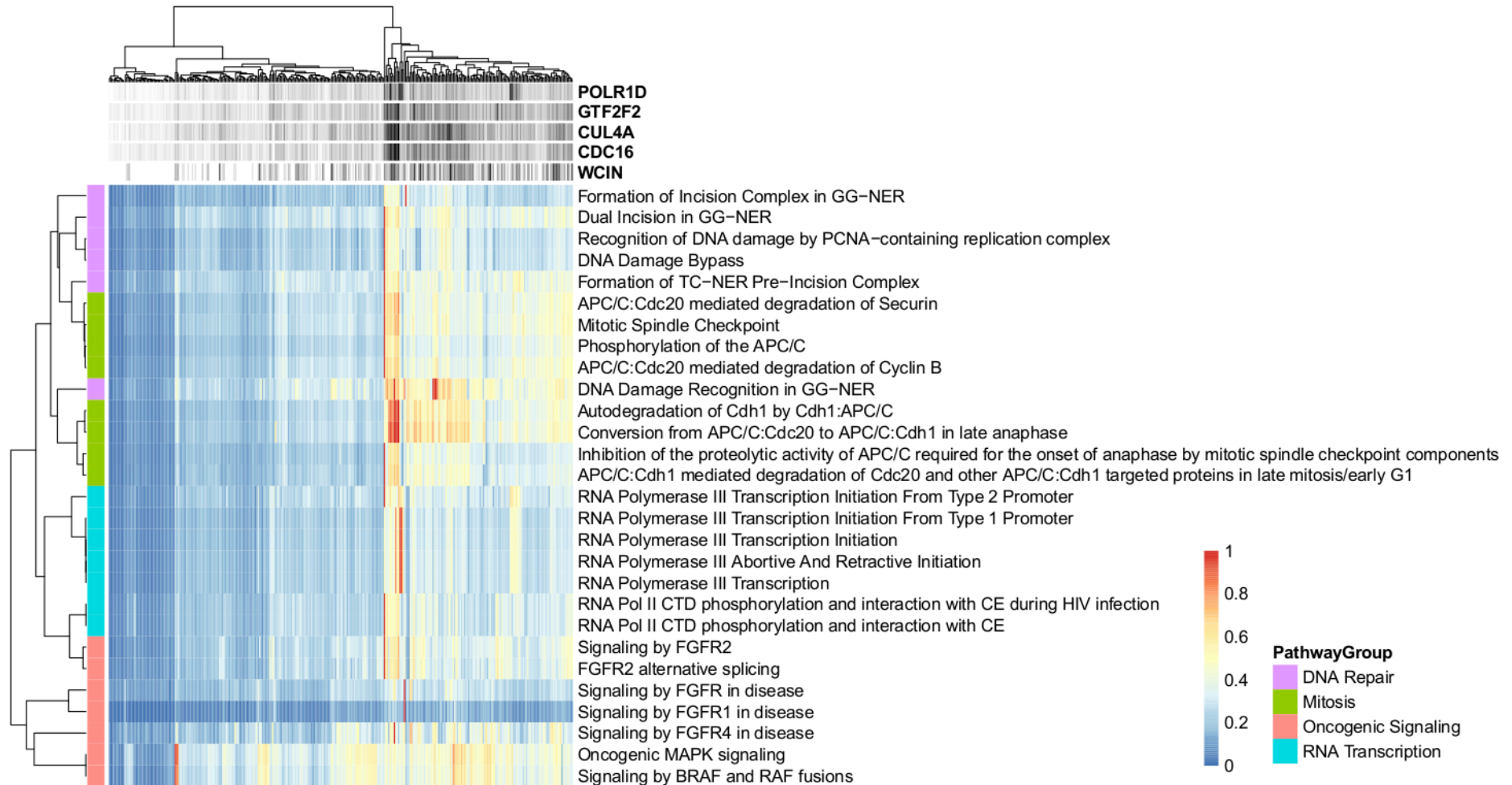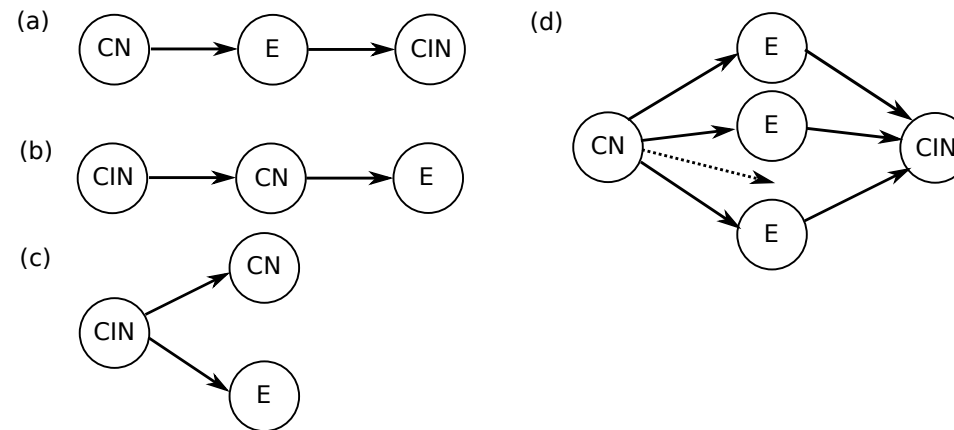
Outlook: Structural causal models
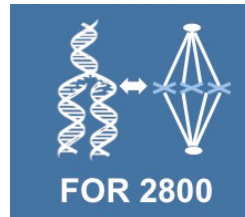
Peters, Janzing, and Schölkopf, 2017

See also Schadt et al., 2011

Possible **causal** links between copy number (CN), gene expression (E) and CIN

Postdoc position

DFG Deutsche Forschungsgemeinschaft

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- 8 groups from Göttingen, Kaiserslautern, Heidelberg and Koblenz
- Start in 2018

Postdoc position

- 3 years
- Strong backgound in mathematics and statistics required
- Email a single pdf file to

   bewerbung-mut@rheinahrcampus.de

- Subject:

   FOR-2800-Postdoc