Resting state fMRI and ICA

- Introduction to resting state
- Independent Component Analysis
  - Single-subject ICA
  - Multi-subject ICA
- Dual regression
Artefact detection

- FMRI data contain a variety of source processes
- Artifactual sources typically have unknown spatial and temporal extent and cannot easily be modelled accurately
- Exploratory techniques do not require a priori knowledge of time-courses and spatial maps
FSLeyes Melodic Mode
motion
cardiac
susceptibility motion
multiband
signal
effects of scan parameters
manual classification

https://doi.org/10.1016/j.neuroimage.2016.12.036
semi-automatic classification
semi-automatic classification

- FIX (fsl.fmrib.ox.ac.uk/fsl/fslwiki/FIX)
  - Classifier with many features
  - Requires manually labelled training data
  - 99% accuracy on high-quality data
semi-automatic classification

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- **ICA-AROMA** ([github.com/rhr-pruim/ICA-AROMA](github.com/rhr-pruim/ICA-AROMA))
  - Simple classifier with only 4 features
  - No training data required
  - Mainly designed for motion artefacts
ICA-based denoising
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\[ Y = X\beta + e \]
ICA-based denoising

$Y = X\beta + e$

cleaned fMRI data