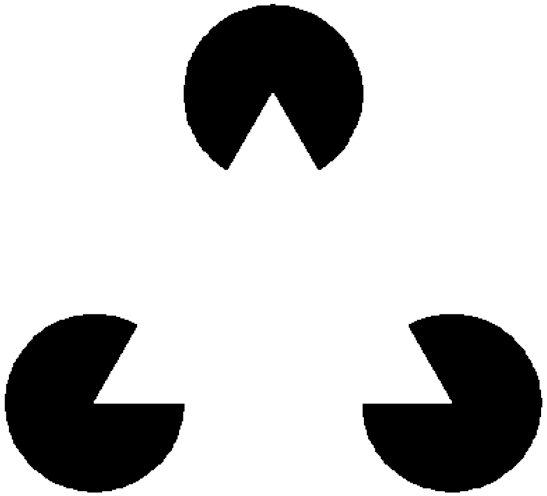
Donders Institute
for Brain, Cognition and Behaviour

Localising fMRI activity



Training school

Practical data analysis and modeling in cognitive and clinical neuroscience

Ghent, 15 April 2014

Peter Kok

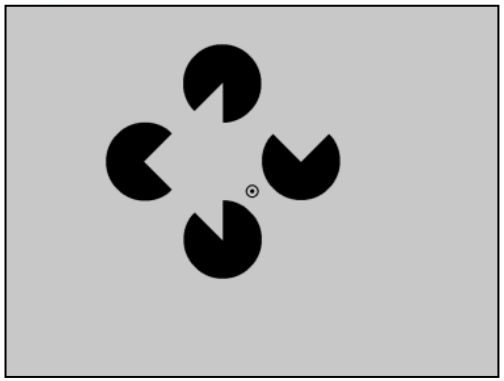
Radboud University Nijmegen

Background

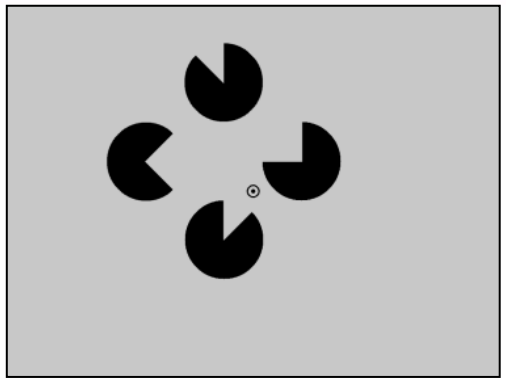
- Advantage of fMRI: measure activity in the whole brain with (relatively) high spatial resolution.

- Challenge of fMRI: >100.000 voxels.
  - Localise activity in a meaningful way.
  - Every brain is different.
  - Multiple comparisons.

Background

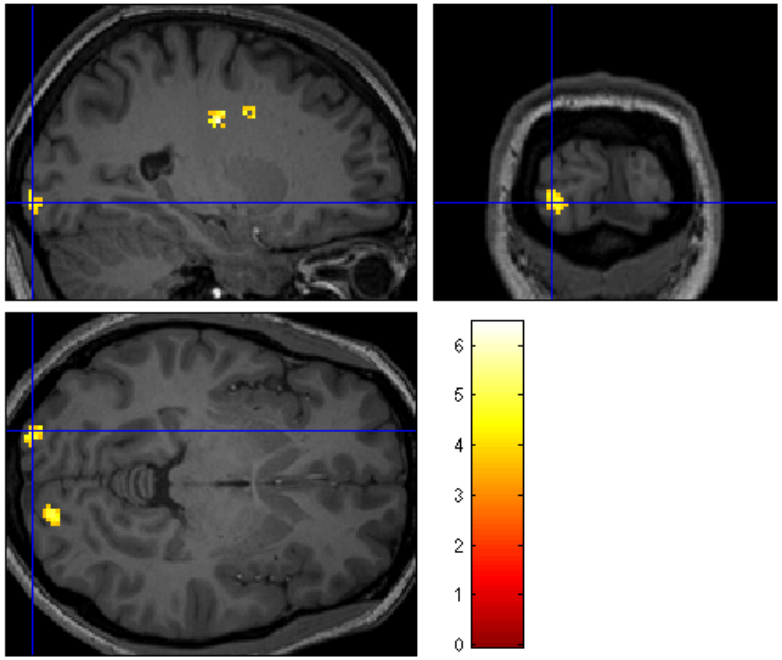


>



Kanizsa illusion

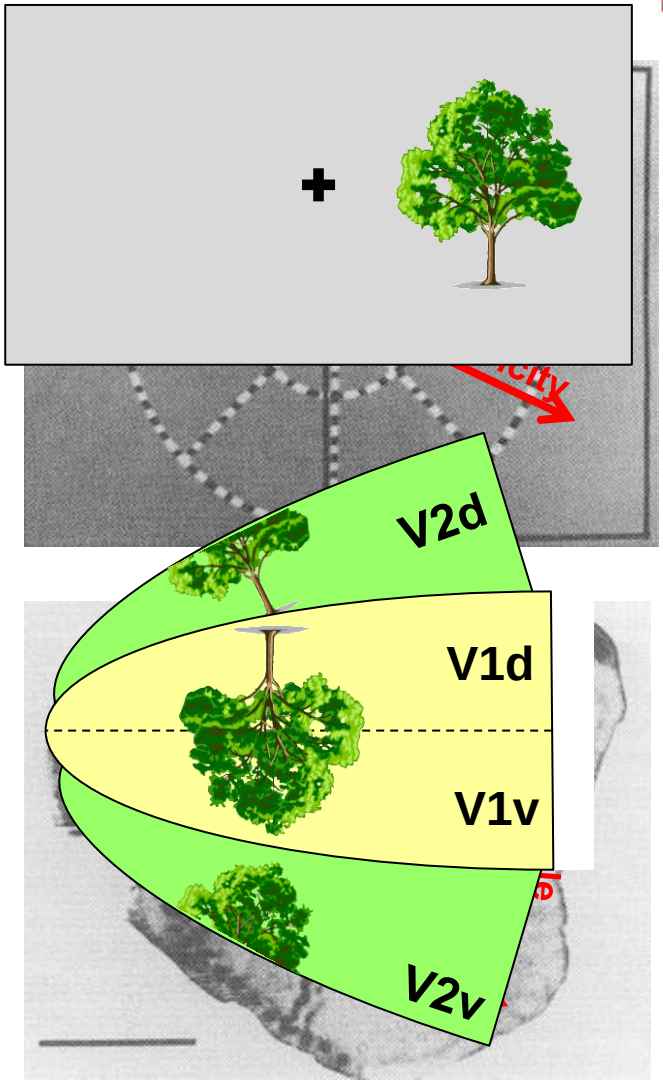
Control stimulus



- How to interpret this?
- In this workshop, you will explore several ways of analysing fMRI activity in a much more fine-grained way.
- One important step is retinotopic mapping.

Retinotopic Representation

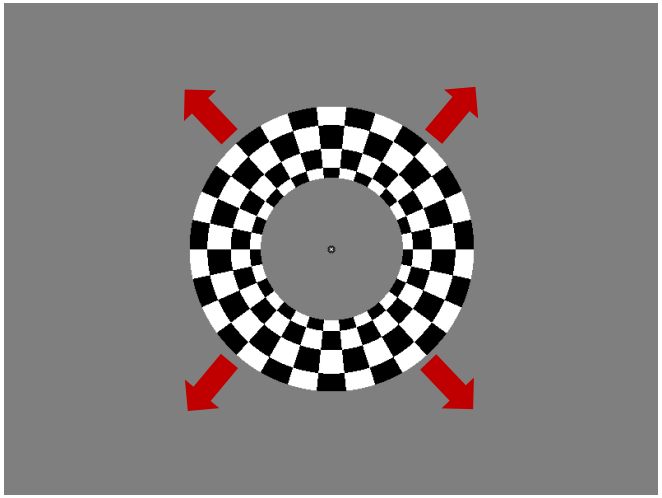
- Each area in (early) visual cortex contains a **distorted** but **topologically accurate** map of the visual field
- Two axes: **eccentricity** and **polar angle**
- Dorsal-ventral split
- Up-down (polar angle) flip between consecutive areas
- If we know polar angle, we can draw borders!

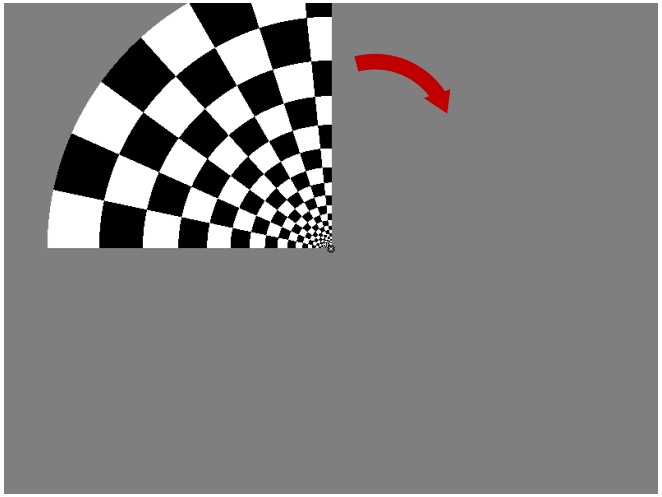


Tootell et al., 1982

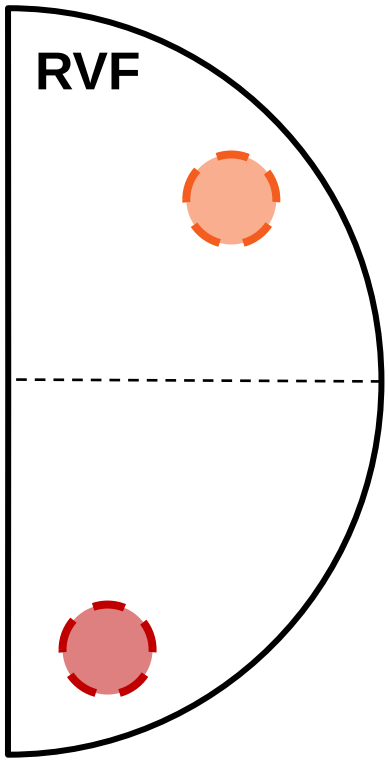
In the Scanner

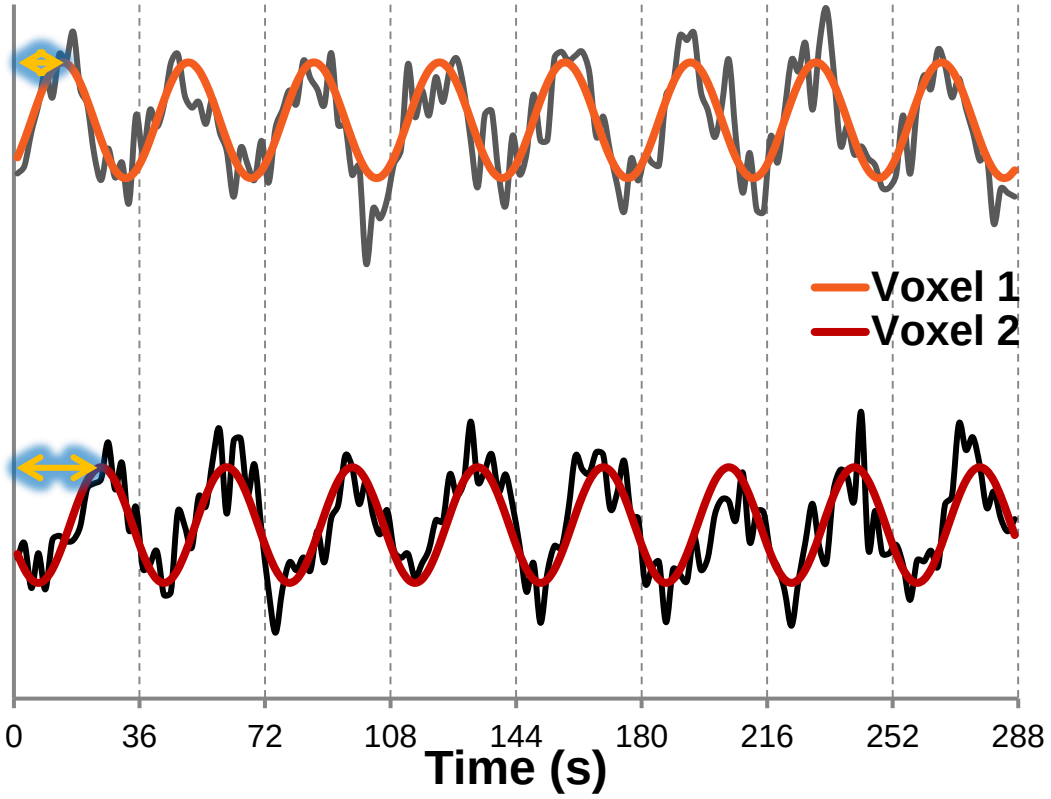
- **Periodic, high-contrast stimuli with slow duty cycle (e.g. 36 s)**
- **Eccentricity: expanding/contracting ring**
- **Polar angle: rotating wedge (CW & CCW)**



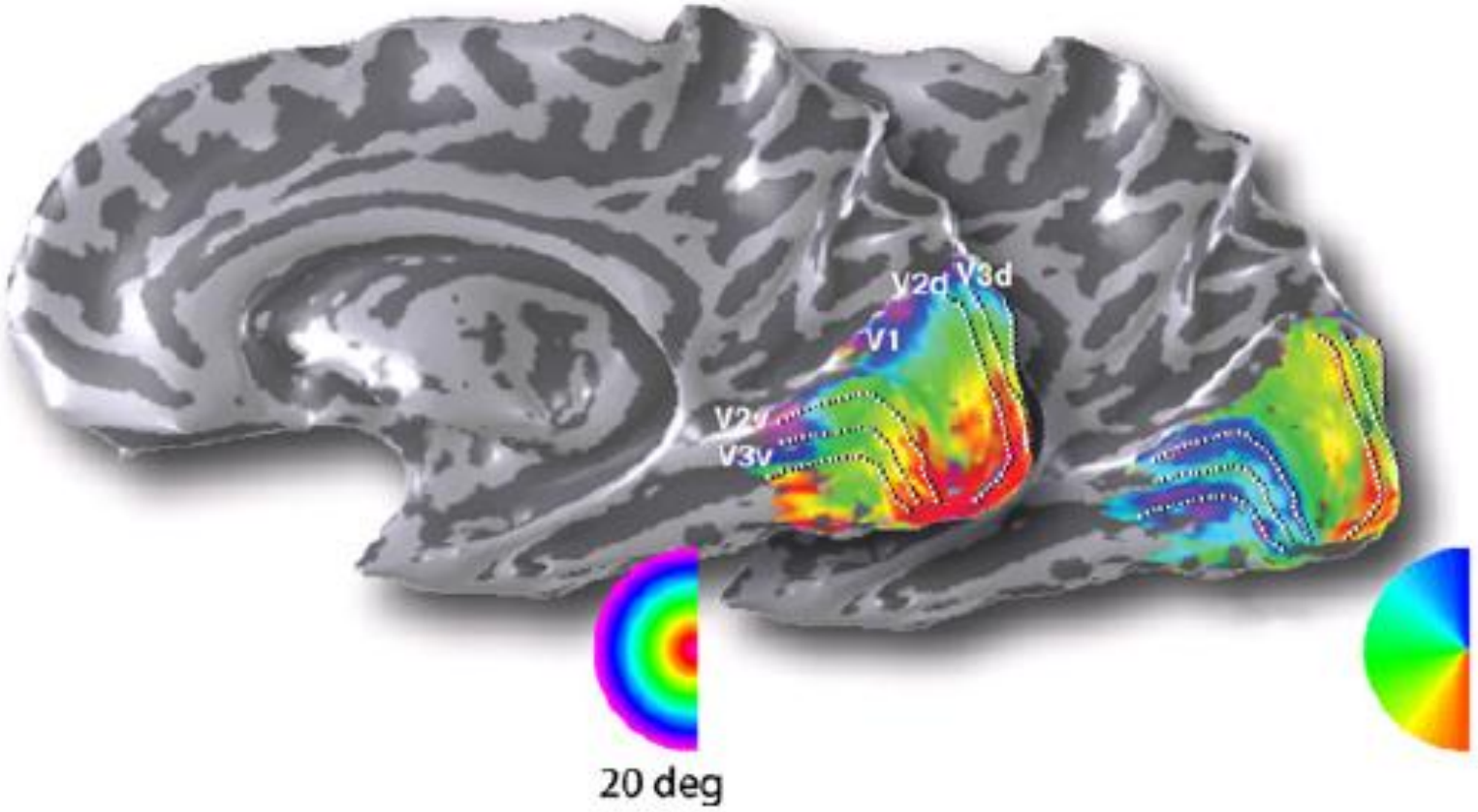


Extract phase values (volume space)





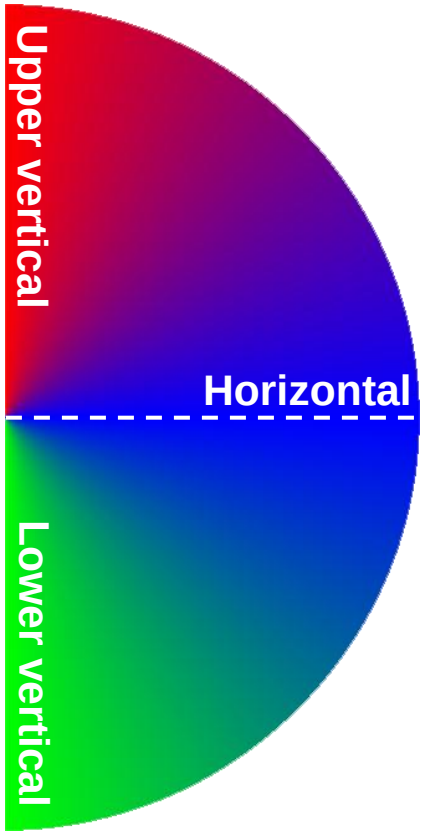
Result

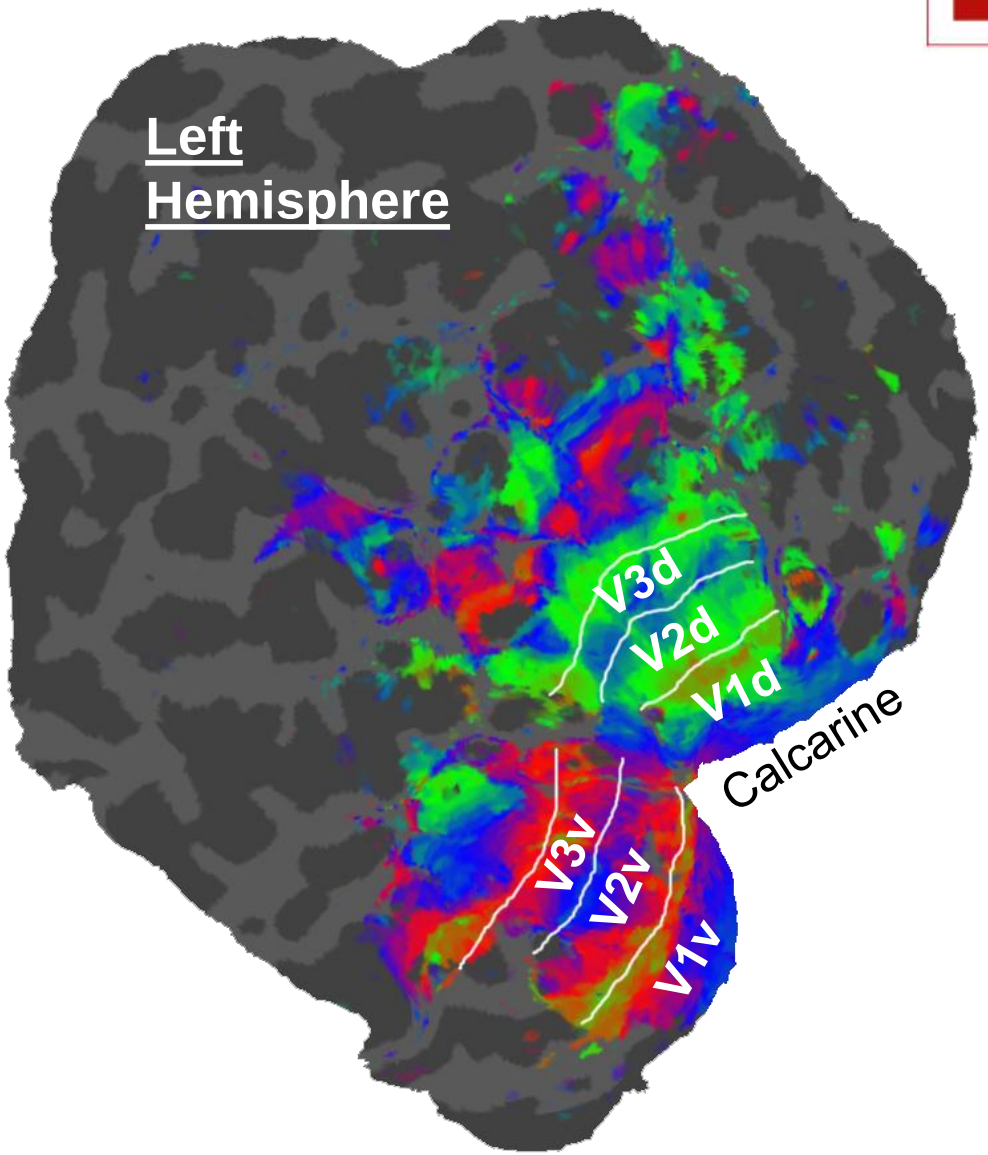


FREESURFER DEMO

Retinotopic mapping

Result





Questions?

From Volume to Surface

- Surface space = vertices
- Volume space = voxels
- Find surfaces in voxel space
- Map voxels to vertices