

Open Science in Neuroimaging

figuring out the fine print

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cbbs
center for behavioral
brain sciences



<http://www.psychoinformatics.de>

Open Science Days 2014

Transparency

paradigms – tools – materials – subjects

Accessibility

data – code – results – publications

Reproducibility

review – facilitated incremental research

Responsibility

publicly funded research – maximize impact – minimize cost

open science = science

tools have changed – more opportunities – standards need update

Not by default (yet)

big data, expensive publication – many modalities
multitude of analysis strategies – significant effort required

But despite the problems, there are successful sharing initiatives: INDI, HCP...

Show the benefits

for society – for an individual researcher

Throw money at the problem

Human Connectome Project, Human Brain Project, Brain Initiative

Money problem

Only if you have it. Who gets it? What if it runs out?

Just do it

How? How much does it cost? What's in for me?

Testing open science

1st hand experience report – 18 months into the experiment

The world
will never be the same
once you've
seen it through the eyes of
Forest Gump.

**Tom
Hanks** is
**Forrest
Gump**

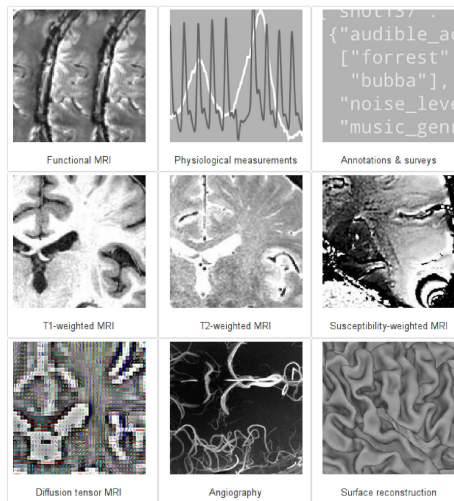


July 6

Paramount Pictures presents a Steve Tisch/Wendy Finerman production a Robert Zemeckis film Tom Hanks Forrest Gump Robin Wright Gary Sinise Mykelti Williamson
and Sally Field with Charles Newirth
directed by Joanna Johnston
written by Alan Silvestri
music by Joel Sil
executive producer Arthur Schnid
producer Rick Carter
executive producer Don Burgess
costume designer Winston Groom
editor Eric Roth
executive producer Wendy Finerman
producer Steve Tisch
producer Steve Starkey
executive producer Robert Zemeckis
A Paramount Communications Company
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- 2 h audio movie
- story narration
- verbal scene descriptions
- „shared memory“
- wide spectrum of music
- real emotions

- 20 participants (plus phantom)
- 2 hours of fMRI (7 Tesla Siemens Magnetom, 2 s TR, 1.4 mm)
- 0.3 mm ToF angiography
- simultaneous physiological data (respiratory, cardiac)
- 0.7 mm T1w, T2w, DWI, SWI (Philips Achieva)
- reproducible stimulus
- 12-page methods description



Doing it by the book

- Immediate publication: materials, code, data (in the public domain)
- Comprehensive methods description in a data paper

Doing it by the book

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Proposed challenge

- Do something cool with real-life cognition data (any)
- Submit a demo webpage – all content must be fully reproducible by a 3rd party
- Jury of leading scientist awards a total of 5000 EUR to the best three submissions

Apr-Jul 2013 Data acquisition

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Aug-Oct 2013 Data curation

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News-Meldung vom 28.05.2014 18:51 Uhr

Open Science: Forschungsdaten frei zugänglich

Magdeburger Hirnforscher veröffentlichen den bislang umfangreichsten Rohdatensatz über die Verarbeitung von Sprache im Gehirn.

Im Gegensatz zu dem verbreiteten Konkurrenzgebaren in der Forschung, Datenmaterial unter Verschluss zu halten, beschreiten die Forscher in Magdeburg einen anderen Weg. Der Psychologe Professor Michael Hanke von der **Arbeitsgruppe Psychoinformatik [1]** an der **Otto-von-Guericke-Universität [2]**, Dr. Jörg Stadler vom **Leibniz Institut für Neurobiologie [3]** und Kollegen stellen ihre Rohdaten **frei zur Verfügung [4]**. Im elektronischen Fachmagazin **Scientific Data [5]** der Nature Publishing Group hat das Team sie am 27. Mai **publiziert [6]**.

Bei dem Projekt geht es um die Verarbeitung akustischer Reize. In der Studie haben die Wissenschaftler den Versuchspersonen eine **Hörfilmversion [7]** des Klassikers Forrest Gump vorgeführt, während die Forscher mit Hilfe der funktionellen Magnetresonanztomographie (fMRT) die Hirnaktivitäten der Testkandidaten bei der Verarbeitung von Sprache, Musik, Emotionen, Erinnerungen und bildlicher Vorstellungen erfasst haben.

Der Datensatz spiegele damit nicht nur eine isolierte Aktivität des Gehirns wider, heißt es in der **Mitteilung [8]** der Projektkoordination, sondern reflektiere die tatsächliche Komplexität des Informationsstroms bei alltäglichen Hörerfahrungen. Neben den gesamten fMRT-Daten stellen die Wissenschaftler umfassende anatomische Beschreibungen der Gehirne aller Versuchsteilnehmer zur Verfügung, ebenso wie Messwerte über Atmung und Herzschlag. "Sie zeigen, an welchen Stellen das

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Open Science - Freie Daten für freie Forscher

15. September 2014 15:16 Open Science


Freie Daten für freie Forscher

Psychologen aus Magdeburg stecken Tausende Euro in ihre Hirnforschung - und dann verschenken sie die Ergebnisse. Verrückt? Nein, vernünftig. Das kann anderen Wissenschaftlern helfen.


Von Bernd Eberhart

Versenden

Drucken







Fernsehen ist Leistungssport für das Gehirn. Von wegen passiv - solange Menschen auf dem Sofa vor der Glotze hängen, laufen im Kopf komplexeste Vorgänge ab. Das Hirn muss die Bilderflut aufnehmen, die akustischen Reize verarbeiten und alles zu einem sinnvollen Plot verknüpfen. Sprachverstehen, Gesichtserkennung, Erinnerungsvermögen, Emotionsverarbeitung sind nur ein Teil der neuronalen Prozesse, die für das Anschauen eines Filmes nötig sind. Fast so komplex also wie das echte Leben - und damit für Hirnforscher höchst interessant.

Feedback

Mit dem Konsum von Hollywood-Produkte versuchen die Wissenschaftler, grundsätzliche Fragen zu klären: Wann ticken alle Menschen gleich? Und welche Abläufe im Hirn sind dagegen individuell verschieden? Das treibt eine Gruppe von Wissenschaftlern unter Leitung des Magdeburger Psychologen Michael Hanke um. Sie schieben ihre Studienteilnehmer jeweils für zwei Stunden in die Röhre eines Magnetresonanztomografen. Diese Maschine kann in bunten Bildern sichtbar machen, welche Hirnbereiche wann besonders aktiv sind. Meist besten Fernsehensalbe Daten wie einen Schatz

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- Nov 1 2014 Contest deadline

None (yet)

some internal projects – but not a single submission – need to be patient

Maybe you should propose concrete tasks?

„easier“ initially – but also a constraint

First people to voice interest did not aim at fMRI



Synthetic Biology based on standard parts

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iGEM Competition

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iGEM 2014 HS

The iGEM 2014 High School Jamboree has ended! See the results [here!](#)

2014hs.igem.org

iGEM 2014 Collegiate

Registration for attending the Giant Jamboree is now open! *Deadline - September 05*

2014.igem.org

The Giant Jamboree

Get Ready for the iGEM 2014 Giant Jamboree! No regionals, new tracks, and more!

[Giant Jamboree](#)

iGEM Labs

Additional program benefits are now available in the new **iGEM Lab** program! Renew or register your lab by Sept 1.

igem.org/Labs

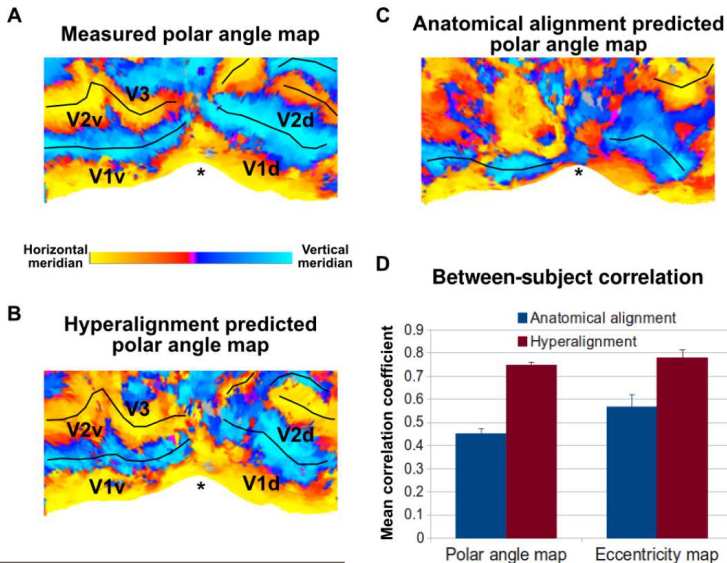


Fantastic talk by Drew Endy on the iGEM Revolution:

<http://longnow.org/seminars/02014/sep/16/igem-revolution>

There is a hidden agenda

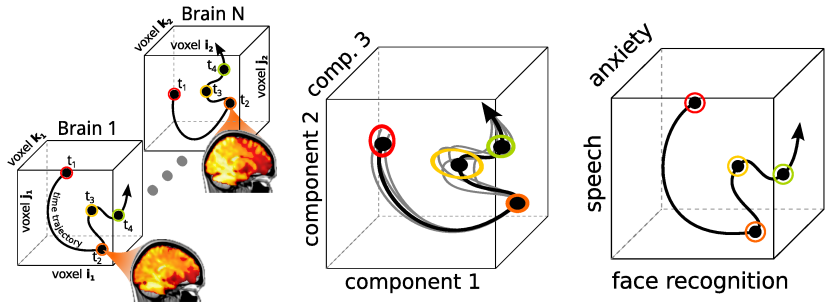
HYPERALIGNMENT ALGORITHM VALIDATION



Haxby et al. (2011, Neuron); Guntupalli et al. (under review)

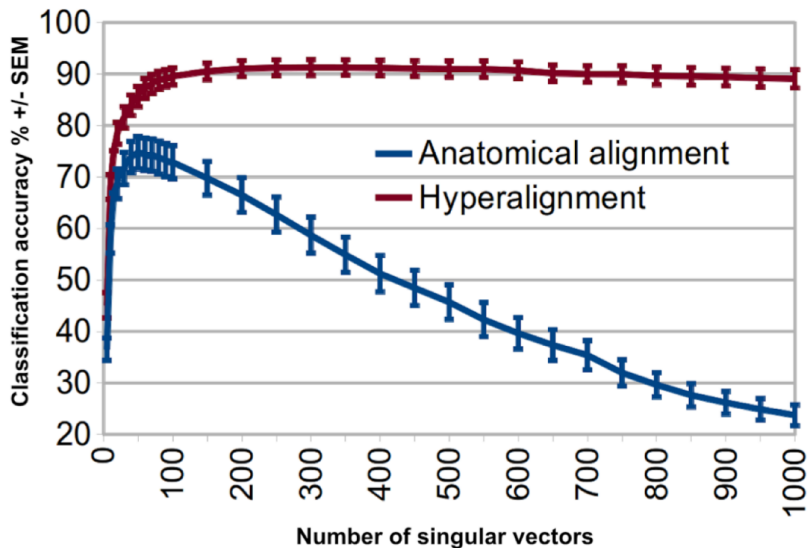
Algorithm available as FOSS in PyMVPA (http://www.py_mvpa.org)

GOAL: A FUNCTIONAL REFERENCE SPACE



opportunities: pre-trained brain computer interface or personality inventory analog

HOW BIG OF A PROBLEM?



Movie segment clf.; 300 comp. explain $\approx 90\%$ variance (Guntupalli et al., under review)

Impossible!

for any individual researcher, lab, or center
not enough data, not enough people

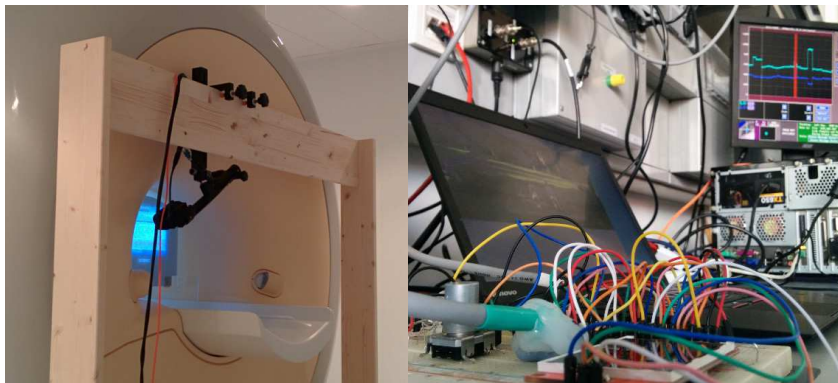
that includes the possibility to get funding for something like this for anyone like me

Open Science

get more people to work with such data – record their own data
promote and help sharing with the community

a concrete opportunity for anyone to aim for the impossible

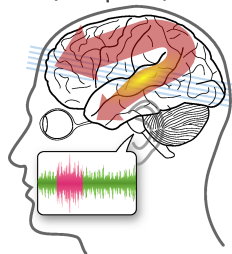
SIMULTANEOUS 3T FMRI AND 1000 HZ EYE-TRACKING



Ask me for a data preview...

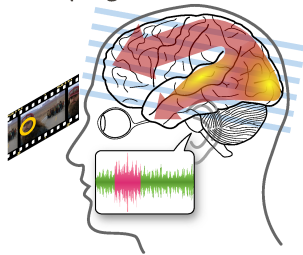
14 participants overlap with phase 1 data; watch data preview

Phase 1
(complete)



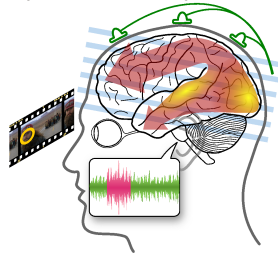
7T
auditory

Phase 2
(in progress)



3T
audio-visual
eye-tracking

Phase 3
(est. Oct. 2014)



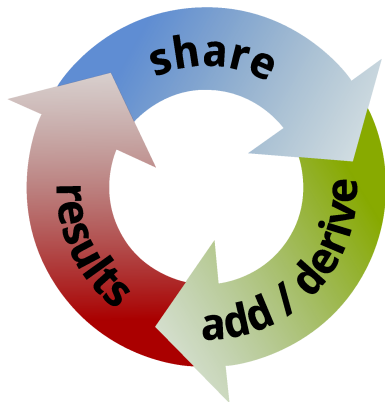
3T
audio-visual
eye-tracking, EEG

Dedicated eye-tracking with GSR and facial expressions is in the works.

Integrate 3rd-party results

costly, laborious task – critical role in making open science default mode of operation for individual researchers

- create, use, share dataset handles (not neuroscience-specific)
- version control for data: track everything
- distributed: obtain, modify, re-publish
 - without a central gatekeeper
- a tool – built off of *git-annex*
- a service – automated generation of dataset handles for public data
- **facilitate incremental collaborative research on the data-level**



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<http://studyforrest.org>

<http://psychoinformatics.de>