



Welcome!

Applied Cognitive Neuroscience

Mark Nieuwenstein

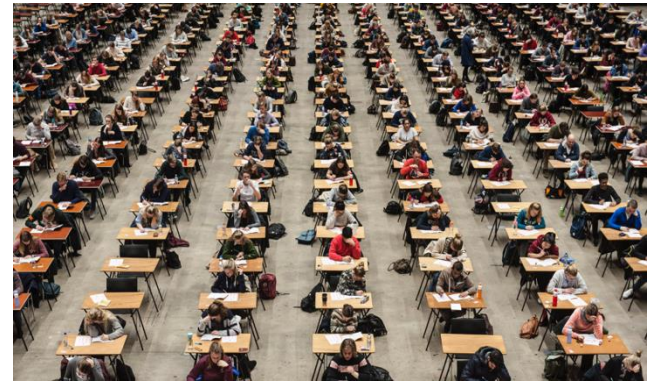
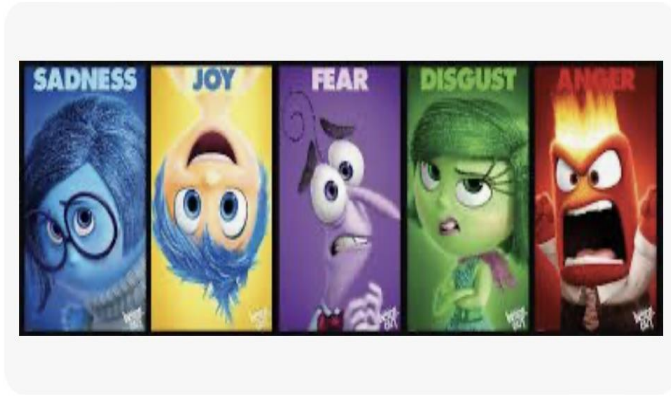
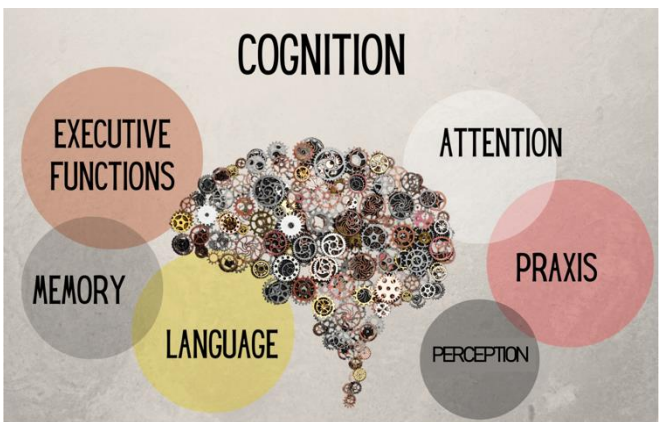
ACN track coordinator

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- ❖ 6th largest city of the Netherlands
- ❖ Population \pm 230,000
- ❖ 2nd largest university (shared with Rotterdam and Utrecht)
- ❖ Students: \pm 26,000







Let's start with an example

Radiology



Scanners and Drillers

Characterizing Expert Visual Search through Volumetric Images

Trafton Drew^{1,2} Melissa Le-Hoa Vo^{1,2} Alex Olwal³
Francine Jacobson¹ Steven E. Seltzer¹ Jeremy M. Wolfe^{1,2}

¹ Brigham & Women's Hospital

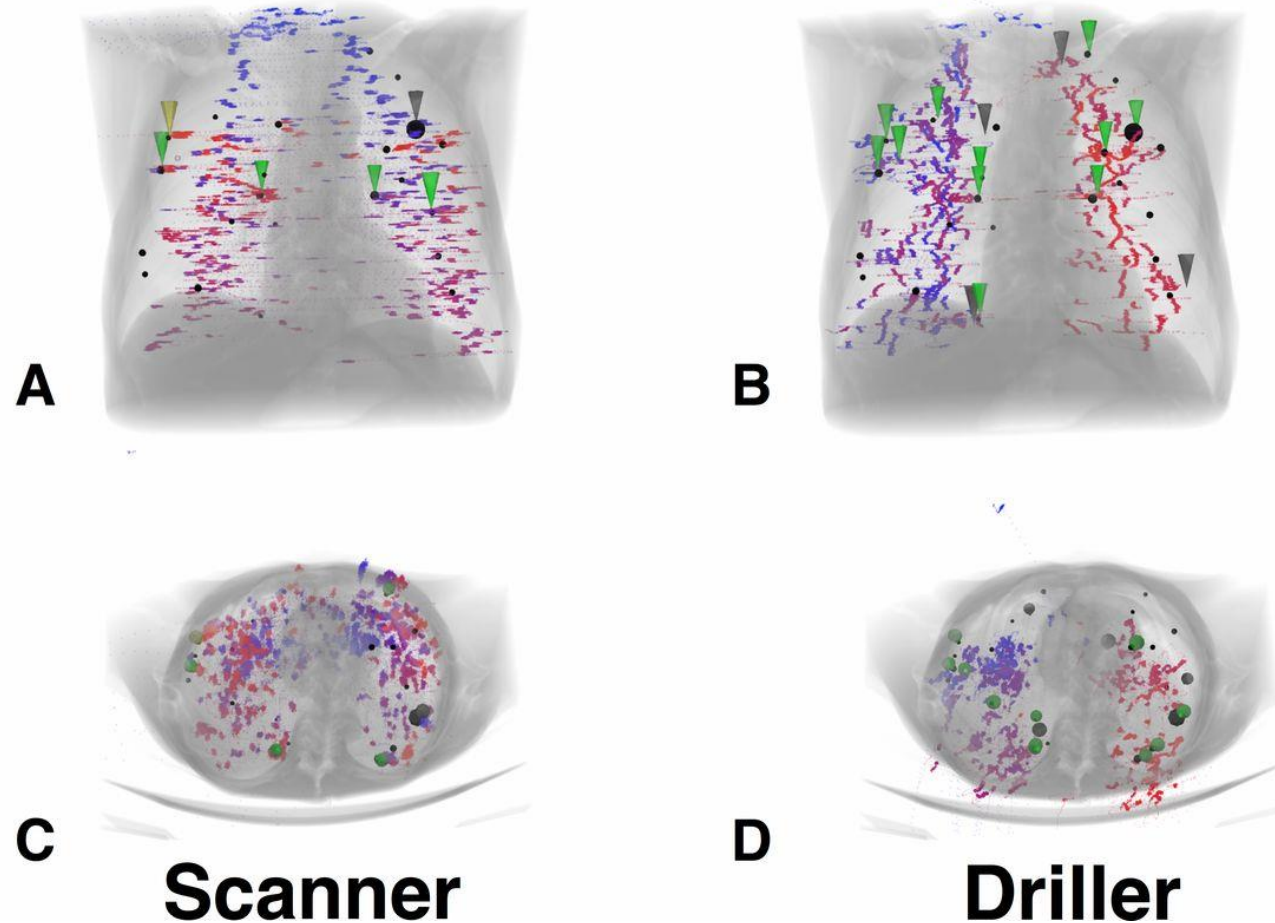
² Harvard Medical School

³ MIT Media Lab

Trial Start

Trial End

Color indicates time in trial



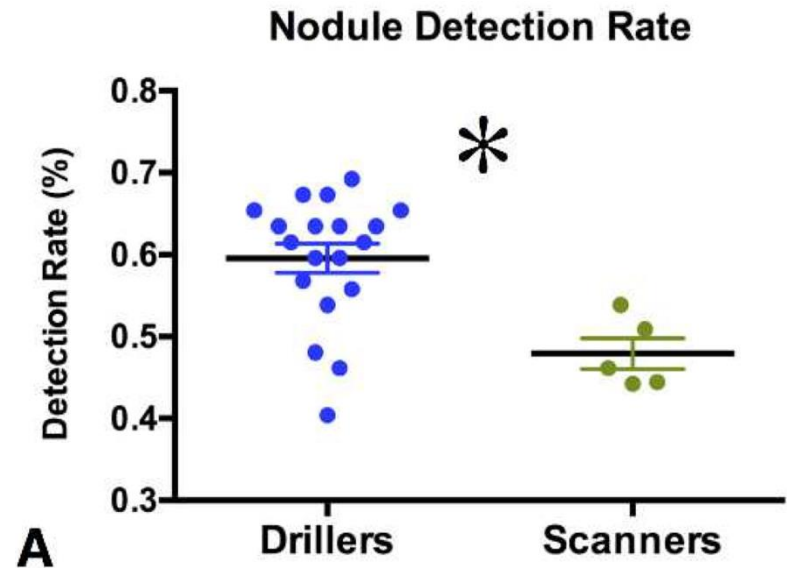
Examples of two observers' eye-movement traces from the coronal (A and B) and axial (C and D) perspective. Color of the symbols connotes time in trial, going from blue at the beginning of the trial to red at the end. Black spheres denote location of nodules according to the LIDC database. Green triangles indicate true positives. Black triangles: false positive marks.

More effective radiology

Using methods of cognitive neuroscience to understand how radiologists work best:

And how can we use this to improve their efficiency?

- ❖ Feedback?
- ❖ Artificial intelligence?
- ❖ Search strategy?



Another example

Learning

Learning effectively

Say that you're learning Indonesian

You've just learned a new word

pejalar → Student

If you don't repeat this word, you'll forget it

But if you repeat it right away, you won't learn effectively either

When should you repeat a word that you've just learned?



Learning effectively

One of our colleagues – Hedderik van Rijn - designed an algorithm to find the optimal moment to repeat items during learning

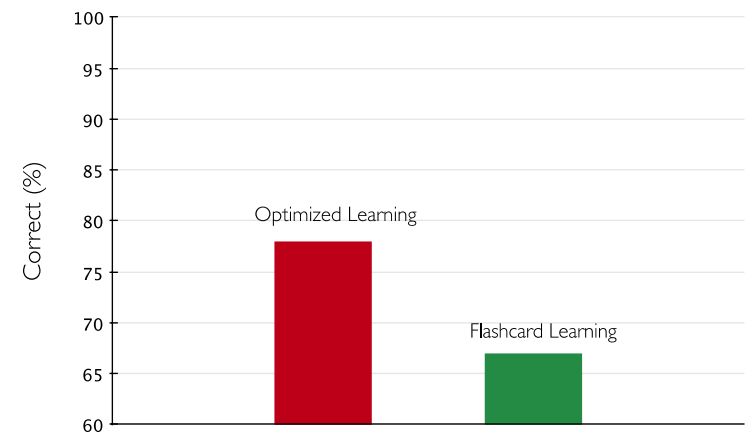
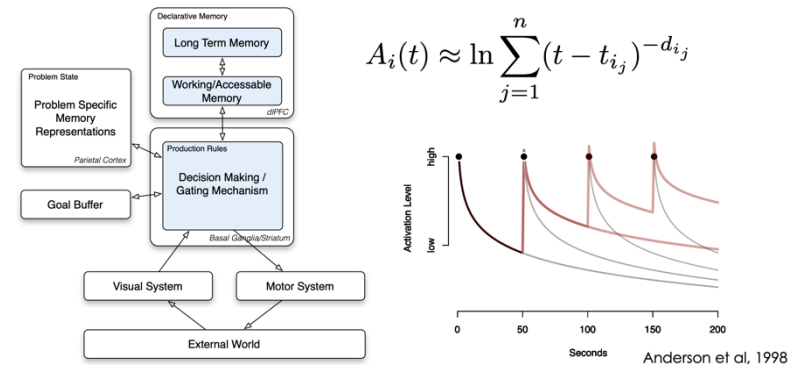
Based on:

- ❖ Response times
- ❖ Electroencephalography
- ❖ Computational modeling

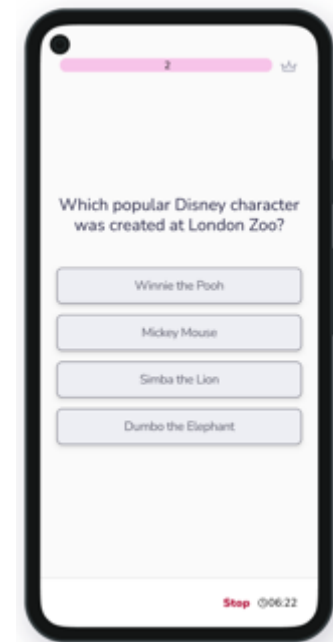
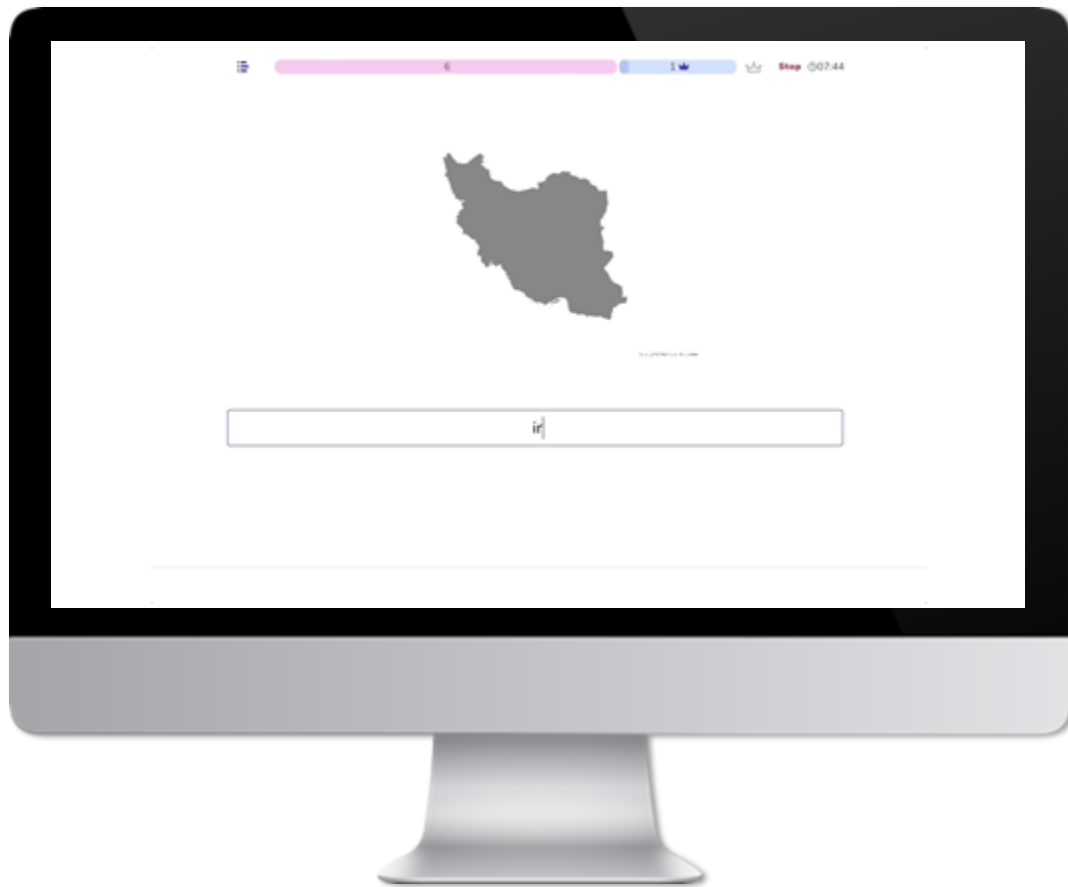
This *substantially* improves learning

Now widely used in schools for fact learning

And as *formative testing* at universities



Learning effectively

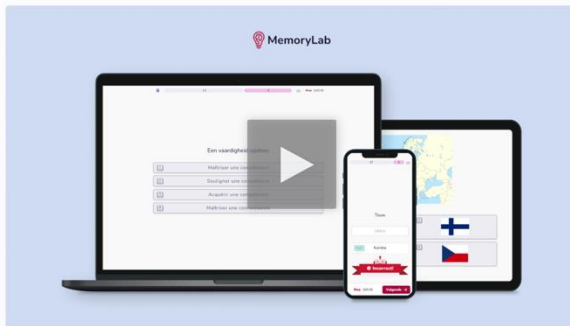




Learn more effectively

With MemoryLab's adaptive learning system you'll spend your learning time optimally

Book a demo



Our partners in science-driven education



Memorylab / Slimstampen



What is Applied Cognitive Neuroscience?

What is ACN?

- ❖ Study of cognitive neuroscience
- ❖ Emphasis on applications
- ❖ How can we apply fundamental research to the real world?
- ❖ Different from research masters
- ❖ Emphasis on state of the art methods
- ❖ Eye tracking
- ❖ Neuroimaging/ electrophysiology
- ❖ Programming and data science

What is ACN?

- ❖ Small cohorts: 12-15 students -> close interaction with teachers and researchers.



Curriculum

Courses: 30 EC

- ❖ Theory
- ❖ Skills and methods

Research and Internship:

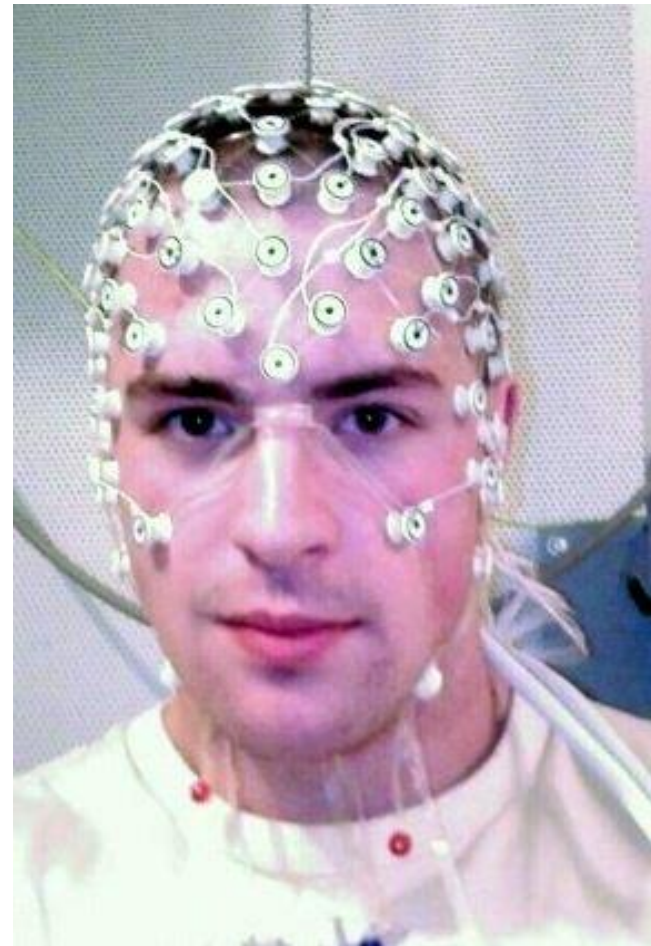
- ❖ Master thesis: 10/20 EC
- ❖ Internship: 10/20 EC



Trends in Cognitive Neuroscience

You will learn

- ❖ About the latest findings and theories in cognitive neuroscience
- ❖ How to critically evaluate research



Applied Cognitive Neuroscience

Builds on the fundamental knowledge that you've learned in *Trends in Cognitive Neuroscience* and brings this to the real world

You will learn

- ❖ To apply research from cognitive neuroscience to real-life applications
- ❖ To develop your own applied research project

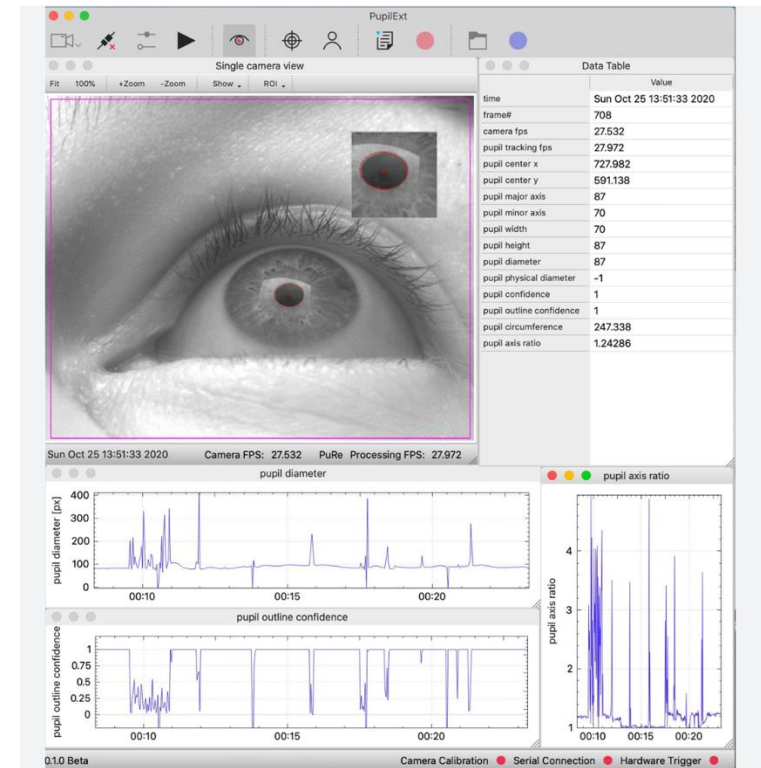
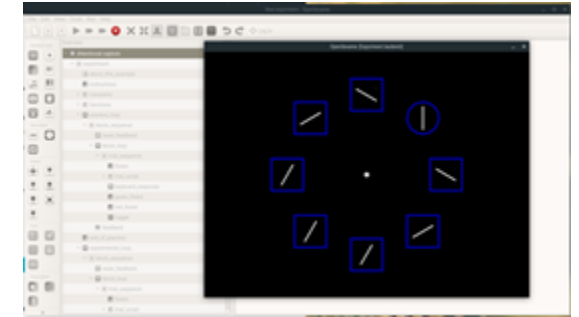


Data Collection and Analysis

for Cognitive Neuroscience

You will learn

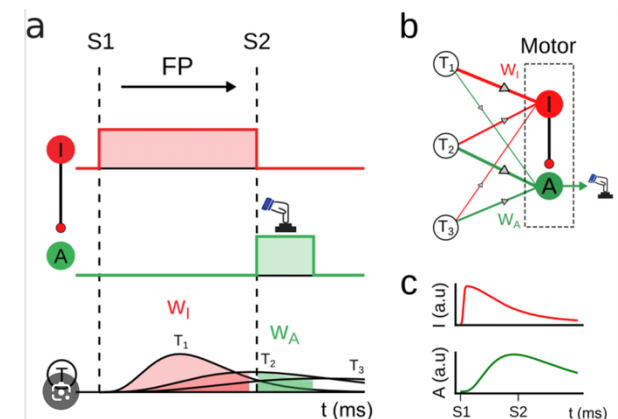
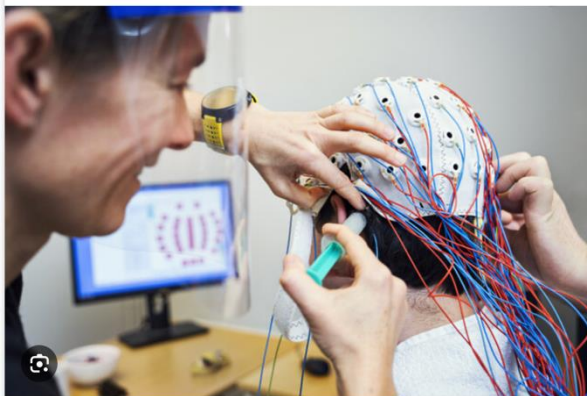
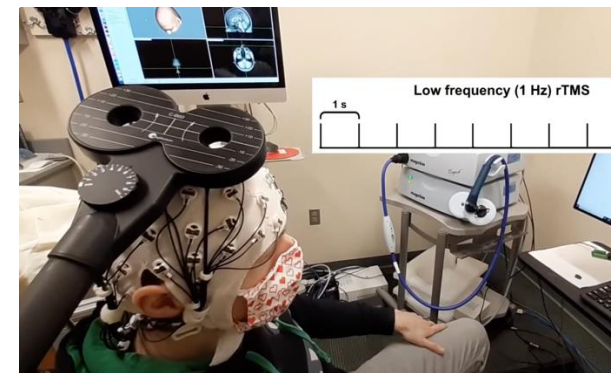
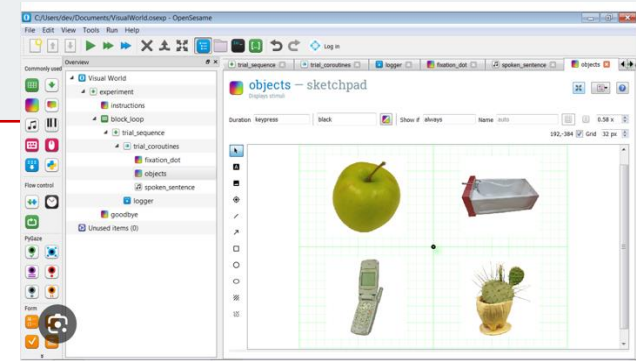
- ❖ How to implement cognitive-neuroscience experiments
- ❖ How to collect data
- ❖ How to analyze data



Master thesis

Master thesis research project: 10 or 20 EC

- ❖ Design your own experiment
- ❖ Collect data
- ❖ Analyze data
- ❖ Write & present your thesis
- ❖ Direct supervision by top researchers



Internship

Apply your knowledge in a professional setting



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R & D (1)

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Gezond / Future electronics

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Laboratory studies

We have 4 time-isolation units available with programmable dynamic lighting system for studies involving humans at the Faculty of Mathematics and Natural Sciences of the University of Groningen, The Netherlands. The laboratory is equipped with sleep EEG, Bodykin temperature sensors, tailored battery of cognitive tests, and pupillometry equipment is available.

Field studies

We are able to collect ambulatory measurements of rest activity and light exposure, sleep EEG, bodykin temperature with specialized equipment, tailored online/offline diaries, questionnaires and cognitive tests.

Environmental light scan

With the help of a spectroradiometer we perform a complete light scan of the environment and translate this information into its potential non-image forming effects on physiology, alertness and behaviour.

Career perspectives

Data scientist

Marketing

Mental (e)health applications

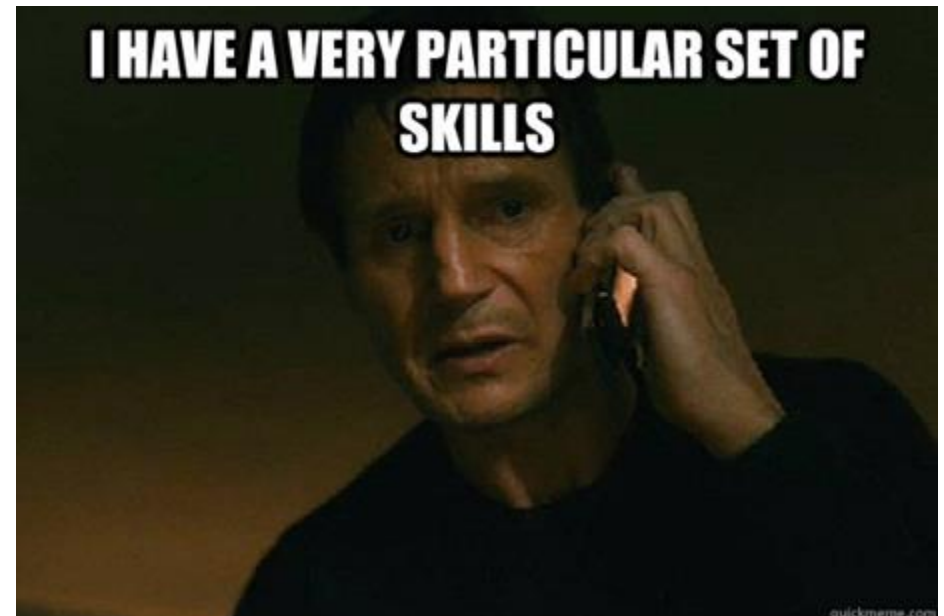
Consultancy

Machine learning/ AI

Software development

Corporate R&D

Academia (PhD student)





Questions?