



# JOSHUA KRAUSE

MSc in Computational Cognitive Science

## CONTACT INFO

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## PUBLICATIONS

Kreinkamp, J., Agostini, M., Krause, J., Leander, P., and the PsyCorona Team (2020). PsyCorona: A world of Reactions to COVID-19, APS Observer, November Edition

More on [ResearchGate](#).

## CONFERENCES & SUMMER SCHOOLS

### ETRA, Seattle 2022

Krause, J. & van Rij, J. (2022). *Using Intelligible Models to Analyze and Interpret the Pupil Dilation Time Course* [Tutorial].

### Spring School on Cognitive Modeling, Groningen 2022

Krause, J., van Rij, J., Borst, J. P. (2022). *Demystifying Cognitive Processing Stages Through Co-registration of EEG and Pupil Dilation* [Poster presentation].

## ACADEMIC EDUCATION

### MSc COMPUTATIONAL COGNITIVE SCIENCE *SUMMA CUM LAUDE (9.5/10)*

September 2020 – August 2022

Participation in the programme allowed me to gain insights into a variety of research directions with courses in machine learning, advanced statistical modelling, design of multi-agent systems, cognitive robotics, and cognitive modelling. Most importantly, I was able to refine my research interests and prepare myself for a research career in computational neuroscience.

### PRE-MASTER COMPUTATIONAL COGNITIVE SCIENCE

September 2019 – August 2020

To qualify for the Computational Cognitive Science Master Programme, I completed several course units that allowed me to refine my programming skills and reinforced my passion for computational neuroscience.

### BSc IN PSYCHOLOGY (HONOURS) *CUM LAUDE (8.8/10)*

September 2017 – August 2020

During my undergraduate education, I developed a passion for statistical analysis of complex data, developed my academic writing skills, and learned to communicate scientific findings to different stakeholders.

Beside my studies, I participated in the Honours College Programme (45 ECTS), which allowed me to explore my strengths and roles in the context of multidisciplinary teamwork while developing intercultural competencies. Additionally, the programme allowed me to work in close collaboration with researchers and develop my own research interests.

### GERMAN ABITUR (1.9)

June 2014

High-school education at the Cusanus-Gymnasium Erkelenz.

## RESEARCH EXPERIENCE

### MASTER THESIS (45 ECTS) (10/10)

September 2021 – August 2022

I measured pupil dilation and scalp EEG from 18 human subjects during a lexical decision task. Using a combination of Hidden semi Markov and generalized additive models, I inferred the processing stages involved in lexical decision making and their demand profile from EEG and pupil data and investigated how stage duration and demand depend on properties such as word frequency and type. Supervised by Dr. van Rij and Dr. Borst.

## PROGRAMMING SKILLS

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### PYTHON

Tensorflow, PyTorch, SKlearn, Pandas, and Numpy

### R

Lme4, MGCV, Tidyverse, Shiny

### MATLAB

EEGLAB

### JAVASCRIPT

node.js (express), REACT, jquery, and d3.js

### SWIFT

UIKit, Core ML

### C / C++

Eigen for fast numerical optimization

## DATABASE SKILLS

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Database design theory and normalization

Database-webserver interaction

### SQL

Data manipulation and data definition using SQL

### NoSQL

experience with document-based approaches

## EXPERIMENTAL METHODS

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### Eye-Tracking

Experience with SR Research eye-tracking solutions and the PyLink Python library

### EEG Recording

Experience with ActiveTwo system from BioSemi

### Experiment Software

OpenSesame

## COGNITIVE MODELLING

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### ACT-R & NENGO

Implementing computational models of cognition

Identifying the appropriate level of abstraction for modelling different tasks

Understanding strengths and weaknesses of different cognitive architectures

## FIRST YEAR MASTER RESEARCH PROJECT (15 ECTS) (9.5/10)

February 2021 – July 2021

I analysed an existing pupillometry dataset collected during a picture naming task. The goal was to infer rapid changes in demand during speech production from the pupil dilation time course using machine learning and to investigate how demand levels evolve differently over time depending on word properties. Supervised by Dr. van Rij and Dr. Sprenger.

## HONOURS BACHELOR THESIS (15 ECTS) (9/10)

February 2020 – August 2020

I investigated the applicability of different approaches for modelling non-stationary time-series, such as adaptive filters and generalized additive models. Supervised by Dr. Bringmann and Dr. Tendeiro.

## HONOURS RESEARCH INTERNSHIP DEVELOPMENTAL PSYCHOLOGY (9/10)

September 2018 – July 2019

I investigated whether specific keywords are associated with individual or multiple dimensions of childhood happiness. Supervised by Dr. Jeronimus.

## DEVELOPER EXPERIENCE

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### R PACKAGE papss

September 2021 – June 2022

For my master thesis I created the penalized additive pupil spline solver (papss) R package, allowing the efficient estimation of penalized versions of the popular additive model of pupil dilation. Eigen is used for the optimization problem while Rcpp acts as the interface between R and C++.

### PSYCORONA SHINY APP

July 2020 – November 2020

The PsyCorona project was a collaborative effort to study psychological and behavioral changes in response to COVID-19 via surveys. I assisted the development of the R Shiny application used to visualize parts of the data.

### GENTLE SOFTWARE

November 2019 – July 2020

In collaboration with Dr. Jeronimus, I developed the Graphical Ego-Network Tool for Longitudinal Examination (GENTLE). This software allows to collect and visualize social network data and is based on REACT and d3.js.

## TEACHING EXPERIENCE

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### TEACHING ASSISTANT

since November 2020

During my Master degree, I developed my teaching and mentoring skills in the role as teaching assistant to several Bachelor- and Master-level course units, including Programming for Psychologists, Architectures of Intelligence, and Advanced Statistical Modelling. My role in those courses mostly related to leading tutorials, answering questions and explaining concepts, and grading assignments.