Maedbh King, **PhD**

· Integrative Computational Neuroscience (ICoN) Fellow · MIT ·

Cambridge, MA

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Summary

Computational neuroscientist using neuroimaging to build maps and models of the human brain, as well as machine learning to identify risk predictors of psychiatric and neurodevelopmental disorders. Strongly committed to using data analytics to drive science policy that promotes equity and inclusivity.

Education

2017-2022 **University of California, Berkeley**, Ph.D. in Cognitive Neuroscience (Psychology) *3.97/4.0*

2020-2022 **University of California, Berkeley**, Graduate Certificate in Applied Data Science *3.98/4.0*

2015-2017 **Western University**, M.Sc. in Neuroscience *4.0/4.0*

2010-2014 **Trinity College Dublin**, B.A. with Honors in Psychology and French (Double Major) *4.0/4.0*

Academic Record

Publication Record 14 publications (>900 citations), including first authorship in #1 neuroscience journal *Nature Neuroscience*

Research Impact Named in the top 0.5% of all scholars worldwide by *ScholarGPS* for "strong publication record and impact of your work"

Funding Record Secured $750,000 in personal grants, scholarships, and fellowships, and student co-writer of successful $5 million R35 NIH grant

Media Coverage Research publicized in the following outlets: Knowable Magazine, Psychology Today, press releases from UC Berkeley and MIT

Public Speaking Invited speaker at 12 international conferences including *Society for Neuroscience* and *Organization for Human Brain Mapping*

Teaching Instructed 6 undergraduate courses (3 at Western University, 2 at UC Berkeley, and 1 at San Quentin State Prison)

Mentoring Formally mentored 12 students at UC Berkeley and MIT: 6 undergraduates, 2 postbaccalaureate students, and 4 PhD students

Experience

ICoN Postdoctoral Fellow at MIT

Advisors: John Gabrieli, PhD; Satrajit Ghosh, PhD

Leveraging machine learning to identify risk predictors of neurodevelopmental disorders. Publications in *Current Opinion in Behavioral Sciences*; *Science Policy Review* *2022-*

- Leveraging large-scale datasets including ABCD and Healthy Brain Network to determine how individual, and sex-based variation relates to symptoms of neurodevelopmental disorders (e.g., ASD; ADHD)
- Collaborating with psychiatrists from the Children's Hospital of Philadelphia to improve clinical workflows for identifying risk predictors of suicide attempt in a racially diverse adolescent population (n=24,000). Using natural language processing to extract meaningful clinical variables from electronic health records.

Ph.D. Researcher at UC Berkeley

Advisor: Richard Ivry, PhD

Investigating cortico-cerebellar contributions to cognition. Publications in *Nature Neuroscience*; *ELife*; *Neurobiology of Language*; *Brain*; *Neuron*; *NeuroImage*; *Human Brain Mapping* *2017-2022*

- Designed and tested a large-scale fMRI study (5 sessions; 300 experimental hours) to investigate how the cerebellum learns, and developed machine learning pipelines to characterize cortico-cerebellar connectivity. Tested patients with cerebellar ataxia on cognitive tasks to assess impairment. Analyzed post-mortem brain data to create a transcriptomic map of the cerebellum. Co-developed SUITPy, a Python library to visualize brain data.
- Recorded >15 hours of varsity athletes, and implemented markerless labeling of videos to understand human performance in predicting action *[link]*.
- Awarded certificate in applied data science by taking graduate classes in advanced statistics and computer science to analyze high-dimensional data.
- Co-wrote an R35 grant that received 5-year funding from the NIH. Managed an institutional review board (IRB) protocol for fMRI experiments.
- Created a widely adopted mentorship agreement for research assistants to ensure transparency and accountability in mentoring practices *[link]*.

M.Sc. Graduate Student Researcher (2015-2017)

Advisor: Joern Diedrichsen, PhD

Mapping the human cerebellum. Publications in *Brain*, *NeuroImage*, *Frontiers*; *Journal of Neuroscience* *Western University*

- Created a novel and highly downloaded map *[link]* of the human cerebellum using machine learning and advanced statistics.
- Led a team of 2 to design and collect a 26-task, 6-session fMRI and behavioral experiment, totaling 250 hours of data collection *[link]*.
- Initiated a collaboration with scientists from Stanford University to use natural language processing to assign cognitive labels to the human cerebellum *[link]*. Developed programming pipeline for other researchers to replicate my novel approach, and wrote supporting documentation.
- Invested in open-source science. My data, which are publicly available, have been downloaded >200 times *[link]*.

Publications

Cerebellum selectively engages action and social prediction during early learning

In Prep

M King, R Ivry *2024*

The gender gap in diagnosis: unrecognized clinical features of ADHD and ASD in females — *In Prep*
M King, A Brown, J Gabrieli, S Ghosh — *2024*

Unmasking a hidden disparity: electronic health records and the misclassification of suicide attempt in Black females — *In Prep*
M King, Visoki E, S Ghosh, R Barzilay — *2024*

The reading gap: are boys and girls different? — *In Prep*
M King, J Gabrieli, O Ozernov-Palchik — *2024*

Precision medicine and schizophrenia: pitfalls, promises, and policy implications — *Science Policy Review*
M King, C Del Graco, M Malik — *2024*

Selective recruitment: Evidence for task-dependent gating of inputs to the cerebellum — *ELife*
L Shahshahani, M King, C Nettekoven, R Ivry, J Diedrichsen — *2024*

Transcriptomic gradients of the human cerebellum — *Imaging Neuroscience (In Review)*
L King, M King, RB Ivry, KS Weiner — *2024*

A task-general connectivity model reveals variation in convergence of cortical inputs to functional regions of the cerebellum — *ELife*
M King, L Shahshahani, R Ivry, J Diedrichsen — *2023*

The big role of the 'little brain': exploring the developing cerebellum and its role in cognition — *Current Opinion in Behavioral Sciences*
M King — *2023*

No evidence for semantic prediction deficits in patients with cerebellar degeneration — *Neurobiology of Language*
M King, S Bruinsma, R Ivry — *2022*

Continuous manipulation of mental representations is compromised in cerebellar degeneration — *Brain*
SD McDougle, J Tsay, B Pitt, M King, W Saban, JA Taylor, RB Ivry — *2022*

Predicting brain activation maps for arbitrary tasks with cognitive encoding models — *Journal of Cognitive Neuroscience*
J Walters, M King, P Bissett, I Ivry, J Diedrichsen, R Poldrack — *2022*

Evaluating brain parcellations using the distance controlled boundary coefficient — *Human Brain Mapping*
D Zhi, M King, J Diedrichsen — *2021*

Functional boundaries in the human cerebellum revealed by a multi-domain task battery — *Nature Neuroscience*
M King, CR Hernandez-Castillo, RA Poldrack, RB Ivry, J Diedrichsen — *2019*

Universal transform or multiple functionality? Understanding the contribution of the human cerebellum across task domains — *Neuron*
J Diedrichsen, M King, C Hernandez-Castillo, M Sereno, RB Ivry — *2019*

Visualizing Topographic Independent Component Analysis with Movies — *arXiv*
Z Chen, D Parvin, M King, S Hao — *2019*

Unique degeneration signatures in the cerebellar cortex for spinocerebellar ataxias 2, 3, and 7 — *NeuroImage: Clinical*
CR Hernandez-Castillo, M King, J Diedrichsen, J Fernandez-Ruiz — *2018*

Individual differences in resting corticospinal excitability are correlated with reaction time and GABA content in motor cortex — *Journal of Neuroscience*
I Greenhouse, M King, S Noah, RJ Maddock, RB Ivry — *2017*

Towards a multi-function mapping of the cerebellar cortex — *Brain*
M King, C Hernandez-Castillo, J Diedrichsen — *2017*

Neural adaptations associated with interlimb transfer in a ballistic wrist flexion task — *Frontiers in Human Neuroscience*
KL Ruddy, AK Rudolf, B Kalkman, M King, A Daffertshofer, TJ Carroll, R Carson — *2016*

Registered reports for student research — *Journal of European Psychology Students*
M King, F Dablander, L Jakob, M Agan, F Huber, J Haslbeck, K Brecht — *2016*

A critical evaluation of the essentialist debate: do fathers make a unique contribution to child development? — *Student Psychology Journal of Ireland*
M King — *2015*

The locus coeruleus-noradrenergic arousal function modulates perceptual decision-making in humans: evidence from pupillometry — *Unpublished Undergraduate Honors Thesis*
M King, R O'Connell — *2014*

Invited Talks

Towards a comprehensive understanding of cerebellar function: Parcellations, connectivity models, and gradients — *Organization for Human Brain Mapping (OHBM)*
Pre-OHBM Gradients Workshop — *Suwon, South Korea*
2024

Leveraging connectivity models to understand the cerebellum's role in cognition — *Organization for Human Brain Mapping (OHBM)*
OHBM Symposium — *Seoul, South Korea*
2024

In search of the universal cerebellar transform — *MGH Ataxia Conference*
Massachusetts General Hospital — *Boston, MA*
2024

Beyond the neocortex: exploring the cerebellum's role in cognition — *CogLunch Seminar, MIT*
McGovern Institute, MIT — *Cambridge, MA*
2024

From theory to practice: a roadmap for machine learning models in adolescent mental health — *Yang-Tan Centers Retreat*
ICoN Center Nominated Speaker — *MIT Endicott House*
2023

Why we should consider the role of the cerebellum in development — *Flux Conference*
Flux Congress Symposia — *Paris, France*
2022

Cerebro-cerebellar connectivity across motor and cognitive circuits — *Neurologische Uniklinik Essen*
Neurophysiologisches Seminar — *Virtual Conference*
2021

Bringing a systems level perspective to neuroimaging analyses — *Organization for Human Brain Mapping*
Educational Symposium: Neuroanatomy for neuroimaging — *Virtual Conference [Link]*
2021

Transcriptomic gradients of the human cerebellum — *University of California, Berkeley*
Cognitive Neuroscience Colloquium — *Berkeley, California*
2020

Mapping the Human Cerebellum Using a Multi-Domain Task Battery — *Society for Neuroscience*
Symposium: New Perspectives on Cerebellar Function: Implications for Mental Health — *Chicago, Illinois*
2019

A multi-domain task battery reveals the functional topography of the human cerebellum — *Helen Wills Neuroscience Institute*
UCB Neuroscience Retreat — *Richmond, California*
2018

Mapping the Human Cerebellum — *Cerebellum Gordon Research Conference*

Seminar: Theories and Models of Cerebellar Function — *Lewiston, Maine*

2017

Honors

Scholarships & Fellowships

2022 **Integrative Computational Neuroscience Fellowship**, ICoN Center, MIT
2021 **Presidential Management Fellowship Finalist 2022 (declined)**, U.S. Office of Personnel Management
2021 **Mark R. Rosenzweig Graduate Fellowship**, Department of Psychology, University of California, Berkeley
2015 **Government of Ireland Postgraduate Scholarship (declined)**, Irish Research Council
2015 **Ussher Fellowship (declined)**, Trinity College Dublin
2013 **Biomedical Vacation Scholarship**, Wellcome Trust, UK
2010 **Government of Ireland Undergraduate Scholarship**, Department of Education and Skills

Awards

2020 **Cognitive Computational Neuroscience Travel Award**, CCN Conference
2017 **Gordon Cerebellum Student Travel Award**, Gordon Research Conferences
2014 **US Fulbright (Shortlisted)**, Fulbright Program
2010 **Entrance Exhibition Award**, Trinity College Dublin

Media Coverage

2020 **The mysterious, multifaceted cerebellum**, Knowable Magazine
2019 **Scientists map our underappreciated "little brain"**, University of California, Berkeley
2019 **New maps of the cerebellum show how our "little brain" works**, Psychology Today

Grants

Transformation of internal representations in multiple task domains. — *NIH R35 (funded)*

Graduate Co-Author — *2020*

Collaboration between University of California, Berkeley; Princeton University; Yale University

Evaluating a Novel Model of Cerebellar Function Using Harmonized Online-Testing of Patients with Cerebellar Degeneration in the Bay Area and Oslo Communities — *Sather Grant (unfunded)*

Graduate Co-Author — *2019*

Collaboration between University of California, Berkeley; University of Oslo

Understanding cortico-cerebellar contributions to cognition — *NIH R01 (unfunded)*

Graduate Co-Author — *2018*

Collaboration between University of California, Berkeley; Western University (Canada)

Public Service & Outreach

Committees & Policy

Council on Family and Work — *Postdoc Representative [Link]*

MIT — *Sep. 2022 -*

- Nominated to be the postdoc representative on the MIT Council on Family and Work based on prior work as part of MIT POWER (women postdocs at MIT). Conducted a project on postdoc satisfaction with parental and childcare policies at MIT (*survey [link]* and *results [link]*).
- As a member of the council, it is our responsibility to: 1) identify family and work-related issues, 2) establish a process to evaluate and respond to these issues, and 3) make periodic recommendations to MIT's senior officers about courses of action relevant to these specific issues.

Science Policy Group - Executive Visit to D.C. — *Member*

MIT — *Sep. 2022 -*

- Selected to attend an executive visit trip to Washington, DC to meet with agency leaders from NSF, USDS, EPA, NASA to discuss science policy.
- Led a meeting at the White House office of science and technology policy (OSTP) with Obama's former CTO, Megan Smith.

Graduate Assembly Students of Psychology — *Member and RSO Signatory*

University of California, Berkeley — *Sep. 2018 - Mar. 2020*

- Recognized need for formal mentor-mentee agreements in the UC Berkeley psychology department *[link]*. Assembled and co-led working committee to create policy to improve lab culture and mentor-mentee relationships.
- Wrote initial draft for 10-page policy document on mentorship and lab policy agreements *[link]*. Advised leadership on implementation of new departmental policies. Since Sep. 2021, 35/42 faculty have created lab policy documents.
- Advisor on Berkeley Psychology state of the department annual meeting *[link]*, led team to conduct data analytics and statistics to translate graduate student concerns into policy recommendations. Used data and statistics to highlight funding discrepancy between neuroscience and clinical psychology students, resulting in a 20% yearly increase in graduate student stipends.
- Provided data analytics to improve efficiency of phone banking for Psychology "Big Give". Contacted 10-fold more donors than previous year.
- Liaison officer between Berkeley development office and external donors. Organized faculty fundraisers in Silicon Valley.

European Federation of Psychology Students' Association — *Editor [Link]*

European Union — *Jan. 2016 - May 2016*

- Spearheaded initiative to pre-register scientific results in the Journal of European Psychology Students, a first for student journals worldwide.
- Advised organization leadership on best practices for successful implementation of pre-registration and authored journal article (>3500 views).

Schulich School of Medicine Graduate Council — *Secretary*

Western University — *Sep. 2015 - Sep. 2016*

- Provided budget evaluation of graduate student insurance plan to council. Served as student liaison officer.

Niteline (Student Helpline) — *Publicity Officer*

Trinity College, Dublin — *Sep. 2011 - May 2014*

- Provided practical program consultation to student helpline *[link]*.

Communication & Administration

Graduate Assembly Students of Psychology — *Writer/Contributor [Link]*

University of California, Berkeley — *Sep. 2019 - May 2021*

- Created, managed, and edited *[link]* Berkeley Psychology blog to spotlight graduate student research.
- Co-founded and co-operated Twitter account for Berkeley Psychology *[link]*. Increased follower count to >1500 after 2 years.
- Co-Writer of Psychology newsletter *[link]* (>2000 circulation). Included profiles on graduates to strengthen ties with alumni community.

Journal of European Psychology Students — *Editor/Contributor [Link]*

European Union — *Jan. 2014 - May 2016*

- Managed peer review process for 30 papers including paper submission, reviewer recruitment, copy editing, and publication.
- Contributor to popular psychology and neuroscience blog post, aimed at engaging aspiring psychology students.

Education & STEM Outreach

Prison University Project — *Lecturer [Link]*

San Quentin State Prison — *Jan. - May 2019*

- Designed and lectured a new curriculum in General Psychology for incarcerated students. I brought human brains into the classroom to teach neuroanatomy, mirroring the UC Berkeley student experience. Provided executive board with formal analysis of organizational operations.

Bay Area Scientists in Schools (BASIS) — *Team Member [Link]*

University of California, Berkeley — *Jan. 2018 - Jan. 2020*

- Deployed neuroscience curriculum, "Know Your Brain", that has been presented to students in >20 Bay Area public schools.

Inspiring Young Women in STEM Inaugural Conference — *Organizing Member [Link]*

Western University — *May 2016*

- Organizing member of first conference to encourage female students in STEM (>150 attendees), recruited keynote speakers, and evaluated research.

Western Women Neuroscientists in Schools — *Team Leader [Link]*

Western University — *Oct. 2015 - May 2017*

- Developed and lectured curriculum to explore neuroscience misinformation ("Myths and the Brain"). Presented to >2000 high-schoolers in Ontario schools.

Brain Bee — *Volunteer*

Western University — *May 2016 and May 2017*

- Member of the organizing committee for the London Brain Bee, a neuroscience event that introduces high school students to neuroanatomy.

Student-to-Student (S2S) — *Peer Mentor*

Trinity College, Dublin — *2011 - 2012*

- Provided after-school homework support to children on the autism spectrum.

Mentorship

Undergraduate Research Assistants at MIT

Alyson Brown, Shreya Ravikumar, Kai McClellan

Sep. 2022 - Sep. 2023 — *Psychology; Computer Science*

- Shreya Ravikumar built predictive models of neuropsychiatric disorders.
- Alyson Brown did a meta-analysis on sex differences in ADHD diagnosis.
- Kai McClellan leveraged large language models to assess semantic similarity in clinical questionnaires.

Honors Thesis Students at Berkeley

Shannon Lee; Sienna Bruinsma

Sep. 2019 - May 2021 — *Cognitive Science; Psychology*

- Shannon Lee's thesis developed eye-tracking and context models to inform social learning.
- Sienna Bruinsma's thesis evaluated the functional role of the cerebellum in linguistic processing using neuropsychology.

Undergraduate Research Assistants at Berkeley

Zanib Naaem; Yiling Kao

Jan. 2021 - May 2021; Sep. 2019 - May 2020 — *Psychology; Computer Science*

- Zanib Naaem tested healthy college-aged students on a multi-session eye-tracking and behavioral learning project.
- Yiling Kao developed a verb generation task and used machine learning to study speech envelopes.

Ph.D. Rotation Students at Berkeley

Amanda LeBel; Jacob Ziontz; Mark Gorenstein

Sep. - Dec. 2020; Jan. - May 2020; Sep. - Dec. 2018 — *Neuroscience*

- Amanda LeBel developed encoding models using speech features to study task-evoked cerebellar activity.
- Jacob Ziontz set up fMRI preprocessing scripts (BIDS and fMRIPrep) on multi-session cerebellar data.
- Mark Gorenstein worked on preprocessing pipelines for cerebro-cerebellar connectivity models.

Post-Baccalaureate Students at Berkeley

Dylan Benkley

Sep. - Dec. 2018 — *Psychology*

- Dylan Benkley conducted a literature review on the role of the cerebellum in social cognition.

Teaching

Mount Tamalpais College

Lecturer [Link]

General Psychology — *10 hrs/week; Sep. - Dec. 2019*

- Designed and lectured course on general psychology to incarcerated students. Topics included "the brain and nervous system", "classical conditioning", and "mood disorders". Devised trauma-informed learning objectives, catering to students with diverse educational needs.

University of California, Berkeley

Instructor [Link]

Biological Psychology, PSYCH 110; Cognitive Neuroscience, PSYCH 127 — *15 hrs/week; Aug. 2017 - Dec. 2018*

- Instructed weekly seminars for 120+ students on topics including "memory and learning" and "ethics of artificial intelligence", under the supervision of UC Berkeley professors. Evaluated and supervised student research and wrote professional references for promising students.

Western University

Instructor [Link]

Biology/Statistics, STAT 2244; Probability and Statistics, STAT 2857 — *15 hrs/week; Jan. 2016 - May. 2017*

- Instructed undergraduate students in a statistics and data science laboratory using the programming language "R". Topics included "central limits theorem", "hypothesis testing" and "conditional probability". Wrote and administered exams and evaluated student work.

Poster Presentations

Cerebro-cerebellar connectivity is dominated by divergent mapping

Society for Neuroscience Conference

M King, L Shahshahani, Ivry, J Diedrichsen — *Virtual Conference*

2021

Predicting brain activation maps for arbitrary tasks with ontology-based encoding models

Organization for Human Brain Mapping Conference

J Walters, M King, P Bissett, Ivry, J Diedrichsen, R Poldrack — *Virtual Conference*

2021

Evaluating Brain Parcellations using the Multi-Domain Task Battery

Organization for Human Brain Mapping Conference

J Diedrichsen, M King, C Hernandez-Castillo, D Zhi, R Ivry — *Rome, Italy*

2019

Evaluating different functional parcellations of the basal ganglia

Organization for Human Brain Mapping Conference

C Hernandez-Castillo, M King, I Harding, J Diedrichsen, R Ivry — *Rome, Italy*

2019

Transcriptomic Gradients of the Human Cerebellum

Cerebellum Gordon Research Conference

M King, R Ivry, K Weiner

Les Diablerets, Switzerland

2019

A multi-domain task battery reveals the functional topography of the human cerebellum

The Society for Neuroscience Conference

M King, C Hernandez-Castillo, R Poldrack, R Ivry, J Diedrichsen

San Diego, California

2018

A multi-domain task battery reveals the functional topography of the human cerebellum

Computational and Cognitive Neuroscience Conference

M King, C Hernandez-Castillo, R Poldrack, R Ivry, J Diedrichsen

Philadelphia, Pennsylvania

2018

Navigating the "Little Brain": Comprehensive mapping of cognitive function in the human cerebellum

Helen Wills Neuroscience Retreat

M King, R Ivry, J Diedrichsen

Lake Tahoe, California

2017

Navigating the "Little Brain": Comprehensive mapping of cognitive function in the human cerebellum

Organization for Human Brain Mapping Conference

M King, R Ivry, J Diedrichsen

Vancouver, British Colombia

2017

Mapping the Human Cerebellum

Cerebellum Gordon Conference

M King, R Ivry, J Diedrichsen

Lewiston, Maine

2017

Transcranial magnetic stimulation measures of intrinsic motor system excitability and task-based inhibition exhibit intra-subject stability across weeks

Society for Neuroscience Conference

I Greenhouse, M King, R Ivry

Chicago, Illinois

2015

Electroencephalography (EEG) signatures of impairment in cognitive, sensory and motor networks in Amyotrophic Lateral Sclerosis (ALS) disease

Annual ALS Irish Meeting

B Nasseroleslami, K Mohr, M King, O Hardiman

Dublin, Ireland

2015

Skills & Interests

Programming Languages	Python, SQL, R, MATLAB, HTML, Bash
Frameworks and Tools	Keras, OpenCV, Git, Vim, Blender, Nipype, Deeplabcut, PsychoPy, Pandas, NumPy, Scikit-learn, Scipy
Conceptual	High performance computing (Savio), Grant Writing and IRB Ethics Protocols, MRI technician certificate
Interpersonal	Project management, Organizational leadership, Resourcefulness, Problem solving, Conflict resolution
Languages	English (Native), Irish (Native), French (Proficient), German (Basic)