Mathias Sablé-Meyer

Computational Cognitive Neuroscience

Current

2023–2025 **UCL / Oxford**, *Tim Behrens*
Senior Research Fellow (post-doctoral position) funded by the FYSSEN fundation about generative replay as a neural mechanism for program induction in human cognition

Education

2018–2022 **PhD, Collège de France & NeuroSpin**, *Stanislas Dehaene*
"Geometric shape perception as a window into the nature of mental representation in humans", using (i) comparative and developmental psychology, (ii) modelization with neural network and generative models, and (iii) M/EEG and fMRI, to understand how humans represent abstract geometric concepts

2017–2018 **MIT, Cambridge US**, *Josh Tenenbaum*
Pre-doctoral internship in computer science and cognitive science, using symbolic representations and deep neural networks.

2017–2018 **ENS, DEC/Institut Jean Nicod**, *Salvador Mascarenhas*
Pre-doctoral internship in linguistics and psychology of reasoning, two articles *in prep.*, ongoing work with the team there.

2016–2017 **ENS Ulm, EHESS and Paris Descartes**, *CogMaster*
Cognitive Science Master. Dissertation and 6 month internship on *intuition of embedded abstract rules in geometry* under the supervision of Stanislas Dehaene

2015–2016 **International waters**, *Gap Year*
A full year of sailing and climbing around the Mediterranean sea

Early 2015 **Oxford**, *Theoretical computer science*
6 months of research under the supervision of Luke Ong, *Towards an unstaging translation for an environment classifier based metaprogramming lambda-calculus*

2014–2015 **ENS Cachan**, *Master degree, 1st year, Parisian Master of Research in CS*
Courses: Basics of verification, Probabilistic aspects of computer science, λ-calculi and categories, Machine learning, Networks, Software engineering

Early 2014 **INRIA Lille, SequeL team**, *Reinforcement Learning Internship*
2 months of research under the supervision of Romaric Gaudel, *Machine learning and sequential recommendation*

2013–2014 **ENS Cachan**, *Bachelor year*, Cachan
Computability, Complexity, Logic, Advanced algorithms, Advanced programming, Formal languages, λ-calculus, Cryptography, Databases, Systems & Architecture

Skills and extra-curricular activities

Languages **French**: Native; **English**: Fluent.

Computers Programming and analyses in `python`/`OCaml`/`R`, efficient HPC admin/user

Sports Certified sailing instructor with 1-year-long sailing trip; adequate climber

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Peer Reviewed Publications

in prep. **Mathias Sablé-Meyer**, Svenja Küchenhoff, Arya Bhomick, Diksha Gupta, Alon Baram, Kristopher Jensen, Sandra Reinert, Jeffrey Erlich, Mohamady El-Gaby, Tim Behrens; *A Neural Mechanism for Nested Repetition*

in prep. **Mathias Sablé-Meyer**, Janek Guerrini, Salvador Mascarenhas; *Evidence for likelihood based reasoning without language*

under review Kris Jensen, Peter Doohan, **Mathias Sablé-Meyer**, Sandra Reinert, Alon Baram, Thomas Akam, Tim Behrens *A mechanistic theory of planning in prefrontal cortex*, eLife

under review **Mathias Sablé-Meyer**, Marie Amalric, Yacin Hamami, *Geometric Cognition*, Handbook of Mathematical Cognition

in press **Mathias Sablé-Meyer**, Joel Fagot, Stanislas Dehaene; *Comparing Geometric Shape Representations in Humans and Baboons: A Language of Thought Perspective*, TopiCS

2025 Sebastijan Veselic, Elena Gutierrez, Mohamady El-Gaby, Sandra Reinert, **Mathias Sablé-Meyer**, *Cognitive maps in the Prefrontal Cortex*, Journal of Neuroscience

2025 **Mathias Sablé-Meyer**, Stanislas Dehaene, *Response to Crows recognize geometric regularity*, eLetter in Science Advances (not peer reviewed)

2025 Maxence Pajot, Théo Morfoisse, **Mathias Sablé-Meyer**, Yair Lakretz, Stanislas Dehaene; *The frequency of numerals revisited: A window into the compositional nature of number concepts*, Cognition

2025 Maxence Pajot, **Mathias Sablé-Meyer**, Stanislas Dehaene; *The frequency of numerals revisited: A window into the compositional nature of number concepts*, Cognition

2025 Andrea Adriano, **Mathias Sablé-Meyer**, Lorenzo Ciccione, Minye Zhan, Stanislas Dehaene; *Sensitivity to geometric shape regularity emerges independently of vision.*, OpenMind

2025 Stanislas Dehaene, **Mathias Sablé-Meyer**, Lorenzo Ciccione; *Origins of numbers: A shared language-of-thought for arithmetic and geometry?*, Trends in Cognitive Sciences.

2025 **Mathias Sablé-Meyer**, Lucas Benjamin, Cassandra Potier Watkins, Chenxi He, Maxence Pajot, Théo Morfoisse, Fosca Al Roumi, Stanislas Dehaene; *A geometric shape regularity effect in the human brain*, eLife

2024 Lucas Benjamin, **Mathias Sablé-Meyer**, Ana Fló, Ghislaine Dehaene-Lambertz, Fosca Al Roumi; Journal of Neuroscience;*Associative learning explains human sensitivity to statistical and network structures in auditory sequences*

2023 Christos Zacharopoulos, Théo Desbordes, **Mathias Sablé-Meyer** (equal contributions); EMNLP; *Assessing the influence of attractor-verb distance on grammatical agreement in humans and language models*

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2023 Lorenzo Ciccione, **Mathias Sablé-Meyer**, Esther Boissin, Mathilde Josserand, Cassandra Potier-Watkins, Serge Caparos, Stanislas Dehaene; Scientific Reports; *Trend judgment as a perceptual building block of graphicacy and mathematics, across age, education, and culture*

2022 **Mathias Sablé-Meyer**, Kevin Ellis, Josh Tenenbaum, Stanislas Dehaene; Cognitive Psychology; *A language of thought for the mental representation of geometric shapes*

2022 Stanislas Dehaene, Fosca Al Roumi, Yair Lakretz, Samuel Planton, **Mathias Sablé-Meyer**; Trends In Cognitive Science; *Symbols and mental programs: A hypothesis about human singularity*

2022 Lorenzo Ciccione* & **Mathias Sablé-Meyer***, Stanislas Dehaene; Cognition; *Analyzing the misperception of exponential growth in graphs*; *shared first-authorhsip

2021 **Mathias Sablé-Meyer**, Joel Fagot, Serge Caparos, Timo van Kerkoerle, Marie Amalric, Stanislas Dehaene; PNAS; *A signature of human uniqueness in the perception of geometric shapes*

2021 Kevin Ellis, Catherine Wong, Maxwell Nye, **Mathias Sablé-Meyer**, Lucas Morales, Luke Hewitt, Luc Cary, Armando Solar-Lezama, Joshua B Tenenbaum; PLDI; *Dreamcoder: Bootstrapping inductive program synthesis with wake-sleep library learning*

2021 **Mathias Sablé-Meyer**, Salvador Mascarenhas; Review of Philosophy and Psychology; *Indirect illusory inferences from disjunction: A new bridge between deductive inference and representativeness*

2018 Kevin Ellis, Lucas Morales, **Mathias Sablé-Meyer**, Armando Solar-Lezama, Joshua B. Tenenbaum; NIPS 2018; *Library Learning for Neurally-Guided Bayesian Program Induction*

Supervision experience

2024- **Svenja Kuchenhoff**; Supervision of a PhD student on an fMRI project about the neural representation of repeating sequences.

2024- **Amy Wong**; Supervision of a Research Assistant on a pre-registered replication of TDLM in MEG.

2024- **Arya Bhomick**; Supervision of a PhD student studying a sequence learning task in mice.

2024- **Naomi Curnow**; Supervision of a student using eye-tracking to study planning and decision making in a maze environment.

2023- **Maxence Pajot**; secondary supervision of Maxence's project connected to numbers and geometry in cognition.

2023-2023 **Mathilde Philippson**; Day-to-day supervision of a first year undergrad student (1 month); composition in humans' strategies during maze solving

2021-2022 **Maxime Cauté**; Day-to-day supervision of an M2 internship exploring cross-modal representation of sequences of parametized complexity using language-of-thought models

2021-2022 **Samuel Debray**; Distant co-supervision of an M2 project on a fMRI and Natural Language Processing approach to the brain's mathematical network

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Awards

2023 **Glushko Dissertation Prize** from the **Cognitive Science Society** for my PhD manuscript. This international prize is awarded to 5 laureates every year for "centrally address issues of interest to multiple fields that comprise cognitive science, including: psychology, computer science, philosophy, linguistics, anthropology, neuroscience, and education"

Funding And Grants

2022-2024 **Fondation Fyssen**, Fundings for 2 years of postdoc studies

2019 **Fondation du Collège de France**, 10k€ for a specific collaboration project in comparative experimental psychology

2018-2021 **CDSN**, French government PhD fundings for 3 years

Teaching experience

2025 **Teaching, Polytechnique**
"Probabilistic Language of Thought" as part of the neuroscience course from Christophe Pallier

2025 **Teaching, ENS**
"Probabilistic Language of Thought" as part of The Bayesian Brain course from Florent Meyniel

2019–2021 **Teaching, ENS**, *Supervised by Paul Égré*
"Introduction à la logique" for L3/M1 student in philosophy and cognitive science

2019–2021 **Grading, Polytechnique**, *Supervised by Stanislas Dehaene*
Grading of the final exam for the course "Introduction aux Sciences Cognitives"

Organized Symposia and Workshops

2025 COSYNE 2026 (Workshop): *Symbols as foundational to the biological basis of intelligent behavior* with Lucas Tian

2025 SfN 2025 (minisymposium): *Cognitive maps in the Prefrontal cortex* with Alla Karpova, Mohamady El-Gaby and Sandra Reinert

2024 CogSci 2024 (woskshop): *Compositionality in minds, brains and machines: a unifying goal that cuts across cognitive sciences*, with Lio Wong and Barbara Pomiechowska.

2023 CogSci 2023 (symposium): *Marks and Meanings: new perspectives on the evolution of human symbolic behavior* jointly with Kristian Tylen, Judith Fan and Michelle Langley

Invited talks and seminars

2025 Mathematics Of Neuroscience and AI, 2025, *Neuoroimaging of Mathematics: the mental representation of geometric shapes*

2025 ABIM conference, 2025, *A Neural Mechanism for Representing Nested Repetition in Humans*

2024 Cortex Club invited talk, Oxford, *The Language of Thought Hypothesis across Marr's level: the case of Geometric Shapes*

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2024 Invited speaker for Max Planck UCL Centre for Computational Psychiatry seminar, *Human Cognition of Geometric Shapes: A Window into the Mental Representation of Abstract Concepts*

2023 Invited speaker for the University of Amsterdam's Brain & Cognition Metings, *Human cognition of geometric shapes: a window into the mental representation of abstract concepts*

2023 Invited speaker at the workshop "Revisiting LoT: New advances on Cognitive Science, Linguistics and Philosophy" in Nantes; *Using a Language of Thought formalism to account for the mental representation of geometric shapes in humans*

2023 Invited speaker at the workshop "Efficiency in Non-verbal Communication" in Leipzig; *"A Minimum Description Length account of how humans mentally represent geometric shapes*

2022 Invited speakers at Vienna University's "Vienna Cognitive Science Hub"; *Human cognition of geometric shapes, a window into the mental representation of abstract concepts*

2022 Invited speakers at CEU's "Department of Cognitive Science Colloquium"; *Geometry as a window into symbolic mental representations*

2022 Invited speaker at the 2022 FYSSEN colloquium entitled "Logic and Symbols"

2022 Speaker at the Lab for the Developing Mind at NYU, invited by Moira Dillon: *Is Geometry a Language That Only Humans Know?*

2022 Speaker at the CoLaLa lab meeting, invited by Steven Piantadosi: *A language of thought for the mental representation of geometric shapes*

2022 Lab meeting of the Department of Psychology and Neuroscience, Temple University, invited by Kathryn A. Hirsh-Pasek & Nora Newcomb: *A language of thought for the mental representation of geometric shapes*

2022 Invited speaker at the McDonnell plenary workshop 2022, *A language of thought for the mental representation of geometric shapes*

2022 Invited speaker at the MPI-EVA (Leipzig) in Daniel Haun's lab meeting, *Sensitivity to geometric shape regularity in humans and baboons: accounting for dissociated performances with symbolic models and neural networks*

2021 Speaker at the Brain/AI at Facebook AI Research (FAIR), invited by Jean-Rémi KING: *Sensitivity to geometric shape regularity in humans and baboons: A putative signature of human singularity*

2021 Chairman for the Fondation Les Treilles's seminar *Cognitive maps in infants: Initial state and development*

2020 Invited member of the seminar *Music, Brain and Education*, organised by Oubradou/Collège de France

2019 ENS's LINGUAE Seminar: *The laws of mental geometry in human and non-human primates*

2019 FYSSEN seminar *Pillars of cognitive development in mathematics*

2018 Invited young researcher at Centre l'Oubradou, *Brain Visions: Art, Geometry & Symbolism*

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2018 Joint talk with Kevin Ellis: *DreamCoder: Bootstrapping Domain-Specific Languages for Neurally-Guided Bayesian Program Learning*

2018 Oxford, LPPRD seminar, joint talk with Salvador Mascarenhas; about indirect illusory inferences from disjunctions

2017 ENS's Experimental Philosophy Group: *On Indirect Illusory Inferences from Discjunction*

Posters

2025 RLDM (poster + spotlight); CogSci: *Algorithmic representations in the human brain that underlie schema generalisation*, 1st author Svenja Kuchenhoff (supervision)

2023 FENS 2023 (poster + spotlight): *Two neural mechanisms of geometric shape perception in humans*

2023 CCN 2023 (poster): *Two Neural Mechanisms of Geometric Shape Perception in Humans*

2021 CogSci 2021 (poster): *Sensitivity to geometric shape regularity in humans and baboons*

2019 CogSci 2019 (poster): *Assessing the role of matching bias in reasoning with disjunctions*

General Public Communication

2025 Event manager (co-organizer) of the Pint of Science 2025 event; UCL/Beautiful Mind

2022 Two of my articles were featured in a 2022 **New York Times** publication, "Is Geometry a Language That Only Humans Know?", written by Siobhan Roberts.

2021-2022 CEA, Collège de France, CNRS and AFP published general audience communications about the 2021 PNAS article. They spread out to several website (tv5monde, NouvelObs, futura-science, scinexx), as well as the in-print math-popularization journal *Tangente*

Reviewing work

2025 One review for *Nature Human Behavior*

2025 One review for *PNAS*

2025 One review for *Journal of Experimental Psychology: General*

2025 One review for *Journal of Neuroscience*

2025 One review for *OpenMind*

2025 One review for *Nature*

2025 One review for *TopiCS*

2025 One review for *ICLR 2025 Workshop on Representational Alignment*

2025 One review for *CogSci 2025*

2025 One review for *Imaging Neuroscience*

2024 One review for *Current Biology*

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2024 One review for an *ERC Synergy Grant (14M€)*
2024 Four reviews for the conference *CogSci 2024*
2023 Three reviews for the conference *NeurIPS*
2023 One review for the journal *Cognition*
2023 One review for the journal *Quarterly Journal of Experimental Psychology*
2023 Many reviews for the conference *CNN 2023*
2022 Three reviews for the conference *CogSci 2023*
2023 Two reviews for the journal *Review of Philosophy and Psychology*
2022 One review for the journal *NeuroImage*
2022 Two reviews for the conference *CogSci 2022*
2021 One review for the journal *Cognitive Science*

Open Science Commitment

I have always been deeply committed to open science on moral grounds. This goes beyond publishing data and code alongside open-access articles (which I do): I have implemented features and fixed minor bugs in very diverse software ecosystems, including state-of-the-art neuroimaging tools such as **`nilearn, mne, fmriprep`**, I have helped improve a pipeline to use open standards for brain imaging data inside labs, and I am always happy to share solutions with colleagues to make science more easily available

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