

Research Topics & Ideas: Neuroscience

About this document

This PDF contains 50 **neuroscience research topics** for dissertations and theses, organized into 10 areas of neuroscience, from computational and theoretical neuroscience to perception, attention and prediction. Each topic is written as a researchable question and linked to a completed dissertation (2022–2026, 19 universities), so you can see how it was studied in practice. Use it to shortlist neuroscience dissertation topics and thesis ideas, then narrow one down to your own population, setting and timeframe.

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Computational and theoretical neuroscience

1. What does a spiking model tell you about cortex that a rate model hides?

See it in a real dissertation: [Understanding Neocortical Dynamics and Computation through Spiking Neural Network Modeling](#) · Yuqing Zhu · University of Chicago · 2023

2. Could a circuit forget on purpose, the way a synapse does?

See it in a real dissertation: [Leveraging Volatile ECRAM Dynamics for Short-Term Plasticity in Neuromorphic Circuits](#) · Sean Borkholder · Rochester Institute of Technology · 2026

3. When may a neuroscientist call an association a cause?

See it in a real dissertation: [Causal Inference in Psychology and Neuroscience: From Association to Causation](#) · Dehua Liang · Chapman University · 2022

4. What does learning look like in a network built from memristive synapses?

See it in a real dissertation: [Analysis of Learning Mechanisms in Spiking Neural Networks with R\(t\) Elements and Memristive Synapses](#) · Farhana Afrin · Boise State University · 2024

5. Can predictive coding account for memory as well as for perception?

See it in a real dissertation: [Extending predictive coding: space, time and memory](#) · Mufeng Tang · University of Oxford · 2025

Learning, memory and plasticity

6. How does a brain keep an aversive memory useful without letting it take over?

See it in a real dissertation: [Memories of Aversive Experiences: Insights from the Thalamic Nucleus Reuniens to Hippocampal CA1 Pathway and CA1 Neuronal Dynamics](#) · Heather Cassidy Ratigan · University of Chicago · 2023

7. What happens to a place cell once the animal has left the place?

See it in a real dissertation: [Hippocampal Cognitive Map Dynamics: Investigating the Fate and Replay of Place Cells](#) · Yu Hung Chiu · University of Chicago · 2023

8. Do age and diet change recognition memory differently in males and females?

See it in a real dissertation: [Sex-Specific Retuning of Recognition Memory by Age and Diet: Prefrontal-Limbic Network Reconfiguration Across the Lifespan in Rats](#) · Bonanno, Gabrielle Riley · Purdue University · 2025

9. What mechanism lets an animal rewrite what a smell means after one bad experience?

See it in a real dissertation: [Mechanisms of Olfactory Plasticity in Caenorhabditis Elegans](#) · Christine Cho · Rockefeller University · 2025

10. What does inhibition contribute while a person is learning a new movement?

See it in a real dissertation: [Investigating the role of inhibition in human motor learning](#) · Ioana Grigoras · University of Oxford · 2022

Motor control and movement

11. Which sensorimotor signals coordinate two limbs that have to move together?

See it in a real dissertation: [Sensorimotor cortical contributions to encoding and integration of bilateral limb movements](#) · Megan Hope Lipton · Purdue University · 2026

12. Is movement control specialized by region, or abstracted across the whole cortex?

See it in a real dissertation: [Specialization and Abstraction for Forelimb Control Across Sensorimotor Cortex](#) · Harrison Arthur Grier · University of Chicago · 2026

13. What is inhibition in motor cortex actually doing when nothing is moving?

See it in a real dissertation: [Investigating the function of inhibition in the human primary motor cortex using multimodal approaches](#) · P Cambalova · University of Oxford · 2025

14. Does recovered movement after a spinal injury use the same circuits as before?

See it in a real dissertation: [Kinematic analysis of locomotion and skilled reaching to understand motor circuit function in health and post-injury](#) · Gavin T. Koma · Temple University · 2026

15. Can sensory adaptation alone give an animal a sense of direction?

See it in a real dissertation: [A Mechanism for Spatial Orientation Based on Sensory Adaptation in Caenorhabditis Elegans](#) · Johannes Larsch · Rockefeller University · 2025

Neural circuits and systems neuroscience

16. How is movement control organized across a sensorimotor cortex that looks uniform?

See it in a real dissertation: [Hierarchical, Intermingled and Segmented: The Organization of Neural Activity in Mouse Sensorimotor Cortex](#) · Sohrab Salimian · University of Chicago · 2025

17. What structural rules decide which neurons end up connected to which?

See it in a real dissertation: [Structural Principles of Synaptic Connectivity Across Hippocampal and Cortical Circuits](#) · Anastasia Sorokina · University of Chicago · 2025

18. How many distinct kinds of pyramidal cell does a single cortical area contain?

See it in a real dissertation: [Molecular and Functional Characterization of Pyramidal Cell Types in the Frontal Cortex of Mouse Brain](#) · Prerana Shrestha · Rockefeller University · 2025

19. Does the brain keep one map of the world and another of the task in front of it?

See it in a real dissertation: [Neural maps of world and behaviour in frontal-entorhinal circuits](#) · A HARRIS · University of Oxford · 2025

20. Which circuit turns a pheromone into a social decision in an animal with 302 neurons?

See it in a real dissertation: [The Neural Circuit for Behavioral Responses to Pheromone and Social Behavior in Caenorhabditis Elegans](#) · Heeun Jang · Rockefeller University · 2025

Neural engineering and stimulation

21. How do you stimulate tissue without leaving charge behind on the electrode?

See it in a real dissertation: [On-Chip Active Pulse-Clamp Stimulation \(APCS\) for Rapid Recovery, Charge-Balanced Neural Stimulation](#) · FNU Tala · Boise State University · 2024

22. Can a neural recorder be powered wirelessly and still be trusted?

See it in a real dissertation: [A Reliable Wirelessly Powered CMOS Platform for Neural Recording](#) · John S. Peterson · Purdue University · 2026

23. Where should stimulation go in an injured spinal cord, and can a model say?

See it in a real dissertation: [Model-driven stimulation for targeted functional restoration in chronic spinal cord injury](#) · Conor Keogh · University of Oxford · 2023

24. Could a biomedical signal be classified on the device that records it?

See it in a real dissertation: [Dot Product Engine Based Neuromorphic Hardware For Continuous-Time Biomedical Signal Classification](#) · Sanjeev Srinivasan · California Polytechnic State University · 2026

25. What has to be automated before a complete map of human synapses is possible?

See it in a real dissertation: [Precision Helical Winding for Automated Handling of Ultrathin Tissues](#) · Gillian Roeder · Massachusetts Institute of Technology · 2026

Neurodegeneration, aging and dementia

26. Does myelin failure drive Alzheimer's progression, or only accompany it?

See it in a real dissertation: [Oligodendrocyte and myelin dysfunction as novel, potent drivers of Alzheimer's Disease progression](#) · Tula Raghavan · University of Virginia · 2026

27. When does a microglial response stop protecting the brain and start damaging it?

See it in a real dissertation: [Microglial Responses in Neurodegeneration and Aging](#) · Aman Mangalmurti · University of Virginia · 2026

28. Which molecular switch decides what state a microglial cell settles into?

See it in a real dissertation: [Novel Roles of P2RY12 in Regulating Microglial States and Early Neurodegeneration in 5xFAD Mice](#) · Aida Lopez Ortiz · University of Virginia · 2026

29. Do midlife vascular risks reach dementia through the brain's blood vessels?

See it in a real dissertation: [The role of cerebrovascular reactivity in the ageing brain: Investigating the vascular link between midlife dementia risk and later-life brain and cognitive health](#) · Congxiyu Wang · University of Oxford · 2025

30. How can one receptor subunit sit behind mood, memory and cell death at once?

See it in a real dissertation: [The GluK4 Kainate Receptor Subunit Regulates Mood, Memory and Excitotoxic Neurodegeneration](#) · Emily R. Lowry · Rockefeller University · 2025

Neurodevelopment and autism

31. Why does the same developmental program build different circuits in males and females?

See it in a real dissertation: [Microglia-astrocyte regulation of sex-specific neural circuit development](#) · Abigayle Duffy · University of Virginia · 2026

32. Which autism model reproduces which part of the human phenotype?

See it in a real dissertation: [Neuroanatomical, Behavioral and Physiological Alterations in Mouse Models of Autism Spectrum Disorder](#) · Tanya Gandhi · Louisiana State University · 2022

33. Does autism look different in the brain by sex, or only in how it gets diagnosed?

See it in a real dissertation: [Mapping Autism Heterogeneity: Topology-Aware Methods for Sex-Moderated Neural Phenotypes](#) · Zachary Jacokes · University of Virginia · 2026

34. Can a scan support an autism diagnosis, and should it be allowed to?

See it in a real dissertation: [The role of MRI in diagnosing autism: a machine learning perspective.](#) · Yaser ElNakieb · University of Louisville · 2022

35. What decides how far a dendrite branches, at the level of protein chemistry?

See it in a real dissertation: [Biochemical mechanisms by which neuronal proteins control actin assembly and dendrite branching](#) · Daniel Kramer · Iowa State University · 2022

Neuroimaging and brain connectivity

36. Does connectivity damage after a stroke look the same in a mouse and in a person?

See it in a real dissertation: [Cross-Species Mapping of Functional Connectivity Alterations and Therapeutic Responses in Hyper-Acute Ischemic Stroke](#) · Chisondi S. Warioba · University of Chicago · 2025

37. Which brain health signals survive when fMRI is read as patterns rather than voxels?

See it in a real dissertation: [Learning Sparse Networks and Brain Health Biomarkers from fMRI Using Dictionary Learning Methods](#) · Sreekrishna Ramakrishnapillai · Louisiana State University · 2022

38. Should anatomy constrain a functional brain network, and by how much?

See it in a real dissertation: [Structure as Prior: Heat Kernel Diffusion for Anatomically Constrained Brain Functional Network Generation](#) · Jinghu Ding · University of Virginia · 2026

39. Do separate psychiatric diagnoses share one underlying pattern in brain morphology?

See it in a real dissertation: [Finding Underlying Morphology Trends and Significant Genes across Mental Illnesses using Dimensionality Reduction](#) · Noronha, Sharon Teresa · Harvard University · 2024

40. Could a model of emotional response be made interpretable enough to trust?

See it in a real dissertation: [Interpretable machine learning for affective psychophysiology and neuroscience](#) · Zulqarnain Khan · Northeastern University · 2022

Pain, injury and recovery

41. Can you switch off a pain signal at the sensory neuron rather than in the brain?

See it in a real dissertation: [Chemogenetic inhibition of sensory neuron excitability attenuates pain-like behaviours](#) · Huimin Hu · University of Oxford · 2025

42. Does the brain learn about pain in the body separately from pain in the world?

See it in a real dissertation: [Dissociable systems for body-oriented and world-oriented pain learning](#) · Yijia Yan · University of Oxford · 2025

43. What decides how a nurse acts on rising intracranial pressure with no gold standard?

See it in a real dissertation: [From Evidence to Action: Nurse Decision-Making in Intracranial Pressure Management](#) · Emily Esposito · University of North Carolina at Chapel Hill · 2024

44. How does a blast injury turn into tau pathology years afterwards?

See it in a real dissertation: [Blast Traumatic Brain Injury and Neurological Consequences: Tau Pathology in a Human Tau Transgenic Mouse Model and Acrolein Mediated Psychosocial Impairment in Rats](#) · Thomas Tan · Purdue University · 2026

45. Does concussion recovery follow a different course in female athletes?

See it in a real dissertation: [Advancing Scientific Understanding of Concussion Recovery in Female Athletes: A Quantitative Examination of a Three-Construct Framework](#) · Rachel Edelstein · University of Virginia · 2026

Perception, attention and prediction

46. Which theory of cortical computation survives contact with real recordings?

See it in a real dissertation: [Testing theories of computation and learning in the visual cortex](#) · Sarah Armstrong · University of Oxford · 2024

47. Do brains and machines make the same kind of prediction, or only look alike?

See it in a real dissertation: [Characterizing Predictive Processing in Minds, Brains, and Machines](#) · Z. Zhang · University of Chicago · 2026

48. What computation does a brain run on a face that a trained network does not?

See it in a real dissertation: [Computational Mechanisms of Face Perception](#) · Jinge Wang · West Virginia University · 2023

49. How does visual coding change when a scene keeps moving rather than flashing?

See it in a real dissertation: [Neural Code for Dynamic Visual Experience in the Primate Brain](#) · Jialiang Lu · California Institute of Technology · 2026

50. What can early vision in a mouse tell us that primate work cannot?

See it in a real dissertation: [Circuits, Structure and Behavior in Mouse Early Vision](#) · Peijia Yu · University of Chicago · 2026

How to turn a topic into your research question

A topic is a starting point, not something you can research yet. These four steps take you from a topic on this list to a focused question you can actually answer.

- 1. Shortlist three, not one.** Pick three topics from this list that genuinely interest you and fit the access you have to people and data.

Recommended reading: [How to find and choose a dissertation topic](#)

- 2. Read the dissertation behind each one.** Its literature review and its "recommendations for future research" section show you what is already known and what is still open.

Recommended reading: [How to find a research gap](#)

- 3. Narrow it to your setting.** Name one population, one setting and one thing you will measure or explore. That turns a broad topic into a question you can finish.

Recommended reading: [How to write a research question](#)

- 4. Line up your aims, objectives and questions.** Your committee will check that they agree.

Recommended reading: [Research aims, objectives and questions](#)

Work through these once and you will have a focused question rather than a broad topic, which is what the rest of your proposal is built on.