Anna Ivanova

annaiv@mit.edu | https://neuranna.mit.edu | @neuranna

Academic Appointment

Massachusetts Institute of Technology *Cambridge, MA, USA*

Postdoctoral Associate (MIT Quest for Intelligence) *2022 - now*

Principal investigators: Jacob Andreas, Evelina Fedorenko, Josh Tenenbaum, Roger Levy

Education

Massachusetts Institute of Technology *Cambridge, MA, USA*

Ph.D. in Brain and Cognitive Sciences *2017 - 2022*

Advisor: Evelina Fedorenko

University of Miami *Coral Gables, FL, USA*

B.S. in Neuroscience and Computer Science *2013 – 2017*

Undergraduate thesis advisor: Lucina Uddin

Key Research Topics

- **The role of language** in broader human cognition
- Brain regions that respond to **semantic tasks** across different input types
- **World knowledge** in brains vs. large language models

Publications

Journal Papers

2022. Beyond linear regression: mapping models in cognitive neuroscience should align with research goals.
Ivanova A. A., Schrimpf M., Anzellotti S., Zaslavsky N., Fedorenko E., Isik L.
Neurons, Behavior, Data analysis, and Theory, 5

2022. LanA (Language Atlas): A probabilistic atlas for the language network based on fMRI data from >800 individuals.
Lipkin B., Tuckute G., Affourtit J., Small H., Mineroff Z., Kean H., Jouravlev O., Rakocevic L., Pritchett B., Siegelman M., Hoeflin C., Pongos A., Blank I. A., Kline Struhl M., **Ivanova A. A.,** Shannon S., Sathe A., Hoffmann M., Nieto-Castañón A., Fedorenko E.
Scientific Data

2021. The language network is recruited but not required for nonverbal event semantics.
Ivanova A. A., Mineroff Z., Zimmerer V., Kanwisher N., Varley R., Fedorenko E.
Neurobiology of Language, 2, pp. 176-–201

2020. Comprehension of computer code relies primarily on domain-general executive brain regions.
Ivanova A. A., Srikant S., Sueoka Y., Kean H. H., Dhamala R., O'Reilly U.-M., Bers M. U., Fedorenko E.
eLife, 9, e58906

2019. The language of programming: a cognitive perspective.
Fedorenko E., **Ivanova A. A.,** Dhamala R., Bers M. U.
Trends in Cognitive Sciences, 23, pp. 525–528

2017. Intrinsic functional organization of putative language networks in the brain following left cerebral hemispherectomy.
Ivanova A. A., Zaidel E., Salamon N., Bookheimer S., Uddin L. Q., Bode S.
Brain Structure and Function, 222, pp. 3795–3805

2014. Post-fire succession in the northern pine forest in Russia: a case study.
Ivanova A. A., Kopylova-Guskova E. O., Shipunov A. B., Volkova P. A.
Wulfenia, 21, pp. 119–128

Conference Papers

2022 [ACCEPTED]. Convergent Representations of Computer Programs in Human and Artificial Neural Networks.
*Srikant S., *Lipkin B., **Ivanova A. A.,** Fedorenko E., O'Reilly U.
Advances in Neural Information Processing Systems (NeurIPS)

2021. Probing artificial neural networks: Insights from neuroscience.
Ivanova A. A., Hewitt J., Zaslavsky N.
ICLR 2021 Workshop "How Can Findings About The Brain Improve AI Systems?"

2020. Linguistic overhypotheses in category learning: Explaining the label advantage effect.
Ivanova A. A., Hofer M.
Proceedings of the 42nd Annual Conference of the Cognitive Science Society, pp. 723–729

2018. Does the brain represent words? An evaluation of brain decoding studies of language understanding.
*Gauthier J., ***Ivanova A. A.**
Computational Cognitive Neuroscience Conference

2018. Pragmatic inference of intended referents from binomial word order.
Ivanova A. A., Levy R. P.
Proceedings of the 40th Annual Conference of the Cognitive Science Society, pp. 1865–1870

Preprints

2022. The language network reliably 'tracks' naturalistic meaningful non-verbal stimuli.
*Sueoka Y., *Paunov A., **Ivanova A. A.,** Blank I. A., Fedorenko E.
bioRxiv, 2022.04.24.489316v1

2021. No evidence for a special role of language in feature-based categorization.
*Benn Y., ***Ivanova A. A.,** Clark O., Mineroff Z., Seikus C., Silva J. S., Varley R., Fedorenko E.
bioRxiv, 2021.03.18.436075

Papers in preparation

(in prep). Multiple brain regions show modality-invariant responses to event semantics.
Ivanova A. A., Kauf C., Kanwisher N., Kean H., Goldhaber T., Mineroff Z., Balewski Z., Varley R., Fedorenko E.

(in prep). Distributional linguistic models partially encode real-world event plausibility.
***Ivanova A. A.,** *Kauf C., Rambelli G., Chersoni E., She J., Chowdhury Z., Fedorenko E., Lenci A.

(in prep). The language network responds robustly to sentences regardless of task.
Ivanova A. A., Siegelman M., Cheung C., Pongos A. L. A., Kean H., Fedorenko E.

(in prep). Language models: surprisingly good at language, unsurprisingly bad at thought.
*Mahowald K., ***Ivanova A. A.,** Blank I. A., Kanwisher N., Tenenbaum J. B., Fedorenko E.

** denotes equal contribution*

Presentations

Invited Talks

Dec 2022 [SCHEDULED]. Invited talk at the Maryland Neuroimaging Center, University of Maryland (virtual)
Beyond linear regression: mapping models in cognitive neuroscience should align with research goals.

May 2022. Invited talk at the ACL Workshop "Learning with Natural Language Supervision" (virtual)
The role of language in broader human cognition.

Nov 2021. Oral presentation at HuthLab meeting, UT Austin (virtual)
The language-semantics relationship.

Mar 2021. Colloquium talk at UC Irvine, Department of Computer Science (virtual)
The brain basis of computer code comprehension.

Mar 2021. Invited student talk, Interview Weekend, MIT Brain and Cognitive Sciences (virtual)
The role of language in broader human cognition.

Conferences and Workshops

Oct 2022 [SCHEDULED]. Poster presentation at the Society for Neurobiology of language (SNL) conference, Philadelphia, PA
Multiple brain regions show modality-invariant responses to event semantics.

Apr 2022. Oral presentation at LangCog meeting, Harvard (virtual)
Language models: Surprisingly good at language, unsurprisingly bad at thought.

Nov 2021. Oral presentation at CogLunch, MIT Brain and Cognitive Sciences (virtual)
Beyond linear regression: mapping models in cognitive neuroscience.

Sep 2021. Oral presentation at the Meaning and Language Workshop, MIT
Meaning in the brain.

Sep 2021. Oral presentation at the Computational Cognitive Neuroscience (CCN) Generative Adversarial Collaborations workshop (virtual)
Linear mapping models in cognitive neuroscience: progress report.

May 2021. Poster presentation at the ICLR 2021 Workshop "How Can Findings About The Brain Improve AI Systems?" (virtual)
Probing artificial neural networks: Insights from neuroscience.

Oct 2020. Opening presentation at the Computational Cognitive Neuroscience (CCN) Generative Adversarial Collaborations workshop (virtual)
Is it that simple? The use of linear models in cognitive neuroscience.

Jul 2020. Poster presentation at the 42nd Annual Meeting of the Cognitive Science Society (virtual)
Linguistic Overhypotheses in Category Learning: Explaining the Label Advantage Effect.

Oct 2019. Poster presentation at the Society for Neuroscience (SfN) conference, Chicago, IL, USA
The neural basis of program comprehension.

Oct 2019. Oral presentation at CogLunch, MIT Brain and Cognitive Sciences
The neural basis of program comprehension.

Sep 2019. Oral presentation at AMLaP 2019, Moscow, Russia
The language network is recruited but not required for non-verbal semantic processing.

Aug 2019. Flash presentation at the Center for Brains, Minds, and Machines (CBMM) retreat, Woods Hole, MA, USA
The neural basis of program comprehension.

Nov 2018. Oral presentation at CogLunch, MIT Brain and Cognitive Sciences
The language network is recruited but not required for non-verbal semantic processing.

Sep 2018. Poster presentation at the Conference on Cognitive Computational Neuroscience, Philadelphia, PA, USA
Does the brain represent words? An evaluation of brain decoding studies of language understanding.

Jul 2018. Poster presentation at the 40th Annual Meeting of the Cognitive Science Society, Madison, WI, USA
Pragmatic Inference of Intended Referents from Binomial Word Order.

Apr 2017. Poster presentation at the Science March, Miami, FL, USA
Neuroscience of language.

Mar 2017. Poster presentation at Research, Creativity and Innovation Forum (RCIF), Miami, FL, USA
Functional organization of language-sensitive brain regions during naturalistic story comprehension.

Apr 2015. Oral presentation at 10th Annual ACC Meeting of the Minds Conference, Raleigh, NC, USA
Functional organization of language brain networks in patients with a lone right hemisphere.

Sep 2014. Poster presentation at the Fourth Biennial Conference on Resting State & Brain Connectivity, Boston, MA, USA
Functional organization of language networks in children with left hemispherectomy.

** denotes equal contribution*

Teaching

Prospective teaching interests

- **Introductory undergraduate courses** in psychology, cognitive science, and cognitive neuroscience
- **Research methods** in psychology and cognitive neuroscience
- **Statistics** (frequentist and Bayesian)
- **Advanced undergraduate and graduate seminars**, such as Neuroscience of Language, Language and Thought, Artificial vs. Biological Intelligence, Psychology of Science

Teaching experience

Educational Studies Program — *MIT*
Volunteer Teacher — *2018 - 2020*
Classes: Introductory Neuroscience (a 6-week course), Brain and Language, Public Speaking

MIT Department of Brain and Cognitive Sciences — *MIT*
Teaching Assistant — *2018 - 2019*
Classes: 9.46 – Neuroscience of Morality, 9.13 – The Human Brain

Academic Teaching Initiative — *MIT*
Computer Science Teacher — *2017 - 2018*
Class: AP Computer Science (Java)

Academic Resource Center — *University of Miami*
Peer Tutor — *2014-2017*
Subjects: Biology, Chemistry, Physics, Computer Science, Statistics

Guest Lectures

May 2022	**9.012: introduction to cognitive science**, guest lecture	*MIT*
Apr 2022	**COGS005: introduction to language & linguistics**, guest lecture	*UC Merced (virtual)*
Mar 2022	**9.S52: language in the mind and brain**, guest lecture	*MIT*
Mar 2022	**STEAM weekend**, invited talk	*Dwight School (virtual)*
Mar 2021	**9.S52: language in the mind and brain**, guest lecture	*MIT (virtual)*
Feb 2021	**TEDx EF Academy**, alumna talk	*EF Academy (virtual)*

Industry

Google, Inc. *Seattle, WA*
Software Engineering Intern *2016*
Applied machine learning and natural language processing techniques to develop a ticket classification system.

Honors & Awards

2022	**Diversity, Equity, Inclusion and Justice Impact Award**, recipient	*MIT BCS*
2021	**Whitaker Health Sciences Fund Fellowship**, recipient (one year of PhD funding)	*MIT*
2019	**Patrick J. McGovern Student Travel Award**, recipient	*McGovern Institute*
2019	**Angus MacDonald Award for Excellence in Undergraduate Teaching**, recipient	*MIT BCS*
2018	**"MIT Can Talk" Oratory Competition**, winner	*MIT*
2017	**IEEE Brain Data Bank Competition in Boston**, winning team	*Cambridge, MA*
2015	**Lois Pope Undergraduate Neuroscience Summer Research Fellowship**, recipient	*University of Miami*
2015	**Phi Beta Kappa**, member	*University of Miami*
2014	**Beyond the Book Scholarship** , recipient (funding for summer research)	*University of Miami*
2013	**Isaac Bashevis Singer Scholarship**, recipient (full tuition for 4 years)	*University of Miami*
2012	**All-Russian Biology Olympiad for high school students**, winner (5th place)	*Russia*
2011	**All-Russian Biology Olympiad for high school students**, winner (1st place)	*Russia*
2011	**Founder's Scholarship**, recipient (fifty percent of tuition for 2 years)	*EF Academy*

Leadership

2020 - now	**Generative Adversarial Collaboration**, team leader	*CCN Conference*
2018 - 2020	**MIT Grad Blog**, editor	*MIT*
2017 - 2019	**Peer Lectures**, organizer	*MIT*
2016 - 2017	**University of Miami Debate Team**, president	*University of Miami*
2016 - 2017	**Academic Resource Center**, lead tutor	*University of Miami*

Service

2021 - now	**Diversity, Equity, Inclusion, and Justice**, lab representative	*MIT BCS*
2019 - now	**Application Assistance Program**, mentor	*MIT BCS*
2019 - 2021	**Resources for Easing Friction and Stress (REFS)**, member (peer support program)	*MIT BCS*
2018 - 2022	**Gradvocates**, member (grad student advocacy group)	*MIT BCS*

Journal reviewer	PNAS, Psychonomic Bulletin & Review, Cortex, Cerebral Cortex, Behavioral and Brain Functions, PLOS One, Journal of Integrative Neuroscience, Aperture, Communications Biology
Assisted with journal reviews	PNAS, Nature Human Behavior, Nature Communications, Neuron, eLife, Journal of Neuroscience, Neuroimage, Neuropsychologia, Cerebral Cortex
Conference reviewer	Association for Computational Linguistics (ACL; ad hoc), Society for Neuroscience of Language (SNL), Cognitive Science (ad hoc), Conference on Computational Natural Language Learning (CoNLL), Cognitive Modeling and Computational Linguistics (CMCL), International Conference on Learning Representations (ICLR) brain2AI workshop

Mentorship

2021 - now	**Selena She**, undergraduate at Haverford College	*MIT*
2021 - now	**David Oluigbo**, undergraduate	*MIT*
2020 - 2021	**Zawad Chowdhury**, undergraduate	*MIT*
2020 - 2021	**Chandler Cheung**, high school student (now an undergraduate at UPenn)	*MIT*
2018 - now	**Yotaro Sueoka**, undergraduate (now a PhD student at Johns Hopkins University)	*MIT*

Skills

Programming Languages	Python, MATLAB, R, Java
Data Collection Tools	fMRI, MEG, Amazon Mechanical Turk, in-lab behavioral testing
Languages	Native Russian, intermediate Spanish and French, basic Japanese

Continuing Education

Diversity & Inclusion Badge Program — *University of Rhode Island*
A series of online DEI workshops — *2022*

Statistical Methods for Linguistics and Psychology — *University of Potsdam*
Online school. Track: advanced methods in frequentist statistics with Julia — *2021*

Neuromatch Academy: Deep Learning — *Neuromatch*
Online summer school on deep learning and its applications to neuroscience — *2021*

Hack for Inclusion — *MIT*
Social justice hackathon organized by MIT Sloan School of Management — *2021*

Semantic Processing and Semantic Knowledge — *Dartmouth University*
Workshop at the Center for Cognitive Neuroscience at Dartmouth — *2019*

Kaufman Certificate Teaching Program — *MIT*
Teaching course conducted by MIT's Teaching and Learning Lab — *2019*

Genetics & Neurobiology of Language — *Cold Spring Harbor Lab*
Summer school for early-career researchers — *2018*

Media Coverage & Outreach

Language and Thought in the Brain — *MIT*
Modus Mirandi podcast — *Aug 2022*
- Discussed my PhD work, including Ivanova et al., 2021 (*Neurobiology of Language*) and Ivanova et al., 2020 (*eLife*)

Google's powerful AI spotlights a human cognitive glitch: mistaking fluent speech for fluent thought — *The Conversation*
Kyle Mahowald & Anna Ivanova — *Jun 2022*
- Popular press article; reached 200,000 views in the first month

Cracking the code: the neural basis of computer code comprehension — *MGH*
Science Rehashed podcast — *Apr 2021*
- A podcast episode discussing Ivanova et al., 2020 (*eLife*)

To the brain, reading computer code is not the same as reading language — *MIT News*
Anne Trafton — *Dec 2020*
- Popular press article discussing Ivanova et al., 2020 (*eLife*)
- The most popular MIT News article in December 2020, reaching over 100,000 views
- Multiple follow-up articles, including coverage in Mandarin, Spanish, Japanese, and Russian

Language is the scaffold of the mind — *Nautilus*
Anna Ivanova — *Sept 2019*
- Popular press article; reached 10,000 views in the first week