

Mariya Toneva

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Positions Held

Max Planck Institute for Software Systems

Tenure-track Faculty (W2)
Visiting Researcher

starting Sept 2022
July 2021–Sept 2022

Princeton University

Postdoctoral Researcher
Advisors: Ken Norman, Uri Hasson

August 2021–Sept 2022

Education

Carnegie Mellon University

Ph.D. in Machine Learning and Neural Computation
Thesis title: Bridging Language in Machines with Language in the Brain
Advisors: Tom Mitchell, Leila Wehbe

2014–2021

Carnegie Mellon University

Masters of Science in Machine Learning

2018

Yale University

Bachelor of Science in Computer Science, Cognitive Science

2014

Publications in Journals and Conference Proceedings

1. Same Cause; Different Effects in the Brain 2022
M. Toneva*, and J. Williams*, A. Bollu, C. Dann, and L. Wehbe
(CLeaR 2022) *Causal Learning and Reasoning* [pdf]
2. Single-trial MEG Data Can Be Denoised Through Cross-Subject Predictive Modeling 2021
S. Ravishankar, **M. Toneva**, and L. Wehbe
Frontiers in Computational Neuroscience 2021 [pdf]
3. Modeling Task Effects on Meaning Representation in the Brain via Zero-Shot MEG Prediction 2020
M. Toneva*, O. Stretcu*, B. Póczos, L. Wehbe, and T. Mitchell
(NeurIPS 2020) *Neural Information Processing Systems* [pdf]
4. Interpreting and Improving Natural-Language Processing (in Machines) with Natural Language-Processing (in the Brain) 2019
M. Toneva and L. Wehbe
(NeurIPS 2019) *Neural Information Processing Systems* [pdf]
5. Inducing Brain-relevant Bias in Natural Language Processing Models 2019
D. Schwartz, **M. Toneva**, and L. Wehbe
(NeurIPS 2019) *Neural Information Processing Systems* [pdf]

6. An Empirical Study of Example Forgetting during Deep Neural Network Learning 2019
M. Toneva*, A. Sordoni*, R. Tachet des Combes*, A. Trischler, Y. Bengio, and G. Gordon
 (ICLR 2019) *International Conference on Learning Representations* [pdf]
7. Applying Artificial Vision Models to Human Scene Understanding 2015
 E. M. Aminoff, **M. Toneva**, A. Shrivastava, X. Chen, I. Misra, A. Gupta, and M. J. Tarr
Frontiers in Computational Neuroscience 2015 [pdf]
8. Exploration of Social Grouping: Effects of Behavioral Mimicry, Appearance, and Eye Gaze 2014
 A. Nawroj, **M. Toneva**, H. Admoni, B. Scassellati
 (CogSci 2014) *Conference of the Cognitive Science Society* [with Oral presentation] [pdf]
9. The Physical Presence of a Robot Tutor Increases Cognitive Learning Gains 2012
 D. Leyzberg, S. Spaulding, **M. Toneva**, and B. Scassellati
 (CogSci 2012) *Conference of the Cognitive Science Society* [pdf]
10. Robot Gaze Does Not Reflexively Cue Human Attention 2011
 H. Admoni, C. Bank, J. Tan, **M. Toneva**, and B. Scassellati
 (CogSci 2011) *Conference of the Cognitive Science Society* [pdf]

Preprints and Non-Proceeding Publications

- Memory for long narratives 2022
M. Toneva, V. Vo, J. Turek, S. Jain, S. Michelmann, M. Capotă, A. Huth, U. Hasson,
 and K. Norman
 (CEMS 2022) *Context and Episodic Memory Symposium*
- The Courtois Neuromod project: a deep, multi-domain fMRI dataset to build individual brain models 2022
 J. Boyle*, B. Pinsard*, V. Borghesani, M. Saint-Laurent, F. Lespinasse, F. Paugam,
 P. Sainath, S. Rastegarnia, A. Boré, J. Chen, A. Cyr, E. Dessureault, E. DuPre, Y. Harel,
M. Toneva, S. Belleville, S. Brambati, J. Cohen-Adad, A. Fuente, M. Hebart, K. Jerbi,
 P. Rainville, L. Wehbe, and P. Bellec
 (HBM 2022) *Human Brain Mapping* [with Oral presentation]
- A roadmap to reverse engineering real-world generalization by combining naturalistic paradigms, deep sampling, and predictive computational models 2022
 P. Herholz, E. Fortier, **M. Toneva**, N. Farrugia, L. Wehbe, V. Borghesani
 (arXiv 2022) [pdf]
- Does Injecting Linguistic Structure into Language Models Lead to Better Alignment with Brain Recordings? 2021
 M. Abdou, A.V. González, **M. Toneva**, D. Hershovich, and A. Søgaard
 (arXiv 2021) [pdf]
- Combining Computational Controls with Natural Text Reveals New Aspects of Meaning Composition 2020
M. Toneva, T. Mitchell, and L. Wehbe
 (bioRxiv 2020) [pdf]

- Investigating Different Alignment Methods Between Natural and Artificial Neural Networks for Language Processing 2020
 A. Bollu, **M. Toneva**, and L. Wehbe
 (SNL 2020) *Society for the Neurobiology of Language*
- Investigating Task Effects on Brain Activity During Stimulus Presentation in MEG 2019
M. Toneva*, O. Stretcu*, B. Poczoz, and T. Mitchell
 (HBM 2019) *Human Brain Mapping*
- Word Length Processing in Left Lateraloccipital through Region-to-Region Connectivity: an MEG Study 2018
M. Toneva, and T. Mitchell
 (HBM 2018) *Human Brain Mapping*
- MEG Representational Similarity Analysis Implicates Hierarchical Integration in Sentence Processing 2018
 N. Rafidi*, D. Schwartz*, **M. Toneva***, S. Jat, and T. Mitchell
 (HBM 2018) *Human Brain Mapping*
- Scene-Space Encoding within the Functional Scene-Selective Network 2015
 E. M. Aminoff, **M. Toneva**, A. Gupta, and M. J. Tarr
 (VSS 2015) *Vision Sciences Society*
- Towards a Model for Mid-level Feature Representation of Scenes 2014
M. Toneva, E. M. Aminoff, A. Gupta, and M. Tarr
 (VSS 2014) *Vision Sciences Society*

Fellowships

C.V. Starr Fellowship

Funded one year of postdoctoral research in computational neuroscience at Princeton University 2021-2022

National Science Foundation Graduate Research Fellowship

Funded three years of interdisciplinary graduate research in machine learning and neuroscience 2016-2019

Grace Hopper Celebration Scholarship

Funded attendance at the 2014 Grace Hopper Celebration of Women in Computing 2014

Mellon Forum Undergraduate Research Grant

Funded submission and attendance at the 2014 Vision Sciences Society conference 2014

Robin Berlin Fellowship

Funded neural modeling research at Laboratory of Computational Neuroscience, EPFL 2013

Awards

Ph.D. Dissertation Award, Honorable Mention

Society for the Neurobiology of Language 2021

Machine Learning Student Leadership Award

Awarded for exemplary efforts and their significant impact on life in the Machine Learning Department 2020

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| NeurIPS Top 30% Reviewer | 2018 |
| Citadel Datathon Runner-up Analyzed a genomics dataset to predict age-related differences in disease-related gene expression | 2017 |
| Machine Learning Teaching Assistant Award Awarded for outstanding performance as a TA in 10-725 Convex Optimization | 2017 |
| BrainHub Neurohackathon Winner Reduced need for human supervision by classifying diffusion MRI tracks into anatomical bundles | 2016 |

Conference and Invited Talks

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| ▪ Deep Neural Networks as Model Organisms for Human Language Comprehension ML, Abstract Thought, and the Expanding Reach of AI: Ethical and Conceptual Frontiers | 2022 |
| ▪ Same Cause; Different Effects in the Brain MIT, Host: Evelina Fedorenko | 2022 |
| ▪ Bridging Language in Machines with Language in the Brain Distinguished Speakers in Language Science Colloquium, Saarland University | 2022 |
| ▪ Data-Driven Transfer of Insight between Brains and AI Systems MIT, Host: Roger Levy | 2021 |
| ▪ NLP Systems as Model Organisms for Human Language Comprehension Computational Neuroscience Symposium | 2021 |
| ▪ Data-Driven Transfer of Insight between Brains and AI Systems Yale University Boston University University of Southern California University of Utah Max Planck Institute for Software Systems Aarhus University Toyota Technological Institute at Chicago IST Austria University of Chicago University of Notre Dame University of North Florida University of Liverpool | 2021 |
| ▪ NLP Systems as Model Organisms for Human Language Comprehension Courtois NeuroMod Group, Host: Pierre Bellec | 2021 |
| ▪ Modeling Context-Dependent Meaning Composition During Language Comprehension Princeton Neuroscience Institute, Hosts: Ken Norman and Uri Hasson | 2021 |
| ▪ Data-Driven Direct Transfer of Insight between Brains and AI Systems SFB-TRR 161 Lecture Series (University of Stuttgart, University of Konstanz, Ulm University, and the LMU Munich), Host: Lewis Chuang | 2020 |

- Modeling Task Effects on Meaning Representation in the Brain** 2020
 Traditional Talk, *Neuromatch Conference*
- Nonlinear Models for Scientific Discovery about Language in the Brain** 2020
 Invited speaker and panelist, *Cognitive Computational Neuroscience (CCN) workshop*
Is it that simple? The use of linear models in cognitive neuroscience
- Modeling Task Effects on Meaning Representation in the Brain** 2020
 Carnegie Mellon University, brAln seminar
- Composition of Context- and Task-dependent Meaning** 2020
 UT Austin, Host: Alexander Huth
- Towards a Model for Mid-level Feature Representation of Scenes** 2014
 Oral presentation, *Women in Machine Learning (WiML) workshop at NeurIPS*
- Exploration of Social Grouping: Effects of Behavioral Mimicry, Appearance, and Eye Gaze** 2014
 Oral presentation, *Conference of the Cognitive Science Society (CogSci)*

Industry Internships

Microsoft Research, Montreal

Research Intern 2018
 Investigated the learning dynamics of neural networks as they train on single classification tasks, finding that certain examples are forgotten with high frequency, and some not at all, and that, based on these forgetting dynamics, a significant fraction of examples can be omitted from the training data set while still maintaining state-of-the-art generalization performance

Cognitive Computing Center, Thomson Reuters

Research Intern 2017
 Investigated the use of a recurrent neural network encoder for unsupervised word-order sensitive hashing as a step towards improving ranking results

Research Visits

Carnegie Mellon University

Research Assistant; Advisor: Michael Tarr 2013–2014
 Investigated mid-level scene representation in humans using computer vision techniques

École Polytechnique Fédérale de Lausanne (EPFL)

Summer Intern; Advisor: Wulfram Gerstner 2013
 Worked towards improving the state-of-the-art calcium-based model of spike-timing dependent plasticity

Massachusetts Institute of Technology

Technical Trainee; Advisor: John Gabrieli 2012
 Examined links between working memory capacity and various brain metrics through the analysis of resting state functional connectivity fMRI data

Mentorship and Supervision

Anand Bollu

Masters at Department of Computer Science, CMU 2019-2021

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| Sydney Zheng Undergraduate at Department of Computer Science, CMU | 2019 |
| Aditri Bhagirath Undergraduate at Department of Computer Science, CMU | 2019 |
| Tara Pirnia MD/PhD candidate, CMU and University of Pittsburgh | 2015 |

Teaching

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| 3370 Mathematical Neuroscience, University of Pittsburgh Teaching Assistant | 2018 |
| 10-725 Convex Optimization, CMU Teaching Assistant Awarded Machine Learning TA award | 2016 |
| Machine Learning for Neuroscience, Multimodal Neuroimaging Training Program Instructor Created curriculum and instructed 4-week course; video recordings can be found on personal webpage | 2016 |

Service

Organizer

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| What can NLP systems teach us about language in the brain? Symposium, Society for the Neurobiology of Language | 2021 |
| How can findings about the brain improve AI systems? Workshop, ICLR | 2021 |

Reviewer

ML: *NeurIPS* 2016, 2018(Top 30% Reviewer)-2021; *ICML* 2019,2021; *AAAI* 2020-2021, *CoLLa* 2022
ICLR 2022 (Highlighted Reviewer)
 NLP: *ACL* 2019-2021; *NAACL* 2019-2021; *EMNLP* 2020-2021; *CoNLL* 2020-2021; *AAACL-IJCNLP* 2020;
EACL 2021
 Neuro: *Frontiers in Computational Neuroscience* journal; *Organization for Human Brain Mapping* 2018
 Other venues: *CogSci* 2021

ML@CMU Blog

Chief Editor and Co-founder 2018–2020
 Oversaw more than 30 research posts featuring recent ML research across 6 departments in the School of Computer Science as well as other CMU schools and departments, and more than 10 educational posts

University Leadership Student Advisory Council

Member 2015–2017
 Advising senior leadership at Carnegie Mellon University on the strategic priorities of the university

Graduate Student Assembly

Representative for the Program of Neural Computation 2015–2018
 Advocating for the needs of graduate students

Yale Review of Undergraduate Research in Psychology

Chief Editor 2013–2014
 Reviewed 50 submissions from 31 universities, and edited 9 submissions for publication

Personal

Languages Bulgarian (Native), English (Fluent), German (Intermediate)
Citizenship United States, Bulgaria
Github profile <http://github.com/mtoneva>
Google Scholar profile <https://scholar.google.com/citations?user=a61sk-4AAAAJ>