

# Mariya Toneva

## Education

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### Carnegie Mellon University

Ph.D. in Machine Learning and Neural Computation

2014–expected April, 2021

Thesis title: Bridging Language in Machines with Language in the Brain

Advisors: Tom Mitchell, Leila Wehbe

### Carnegie Mellon University

Masters of Science in Machine Learning

2014–2018

### Yale University

Bachelor of Science in Computer Science, Cognitive Science

2010–2014

## Publications in Journals and Conference Proceedings

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1. 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]
2. 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]
3. Inducing Brain-relevant Bias in Natural Language Processing Models 2019  
D. Schwartz, **M. Toneva**, and L. Wehbe  
(NeurIPS 2019) *Neural Information Processing Systems* [pdf]
4. 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]
5. 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]
6. 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]
7. 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]

8. 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

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- 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. Poczós, 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

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- 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

<b>Mellon Forum Undergraduate Research Grant</b>	2014
Funded submission and attendance at the 2014 Vision Sciences Society conference	
<b>Robin Berlin Fellowship</b>	2013
Funded neural modeling research at Laboratory of Computational Neuroscience, EPFL	

## Awards

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<b>Machine Learning Student Leadership Award</b>	2020
Awarded for exemplary efforts and their significant impact on life in the Machine Learning Department	
<b>NeurIPS</b>	2018
Top 30% Reviewer	
<b>Citadel Datathon Runner-up</b>	2017
Analyzed a genomics dataset to predict age-related differences in disease-related gene expression	
<b>Machine Learning Teaching Assistant Award</b>	2017
Awarded for outstanding performance as a TA in 10-725 Convex Optimization	
<b>BrainHub Neurohackathon Winner</b>	2016
Reduced need for human supervision by classifying diffusion MRI tracks into anatomical bundles	

## Conference and Invited Talks

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<ul style="list-style-type: none"> <li>▪ <b>Data-Driven Direct Transfer of Insight between Brains and AI Systems</b></li> </ul>	2020
SFB-TRR 161 Lecture Series (University of Stuttgart, University of Konstanz, Ulm University, and the LMU Munich), Host: Lewis Chuang	
<ul style="list-style-type: none"> <li>▪ <b>Modeling Task Effects on Meaning Representation in the Brain</b></li> </ul>	2020
Traditional Talk, <i>Neuromatch Conference</i>	
<ul style="list-style-type: none"> <li>▪ <b>Nonlinear Models for Scientific Discovery about Language in the Brain</b></li> </ul>	2020
Invited speaker and panelist, <i>Cognitive Computational Neuroscience (CCN) workshop</i> <i>Is it that simple? The use of linear models in cognitive neuroscience</i>	
<ul style="list-style-type: none"> <li>▪ <b>Modeling Task Effects on Meaning Representation in the Brain</b></li> </ul>	2020
Carnegie Mellon University, brAIIn seminar	
<ul style="list-style-type: none"> <li>▪ <b>Composition of Context- and Task-dependent Meaning</b></li> </ul>	2020
UT Austin, Host: Alexander Huth	
<ul style="list-style-type: none"> <li>▪ <b>Towards a Model for Mid-level Feature Representation of Scenes</b></li> </ul>	2014
Oral presentation, <i>Women in Machine Learning (WiML) workshop at NeurIPS</i>	
<ul style="list-style-type: none"> <li>▪ <b>Exploration of Social Grouping: Effects of Behavioral Mimicry, Appearance, and Eye Gaze</b></li> </ul>	2014
Oral presentation, <i>Conference of the Cognitive Science Society (CogSci)</i>	

## Industry Internships

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<b>Microsoft Research, Montreal</b>	2018
Research Intern	

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

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### **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

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### **Anand Bollu**

Masters at Department of Computer Science, CMU 2020

### **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 2016  
Awarded Machine Learning TA award

### **Machine Learning for Neuroscience, Multimodal Neuroimaging Training Program**

Instructor 2016  
Created curriculum and instructed 4-week course; video recordings can be found on personal webpage

## Community Service

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### Reviewer

ML venues: *NeurIPS* 2016, 2018(Top 30% Reviewer)-2020; *ICML* 2019,2021; *AAAI* 2020-2021

NLP venues: *ACL* 2019-2021; *NAACL* 2019-2021; *EMNLP* 2020; *CoNLL* 2020; *AAACL-IJCNLP* 2020; *EACL* 2021

Neuro venues: *Frontiers in Computational Neuroscience* journal; *Organization for Human Brain Mapping* 2018

### 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

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**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>