Michael Shvartsman
Research Scientist
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Overview

I currently lead the human data program for FAIR's AI Research Agents project. I have a track record of setting scientific direction, leading ML-driven projects from conception to publication and product transfer or open-source release, and evangelizing their usage. I am motivated by the goal of accelerating the progress of science with contemporary AI methods.

Education and work experience

Meta (formerly Facebook)

Research Scientist, Fundamental AI Research (FAIR) 2023–present
Technical Lead / Manager, Reality Labs Research 2022–2023
Research Scientist, Oculus / Reality Labs Research 2018–2021

Scientific Direction & Impact

- Developed the modeling and experimentation strategy for a large-scale sEMG foundation model based on thousands of hours of high-frequency electrophysiology recordings and trained on industry-scale compute infrastructure. Guided technical execution, resulting in a draft publication and transfer to Meta's product organization, where it remains in use.
- Defined the research vision for ML-driven human-in-the-loop experimentation, and created the team that developed AEPsych, an open-source platform enabling SOTA results in this domain (AISTATS2022; AAAI2023; UAI2024).
- Drove adoption of AEPsych to 3+ internal teams and external labs, where it enables experiments not previously possible in both applied (e.g. SIGGRAPH2022), and academic (e.g. JoV 2025) settings.

Program & Organizational Development

- Lead the human data workstream for FAIR's AI Research Agents project, including defining data collection protocols, establishing quality gates, guiding the training (SFT/DPO) strategy, and directing a team of 3+ in execution. Scaled data acquisition from zero to a multi-million dollar delivery in under 6 months by engaging with 5+ vendors and 4+ annotation types (45+ distinct engagements).
- Co-authored a charter to consolidate research efforts into a new AI team focused on human-machine collaboration, an initiative that has since grown to a 20+ person organization.
- Performed technical due diligence on machine learning systems and data infrastructure for a $500M+ acquisition.
- Created and lead an org-wide diversity, equity and inclusion champions initiative.

Mentorship & people management

- Formally mentored 5+ engineers and scientists from junior to senior levels (L3-L5) outside my direct reporting chain, and drove a direct report's promotion to an L5 role.
- Drove team growth and development: hired 1 FTE and secured budget for 3 contractors, ran planning and goal-setting for a team of 5+ scientists, engineers and prototypers, and secured cross-functional alignment and support.

- Mentored 9+ PhD interns on topics including multi-scale memory systems, adaptive experimentation, theory of deep learning, brain-computer interfaces (EEG, DOT) and action recognition.

Princeton University
Postdoctoral Research Associate 2014–2018
Advisor: J. D. Cohen

- Built a theory and model of the dynamics of multi-stimulus decision making, extending the diffusion decision model and sequential probability ratio test. Evaluated against human behavioral data.
- Developed separable covariance models for analysis of high-dimensional spatiotemporal neuroimaging data (fMRI) as part of Intel-Princeton collaboration, open-sourced as part of the brainIAK package.
- Mentored undergraduate and graduate students.

University of Michigan
Ph.D., Psychology (Cognition & Cognitive Neuroscience) 2009-2014
Committee: R. L. Lewis & S. Singh (co-chairs), J. Boland, J. Brennan, J. Hale

- Designed, performed and analyzed behavioral, eye-tracking, and computational experiments to drive theoretical developments in the understanding of eye movement control for reading as a bounded-optimal sequential inference process.
- Mentored undergraduate and master's students, including co-advising 4 undergraduate senior theses and one accelerated master's thesis.

Cognitive Neuroscience of Language Lab, University of Maryland
Research Assistant 2008-2009

- Designed and executed behavioral and neuroimaging experiments while leading infrastructure upgrades, including selecting vendors for two new eye-trackers, implementing a lab-wide backup system, and delivering a technical mini-course.

Gartner, Inc
Associate Product Manager 2007-2008

- Managed the full product lifecycle for a new research offering, driving its expansion from a North American pilot to a worldwide launch that significantly exceeded revenue and adoption targets; presented usage and retention analyses to guide strategy at the executive level.

Yale University
B.A., Linguistics 2007
Senior thesis advisor: Maria Piñango.

Skills and Languages

- **Areas of Expertise**: deep learning (Transformers, LLMs); generative AI; AI-assisted and data-driven scientific discovery, with applications to AI, neuroscience, psychology, and cognitive science; reinforcement learning; industry-scale ML training and data pipelines, including pre-, mid- and post-training; scaffolds for agentic planning, reasoning, and learning; LLM-based intelligent agents; probabilistic machine learning (Gaussian Processes, Bayesian Optimization); applied statistics (mixed effect / hierarchical modeling, probabilistic programming); broad familiarity with other areas of contemporary ML including tensor methods, time series analysis, computer vision, etc.

- **Technical skills**: scientific programming: expert Python (NumPy, SciPy, etc) & R (data.table, lme4, rstan), familiarity with C++, Unity/C#, and MATLAB; High-throughput and high-performance computing; Deep learning frameworks (PyTorch, Huggingface Accelerate, fairseq2); Neuroimaging methods (fMRI, EEG/MEG/EMG, DOT).
- **Leadership & Execution**: research planning, alignment, and roadmapping; people management (hiring, performance, career growth); project management; vendor management.
- **Languages**: English, Russian, Hebrew, basic French.

Professional Activities, Service, & Awards

- **Open-source contributions**: creator of AEPsych package for adaptive experimentation in psychophysics; primary developer of brainiak.matnormal prototyping toolkit for kronecker-separable covariance models for neuroscience; contributor to botorch, gpytorch, pymanopt.
- **Reviewing**: AISTATS (Area Chair since 2022), ICLR, ICML, NeurIPS, AAAI, UAI, TMLR, Cognitive Science, Psychological Review, Journal of Experimental Psychology: General, Journal of Memory and Language, NeuroImage, Frontiers in Psychology, Quarterly Journal of Experimental Psychology, Computational Brain and Behavior, Open Mind.
- **Career development talks**: University of Puget Sound Neuroscience Department, Princeton Neuroscience Institute, International Brain Lab, University of Michigan Psychology Department.
- Founding organizer, Conference on the Mathematical Theory of Deep Neural Networks (DeepMath). 2018–2022
- Co-organizer, workshop on Random Walks across Decision Making Domains, Computational and Systems Neuroscience (Cosyne) 2015.
- Best Student Paper, Cognitive Modeling and Computational Linguistics (CMCL) 2014.

Selected Publications & Talks

For a complete list, see https://scholar.google.com/citations?user=DFmkeEQAAAAJ

Journal articles, book chapters, and proceedings

Toledo, E., Hambardzumyan, K., Josifoski, M., Hazra, R., Baldwin, N., ..., **Shvartsman, M.**, et al. (2025). AI Research Agents for Machine Learning: Search, Exploration, and Generalization in MLE-bench. To appear in NeurIPS 2025. pdf

Zhao, B., Magka, D., Jiang, M., Li, X., Raileanu, R., ..., **Shvartsman, M.**, et al. (2025). The Automated LLM Speedrunning Benchmark: Reproducing NanoGPT Improvements. To appear in NeurIPS 2025. pdf

Mehlman, N., Gagnon-Audet, J., **Shvartsman, M.**, Niu, K., Miller, A. H., and Sodhani, S. (2025). Scaling and Distilling Transformer Models for sEMG. *Transactions on Machine Learning Research*. pdf

Williams, A., Hong, F., Sanders, C., **Shvartsman, M.**, Guan, P., and Brainard, D. (2025). A Wishart Process model combined with adaptive sampling for efficiently capturing discrimination thresholds in high-dimensional stimulus spaces. *Journal of Vision*, 25(9), 2641-2641. DOI:10.1167/jov.25.9.2641

Shvartsman, M., Letham, B., Bakshy, E., and Keeley, S. (2024). Response Time Improves Gaussian Process Models for Perception and Preferences. UAI2024. pdf.

Keeley, S., Letham, B., Tymms, C., Sanders, C., and **Shvartsman, M**. A Semi-Parametric Model for Decision Making in High-Dimensional Sensory Discrimination Tasks. AAAI2023. pdf.

Letham, B., Guan, P., Tymms, C., Bakshy, E., and **Shvartsman, M**. Look-Ahead Acquisition Functions for Bernoulli Level Set Estimation. AISTATS2022. pdf.

Kumar, M., ..., **Shvartsman, M.**, et al. (2021). BrainIAK: The Brain Imaging Analysis Kit. *Aperture Neuro*. DOI:10.52294/31bb5b68-2184-411b-8c00-a1dacb61e1da

Shvartsman, M., Sundaram, N., Aoi, M., Charles, A., Willke, T and Cohen, J. D. (2018). Matrix-variate models for fMRI analysis. AISTATS2018. Extended version available at arXiv: 1711.03058.

Shvartsman, M., Srivastava, V., and Cohen, J. D. (2015) A Theory of Decision Making Under Dynamically Changing Context. NeurIPS2015.

Shvartsman, M., Lewis, R. L., and Singh, S. Computationally Rational Saccadic Control: An Explanation of Spillover Effects Based on Sampling from Noisy Perception and Memory. CMCL @ ACL2014. **Best student paper award**.

⋆Bratman, J., ⋆**Shvartsman, M.**., Lewis, R. L., & Singh, S. (2010). A new approach to exploring language emergence as boundedly optimal control in the face of environmental and cognitive constraints. ICCM2010. (⋆equal contribution) **Best Student Paper honorable mention**.

Working papers, preprints, and commentaries

Shvartsman, M., et al. (in prep.). A foundation model for surface electromyography. Under internal review.

Shvartsman, M., Srivastava, V., Sundaram, N. and Cohen, J. D. (in prep.). A theory of decision making from multiple stimuli. Draft available upon request.

Posters and Oral Presentations (without proceedings)

Kalra, D., Gagnon-Audet, J., Gromov, A., Mediratta, I., Niu, K., Miller, A. H., and **Shvartsman, M.** A Scalable Measure of Loss Landscape Curvature for Analyzing the Training Dynamics of LLMs. DeepMath 2025 (oral).

Shvartsman, M. (2023) AEPsych: a platform for human-in-the-loop experimentation. **Invited talk** given at STE||AR Colloquium on Artificial Intelligence Research and Optimization @ LSU, and Perceptual Reality Lab @ Berkeley.

Shvartsman, M. (2019). Gaussian processes and cognitive models for joint modeling of brain and behavior. **Invited talk**, Joint Modeling Workshop, Midwest Cognitive Science Conference.

Shvartsman, M., Srivastava, V., Sundaram, N., and Cohen, J. D. (2017) A theory of decision making under changing context. **Invited talk** given at IBM Research; Koditschek Lab, Dept. of Eletrical and Systems Engineering, University of Pennsylvannia; Frank Lab, Dept. of Cognitive, Linguistic and Psychological Sciences, Brown University.

Shvartsman, M., Lewis, R. L., & Singh, S. (2014) Spillover frequency effects in a sequential sampling model of reading. Talk given at the CUNY conference on human sentence processing. **<10% talk acceptance rate.**

Shvartsman, M., Lewis, R. L., & Singh, S. (2012) The adaptive nature of eye-movement control in linguistic tasks. Talk given at the CUNY conference on human sentence processing. **<10% talk acceptance rate.**

Shvartsman, M., Bergelson, E. & Idsardi, W.J. (2009) From tones to vowels: a neurophysiological investigation of sine and formant dyads. Poster presented at the neurobiology of language conference.

Mentoring and Teaching

- Mentor for the Aspirations in Computing Program at the National Association for Women in Technology (AiC @ NCWiT) and Meta-internal mentorship programs. 2020–present.
- Weekly statistics workshops/tutorials for Princeton Neuroscience Institute graduate students and postdocs (jointly with Dave Kleinschmidt). 2016-2018.
- Co-mentoring 4 University of Michigan honors undergraduate theses (B. Berend, C. Sanders, M. Shyam, E. Wilcox) and one accelerated masters thesis (Y. Kazerooni). 2010–2016.
- Graduate Student Instructor, Introduction to Linguistics and Introduction to Cognitive Psychology. Grader, Introduction to Psycholinguistics. 2010–2012.