Nicholas Thompson Franklin

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Machine learning researcher specializing in deep generative models, reinforcement learning, and Bayesian methods. Over seven years of post-PhD experience in machine learning research, including deep generative models and probabilistic approaches. Current research focus is scientific discovery through AI, including biomolecular design, protein and small molecule generative modeling.

Education

Ph.D. in Cognitive Science, Brown University — August 2017
B.S. Biology, B.A. Spanish, The University of Texas at Austin — May 2009

Professional Experience

Flagship Pioneering — Cambridge, MA
Senior Scientist, Machine Learning, Pioneering Intelligence — Nov 2023-Present

- Key member in a small research team responsible for conducting original research, developing our engineering and technical stack, strategic directions, and recruitment and training of junior staff.
- Develop novel methods in deep generative models for biomolecular design, including pre-training autoregressive protein and small molecule language models, reward-based fine tuning with PPO and GFlow Nets, sequence-based variational autoencoders, and latent diffusion (flow matching) models.
- Support early-stage venture creation efforts through scientific research

Hyperscience — New York, NY
Applied Scientist — Feb 2021-Jul 2022

- Member of ML research and engineering team in a growth stage start-up focused on OCR and business automation.
- Led research initiatives to enhance machine learning models for document understanding, spanning computer vision and natural language processing.
- Developed deep learning architectures for image segmentation (CNNs) and document classification (transformers).
- Designed ML solutions from prototype to production in Python and PyTorch.

Harvard University — Cambridge, MA
Postdoctoral Fellow, *Lab of Samuel J Gershman* — Sep 2017 – Jan 2021

- Research in human learning and cognition with deep generative models and probabilistic Bayesian methods.
- Designed neuro-symbolic machine learning using autoregressive models, variational autoencoders and probabilistic inference (non-parametric Bayes). Used these methods as a theoretical account of human learning and for video segmentation.
- Created research software used by external collaborators; supervised student projects in computational neuroscience and deep learning.

Brown University Providence, RI
Graduate Researcher, Lab of Michael J Frank Sept 2011 – Aug 2017

- Conducted theoretical research on human learning and brain function, focusing on reinforcement learning, Bayesian methods, and neural network modeling.
- Developed models for biological neural networks and Bayesian nonparametric reinforcement learning.
- Published theoretical and empirical findings in leading computational neuroscience journals.
- Taught and mentored students in neural network and cognitive modeling courses.

Skills

Programming:	Python, PyTorch, NumPy, Git, AWS, Pytorch Lightning
Machine learning & AI:	Deep generative models (VAEs, autoregressive methods, transformers, flow-matching), reinforcement learning (GFlowNets, tabular methods, PPO), Bayesian nonparametrics, probabilistic modeling
Domains of Application:	*Biomolecular design, protein and small molecule modeling, computational neuroscience*
Spoken Languages:	English (native), Spanish (professionally proficient), French (intermediate)

Selected Publications

[1] Franklin NT & Frank MJ (2020). Generalizing to generalize: humans flexibly switch between compositional and conjunctive structures during reinforcement learning. *PLOS Computational Biology*

[2] Franklin NT, Norman K.A., Ranganath C., Zacks J.M., Gershman S.J., (2020) Structured event memory: a neuro-symbolic model of event cognition. *Psychological Review*

[3] Schulz E, Franklin NT, Gershman S.J., (2020). Finding structure in multi-armed bandits. *Cognitive Psychology*

[4] Franklin NT, Frank MJ (2018). Compositional clustering in task structure learning. *PLOS Computational Biology*

[5] Franklin, NT, & Frank, MJ (2015). A cholinergic feedback circuit to regulate striatal population uncertainty and optimize reinforcement learning. e*Life*