Eugene Brevdo

Staff Software Engineer

Google DeepMind

Biography

Eugene Brevdo is a Staff SWE at Google DeepMind. His research interests span many interconnected areas:

- Uncertainty, evolutionary strategies, and population-based training as applied to optimization (including e.g., software and biological systems).
- Software systems for training and deploying ML, Bandits, and RL models.
- Uncertainty, evolutionary strategies, and population-based training.
- Machine Learning applied to optimizing large software systems (databases, datacenter scheduling, caches, compilers like LLVM and XLA/TPU).

Eugene received his PhD in Electrical Engineering from Princeton University, where his advisers were Peter Ramadge and Ingrid Daubechies.

Education

PhD in Electrical Engineering, 2011
Princeton University

BSc in Electrical, Computer, and Systems Engineering, 2005
Rensselaer Polytechnic Institute

Projects

MATLAB Synchrosqueezing Toolbox

This toolbox implements several time-frequency and time-scale analysis methods, including the Forward/Inverse Discretized CWT, and CWT-based Synchrosqueezing.

GitHub

MLGO

MLGO is a framework for integrating ML techniques systematically in LLVM. It replaces human-crafted optimization heuristics in LLVM with machine learned models.

GitHub

ProtNLM

ProtNLM is a new method used by UniProt to automatically annotate uncharacterized protein sequences. This method works by predicting a short textual description for proteins based solely on their amino acid sequence, using a sequence-to-sequence model.

Uniprot

Reverb

Reverb is an efficient and easy-to-use data storage and transport system designed for machine learning research. Reverb is primarily used as an experience replay system for distributed reinforcement learning algorithms but the system also supports multiple data structure representations such as FIFO, LIFO, and priority queues.

GitHub

TensorFlow

TensorFlow is an end-to-end open source platform for machine learning.

GitHub

TensorFlow Probability

A library for probabilistic reasoning and statistical analysis.

GitHub

TF Agents

A reliable, scalable and easy to use TensorFlow library for Contextual Bandits and Reinforcement Learning.

GitHub

Experience

Staff Software Engineer
Google Brain + Google DeepMind
Jan 2022 – Present · California

Brain Sequin (now GDM Alchemy) team.

- Focusing on protein understanding and optimization under uncertainty.
- Multi-stage peptide library design, co-optimizing cell permeability and protein binding.
- LLM models for protein function annotation and target-conditional optimization.

Staff Software Engineer
Google Brain
Apr 2017 – Dec 2021 · California

Co-TLM of the TF-Agents team (2018 - 2021).

TLM of the Brain Learned Systems Team (2017 - 2022). Clients include Spanner, Compiler, and Cloud infrastructure teams.

- Built smarter query optimizers, cache eviction algorithms, inlining and register allocation passes.
- Grew the Learned Systems team from 1 to 7 researchers and engineers.
- Aligned engagements between Brain, Technical Infrastructure, and Cloud orgs.
- Set research direction for systems and ML engineers.

Senior Software Engineer
Google Brain
Oct 2015 – Mar 2017 · California

SWE on Brain Applied Machine Intelligence team.

- Core TensorFlow maintainer.
- Developed interfaces and support for sparse and sequential input, debugged graph control flow, implemented CPU and GPU kernels; whatever needed doing.
- Founding SWE / API designer of TF Distributions (now Tensorflow Probability).

Software Engineer
Google Research
Apr 2014 – Sep 2015 · California

Hacked on DistBelief, helped opensource TensorFlow.

Software Engineer
Lifecode, Inc.
Mar 2013 – Mar 2014 · California

Built supervised learning ML pipelines for clinical diagnosis of rare diseases from NGS assays.

Senior Data Scientist
The Climate Corporation
Mar 2013 – Mar 2014 · California

I worked on two teams:

- Computational Climatology: Statistical weather forecasting in the short-to-medium-term scale (2 weeks-2 years) using a combination of techniques from climatology, machine learning/statistics, and spatiotemporal signal processing.
- Computational Agronomy: Analyzed, assimilated, and reconciled remotely sensed weather and agricultural data. Built growth forecasts for corn, sorghum, soy, and winter wheat.

Research Intern
Siemens Corporate Research
May 2008 – Aug 2008 · Princeton, NJ

Focused on applications of Compressive Sensing to inverse problems in medical imaging.

- Developed CS-based estimator for Computational Tomography with Sinogram Occlusion.
- Developed a novel CS-based reconstruction technique for Ultrasound tomography.

Featured Publications

Zhenyu Song, Kevin Chen, Nuikhil Sarda, Deniz Altinbüken, Eugene Brevdo, Jimmy Coleman, Xiao Ju, Pawel Jurczyk, Richard Schooler, Ramki Gummadi (2023). HALP: Heuristic Aided Learned Preference Eviction Policy for YouTube Content Delivery Network. *20th USENIX Symposium on Networked Systems Design and Implementation, NSDI 2023, Boston, MA, April 17-19, 2023*.

Cite URL

Lyric Doshi, Vincent Zhuang, Gaurav Jain, Ryan Marcus, Haoyu Huang, Deniz Altinbüken, Eugene Brevdo, Campbell Fraser (2023). Kepler: Robust Learning for Parametric Query Optimization. *Proc. ACM Manag. Data*.

Cite DOI URL

S. VenkataKeerthy, Siddharth Jain, Umesh Kalvakuntla, Pranav Sai Gorantla, Rajiv Shailesh Chitale, Eugene Brevdo, Albert Cohen, Mircea Trofin, Ramakrishna Upadrasta (2023). The Next 700 ML-Enabled Compiler Optimizations. *CoRR*.

Cite DOI URL

Xinfeng Xie, Prakash Prabhu, Ulysse Beaugnon, Phitchaya Mangpo Phothilimthana, Sudip Roy, Azalia Mirhoseini, Eugene Brevdo, James Laudon, Yanqi Zhou (2022). A Transferable Approach for Partitioning Machine Learning Models on Multi-Chip-Modules. *Proceedings of Machine Learning and Systems 2022, MLSys 2022, Santa Clara, CA, USA, August 29 - September 1, 2022*.

Cite URL

Yingjie Miao, Xingyou Song, John D. Co-Reyes, Daiyi Peng, Summer Yue, Eugene Brevdo, Aleksandra Faust (2022). Differentiable Architecture Search for Reinforcement Learning. *International Conference on Automated Machine Learning, AutoML 2022, 25-27 July 2022, Johns Hopkins University, Baltimore, MD, USA*.

Cite URL

Andreea Gane, Maxwell L Bileschi, David Dohan, Elena Speretta, Amélie Héliou, Laetitia Meng-Papaxanthos, Hermann Zellner, Eugene Brevdo, Ankur Parikh, Maria J Martin, Sandra Orchard, Lucy J Colwell (2022). ProtNLM: Model-based Natural Language Protein Annotation.

PDF Cite

Mircea Trofin, Yundi Qian, Eugene Brevdo, Zinan Lin, Krzysztof Choromanski, David Li (2021). MLGO: a Machine Learning Guided Compiler Optimizations Framework. *CoRR*.

Cite URL

Albin Cassirer, Gabriel Barth-Maron, Eugene Brevdo, Sabela Ramos, Toby Boyd, Thibault Sottiaux, Manuel Kroiss (2021). Reverb: A Framework For Experience Replay. *CoRR*.

Cite URL

Yuan Yu, Martín Abadi, Paul Barham, Eugene Brevdo, Mike Burrows, Andy Davis, Jeff Dean, Sanjay Ghemawat, Tim Harley, Peter Hawkins, Michael Isard, Manjunath Kudlur, Rajat Monga, Derek Gordon Murray, Xiaoqiang Zheng (2018). Dynamic control flow in large-scale machine learning. *Proceedings of the Thirteenth EuroSys Conference, EuroSys 2018, Porto, Portugal, April 23-26, 2018*.

Cite DOI URL

Yuan Yu, Martín Abadi, Paul Barham, Eugene Brevdo, Mike Burrows, Andy Davis, Jeff Dean, Sanjay Ghemawat, Tim Harley, Peter Hawkins, Michael Isard, Manjunath Kudlur, Rajat Monga, Derek Gordon Murray, Xiaoqiang Zheng (2018). Dynamic Control Flow in Large-Scale Machine Learning. *CoRR*.

Cite URL

Ashish Vaswani, Samy Bengio, Eugene Brevdo, François Chollet, Aidan N. Gomez, Stephan Gouws, Llion Jones, Lukasz Kaiser, Nal Kalchbrenner, Niki Parmar, Ryan Sepassi, Noam Shazeer, Jakob Uszkoreit (2018). Tensor2Tensor for Neural Machine Translation. *Proceedings of the 13th Conference of the Association for Machine Translation in the Americas, AMTA 2018, Boston, MA, USA, March 17-21, 2018 - Volume 1: Research Papers*.

Cite URL

Dustin Tran, Matthew D. Hoffman, Rif A. Saurous, Eugene Brevdo, Kevin Murphy, David M. Blei (2017). Deep Probabilistic Programming. *5th International Conference on Learning Representations, ICLR 2017, Toulon, France, April 24-26, 2017, Conference*

Track Proceedings.

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Joshua V. Dillon, Ian Langmore, Dustin Tran, Eugene Brevdo, Srinivas Vasudevan, Dave Moore, Brian Patton, Alex Alemi, Matthew D. Hoffman, Rif A. Saurous (2017). TensorFlow Distributions. *CoRR*.

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Martín Abadi, Ashish Agarwal, Paul Barham, Eugene Brevdo, Zhifeng Chen, Craig Citro, Gregory S. Corrado, Andy Davis, Jeffrey Dean, Matthieu Devin, Sanjay Ghemawat, Ian J. Goodfellow, Andrew Harp, Geoffrey Irving, Michael Isard, Yangqing Jia, Rafal Józefowicz, Lukasz Kaiser, Manjunath Kudlur, Josh Levenberg, Dan Mané, Rajat Monga, Sherry Moore, Derek Gordon Murray, Chris Olah, Mike Schuster, Jonathon Shlens, Benoit Steiner, Ilya Sutskever, Kunal Talwar, Paul A. Tucker, Vincent Vanhoucke, Vijay Vasudevan, Fernanda B. Viégas, Oriol Vinyals, Pete Warden, Martin Wattenberg, Martin Wicke, Yuan Yu, Xiaoqiang Zheng (2016). TensorFlow: Large-Scale Machine Learning on Heterogeneous Distributed Systems. *CoRR*.

Cite URL

Gaurav Thakur, Eugene Brevdo, Neven S. Fuckar, Hau-Tieng Wu (2013). The Synchrosqueezing algorithm for time-varying spectral analysis: Robustness properties and new paleoclimate applications. *Signal Process.*.

Cite DOI URL

Sina Jafarpour, Gungor Polatkan, Eugene Brevdo, Shannon M. Hughes, Andrei Brasoveanu, Ingrid Daubechies (2009). Stylistic analysis of paintings using wavelets and machine learning. *17th European Signal Processing Conference, EUSIPCO 2009, Glasgow, Scotland, UK, August 24-28, 2009*.

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Ella Hendriks, Igor J. Berezhnoy, Eugene Brevdo, Shannon M. Hughes, Ingrid Daubechies, Jia Li, Eric O. Postma, James Z. Wang (2008). Image processing for artist identification. *IEEE Signal Process. Mag.*.

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