Ebrahim M. Songhori

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Summary

- Experienced Software Engineer enthusiastic in machine learning engineering and research.
- Experience in top industry research lab like **Google Brain** and record of innovation and publications, e.g., paper published at **Nature**.
- Strong engineering professional skilled in Machine Learning, Reinforcement Learning, Ad Serving and Indexing.

Employment Experiences

- **Senior Software Engineer at Google Brain**, Mountain View, CA 2019—
  - Member of Google Brain's Machine Learning for Systems team which applies modern machine learning techniques to optimize and improve computer systems.
  - Quality **lead engineer** for Morpheus: Google Brain's Moonshot project to improve hardware chip floorplaning using a Deep Reinforcement Learning (RL). The work has been published at **Nature**: nature.com/articles/s41586-021-03544-w, blog post and attracts external media coverage: IEEE Spectrum, MIT Technology Review.
  - Led a team of 10 researchers and engineers to develop a novel solution using curriculum and reinforcement learning to deliver superhuman placements for top most challenging TPU blocks.
  - Proposed and developed the RL agent's policy networks that generalizes over different chip blocks using graph convolution and deconvolution layers, Section 4 of paper.
  - Reduced run-time by 2x using a pre-trained generealizable agent and removing the need for fine-tuning placements with Simulated Annealing.
  - Cross-organization collaboration with hardware engineers in the TPU team to improve the correlation of the RL agent reward with the hardware tool metrics. Hosted a summer intern and mentored new engineers in the team.
  - Lead contributor to the open source the project on github.com/google-research/circuit_training.
  - Saved Google **$1XXM** by reducing time-to-market for past two TPU chip versions.
- **Software Engineer at Google Shopping Ads**, Mountain View, CA 2017–2019
  - Developed the infrastructure for a two-tower deep learning solution for low-latency and highly accurate ads retrieval in Google Shopping. Cross-organization collaboration with Shopping Search Quality team and Google Research team to adopt the machine learned solution to Shopping infrastructure. The launch had **$500M+** revenue increase per year for Shopping.
  - Developing an indexing systems for Google Organic Shopping System.
  - Ownership of an internal search engine system for shopping data with numerous internal users. Markedly reduced the system maintenance cost and resource footprint without degrading the quality of service. Also improved its URL matching coverage which was on the critical path for Google Organic Shopping Project by **+47%**.
- **Software Engineer Intern at Google**, Mountain View, CA Summer 2016
  Developed an evaluation pipeline for retrieval using deep neural networks for Google Shopping.
- **Software Engineer Intern at Google**, Mountain View, CA Summer 2015
  Developed an intelligent monitoring and alerting system for Google Shopping Infrastructure.

Technical Skills

- **Machine Learning**: Deep Learning, Deep Reinforcement Learning.
- **Programming Skills:** Python, C/C++.
- **Other technologies:** TensorFlow, Vizier, Protocol Buffer, Bigtable (NoSQL Database), MapReduce, Git, SQL, Amazon AWS.

Education

- **Ph.D. in Electrical and Computer Engineering** 2015—2017
  Rice University, TX.
  Supervisor: Prof. Farinaz Koushanfar (University of California, San Diego)
  Thesis Title: "TinyGarble: Efficient, Scalable, and Versatile Privacy-Preserving Computation Through Sequential Garbled Circuit."
  Visitor student at University of California, San Diego, CA, 2015—2017.
  An open-source and academic framework for privacy-preserving computation based on the Garbled Circuit protocol and hardware synthesis (available in TinyGarble Github).
- **M.Sc. in Electrical and Computer Engineering** 2012—2014
  Rice University, TX.
- **B.Sc. in Computer Engineering** 2007—2011
  University of Tehran, Iran.

Selected Publications and Patents

- Mirhoseini, Azalia, Anna Goldie, Mustafa Yazgan, Joe Wenjie Jiang, **Ebrahim Songhori**, Shen Wang, Young-Joon Lee et al. "A graph placement methodology for fast chip design." Nature 594, no. 7862 (2021): 207-212.
- Goldie, Anna Darling, Azalia Mirhoseini, **Ebrahim Songhori**, Wenjie Jiang, Shen Wang, Roger David Carpenter, Young-Joon Lee et al. "Generating integrated circuit placements using neural networks." U.S. Patent Application 17/555,085, filed April 7, 2022.
- Zhang, Dan, Safeen Huda, **Ebrahim Songhori**, Kartik Prabhu, Quoc Le, Anna Goldie, and Azalia Mirhoseini. "A full-stack search technique for domain optimized deep learning accelerators." In Proceedings of the 27th ACM ASPLOS, pp. 27-42. 2022.
- Riazi, M. Sadegh, Christian Weinert, Oleksandr Tkachenko, **Ebrahim M. Songhori**, Thomas Schneider, and Farinaz Koushanfar. "Chameleon: A hybrid secure computation framework for machine learning applications." In Proceedings of the 2018 on Asia Conference on Computer and Communications Security (ASIACCS), pp. 707-721. 2018.
- **Songhori, Ebrahim M.**, Siam U. Hussain, Ahmad-Reza Sadeghi, Thomas Schneider, and Farinaz Koushanfar. "TinyGarble: Highly compressed and scalable sequential garbled circuits." In Security and Privacy (SP), 2015 IEEE Symposium on, pp. 411-428. IEEE, 2015.

Awards and Honors

- **PhD Student Fellowship**, Houston, TX 2012
  Rice University ECE Graduate Fellowship.
- **Valedictorian**, Tehran, Iran 2011
  Ranked 1st in the class of 2011 Computer Engineering, University of Tehran.
- **Olympiad**, Tehran, Iran
  Ranked 5th in the National Scientific Olympiads for College Students in Computer Engineering. 2009
  Silver Medal in the National Scientific Olympiads for High School Students in Physics. 2006