

# CHRISTOPHER SHALLUE

Harvard University  $\diamond$  Cambridge, MA 02138

`chris.shallue@gmail.com`

## SUMMARY

---

- **Experienced researcher:** 10+ years across astrophysics, cosmology, machine learning, and mathematics. 1900+ citations (900+ as first author).
- **Senior software engineer:** former Google Senior Software Engineer experienced in code design, parallel computing, unit testing, and collaborative coding.
- **Machine learning specialist:** extensive experience designing, implementing, and improving machine learning models for both research and production.

## EXPERIENCE

---

### Harvard University

*Graduate Research Fellow*

Cambridge, MA, USA

September 2019—present

- Developed a new method to reconstruct the conditions of the early universe by combining physics with deep neural networks, achieving substantial improvements over prior techniques.

### Google Brain Research Team (now Google DeepMind)

*Senior Research Software Engineer*

Mountain View, CA, USA

March 2016—October 2019

Independent researcher in a collaborative lab focused on machine learning and AI.

- Co-led a multi-year research program aimed at understanding and improving neural network training. Published 5 papers on data parallelism, optimization methods, and hyperparameter tuning as a primary author.
- Conceived and designed a deep neural network for detecting extrasolar planets. Discovered the first planet ever found with machine learning, as well as the first known extrasolar system with eight planets.
- Co-advised 3 junior researchers in the Google AI residency program, resulting in 3 publications and 1 patent.

### Google Display Ads

*Software Engineer*

Mountain View, CA, USA

January 2014—March 2016

Technical lead of machine learning modeling team for Gmail ads (9 people).

- Developed machine learning models for global personalized ad targeting. Personally designed and launched new models with \$10M+/year in revenue gains.
- Led weekly group meetings, gave guidance and feedback on projects, mentored junior team members.

## EDUCATION

---

### Harvard University

*PhD in Astrophysics (GPA: 3.81)*

Cambridge, MA, USA

2019—May 2025 (expected)

- Honors: Quad Fellowship (*leaders in science and technology committed to innovation and collaboration*), Ardis and Robert James Graduate Fellowship (*exceptional Harvard graduate students*)

### Monash University

*BS (Hons) in Mathematics (GPA: 4.00)*

Clayton, VIC, Australia

2009—2012

- Honors: Carl Moppert Prize for Mathematics (*top mathematics honors student*), Monash University Medal for Excellence (*top science student university-wide*), Highest Academic Performance in a Science Course (6 time recipient), Monash University Scholarship for Excellence.

## TECHNICAL SKILLS

---

**Programming languages:** Python, C++

**ML frameworks:** JAX, TensorFlow

**ML implementation:** Architecture design, GPU acceleration

**ML training:** Hyperparameter tuning, training algorithms

## PUBLICATIONS

---

1900+ citations (900+ as first author). [Google scholar](#).

### Astrophysics and Cosmology (selected order)

- **Shallue** and Eisenstein. “Reconstructing Cosmological Initial Conditions from Late-Time Structure with Convolutional Neural Networks.” *Monthly Notices of the Royal Astronomical Society*, 520, 4 (2023). [arXiv](#)
- **Shallue** et al. “Warm Hawking Relics From Primordial Black Hole Domination” *Journal of Cosmology and Astroparticle Physics*, submitted (2024). [arXiv](#)
- **Shallue** and Vanderburg. “Identifying Exoplanets with Deep Learning: A Five Planet Resonant Chain around Kepler-80 and an Eighth Planet around Kepler-90.” *The Astronomical Journal*, 155, 94 (2018). [arXiv](#)
- de Beurs et al, including **Shallue**. “Characterization of K2-167 b and CALM, a new stellar activity mitigation method.” *Monthly Notices of the Royal Astronomical Society*, 529, 2 (2024). [arXiv](#)
- de Beurs, Vanderburg, **Shallue**, et al. “Identifying Exoplanets with Deep Learning. IV. Removing Stellar Activity Signals from Radial Velocity Measurements Using Neural Networks.” *The Astronomical Journal*, 164, 49 (2022). [arXiv](#)
- Yu et al, including **Shallue**. “Identifying Exoplanets with Deep Learning III: Automated Triage and Vetting of TESS Candidates.” *The Astronomical Journal*, 158, 1 (2019). [arXiv](#)
- Dattilo, Vanderburg, **Shallue**, et al. “Identifying Exoplanets with Deep Learning II: Two New Super-Earths Uncovered by a Neural Network in K2 Data.” *The Astronomical Journal*, 157, 5 (2019). [arXiv](#)

### Machine Learning (selected order)

- **Shallue** et al. “Measuring the Effects of Data Parallelism on Neural Network Training.” *Journal of Machine Learning Research*, 20, 112 (2019). [arXiv](#)
- Choi, **Shallue**, et al. “On Empirical Comparisons of Optimizers for Deep Learning.” *Technical report* (2020). [arXiv](#)
- Dhingra, **Shallue**, et al. “Embedding Text in Hyperbolic Spaces.” *Twelfth Workshop on Graph-Based Methods for Natural Language Processing*, 59 (2018). [arXiv](#)
- Godbole et al, including **Shallue**. “Deep Learning Tuning Playbook.” *Field guide* (2023). [GitHub](#)
- Zhang et al, including **Shallue**. “Which Algorithmic Choices Matter at Which Batch Sizes? Insights From a Noisy Quadratic Model.” *Neural Information Processing Systems*, 8194 (2019). [arXiv](#)
- Choi, Passos, **Shallue**, et al. “Faster Neural Network Training with Data Echoing.” *Technical report* (2019). [arXiv](#)
- Nado, Gilmer, **Shallue** et al. “A Large Batch Optimizer Reality Check: Traditional, Generic Optimizers Suffice Across Batch Sizes.” *Technical report* (2021). [arXiv](#)

### Mathematics

- **Shallue** and Wanless. “Permutation Polynomials and Orthomorphism Polynomials of Degree Six.” *Finite Fields and Their Applications*, 20, 84 (2013). [Publisher](#)
- **Shallue**. “Permutation Polynomials of Finite Fields.” *Honors Thesis* (2012). [arXiv](#)

## PATENTS

---

- “Systems and Methods for Reducing Idleness in a Machine-Learning Training System using Data Echoing.” *US Patent 11,537,949* (2022).

## OPEN SOURCE CODE

---

- **AstroNet**: A deep neural network library for identifying exoplanets in stellar light curves. [GitHub](#)
- **recon-cnn**: A convolutional neural network library for reconstructing cosmological initial conditions. [GitHub](#)