







Christopher A. Choquette-Choo

 christopherchoquette.com
 choquette.christopher@gmail.com
 [christopher-choquette-choo](https://in.christopher-choquette-choo)

 +1 408-442-7846
 [cchoquette](https://github.com/cchoquette)
 CA, USA

Research Scientist 40+ papers, lead product deployments.

Significant contributions to 8+ major products with billions of users and enabling 100s of downstream usecases. I am a scientist and engineer. I enjoy defining then solving tough problems, and deploying the solutions.

Research Experience

Google Brain & Google DeepMind

Research Scientist

Machine Learning Researcher

Mountain View, CA, USA

2024 – Present

2022 – 2023

- Lead memorization analysis in large language models. Research how memorization manifests.
- Analyze and ensure product compliance of LLMs for release—enabled 8+ launches and 100s of products, including Gemini (+1.5 Pro/Flash), Gemma (+CodeGemma), GBoard, and PaLM 2.
- Research privacy/security vulnerabilities and auditing of machine learning and language models.
- Research and develop state-of-the-art differential privacy mechanisms for machine learning.
- Lead research into compression in federated learning.
- Deploy my techniques for compression, memorization analysis, and differential privacy into production.
- 8 spot bonuses for exceptional work, including LLM releases like Gemini (+1.5 Pro), Gemma, and PaLM 2, as well as impactful research like DP-FTRL and attacking SOTA models like GPT-3.
- 500+ CLs, 1 competition, 25+ papers released to date.

Google Research, Cerebra team

Brain Resident

New York, NY, USA

2020 – 2022

- Investigated concept interpretability of acoustic models. Presented at Google Research Conference.
- Led research into optimal privacy-communication-accuracy tradeoffs with sparsity in federated learning.
- Researched differentially private multi-winner voting mechanisms for machine learning.
- Guided and advise project into private semi-supervised learning for federated learning in dermatology.

Vector Institute, with Professor Nicolas Papernot

Research Assistant

Toronto, ON, Canada

Sept 2019 – Oct. 2020

- Led research into differentially private collaborative algorithms.
- Led Privacy-preserving machine learning.

Georgian Partners

Research Engineer

Toronto, ON, Canada

Apr. 2019 – Aug. 2019

- Owned development of a differentially private ML model, to guarantee user data privacy, in collaboration with Google's top machine learning library, TensorFlow/Privacy, which is used by 1000 people.
- Designed an AutoML package to intelligently tune an ML model on any dataset; used by 25+ people.

Vector Institute, with Professor Aspuru-Guzik

Undergraduate Researcher

Toronto, ON, Canada

Apr. 2019 – Aug. 2019

- Researched machine learning for molecular discovery via Gaussian processes and active learning.

Intel Corp.

Research Engineer

Toronto, ON, Canada

May 2018 – May 2019

- Spearheaded SOTA ML bug triager with 55% accuracy on 2000+ engineers and 76% on 500+ teams.
- Productionized triager with an engineering efficiency improvement of 25% and savings of >\$10M annually.

- Studied mechanical properties of polyurethane scaffolds and dental resin composites. Used in patents.

Research and Papers

[X] = **First or Co-First Author**. To date, I've first or co-first authored 13 papers.

Peer-Reviewed Conference and Journal Proceedings

- [45] *Auditing Private Prediction* [Link](#) 2024
Proceedings of the 41st International Conference on Machine Learning (ICML)
Karan Chadha, Matthew Jagielski, Nicolas Papernot, **Christopher A. Choquette-Choo**, Milad Nasr
- [44] *Privacy Side-Channels in Machine Learning Systems* [Link](#) 2024
USENIX Security Symposium (USENIX)
Edoardo DeBenedetti, Giorgio Severi, Milad Nasr, **Christopher A. Choquette-Choo**, Matthew Jagielski, Eric Wallace, Nicholas Carlini, Florian Tramèr
- [43] *Privacy Amplification for Matrix Mechanisms* [Link](#) 2024
(Spotlight) International Conference on Learning Representations (ICLR)
Christopher A. Choquette-Choo, Arun Ganesh, Thomas Steinke, Abhradeep Guha Thakurta
- [42] *Correlated Noise Provably Beats Independent Noise for Differentially Private Learning* [Link](#) 2024
International Conference on Learning Representations (ICLR)
Christopher A. Choquette-Choo, Krishnamurthy Dj Dvijotham, Krishna Pillutla, Arun Ganesh, Thomas Steinke, Abhradeep Guha Thakurta
- [41] *Teach LLMs to Phish: Stealing Private Information from Language Models* [Link](#) 2024
International Conference on Learning Representations (ICLR)
Ashwinee Panda, **Christopher A. Choquette-Choo**, Zhengming Zhang, Yaoqing Yang, Prateek Mittal
- [40] *Poisoning web-scale training datasets is practical* [Link](#) 2024
IEEE Symposium on Security and Privacy (IEEE S&P)
Nicholas Carlini, Matthew Jagielski, **Christopher A. Choquette-Choo**, Daniel Paleka, Will Pearce, Hyrum Anderson, Andreas Terzis, Kurt Thomas, Florian Tramèr.
- [39] *(Amplified) Banded Matrix Factorization: A unified approach to private training* [Link](#) 2023
Thirty-seventh Conference on Neural Information Processing Systems (Neurips)
Christopher A. Choquette-Choo, Arun Ganesh, Ryan McKenna, H. Brendan McMahan, Keith Rush, Abhradeep Guha Thakurta, Zheng Xu.
- [38] *Are aligned neural networks adversarially aligned?* [Link](#) 2023
Thirty-seventh Conference on Neural Information Processing Systems (Neurips)
Nicholas Carlini, Milad Nasr, **Christopher A. Choquette-Choo**, Matthew Jagielski, Irena Gao, Anas Awadalla, Pang Wei Koh, Daphne Ippolito, Katherine Lee, Florian Tramèr, Ludwig Schmidt.
- [37] *Students Parrot Their Teachers: Membership Inference on Model Distillation* [Link](#) 2023
(Oral) Thirty-seventh Conference on Neural Information Processing Systems (Neurips)
Matthew Jagielski, Milad Nasr, Katherine Lee, **Christopher A. Choquette-Choo**, Nicholas Carlini.
- [36] *MADLAD-400: Multilingual And Document-Level Large Audited Dataset* [Link](#) 2023
Thirty-seventh Conference on Neural Information Processing Systems (Neurips)
Sneha Kudugunta, Isaac Caswell, Biao Zhang, Xavier Garcia, **Christopher A. Choquette-Choo**, Katherine Lee, Derrick Xin, Aditya Kusupati, Romi Stella, Ankur Bapna, Orhan Firat
- [35] *Robust and Actively Secure Serverless Collaborative Learning* [Link](#) 2023
Thirty-seventh Conference on Neural Information Processing Systems (Neurips)

- Nicholas Franzese, Adam Dziedzic, **Christopher A. Choquette-Choo**, Mark R. Thomas, Muhammad Ahmad Kaleem, Stephan Rabanser, Congyu Fang, Somesh Jha, Nicolas Papernot, Xiao Wang
- [34] *Multi-epoch matrix factorization mechanisms for private machine learning* [Link](#) 2023
 (Oral) Proceedings of the 40th International Conference on Machine Learning (ICML)
Christopher A. Choquette-Choo, H. Brendan McMahan, Keith Rush, Abhradeep Thakurta.
- [33] *Private Federated Learning with Autotuned Compression* [Link](#) 2023
 Proceedings of the 40th International Conference on Machine Learning (ICML)
 Enayat Ullah*, **Christopher A. Choquette-Choo***, Peter Kairouz*, Sewoong Oh*.
 *Equal contribution
- [32] *Federated Learning of Gboard Language Models with Differential Privacy* [Link](#) 2023
 The 61st Annual Meeting of the Association for Computational Linguistics
 Zheng Xu, Yanxiang Zhang, Galen Andrew, **Christopher A. Choquette-Choo**, Peter Kairouz, H. Brendan McMahan, Jesse Rosenstock, Yuanbo Zhang.
- [31] *Preventing verbatim memorization in language models gives a false sense of privacy* [Link](#) 2023
 (Runner-up Best Paper) Proceedings of the 16th International Natural Language Generation Conference
 Daphne Ippolito, Florian Tramèr*, Milad Nasr*, Chiyuan Zhang*, Matthew Jagielski*, Katherine Lee*,
Christopher A. Choquette-Choo*, Nicholas Carlini.
 *Equal contribution, random ordering.
- [30] *Proof-of-Learning is Currently More Broken Than You Think* [Link](#) 2023
 IEEE 8th European Symposium on Security and Privacy (EuroS&P). IEEE Computer Society
 Congyu Fang*, Hengrui Jia*, Anvith Thudi, Mohammad Yaghini, **Christopher A. Choquette-Choo**,
 Natalie Dullerud, Varun Chandrasekaran, Nicolas Papernot.
 *Equal contribution, alphabetical ordering.
- [29] *Private Multi-Winner Voting for Machine Learning* [Link](#) 2023
 Proceedings on 23rd Privacy Enhancing Technologies Symposium (PETS)
 Adam Dziedzic, **Christopher A. Choquette-Choo**, Natalie Dullerud, Vinith Menon Suriyakumar, Ali
 Shahin Shamsabadi, Muhammad Ahmad Kaleem, Somesh Jha.
- [28] *The fundamental price of secure aggregation in differentially private federated learning* [Link](#) 2022
 (Spotlight) International Conference on Machine Learning. PMLR
 Wei-ning Chen*, **Christopher A. Choquette-Choo***, Peter Kairouz*, Ananda Theertha Suresh*.
 *Equal contribution, alphabetical ordering.
- [27] *Label-Only Membership Inference Attacks* [Link](#) 2021
 (Spotlight) International Conference on Machine Learning (ICML)
Christopher A. Choquette-Choo, Florian Tramer, Nicholas Carlini, Nicolas Papernot.
- [26] *Entangled Watermarks as a Defense against Model Extraction* [Link](#) 2021
 USENIX Security Symposium (USENIX)
 Hengrui Jia, **Christopher A. Choquette-Choo**, Varun Chandrasekaran, Nicolas Papernot.
- [25] *Proof of Learning: Definitions and Practice* [Link](#) 2021
 IEEE Symposium on Security and Privacy (IEEE S&P)
 Hengrui Jia*, Mohammad Yaghini*, **Christopher A Choquette-Choo**, Natalie Dullerud, Anvith Thudi,
 Varun Chandrasekaran, Nicolas Papernot.
 *, Equal contribution, alphabetical ordering.
- [24] *Machine Unlearning* [Link](#) 2021
 IEEE Symposium on Security and Privacy (IEEE S&P)
 Lucas Bourtole*, Varun Chandrasekaran*, **Christopher A. Choquette-Choo***, Hengrui Jia*, Adelin
 Travers*, Baiwu Zhang*, David Lie, Nicolas Papernot.
 *Equal contribution, alphabetical ordering.

[23] *CaPC Learning: Confidential and Private Collaborative Learning* [Link](#) 2021
International Conference on Learning Representations (ICLR)
Christopher A. Choquette-Choo*, Natalie Dullerud*, Adam Dziedzic*, Yunxiang Zhang*, Somesh Jha, Nicolas Papernot, Xiao Wang.
*Equal contribution, alphabetical ordering.

[22] *A Multi-label, Dual-Output Deep Neural Network for Automated Bug Triaging* [Link](#) 2019
International Conference on Machine Learning and Applications (ICMLA)
Christopher A. Choquette-Choo, David Sheldon, Jonny Proppe, John Alphonso-Gibbs, Harsha Gupta.

Peer-Reviewed Workshop Proceedings

[21] *Privacy Auditing of Large Language Models* [Link](#) 2024
Next Generation of AI Safety Workshop at ICML 2024
Ashwinee Panda, Xinyu Tang, Milad Nasr, **Christopher A. Choquette-Choo**, Prateek Mittal

[20] *Privacy Auditing of Large Language Models* [Link](#) 2024
FM-Wild Workshop at ICML 2024
Ashwinee Panda, Xinyu Tang, Milad Nasr, **Christopher A. Choquette-Choo**, Prateek Mittal

[19] *User Inference Attacks on Large Language Models* [Link](#) 2023
International Workshop on Federated Learning in the Age of Foundation Models in Conjunction with NeurIPS (FL@FM-NeurIPS'23)
Nikhil Kandpal, Krishna Pillutla, Alina Oprea, Peter Kairouz, **Christopher A. Choquette-Choo**, Zheng Xu

[18] *Correlated Noise Provably Beats Independent Noise for Differentially Private Learning* [Link](#) 2023
International Workshop on Federated Learning in the Age of Foundation Models (FL@FM-NeurIPS'23)
Christopher A. Choquette-Choo, Krishnamurthy Dj Dvijotham, Krishna Pillutla, Arun Ganesh, Thomas Steinke, Abhradeep Guha Thakurta

[17] *User Inference Attacks on Large Language Models* [Link](#) 2023
Socially Responsible Language Modelling Research (SoLaR)
Nikhil Kandpal, Krishna Pillutla, Alina Oprea, Peter Kairouz, **Christopher A. Choquette-Choo**, Zheng Xu

[16] *Communication Efficient Federated Learning with Secure Aggregation and Differential Privacy* [Link](#) 2021
the Neural Information Processing Systems (NeurIPS) workshop on Privacy in Machine Learning
Wei-ning Chen*, Christopher A. Choquette-Choo*, Peter Kairouz*.
*Equal contribution, alphabetical ordering.

Reports

[15] *CodeGemma: Open Code Models Based on Gemma* [Link](#) 2024
arXiv
..., **Christopher A. Choquette-Choo***, ...
*Contributor.

[14] *Gemma: Open Models Based on Gemini Research and Technology* [Link](#) 2024
arXiv
..., **Christopher A. Choquette-Choo***, ...
*Contributor. Led memorization efforts.

[13] *Gemini 1.5: Unlocking multimodal understanding across millions of tokens of context* [Link](#) 2024
arXiv
..., **Christopher A. Choquette-Choo***, ...
*Contributor. Led memorization testing.

- [12] *Gemini: A Family of Highly Capable Multimodal Models* [Link](#) 2023
arXiv
Anil, R., ..., **Christopher A. Choquette-Choo***, ..., & Vinyals, O.
*Contributor. Led memorization efforts.
- [11] *Palm 2 technical report* [Link](#) 2023
arXiv
Anil, R., Dai, A. M., Firat, O., Johnson, M., Lepikhin, D., Passos, A., ..., **Christopher A. Choquette-Choo***, ..., & Wu, Y.
*Core contributor. Led memorization efforts.
- [10] *Report of the 1st Workshop on Generative AI and Law* [Link](#) 2023
arXiv
A. Feder Cooper*, Katherine Lee*, James Grimmelmann, Daphne Ippolito, Christopher Callison-Burch, **Christopher A. Choquette-Choo**, ...
*Equal contribution, alphabetical ordering.

Pre-Prints (arXiv)

- [9] *Recite, Reconstruct, Recollect: Memorization in LMs as a Multifaceted Phenomenon* [Link](#) 2024
arXiv
USVSN Sai Prashanth, Alvin Deng, Kyle O'Brien, Jyothir SV, Mohammad Aflah Khan, Jaydeep Borkar, **Christopher A. Choquette-Choo**, Jacob Ray Fuehne, Stella Biderman, Tracy Ke, Katherine Lee, Naomi Saphra
- [8] *Optimal Rates for DP-SCO with a Single Epoch and Large Batches* [Link](#) 2024
arXiv
Christopher A. Choquette-Choo, Arun Ganesh, Abhradeep Thakurta
- [7] *Phantom: General Trigger Attacks on Retrieval Augmented Language Generation* [Link](#) 2024
arXiv
Harsh Chaudhari, Giorgio Severi, John Abascal, Matthew Jagielski, **Christopher A. Choquette-Choo**, Milad Nasr, Cristina Nita-Rotaru, Alina Oprea
- [6] *Scalable Extraction of Training Data from (Production) Language Models* [Link](#) 2023
arXiv
Milad Nasr, Nicholas Carlini, Jonathan Hayase, Matthew Jagielski, A. Feder Cooper, Daphne Ippolito, **Christopher A. Choquette-Choo**, Eric Wallace, Florian Tramèr, Katherine Lee
- [5] *User Inference Attacks on Large Language Models* [Link](#) 2023
arXiv
Nikhil Kandpal, Krishna Pillutla, Alina Oprea, Peter Kairouz, **Christopher A. Choquette-Choo**, Zheng Xu
- [4] *Fine-tuning with differential privacy necessitates an additional hyperparameter search* [Link](#) 2022
arXiv
Yannis Cattan, **Christopher A Choquette-Choo**, Nicolas Papernot, Abhradeep Thakurta

Under Review (and not yet released)

- [3] *Privacy Auditing of Large Language Models* [Link](#) 2024
under review
Ashwinee Panda, Xinyu Tang, Milad Nasr, **Christopher A. Choquette-Choo**, Prateek Mittal
- [2] *The Last Iterate Advantage: Empirical Auditing and Principled Heuristic Analysis of Differentially Private SGD* [Link](#) 2024
under review

Milad Nasr, Thomas Steinke, Borja Balle, **Christopher A. Choquette-Choo**, Arun Ganesh, Matthew Jagielski, Jamie Hayes, Abhradeep Thakurta, Adam Smith, Andreas Terzis

[1] *POST: A Framework for Privacy of Soft-prompt Transfer* [Link](#) 2024
under review

Xun Wang, Jing Xu, **Christopher A. Choquette-Choo**, Adam Dziedzic, Franziska, Boenisch

[0] *Data Source Attribution in Diffusion Models* [Link](#) 2024
under review

Matthew Jagielski, Milad Nasr, Nicholas Carlini, **Christopher A. Choquette-Choo**, A. Feder Cooper, Katherine Lee, Andreas Terzis, Georgina Evans, Chiyuan Zhang, Avijit Ghosh, Florian Tramèr

Talks

Invited Talks

DP-Follow-The-Regularized-Leader: State-of-the-art Optimizers for Private Machine Learning. 2024
Institute of Science and Technology Austria (ISTA) for Prof. Christoph Lampert Slides available upon request.

DP-Follow-The-Regularized-Leader: State-of-the-art Optimizers for Private Machine Learning. 2024
"Federated Learning on the Edge" AAI Spring 2024 Symposium. Slides available upon request.

Host of "Private Optimization with Correlated Noise" invited session and co-presented first talk 2024
Information Theory and Applications (ITA) Slides available upon request.

Poisoning Web-Scale Training Datasets is Practical 2024
Guest talk for Prof. Varun Chandrasekaran at University of Illinois Slides available upon request.

The Privacy Considerations of Production Machine Learning 2021
MLOps New York Area Summit Slides available upon request.

Adversarial Machine Learning: Ensuring Security and Privacy of ML Models and Sensitive Data 2019
REWORK Responsible AI Summit [Available as a part of the Privacy and Security in Machine Learning package](#)

Paper Presentations

Multi-Epoch Matrix Factorization Mechanisms for Private Machine Learning [Oral presentation at ICML 2023](#)

The Fundamental Price of Secure Aggregation in Differentially Private Machine Learning [Spotlight at ICML 2022](#)

Label-Only Membership Inference Attacks [Spotlight at ICML 2021](#)

Proof-of-Learning Definitions and Practice [Oral presentation at IEEE S&P 2021](#)

Machine Unlearning [Oral presentation at IEEE S&P 2021](#)

Professional Activities

Program Committee

IEEE Security and Privacy (S&P) conference 2025

IEEE Security and Privacy (S&P) conference 2024

Generative AI + Law (GenLaw)'23 Workshop at ICML 2023

Area Chair

Neural Information Processing Systems (NeurIPS) 2024

Session Chair

DL: Robustness at International Conference on Machine Learning (ICML) 2022

Reviewer

International Conference on Machine Learning (ICML) 2024

International Conference on Learning Representations (ICLR) 2024

Google Research Scholar 2023-2024

Nature Machine Intelligence Journal 2023

Neural Information Processing Systems (NeurIPS) + **Top Reviewer** 2023

International Conference on Machine Learning (ICML) 2023

Neural Information Processing Systems (NeurIPS) 2022

Nature Machine Intelligence Journal 2022

International Conference on Machine Learning (ICML) + **Outstanding Reviewer** 2022

IEEE Transactions on Emerging Topics in Computing 2022

Machine Learning for the Developing World (ML4D) workshop at NeurIPS 2021

Journal of Machine Learning Research 2021

Machine Learning for the Developing World (ML4D) workshop at NeurIPS 2020

External Reviewer

USENIX Security Symposium 2022

IEEE Symposium on Security and Privacy 2022

International Conference on Machine Learning (ICML) 2021

USENIX Security Symposium 2021

IEEE Symposium on Security and Privacy 2021

Mentorship

Ken Ziyu Liu 2024
Stanford University PhD Student Researcher

Saminul Haque 2024
Stanford University PhD Student Researcher

Enayat Ullah 2023
John Hopkins University PhD Student Researcher

Education

Bachelor of Applied Science in Engineering Science

Major in Robotics Engineering

Thesis: Label-Only Membership Inference Attacks as Realistic Privacy Threats

Graduation with Honors (cGPA 3.73/4.00)

University of Toronto

2015-2020

Honors and Awards

Schulich Leaders Full Scholarship

\$100,000 Value

Awarded on the basis of academic achievement and leadership to students pursuing a STEM degree.

University of Toronto

2015-2020

Class of 9T7 Award

\$4000 Value

Awarded on the basis of academic achievement and leadership.

University of Toronto

2017

Director's Summer Research Opportunities

\$5000 Value

Awarded to fund a summer research opportunity in Canada at the Institute for Biomaterials and Biomedical Engineering.

University of Toronto

2016

Burger King Scholarship

\$1500 Value

Awarded on the basis of academic achievement and leadership.

University of Toronto

2015

University of Toronto Scholarship

\$6000 Value

Awarded on the basis of academic achievement.

University of Toronto

2015

Competitions

Undergraduate Science Case Competition (SCINAPSE)

(Finalist of 2) of 250+ teams. Upper Year Division.

Western University

2017

Microsoft Azure Machine Learning Case Competition

(1st) of 20+ teams.

University of Toronto

2017

UTEK Consulting Competition

(Semi-Finalist) of 20+ teams.

University of Toronto

2016

The Game, Engineering Design Competition

(1st) of 10+ teams. \$10,000 value.

University of Toronto

Sept. 2015 - Mar. 2016

Community Outreach

Public Software

Google Research: Main Owner of [Multi-Epoch Matrix Factorization](#) package

2023

Google Research: Owner of [Private Linear Compression](#)

2022

TensorFlow Privacy: Sole Contributor of [Bolt-On Method](#) for Differentially Private Training

2019

CleverHans Blog

Arbitrating the integrity of stochastic gradient descent with proof-of-learning 2021
Beyond federation: collaborating in ML with confidentiality and privacy 2021
Teaching Machines to Unlearn 2020

Personal Blog

How to do Machine Unlearning 2021
Teaching Machines to Unlearn 2020

Community Service and Leadership

University of Toronto Consulting Association, University of Toronto University of Toronto
Director of Volunteer Consulting Group 2017-2018

FoodSkrap Startup Own Incorporation
Co-Founder, CEO, and Software Developer 2016-2017

You're Next Career Network University of Toronto
Director of Business Development, Startup 2016-2017

Board of Directors Plan Canada
Youth Advisor 2015-2017

Youth Advisory Council Plan Canada
Member 2014-2017

Technical skills

Proficient in: Python, C
Familiar with: Java, MATLAB, Perl, SQL, Elasticsearch, JavaScript
Python libraries: TensorFlow, Jax, Pax, SeqIO, T5X, PyTorch, NumPy, Pandas, Matplotlib, Scikit-learn, TensorFlow Federated, TensorFlow Privacy

Soft skills

Communication I focus on communicating complex ideas in a way anyone can understand.
Teamwork I care about being considerate and sharing responsibility in effective ways. Evidenced by 10 peer bonuses and 2 kudos at Google.
Leadership I believe that identifying strengths and clearing runways enables success.