**“Tao” Uthaipon Tantipongpipat**

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**Topics of Expertise**

* Fairness and privacy in machine learning – fair, explainable, and accountable machine learning; differential privacy, especially in deep learning and synthetic data generation; discrete and continuous optimization
* optimal design in statistics, or design of experiments (DoE); diversity and representative sampling.

**Other Interests**: privacy and security; model compression

**Work Experiences**

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| Jun 2020 -Now | **Machine Learning Researcher,** Twitter, remote US  META (Machine learning Ethics, Transparency and Accountability), Cortex   * Drive Twitter image cropping fairness analysis resulting in published academic paper and $1.5M press ad equivalency and 3B readership from 500 news articles in 49 countries. The follow-up work by team members resulted in additional $1.4M, 2.7B reads, and 800 articles from 47 additional countries. * Advise and suggest 13-18% precision-recall video classification model improvement with no additional cost to partnering team to fix the racial egregious mistake on the Topic Tweet * Guide company-wide engineering practice in using inequality metrics in A/B statistical testing and present its application to business leadership * Publish two academic papers in CS community – one where I lead the project and one where I am a collaborator. |
| May - Jul 2019 | **Research Intern**, Microsoft Research,Redmond, WA  Algorithms group. Supervisor: Janardhan Kulkarni and Sergey Yekhanin.   * Implemented privacy guarantee on large-scale Natural Language Processing models (RNNs and LSTMs) to protect against privacy deidentification due to model usage. * Published one academic paper (NeurIPS 2021) as a result * Developed novel correlation clustering algorithm and its corresponding privacy analysis * Researched on private submodular optimization and surveyed state-of-the-art technique for private stochastic gradient descent for training deep learning models |

**Education**

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| Aug 2016 -May 2020 | **Georgia Institute of Technology**, Atlanta, GA, United States  PhD in Algorithms, Combinatorics, and Optimization (ACO), School of Computer Science GPA 4.00/4.00   * Minor in Computational Learning Theory * Advisor: Dr. Mohit Singh * Thesis: **Fair and Diverse Data Representation in Machine Learning** |
| Aug 2012 - May 2016 | **University of Richmond**, Richmond, VA, United States  BS in Mathematics (Honors). GPA: 3.97/4.00   * Full-merit Robins Science scholarship covering tuition, fees, accommodations, and meals * Thesis in algebraic combinatorics and discrete geometry * Minor in Computer Science |
| Oct 2014 -Jun 2015 | **University of Oxford**, Oxford, United Kingdom  Study Abroad Program in Mathematics and Computer Science  Grade: First-Class (equivalent to A/A+) |

**Publications**

\* papers whose authors are in alphabetical order or are with equal contributions

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| Conferences | 1. \* Zhiqi Bu, Sivakanth Gopi, Janardhan Kulkarni, Yin Tat Lee, Judy Hanwen Shen, and **Uthaipon Tantipongpipat**. *Fast and Memory Efficient Differentially Private-SGD via JL Projections.* Neural Information Processing Systems (NeurIPS), 2021 2. \* Kyra Yee, **Uthaipon Tantipongpipat**, and Shubhanshu Mishra. *Image Cropping on Twitter: Fairness Metrics, their Limitations, and the Importance of Representation, Design, and Agency.* Computer-Supported Cooperative Work and Social Computing (CSCW), 2021 3. **Uthaipon Tantipongpipat**, Chris Waites, Digvijay Boob, Amaresh (Ankit) Siva, and Rachel Cummings. *Differentially Private Mixed-Type Data Generation for Unsupervised Learning*. International Conference on Information, Intelligence, Systems and Applications (IISA), 2021 4. \* Vivek Madan, Aleksandar Nikolov, Mohit Singh, and **Uthaipon Tantipongpipat**. *Maximizing Determinants under Matroid Constraints.* Symposium on Foundations of Computer Science (FOCS), 2020 5. **Uthaipon Tantipongpipat**, Samira Samadi, Mohit Singh, Jamie Morgenstern, and Santosh Vempala. *Multi-Criteria Dimensionality Reduction with Applications to Fairness.* Neural Information Processing Systems (NeurIPS), 2019, Spotlight (top 2.5% of submitted papers) 6. \* Vivek Madan, Mohit Singh, **Uthaipon Tantipongpipat**, and Weijun Xie. *Combinatorial Algorithms for Optimal Design.* Conference on Learning Theory (COLT), pages 2210–2258, 2019 7. \* Aleksandar Nikolov, Mohit Singh, and **Uthaipon Tantipongpipat**. *Proportional Volume Sampling and Approximation Algorithms for A-Optimal Design.* ACM-SIAM Symposium on Discrete Algorithms (SODA), 2019 8. Samira Samadi, **Uthaipon Tantipongpipat**, Jamie Morgenstern, Mohit Singh, and Santosh Vempala. *The Price of Fair PCA: One Extra Dimension.* Neural Information Processing Systems (NeurIPS), 2018 9. \* Rachel Cummings, Sara Krehbiel, Kevin A Lai, and **Uthaipon Tantipongpipat**. *Differential Privacy for Growing Databases.* Neural Information Processing Systems (NeurIPS), 2018 |
| Manuscripts | 1. **Uthaipon Tantipongpipat**. *λ-Regularized A-Optimal Design and its Approximation by λ-Regularized Proportional Volume Sampling.* 2020 |
| Journals | 1. Tomo Lazovich, Luca Belli, Aaron Gonzales, Amanda Bower, **Uthaipon Tantipongpipat,** Kristian Lum, Ferenc Huszar, Rumman Chowdhury. Measuring Disparate Outcomes of Content Recommendation Algorithms with Distributional Inequality Metrics. Patterns Journal. 2022. 2. \* Aleksandar Nikolov, Mohit Singh, and **Uthaipon Tantipongpipat**. *Proportional Volume Sampling and Approximation Algorithms for A-Optimal Design.* Mathematics of Operation Research. 2022. 3. **Uthaipon Tantipongpipat**. *A Combinatorial Approach to Ebert’s Hat Game with Many Colors*. The Electronic Journal of Combinatorics, 21(4):4–33, 2014 |
| Workshops | 1. \* Digvijay Boob, Rachel Cummings, Dhamma Kimpara, **Uthaipon Tantipongpipat**, Chris Waites, and Kyle Zimmerman. *Differentially Private Synthetic Data Generation via GANs.* Theory and Practice of Differential Privacy (TPDP 2018) workshop, 2018 |
| Theses | 1. **Uthaipon Tantipongpipat.** *Fair and Diverse Data Representation in Machine Learning.* PhD Thesis, Georgia Institute of Technology, 2020 2. **Uthaipon Tantipongpipat**. *Cameron-Liebler Line Classes and Partial Difference Sets.* Undergraduate Thesis, University of Richmond, 2016 |

**Talks and Presentations**

1. *Image Cropping on Twitter: Fairness Metrics, their Limitations, and the Importance of Representation, Design, and Agency*
   1. **Conference Presentation:** ACM Conference On Computer-Supported Cooperative Work And Social Computing, Virtual, October 2021
2. *Multi-Criteria Dimensionality Reduction with Applications to Fairness*(earlier version: Fair Dimensionality Reduction and Iterative Rounding for SDPs)
   1. **Invited talk**: Second Conference on Discrete Optimization and Machine Learning at RIKEN Center for Advanced Intelligence Project (AIP), Tokyo, Japan, July 2019
   2. **Invited talk**: Cornell Operations Research and Information Engineering (ORIE) workshop, Ithaca, NY, USA, October 2019
   3. **Invited talk**: INFORMS Annual Meeting, Seattle, WA, USA, October 2019
   4. **Spotlight and accepted for poster**: Conference on Neural Information Processing Systems (NeurIPS), Vancouver, Canada, December 2019
3. *The Price of Fair PCA: One Extra Dimension*
   1. **Accepted for poster**: Conference on Neural Information Processing Systems (NeurIPS), Montreal, Canada, December 2018
4. *Proportional Volume Sampling and Approximation Algorithms for A-Optimal Design*
   1. **Accepted paper presentation**: ACM-SIAM Symposium on Discrete Algorithms (SODA), San Diego, California, January 2019
   2. **Talk**: Machine learning theory group, Georgia Institute of Technology, November 2018
   3. **Poster**: Machine Learning in Science and Engineering (MLSE) Conference, Carnegie Mellon University, June 2018
   4. **Poster**: Algorithms and Randomness, Algorithms and Randomness Center (ARC) workshop, Georgia Institute of Technology, May 2018
   5. **Talk**: Algorithms, Combinatorics, and Optimization (ACO) seminar, Georgia Institute of Technology, April 2018
5. *Differential Privacy for Growing Databases*
   1. **Accepted for poster**: Conference on Neural Information Processing Systems (NeurIPS), Montreal, Canada, December 2018
   2. **Talk**: Privacy reading group, Georgia Institute of Technology, February 2018
   3. **Accepted for poster**: Theory and Practice of Differential Privacy workshop (TPDP), Dallas, Texas, October 2017

**Awards and Fellowships**

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| 2021 | Impact Recognitions Award, CSCW   * “intended to recognize papers that contribute to a potentially significant impact in CSCW research, in practice, in design, in policy, or in the real world in substantive ways.” |
| 2020 | ACO Outstanding Student Award   * “[For] his overall research contributions, spanning all three components of ACO, including his work on algorithmic foundations of experimental design, fairness in machine learning algorithms, and differential privacy; his scientific leadership and collaborative attitude; and the quality and breadth of his research.” |
| 2019, 2020 | Best Reviewers (top 10%) of NeurIPS (Conference on Neural Information Processing Systems). Awarded free registration |
| 2018 | First prize winner and People’s Choice Awards ($20,000 total prize), Privacy Engineering Challenge, National Institute of Standards and Technology (NIST), Public Safety Communications Research Divisions (PSCR). https://www.herox.com/UnlinkableDataChallenge |
| 2018 | Algorithm and Randomness Center (ARC) and Transdisciplinary Research Institute for Advancing Data Science (TRIAD) Fellowship, Georgia Institute of Technology |
| 2016 | Finalist, ITA Tech Challenge programming competition, Illinois Technology Association, IL |
| 2016 | David C. Evans Awards for Outstanding Achievement in Scholarship, Annual Honors Convocation, University of Richmond, VA.   * Awarded to a few students each year for achievements in arts and sciences. In press: https://news.richmond.edu/features/article/-/13415/2016-david-c.-evans-awards-school-of-arts-and-sciences-recognizes-outstanding-achievement.html |
| 2012-2016 | Robins Science Scholar, University of Richmond (merit scholarship covering full tuition, fees, accommodations, and meals for four years) |
| 2016 | Phi Beta Kappa (most prestigious honor society for liberal arts and sciences) |
| 2015 | Honorable Mention (top 2.5%), William Lowell Putnam Mathematical Competition   * Widely considered to be the most prestigious undergraduate-level mathematics examination |
| 2015 | Second Place, Mid-Atlantic Regional ACM Programming Contest, Christopher Newport University site |
| *Prior to Undergraduate Education:* | |
| 2010-2012 | 3-Year Finalist, International Mathematical Olympiad (IMO) selection, Thailand |
| 2012 | Honorable Mention, Nern-Thong-Khong-Mee-Ka National Contest in Economics, Thailand |
| 2011 | Honorable Mention, Finance and Economics National Competition, National Bank of Thailand |
| 2010, 2011 | Bronze Medal and Honorable Mention, Asia-Pacific Mathematics Olympiad (APMO) |
| 2008, 2009 | Gold and Bronze Medals, IWYMIC International Mathematics Competition |
| 2008, 2009 | Two Gold Medals, Thailand Mathematical Olympiad |

**Codes**

1. **Twitter Image Cropping.** In communication internally to push to open-source the code of Twitter’s saliency-based cropping algorithm. Publicly available at <https://github.com/twitter-research/image-crop-analysis>
2. **Fair PCA project.** Semi-definite program and multiplicative weight heuristics for solving multi-criteria principle component analysis. In MATLAB and CVXOPT on Python. Publicly available at <https://github.com/sdpforall> (a website of the project is at <https://sites.google.com/site/ssamadi/fair-pca-homepage>).
3. **DPautoGAN.** Combining autoencoder and GAN to generate synthetic data with privacy protection guarantee. In Python and using Pytorch for neural networks. Publicly available at <https://github.com/DPautoGAN/DPautoGAN>.

**Academic Service**

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| 2018-2021 | Reviewer for NeurIPS (Conference on Neural Information Processing Systems), AAAI Conference on Artificial Intelligence, FOCS (Symposium on Foundations of Computer Science), MAPR (Mathematical Programming journal) |
| 2018-2019 | Co-organizer of ACO student seminar, Georgia Institute of Technology |

**Teaching Experience**

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| 2019 | Teaching Assistant, CS7520/ISYE8813 Approximation Algorithms, Georgia Institute of Technology |
| 2018 | Teaching Assistant, CS6550 Graduate Algorithms, Georgia Institute of Technology |
| 2015-2016 | Language Partner, Self-Directed Language Acquisition Program, University of Richmond |
| 2014 | Grader, MATH245 Linear Algebra, University of Richmond |
| 2011-2017 | Teacher and tutor for middle- and high-school competitive mathematics, Bangkok Christian College, Bangkok, Thailand |

**Skills**

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| Technical | Python (Pandas, numpy, scipy), Jupyter and Colab notebooks, SQL (BigQuery), Git, CVXOPT, Java, C++, MATLAB, Mathematica, LaTeX, MS Word, MS Excel, MS PowerPoint |
| Communication | Public speaking – Toastmaster |
| Languages | Thai (native speaker); English (fluent) |