Arman Zharmagambetov, Ph.D.

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	Google Scholar:	https://scholar.google.com/citations?user=D6QocXMAAAAJ

Research Interests **Machine Learning, Optimization, Decision Trees and Tree-based Models, ML-guided Optimization**

Education

University of California, Merced, CA

Ph.D., Machine Learning and Optimization, Dec 2022

- Advisor: Miguel Á. Carreira-Perpiñán
- Ph.D. thesis: *Learning Tree-Based Models with Manifold Regularization: Alternating Optimization Algorithms*

International Information Technologies University (IITU), Almaty, Kazakhstan

M.S., Mathematical and Computer modeling, Jul 2017

- M.S. thesis: *Numerical methods for solving Fredholm Integral-Differential equations.*

B.S. (summa cum laude), Mathematical and Computer modeling, Jul 2015

Professional Experience

Postdoctoral Researcher Jan 2023 to present
Meta AI (FAIR). Advisor: Yuandong Tian
Research direction: ML-guided optimization, Reinforcement Learning.

Research/Teaching Assistant Aug 2017 to Dec 2022
University of California, Merced
Member of the machine learning research group.
TA for the following courses: Algorithm Design and Analysis; Object Oriented Programming.

Applied Scientist Intern May 2021 – Aug 2021
Amazon, Cambridge, Massachusetts.
Amazon Alexa. Hosts: Qingming Tang, Ming Sun.
Improved Representation Learning for Acoustic Event Classification Using Tree-structured Ontology (ICASSP '22): link to the paper.

Applied Scientist Intern May 2020 to Aug 2020
Amazon, Seattle, Washington.
Supply Chain Optimization Team (SCOT). Hosts: Joyjit Roy, Henry Dai.
Designed a data-driven approach in forecasting outbound network flow for Amazon facilities.

ML Engineer Jul 2016 to Jul 2017
Kaspi bank, Almaty, Kazakhstan
Developed AI/ML based solutions for financial sector: default prediction, fraud detection, recommender systems, etc.

ML Engineer Jul 2014 to Feb 2017
Alem Research LLP, Almaty, Kazakhstan
Designed and deployed ML models for natural language processing tasks: sentiment classification of news articles, clustering documents in Kazakh and Russian languages.

Publications

ML-guided optimization

1. A. Zharmagambetov*, A. Paulus*, C. Guo, B. Amos, and Y. Tian. AdvPrompter: Fast Adaptive Adversarial Prompting for LLMs. ArXiv, 2024.
2. [**NeurIPS**] A. Zharmagambetov, B. Amos, A. Ferber, T. Huang, B. Dilkina, and Y. Tian. Landscape Surrogate: Learning Decision Losses for Mathematical Optimization Under Partial Information. Advances in Neural Information Processing Systems, 2023, to appear.
3. A. Ferber, A. Zharmagambetov, T. Huang, B. Dilkina, and Y. Tian. GenCO: Generating Diverse Solutions to Design Problems with Combinatorial Nature. arXiv: 2310.02442. In submission, 2023.
4. [**OPT@NeurIPS**] T. Huang, A. Ferber, A. Zharmagambetov, Y. Tian and B. Dilkina. Contrastive Predict-and-Search for Mixed Integer Linear Programs. In submission, 2023. Also, to appear in the Workshop on Optimization for Machine Learning at NeurIPS 2023.

Decision trees and tree-based models

5. [**CVPR**] M. Á. Carreira-Perpiñán, M. Gabidolla, A. Zharmagambetov. Towards better decision forests: Forest Alternating Optimization. IEEE Conf. on Computer Vision and Pattern Recognition, 2023.
6. [**NeurIPS**] A. Zharmagambetov and M. Á. Carreira-Perpiñán. Semi-Supervised Learning with Decision Trees: Graph Laplacian Tree Alternating Optimization. Advances in Neural Information Processing Systems, 2022.
7. [**AISTATS**] A. Zharmagambetov and M. Á. Carreira-Perpiñán. Learning Interpretable, Tree-Based Projection Mappings for Nonlinear Embeddings. International Conf. on Artificial Intelligence and Statistics, 2022.
8. [**ICML**] A. Zharmagambetov and M. Á. Carreira-Perpiñán. Smaller, More Accurate Regression Forests Using Tree Alternating Optimization. International Conf. on Machine Learning, 2020.
9. [**ICASSP**] A. Zharmagambetov, Q. Tang , C.-C. Kao, Q. Zhang, M. Sun, V. Rozgic, J. Droppo, C. Wang. Improved Representation Learning for Acoustic Event Classification Using Tree-structured Ontology. IEEE International Conf. on Acoustics, Speech and Signal Processing, 2022.
10. [**EMNLP**] A. Zharmagambetov, M. Gabidolla and M. Á. Carreira-Perpiñán. Softmax Tree: An Accurate, Fast Classifier When the Number of Classes Is Large. Conf. on Empirical Methods in Natural Language Processing, 2021.
11. [**ICASSP**] A. Zharmagambetov and M. Á. Carreira-Perpiñán. Learning a Tree of Neural Nets. IEEE International Conf. on Acoustics, Speech and Signal Processing, 2021.
12. A. Zharmagambetov and M. Gabidolla and M. Á. Carreira-Perpiñán. Improved Boosted Regression Forests Through Non-Greedy Tree Optimization. International Joint Conf. on Neural Networks, 2021.
13. A. Zharmagambetov and M. Á. Carreira-Perpiñán. A Simple, Effective Way to Improve Neural Net Classification: Ensembling Unit Activations with a Sparse Oblique Decision Tree. IEEE International Conference on Image Processing (ICIP 2021), 2021.

14. M. Á. Carreira-Perpiñán and A. Zharmagambetov. Ensembles of bagged TAO trees consistently improve over Random Forests, AdaBoost and Gradient Boosting. ACM-IMS Foundations of Data Science Conf., 2020.

15. S. S. Hada, M. Á. Carreira-Perpiñán, A. Zharmagambetov. Sparse oblique decision trees: a tool to understand and manipulate neural net features. arXiv:2104.02922, 2020.

16. A. Zharmagambetov and S. S. Hada and M. Gabidolla and M. Á. Carreira-Perpiñán. Non-Greedy Algorithms for Decision Tree Optimization: An Experimental Comparison. arXiv:1911.03054, 2019.

NEURAL NET COMPRESSION

17. Y. Idelbayev, A. Zharmagambetov, M. Gabidolla and M. Á. Carreira-Perpiñán. Faster Neural Net Inference via Forests of Sparse Oblique Decision Trees. Unpublished manuscript. 2021.

18. M. Á. Carreira-Perpiñán and A. Zharmagambetov. Fast Model Compression. Extended abstract at Bay Area Machine Learning Symposium, 2018.

OTHER PUBLICATIONS

19. D.S. Dzhumabaev and A. Zharmagambetov. Numerical Method for Solving a Linear Boundary Value Problem for Fredholm Integro-Differential Equations. News of the National Academy of Sciences of the Republic of Kazakhstan, vol. 2, issue 312, 2017.

20. S. Narynov and A. Zharmagambetov. On One Approach of Solving Sentiment Analysis Task for Kazakh and Russian Languages Using Deep Learning. Int. Conf. on Computational Collective Intelligence (ICCCI). Halkidiki, Greece, 2016.

21. A. Zharmagambetov, A. A. Pak. Sentiment Analysis of a Document using Deep Learning Approach and Decision Trees. IEEE 12th International Conference on Electronics Computer and Computation. Almaty, Kazakhstan, 2015.

22. A. A. Pak, S. Narynov, A. Zharmagambetov, Sh. Sagyndykova, Zh. Kenzhebayeva. The Method of Synonyms Extraction from Unannotated Corpus. IEEE 3rd Int. Conf. on Digital Information, Networking, and Wireless Communications. Moscow, Russia, 2015.

PH.D. THESIS:

23. A. Zharmagambetov. Learning Tree-Based Models with Manifold Regularization: Alternating Optimization Algorithms. University of California, Merced, USA, 2022.

AWARDS

- NSF #2228243. I-Corps: *Tree-based artificial AI models for financial fraud detection*, co-PI ($50,000) May 2022
- Scholar Award from NeurIPS 2022 organizing committee (∼$2,000) Nov 2022
- D&I travel award from EMNLP 2021 organizing committee (∼$2,000) Nov 2021
- UC Merced Outstanding Teaching Award ($1,000) May 2019
- UC Merced Chancellor's Graduate Fellowship ($16,000) August 2017

PROFESSIONAL ACTIVITIES

Reviewer for the following venues:

- Reviewer, Journal of Machine Learning Research (JMLR), since 2023.
- Neural Information Processing Systems (NeurIPS), since 2020.
- International Conf. on Machine Learning (ICML), since 2020.
- International Conf. on Learning Representations (ICLR), since 2021.
- AAAI Conf. on Artificial Intelligence (AAAI): 2020, 2021.
- International Conf. on Artificial Intelligence and Statistics (AISTATS), 2022.

Teaching Experience

- UC Merced (2017 – 2022). Teaching Assistant for the following courses: *CSE100* Algorithm Design and Analysis (2017-2022); *CSE165* Object Oriented Programming (2018).
- IITU, Almaty, Kazakhstan (2016-2017). Lecturer for the graduate level course on Introduction to Machine Learning.

Mentorship

- Mentor in *GradEXCEL* Peer Mentor Program (2019, 2020), UC Merced. Designed to promote early success in first-year doctoral students, through coaching and engagement with a community of advanced doctoral peer mentors.
- Co-supervised incoming PhD students: Magzhan Gabidolla, Rasul Kairgeldin, Kuat Gazizov.

Invited talks

- Learning trees with manifold regularization, EECS260, guest lecture — Nov 2023
- ML-guided optimization, OptSummit at Meta — Oct 2023
- Learning trees with manifold regularization, Meta AI (FAIR) — Apr 2023
- Learning trees with manifold regularization, NTR, Remote — Dec 2022
- Learning a tree of neural nets, Samsung Research — Sept 2022
- Learning trees with manifold regularization, Google Research — Aug 2022
- Tree Alternating Optimization, IICT, Almaty, Kazakhstan — Jan 2022
- ML-guided optimization, IITU seminar, Almaty, Kazakhstan — Jan 2022
- Tree Alternating Optimization, EECS seminar, UC Merced — Dec 2021
- Tree Alternating Optimization, NTR, Remote — Jul 2021
- Modern approaches in neural net compression, IITU seminar, Almaty, KZ — Dec 2018
- Sentiment Classification for Kazakh Language, AI Day, Almaty, KZ — Mar 2017
- Applied machine learning in banks, KBTU IT talks, Almaty, Kazakhstan — Jul 2016

Interviews / Podcasts

- GenAI, Optimization and beyond, Nfactorial podcast, 5K+ views — Oct 2023
- On Development of AI in Kazakhstan, Narikbi podcast, 10K+ views — Mar 2023

Entrepreneurship

- Summer 2022: participation in the NSF I-Corps Teams program as entrepreneur lead (team "TAO Trees" with my PhD advisor Miguel and Amer Kayani as industrial mentor).
- Fall 2021: participation in the CITRIS Foundry incubator (team "TAO Trees").
- Fall 2021: participation in the NSF I-Corps Regional course (UC Berkeley) as entrepreneur lead (team "TAO Trees").

Technical skills

- Programming languages: Python, Matlab, Java, C/C++;
- Operating Systems: Linux, MacOS, Windows;
- Frameworks: pytorch, tensorflow, keras, scikit-learn, numpy, libsvm/liblinear, gurobi, scip, etc.;

Languages

Kazakh (native), English (fluent), Russian (fluent)