Arman Zharmagambetov, PhD candidate

Contact Information

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Research Interests

My research focuses on Machine Learning and Mathematical Optimization. Specifically, my primary area of expertise is in learning decision trees and tree-based models; and their applications in various areas, such as: supervised learning, neural networks compression, dimensionality reduction, semi-supervised learning, model interpretability, etc.

Education

University of California, Merced, CA

Ph.D., Machine Learning and Optimization, *Expected:* Fall 2022

- Advisor: Miguel Á. Carreira-Perpiñán

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.*
- Advisor: Dulat S. Dzhumabaev

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

- B.S. thesis: *Statistical methods for measuring word similarities in Kazakh language.*

Professional Experience

Applied Scientist Intern May 2021 to 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.

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

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 [Google Scholar page]

1. [**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, to appear, 2022.

2. [**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.

3. [**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.

4. [**ICML**] A. Zharmagambetov and M. Á. Carreira-Perpiñán. Smaller, More Accurate Regression Forests Using Tree Alternating Optimization. International Conf. on Machine Learning, 2020.

5. [**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.

6. [**ICASSP**] A. Zharmagambetov and M. Á. Carreira-Perpiñán. Learning a Tree of Neural Nets. IEEE International Conf. on Acoustics, Speech and Signal Processing, 2021.

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

8. [**IJCNN**] 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.

9. [**IJCNN**] A. Zharmagambetov and S. S. Hada and M. Gabidolla and M. Á. Carreira-Perpiñán. Non-Greedy Algorithms for Decision Tree Optimization: An Experimental Comparison. International Joint Conf. on Neural Networks, 2021.

10. [**ICIP**] A. Zharmagambetov and M. Gabidolla and M. Á. Carreira-Perpiñán. Improved Multiclass AdaBoost for Image Classification: The Role of Tree Optimization. IEEE International Conf. on Image Processing, 2021.

11. [**ICIP**] 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 Conf. on Image Processing, 2021.

12. [**ICIP**] S.S.Hada, M. Á. Carreira-Perpiñán, A. Zharmagambetov. Understanding and Manipulating Neural Net Features Using Sparse Oblique Classification Trees. IEEE International Conf. on Image Processing, 2021.

13. [**FODS**] 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.

14. 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. Springer.

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

Posters and extended abstracts

1. [**BayLearn**] M. Gabidolla and A. Zharmagambetov and M. Á. Carreira-Perpiñán. Boosted Sparse Oblique Decision Trees. Bay Area Machine Learning Symposium, 2020.
2. [**BayLearn**] M. Á. Carreira-Perpiñán and A. Zharmagambetov. Fast Model Compression. Bay Area Machine Learning Symposium, 2018.

Professional activities

Reviewer for the following conferences:

- Neural Information Processing Systems (NeurIPS), since 2020.
- International Conf. Machine Learning (ICML), since 2020.
- AAAI Conf. on Artificial Intelligence (AAAI), since 2020.
- International Conf. on Artificial Intelligence and Statistics (AISTATS), since 2021.
- International Conf. on Learning Representations (ICLR), since 2021.

Awards

- D&I travel award from EMNLP 2021 organizing committee — November 2021
- UC Merced Outstanding Teaching Award ($1000) — May 2019
- UC Merced Chancellor's Graduate Fellowship ($16000) — August 2017
- ML Challenge winner (programming contest, Almaty, KZ) — January 2015
- Hackday winner (projects contest, Almaty, KZ) — April 2013

Invited talks

- IICT, Almaty, Kazakhstan — Jan 2022
  Topic: "TAO: Efficient and Universal Algorithm to Train Decision Trees and Tree-Based Models."
- IITU, Almaty, Kazakhstan — Dec 2018
  Applied mathematics department seminar. Topic: "Modern approaches in neural net compression."
- Artificial Intelligence Day, Almaty, Kazakhstan — Mar 2017
  Topic: "Sentiment Analysis Task for Kazakh and Russian Languages Using Deep Learning"
- KBTU IT talks, Almaty, Kazakhstan — Jul 2016
  Topic: "Machine learning in banks"

Technical skills

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

Languages

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