Aziz Koçanaoğulları

Analog Devices Inc. - Analog Garage
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RESEARCH INTERESTS Signal Processing, Biomedical Signal Processing, Machine Learning, Active Learning
Active Recursive Inference/Classification, Sequential Decision Making, Active Deep Learning

EXPERIENCE

Lead Research Scientist Analog Devices Inc.
Analog Garage Jan 2022 - Present
Worked in advanced computer vision algorithm development for handheld devices. Specifically contributed in algorithm development and software development.
Worked in biomedical signal processing and machine learning algorithm development for advanced clinical diagnostic systems. Main contribution in this field is developing scalable, robust and data efficient machine learning algorithms for the diagnostics systems.

Postdoctoral Research Fellow Boston Children's Hospital & Harvard Medical School
Computational Radiology Lab Jan 2021 - Jan 2022
Worked on deep image prior and deep learning methods for quantitative assessment and image reconstruction in dynamic contrast enhanced magnetic resonance imaging. Developed a motion corrected reconstruction framework.

Research Assistant Northeastern University
RSVPKeyboard Sep 2016 - Dec 2020
Worked in an interdisciplinary team that develops a non-invasive typing interface for people with severe speech disorders. Co-designed the open-software brain computer interface and specifically led the design of machine learning for Bcipy [https://github.com/BciPy/BciPy].
Contributed with active recursive inference in brain-computer interfaces that speeds-up typing.
Designed information theoretic objectives that allowed faster and more accurate learning.
Provided information geometric active learning analysis that eased the reasoning and design.
Learning with less labels (LwLL) Sep 2019 - Dec 2020
Contributed in model transfer of deep image classifiers. Specifically worked on novel algorithms in few-shot learning for deep classifiers.
Proposed active novel analysis for sample selection for deep neural network training.
Provided a comprehensive analysis in active few-shot learning for image classification.

Research Intern Mitsubishi Electric Research Labs. (Computer Vision Group)
Simultaneous localization and mapping (SLAM) system for an indoor operating robot.
Developed deep learning feature extraction that allowed a robust mapping that matched state of the art methods avoiding over-fitting. Proposed a curriculum for deep neural network training that matches state of the art with shallower models and utilizing less data.

Teaching Assistant Machine Learning and Pattern Recognition Spring 2017, Spring 2018

Research Assistant Istanbul Technical University
Sparsity Based Modifications for Microphone Arrays Jun 2014 - Mar 2016
Contributed with sparsity driven convex formulations for dereverberation and denoising for signals acquired indoors with a sensor array that allowed higher signal-to-noise ratio retrieval of the undeteriorated signal.

EDUCATION

Northeastern University
Ph.D. Electrical Engineering December 19^{th} 2020
Ph.D. Advisor: Deniz Erdoğmuş
Active recursive Bayesian inference/classification, actively learning models using fewer samples. Sequential decision making and active Bayesian decision geometry.
Gordon Engineering Leadership Fellow (Ms. Equivalent) August 8^{th} 2019
Industry Sponsor: Barry Oken, Faculty Advisor: Deniz Erdoğmuş, Mentor: John Beaty
Active brain computer interfacing and analysis on market value and branding.
A comprehensive and complimentary leadership experience and market analysis.

Istanbul Technical University

MSc. Telecommunications Engineering [GPA:3.90/4.00] June 24^{th} 2016
MSc. Advisor: İlker Bayram
Sparsity Based Modifications for Microphone Arrays.

BSc. Mathematical Engineering [GPA:3.71/4.00] June 29^{th} 2015
BSc. Advisor: Burcu Tunga
High Dimensional Model Representation for digital signals

BSc. Electronics Engineering [GPA:3.82/4.00] July 4^{th} 2014
BSc. Advisor: İlker Bayram
Image Inpainting. Convex formulation to recover partially deteriorated images.

AWARDS

Stipend for the ISMRM Workshop on Kidney MRI Biomarkers 2021
NSF PETRA Doctoral Consortium Award 2020
Northeastern University College of Engineering Dean's Fellowship 2016 - 2020
Istanbul Technical University Merit Based Scholarship 2009 - 2014

SKILLS

Languages python (advanced - 9 yrs), matlab (advanced - 12 yrs), C++, C (intermediate - 4 yrs)
ML-data science scikit-learn, pandas, keras, tensorflow, pytorch, chainer

REVIEWING

IEEE Transactions on Human-Machine Systems (IEEE-THMS)
IEEE Signal Processing Letters (IEEE-SPL)
IEEE International Workshop on Machine Learning for Signal Processing (IEEE-MLSP)
IEEE International Conference on Acoustics, Speech, and Signal Processing (IEEE-ICASSP)
International Joint Conference on Artificial Intelligence (IJCAI-PRICAI)

PUBLICATIONS

Journal Papers

- Smedemark-Margulies, N., Celik, B., Imbiriba, T., **Kocanaogullari, A.**, Erdoğmuş, D. (2023, June). Recursive Estimation of User Intent From Noninvasive Electroencephalography Using Discriminative Models. In ICASSP 2023-2023 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) (pp. 1-5). IEEE.
- Marghi, Y. M., **Koçanaoğulları, A.**, Akçakaya, M., Erdoğmuş, D. (2022). Active recursive Bayesian inference using Rényi information measures. Pattern Recognition Letters, 154, 90-98.
- **Koçanaoğulları, A.**, Ariyurek, C., Afacan, O., Kurugol, S. (2021). Learning the Regularization in DCE-MR Image Reconstruction for Functional Imaging of Kidneys. IEEE Access.
- **Koçanaoğulları, A.**, Akcakaya, M., Erdogmus, D. (2021). Stopping Criterion Design for Recursive Bayesian Classification: Analysis and Decision Geometry. IEEE Transactions on Pattern Analysis and Machine Intelligence.
- **Koçanaoğulları, A.**, Smedemark-Margulies, N., Akcakaya, M., Erdoğmuş, D. (2021). Geometric Analysis of Uncertainty Sampling for Dense Neural Network Layer. IEEE Signal Processing Letters, 28, 867-871.
- Memmott, T., **Koçanaoğulları, A.**, Lawhead, M., Klee, D., Dudy, S., Fried-Oken, M., Oken, B. (2021). BciPy: brain–computer interface software in Python. Brain-Computer Interfaces.
- **Koçanaoğulları, A.**, M. Marghi, Y., Akçakaya, M., Erdoğmuş, D. (2019). An active recursive state estimation framework for brain-interfaced typing systems. Brain-Computer Interfaces, 6(4), 149-161.
- **Koçanaoğulları, A.**, Marghi, Y. M., Akçakaya, M. and Erdoğmuş, D. "Optimal Query Selection Using Multi-Armed Bandits." IEEE Signal Processing Letters 25.12 (2018): 1870-1874.
- **Koçanaoğulları, A.** and Akçakaya, M. and Erdoğmuş, D. "On Analysis of Active Querying for Recursive State Estimation", IEEE Signal Processing Letters 25.6 (2018): 743.
- Tunga, B., and **Koçanaoğulları, A.**. "Digital image decomposition and contrast enhancement using high-dimensional model representation." Signal, Image and Video Processing 12.2 (2018): 299-306.

Patents

- **Kocanaogullari, A.**, Cansizoglu, E., Corcodel, R. I. (2020). U.S. Patent No. 10,810,468. Washington, DC: U.S. Patent and Trademark Office.

Conference Papers

- Smedemark-Margulies, N., Celik, B., Imbiriba, T., **Kocanaogullari, A.**, Erdogmus, D. (2022). Recursive Estimation of User Intent from Noninvasive Electroencephalography using Discriminative Models. arXiv preprint arXiv:2211.02630.

- **Koçanaoğulları, A.**, Akçakaya, M., Oken, B., Erdoğmuş, D. (2020, June). Optimal modality selection using information transfer rate for event related potential driven brain computer interfaces. In Proceedings of the 13th ACM International Conference on Pervasive Technologies Related to Assistive Environments (pp. 1-7).
- **Koçanaoğulları, A.**, Marghi, Y. M., Akçakaya, M., and Erdoğmuş, D., "A History-based Stopping Criterion in Recursive Bayesian State Estimation." ICASSP 2019-2019 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP). IEEE, 2019.
- **Koçanaoğulları, A.** and Quivira, F. and Erdoğmuş, D. "Incorporating Temporal Dependency on ERP Based BCI", Biomedical Imaging (ISBI 2018), 2018 IEEE 15th International Symposium on. IEEE, 2018.
- **Koçanaoğulları, A.**, and Bayram, İ. A dereverberation formulation employing phase information. In Signal Processing and Communication Application Conference (SIU 2016), 2016 24th (pp. 633-636). IEEE.
- **Koçanaoğulları, A.**, and Bayram, İ. A dereverberation formulation based on sparsity. In Signal Processing and Communications Applications Conference (SIU 2015), 2015 23th (pp. 1018-1021). IEEE.
- Bayram, İ., and **Koçanaoğulları, A.**. A Minimization Formulation for Source Separation with a Microphone Array. In Signal Processing and Communications Applications Conference (SIU 2015), 2015 23th (pp. 1014-1017). IEEE.

Workshop Papers

- **Koçanaoğulları, A.** and Ataer-Cansızoğlu, E. "Active Descriptor Learning for Feature Matching." European Conference on Computer Vision. Springer, Cham, 2018.
- Memmott, T., **Kocanaogullari, A.**, Erdogmus, D., Bedrick, S., Peters, B., Fried-Oken, M., Oken, B. (2018). BciPy: A python framework for brain-computer interface research. In Proc. 7th Int. BCI Meeting (pp. 183-184).