

# Aziz Koçanaoğulları

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## SUMMARY

10 years of experience in signal-processing and ML algorithm design (Python/C++). 4 years of experience delivering production-grade algorithms. PhD in Bayesian inference; deploys scalable AI on real clinical-trial data to deliver actionable diagnostics. Author of 22 peer-reviewed papers and a US patent.

## SKILLS

- **Languages:** Python (10 yrs), MATLAB (13 yrs), C++ (6 yrs)
- **Signal Processing/Machine Learning:** scikit-learn, pandas, NumPy, OpenCV
- **Deep Learning:** PyTorch, TensorFlow, Keras, Chainer, OpenCV
- **Software Engineering:** Git, CI/CD, Docker, Bash, unit testing, code reviews, automated pipelines
- **Tools / Frameworks:** Jupyter, VS Code, Linux, Slurm, AWS EC2/S3
- **Development Practices:** Agile workflows, reproducible research, software documentation, model deployment

## EDUCATION

### **Northeastern University**

*Ph.D. Electrical Engineering*

*Gordon Engineering Leadership Fellow (Ms. Equivalent)*

Boston, MA, USA

December 19<sup>th</sup> 2020

August 8<sup>th</sup> 2019

### **Istanbul Technical University**

*MSc. Telecommunications Engineering [GPA:3.90/4.00]*

*BSc. Mathematical Engineering [GPA:3.71/4.00]*

*BSc. Electronics Engineering [GPA:3.82/4.00]*

Istanbul, Turkey

June 24<sup>th</sup> 2016

June 29<sup>th</sup> 2015

July 4<sup>th</sup> 2014

## INDUSTRY EXPERIENCE

### **Analog Devices Inc.**

*Xtech, Manager – Machine Learning*

2025.02 – Present

- Implemented high-impact ML initiatives as a lead individual contributor, while mentoring peers and driving algorithmic advancement.
- Expanded a cutting-edge algorithmic portfolio into other domains, scaling impact beyond healthcare.
- Directed collaborative efforts with academic institutions and industry stakeholders to translate research models into real-world applications.

*Xtech, Lead Research Scientist*

2023.08 – 2025.02

- Designed and implemented full-stack software to transform raw sensor data into actionable diagnostics for rapid bacterial detection and classification (Python [PyTorch], C++).
- Built an ensemble deep learning model for early sepsis detection and identification of causal biomarkers.
- Achieved 99.6% sensitivity, 99% specificity in sepsis detection, and 89% accuracy of distinction over 8 different etiology categories over 1,000 samples.
- Partnered with clinicians to validate the approach in a blind clinical study at Massachusetts General Hospital, outperforming existing diagnostic solutions.

*Analog Garage, Lead Research Scientist*

2022.01 – 2023.08

- Developed advanced computer vision algorithms for handheld devices, achieving sub-millimeter accuracy in dimensioning and object detection in indoor environments (C++).
- Achieved 3 orders of magnitude compression in biomedical sensor fusion minimizing information loss (Python).

### **Mitsubishi Electric Research Laboratories**

*Computer Vision, Research Intern*

2018.05 – 2018.08 and, 2019.05 – 2019.08

- Developed algorithmic improvements for simultaneous localization in indoor robotics (C++).
- Co-invented a patented deep feature extraction method using curriculum learning, enabling use of shallower architectures and lower-cost training (Python [TensorFlow]).

## ACADEMIC EXPERIENCE

### **Boston Children's Hospital & Harvard Medical School, PostDoc**

2021.01 – 2022.01

- Developed a deep learning algorithm for MRI reconstruction, achieving accurate estimation of TK parameters.(Python)
- Led development of a GPU-accelerated dynamic MRI reconstruction, reducing runtime from 8 hours to 20 minutes.(Python)
- Implemented motion correction techniques for infant MRI, improving accuracy by 15%. (Python, Matlab)

- Lead machine learning development for non-invasive Brain Computer Interfaced typing system.
- Developed active querying algorithms that doubled typing speed in adversarial conditions.

*Learning with Less Labels*

2019.09 - 2020.12

- Developed an active few-shot learning algorithm for image classification with comparable performance using 20% less data.
- Contributed to the transfer of deep image classifiers by designing novel algorithms for few-shot learning.
- Proposed a sample selection strategy to improve training efficiency in deep neural networks.
- Conducted comprehensive analysis of active learning techniques in low-data regimes for image classification.

**ADDITIONAL**

- Languages: English (fluent), Turkish (native)
- Awards:
  - ADI Award of Excellence for Launching Xtech: Intelligent Diagnostics 2023
  - 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

**PUBLICATIONS**

**Journal Papers**

1. Ariyurek, C., **Koçanaoğulları, A.**, Afacan, O., & Kurugol, S. (2024). Motion-compensated image reconstruction for improved kidney function assessment using dynamic contrast-enhanced MRI. *NMR in Biomedicine*, 37(6), e5116.
2. Marghi, Y. M., **Koçanaoğulları, A.**, Akçakaya, M., & Erdoğan, D. (2022). Active recursive Bayesian inference using Rényi information measures. *Pattern Recognition Letters*, 154, 90-98.
3. **Koçanaoğulları, A.**, Ariyurek, C., Afacan, O., & Kurugol, S. (2021). Learning the Regularization in DCE-MR Image Reconstruction for Functional Imaging of Kidneys. *IEEE Access*.
4. **Koçanaoğulları, A.**, Akçakaya, M., & Erdoğan, D. (2021). Stopping Criterion Design for Recursive Bayesian Classification: Analysis and Decision Geometry. *IEEE Transactions on Pattern Analysis and Machine Intelligence*.
5. **Koçanaoğulları, A.**, Smedemark-Margulies, N., Akçakaya, M., & Erdoğan, D. (2021). Geometric Analysis of Uncertainty Sampling for Dense Neural Network Layer. *IEEE Signal Processing Letters*, 28, 867-871.
6. 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*.
7. **Koçanaoğulları, A.**, Marghi, Y., Akçakaya, M., & Erdoğan, D. (2019). An active recursive state estimation framework for brain-interfaced typing systems. *Brain-Computer Interfaces*, 6(4), 149-161.
8. **Koçanaoğulları, A.**, Marghi, Y. M., Akçakaya, M. and Erdoğan, D. "Optimal Query Selection Using Multi-Armed Bandits." *IEEE Signal Processing Letters* 25.12 (2018): 1870-1874.
9. **Koçanaoğulları, A.** and Akçakaya, M. and Erdoğan, D. "On Analysis of Active Querying for Recursive State Estimation", *IEEE Signal Processing Letters* 25.6 (2018): 743.
10. 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**

1. **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**

1. Smedemark-Margulies, N., Celik, B., Imbiriba, T., **Kocanaogullari, A.**, & Erdoğan, 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.
2. **Koçanaoğulları, A.**, Akçakaya, M., Oken, B., & Erdoğan, 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).
3. **Koçanaoğulları, A.**, Marghi, Y. M., Akçakaya, M., and Erdoğan, 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.
4. **Koçanaoğulları, A.** and Quivira, F. and Erdoğan, D. "Incorporating Temporal Dependency on ERP Based BCI", *Biomedical Imaging (ISBI 2018)*, 2018 IEEE 15th International Symposium on. IEEE, 2018.
5. **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.

6. **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.
7. 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

1. Ariyurek, C., **Kocanaogullari, A.**, Sari, T. C., Vasylechko, S., Afacan, O., & Kurugol, S. (2023). PyGRASP: A standalone python image reconstruction library for DCE-MRI acquired with radial sampling. In ISMRM (p. 2404).
2. **Kocanaogullari, A.**, Ariyurek, C., Afacan, O., & Kurugol, S. (2022). Coil selective golden angle dce-mr image reconstruction using mutual dependence. In Proceedings of the 30th annual meeting of ismr, london ISMRM (Vol. 2442).
3. Ariyurek, C., Wallace, T. E., Kober, T., **Koçanaoğulları, A.**, Warfield, S. K., Kurugol, S., & Afacan, O. (2021). Prospective motion correction in kidney MRI using free induction decay navigators. ISMRM poster session on motion detection and correction.
4. **Koçanaoğulları, A.** and Ataer-Cansızoglu, E. "Active Descriptor Learning for Feature Matching." European Conference on Computer Vision. Springer, Cham, 2018.
5. 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).