

Sercan Ö. Arik

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Education

Stanford University <i>PhD, Electrical Engineering</i>	Stanford, CA <i>September 2011 – September 2016</i>
Stanford University <i>Master of Science, Electrical Engineering</i>	Stanford, CA <i>September 2011 – April 2013</i>
Bilkent University <i>Bachelor of Science, Electrical and Electronics Engineering</i>	Ankara, Turkey <i>September 2007 – June 2011</i>

Professional Experience

Google Cloud AI <i>Research Scientist and Manager</i>	Sunnyvale, CA <i>October 2018 – Current</i>
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- Led research and development projects towards widespread adoption and useful deployments of AI for impactful business use cases, from Finance, Retail, Healthcare, Technology and many other industries.
- Led a team on AI-enhanced epidemiology for Covid-19 modeling and forecasting. Launched products have been used by major public sector organizations and healthcare companies.
- Invented novel approaches for design of explainable deep neural network architectures.
- Developed novel models for high-performance tabular and time-series learning that achieve state-of-the-art performance. These are launched as horizontal Cloud products, and integrated into numerous high value enterprise use cases.
- Developed reinforcement learning-based transfer learning and domain adaptation frameworks, yielding state-of-the-art performance results.
- Developed robust learning frameworks for learning with noisy and imperfect data, demonstrating performance results unprecedented before.
- Invented novel methods for evaluation of value of data in machine learning, towards improved performance and novel business data valuation based models.
- Involved in executive-level discussions with numerous companies and organizations, to develop strategic solutions to their key AI problems.

Baidu Silicon Valley AI Research Lab <i>Research Scientist</i>	Sunnyvale, CA <i>October 2016 – September 2018</i>
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- Led research projects in deep neural networks, signal processing and efficient implementation of machine learning algorithms.
- Developed keyword spotting systems for applications in conversational interfaces, demonstrated state-of-the-art detection performance using deep learning and worked on deployment in embedded environments.
- Developed neural artificial speech synthesis systems, achieving state-of-the-art synthesis performance with human-level naturalness and production-level generation capability.
- Developed speaker classification systems using discriminative deep learning for applications in identity detection and personalized speech generation.
- Developed neural voice cloning systems, achieving state-of-the-art capabilities in style transfer and synthesized audio quality towards applications in personalization of human-machine interfaces.
- Provided technical consultancy for venture capital investments and business strategy development in artificial intelligence related areas.
- Received 'Baidu Quarterly Star' award.

Binatix Labs <i>Research Intern</i>	Palo Alto, CA <i>July 2015 – September 2015</i>
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- Researched machine learning models, signal processing algorithms, and optimization methods in stochastic decision making, for applications in robust time-series forecasting.
- Developed information retrieval techniques for financial data sets.
- Implemented trading and portfolio optimization algorithms.
- Demonstrated notable performance results for global financial instruments.

Mitsubishi Electric Research Labs

Research Intern

Cambridge, MA

July 2013 - September 2013

- Researched advanced modulation and coding techniques for digital communication systems, and digital signal processing algorithms for compensation of noise and distortion effects.
- Developed transmission schemes based on high-dimensional signal constellations.
- Demonstrated significant achievements towards information-theoretic capacity-approaching long-haul optical networks.

Google

Research Intern

Mountain View, CA

July 2012 - September 2012

- Researched transmission and switching technologies for data centers, and architectures for fiber-to-the-home access networks.
- Developed statistical estimation methods for analysis of optical effects.
- Designed and simulated transmission and networking architectures that contributed to future strategies.

Swiss Federal Institute of Technology (EPFL)

Research Intern

Lausanne, Switzerland

June 2010 - September 2010

- Researched computer vision algorithms for feature detection, image matching, and 3-D reconstruction, and machine learning techniques for semi-supervised classification.
- Developed similarity determination methods for uncalibrated multi-view images and demonstrated high performance for various image classification applications.

National Space Technologies Research Institute

Hardware Engineering Intern

Ankara, Turkey

August 2009 - September 2009

- Researched image compression techniques, and efficient hardware implementation of decoding/encoding algorithms.
- Designed the embedded system for a wireless image communication system based on a media-on-chip microprocessor.

Teaching Experience

AI4ALL

Mentor & Consultant

Oakland, CA

December 2018-June 2019

- Provided consulting for preparation of curriculum and course materials for high school-level AI education programs, focusing on students from underrepresented communities.
- Served as a mentor at hackathon events for high school students.

Stanford University

Instructor

Stanford, CA

Summer 2014 & Summer 2016

- Taught the classes 'Digital Signal Processing' and 'The Fourier Transform and Its Applications' in the Summer quarters; prepared the curriculum, lecture notes, assignments and exams.

Stanford Pre-Collegiate Studies

Instructor

Stanford, CA

April 2014

- Taught the middle school-level class 'Information Technologies: from Particles to Bits' - on fundamentals of modern information technologies (digital signal processing, computing architectures, communication technologies, information theory, algorithms and machine learning), prepared the curriculum and lecture notes.

Publications

Academic Impact: (from Google Scholar, Aug 2021)

- Citations ≥ 2986
- h-index ≥ 23

Journal Papers:

1. [S. Ö. Arik](#), J. Ledsam, J. Shor, R. Sinha, J. Yoon et al., "A prospective evaluation of AI-augmented epidemiology to forecast COVID-19 in the USA and Japan", *npj Digital Medicine*, 2021.
2. B. Lim, [S. Ö. Arik](#), N. Loeff and T. Pfister, "Temporal fusion transformers for interpretable multi-horizon time series forecasting", *International Journal of Forecasting*, vol. 37, no. 4, pp. 1748 - 1764, Oct. 2021.
3. [S. Ö. Arik](#), H. Jun and G. Damos, "Fast spectrogram inversion using multi-head convolutional neural networks", *IEEE Signal Processing Letters*, vol. 26, no. 1, pp. 94 - 98, Aug. 2018.
4. K. Choutagunta, [S. Ö. Arik](#), K. P. Ho, and J. M. Kahn, "Characterizing mode-dependent loss and gain in multimode components", *Journal of Lightwave Technology*, vol. 36, no. 18, pp. 3815-3823, Sep. 2018.
5. [S. Ö. Arik](#), and J. M. Kahn, "Low complexity implementation of convex optimization based phase retrieval", *Journal of Lightwave Technology*, vol. 36, no. 12, pp. 2358 - 2365, Jun. 2018.
6. O. D. Domingues, D. A. A. Mello, R. Silva, [S. Ö. Arik](#), and J. M. Kahn, "Achievable rates of space-division multiplexed submarine links subject to nonlinearities and power feed constraints", *Journal of Lightwave Technology*, vol. 35, no. 18, pp. 4004 - 4010, Jun. 2017.

7. S. Ö. Arık, B. Ibragimov and L. Xing, "Fully automated quantitative cephalometry using convolutional neural networks", *Journal of Medical Imaging*, vol. 4, no. 1, pp. 014501-014501, Jan. 2017.
8. S. Ö. Arık and J. M. Kahn, "Direct-detection mode-division multiplexing enabled by phase retrieval", *Optics Letters*, vol. 41, no. 18, pp. 4265-4268, May 2016.
9. S. Ö. Arık, K. P. Ho and J. M. Kahn, "Group delay management and multi-input multi-output signal processing in mode-division multiplexing systems", *Journal of Lightwave Technology*, vol. 34, no. 11, pp. 2867 - 2880, Jun. 2016 (Invited).
10. S. Ö. Arık and H. M. Özaktaş, "Optimal representation and processing of optical signals in quadratic-phase systems", *Optics Communications*, vol. 366, pp. 17 - 21, May 2016.
11. S. Ö. Arık, K. P. Ho and J. M. Kahn, "Delay spread reduction in mode-division multiplexing: mode coupling vs. delay compensation", *Journal of Lightwave Technology*, vol. 33, no. 21, pp. 4504 - 4512, Nov. 2015.
12. S. Ö. Arık and J. M. Kahn, "Spectral and spatial aggregation for high-throughput data transmission and networking", *SPIE Newsroom* 10.1117/2.1201501.005757, Feb. 2015 (Invited).
13. S. Ö. Arık, K. P. Ho and J. M. Kahn, "Optical network scaling: roles of spatial and spectral aggregation", *Optics Express*, vol. 22, no. 24, pp. 29868 - 29887, Dec. 2014 (Invited).
14. S. Ö. Arık and J. M. Kahn, "Diversity-multiplexing tradeoff in mode-division multiplexing", *Optics Letters*, vol. 39, no. 11, pp. 3258 - 3261, Jun. 2014.
15. S. Ö. Arık, D. Askarov and J. M. Kahn, "Adaptive frequency domain equalization in mode-division multiplexed systems", *Journal of Lightwave Technology*, vol. 32, no. 10, pp. 1841-1852, May. 2014.
16. D. Millar, T. K.-Akino, S. Ö. Arık, K. Kojima, K. Parsons, T. Yoshida and T. Sugihara, "High-dimensional modulation for coherent optical communications systems", *Optics Express*, vol. 22, no. 7, pp. 8798-8812, Apr. 2014.
17. S. Ö. Arık, J. M. Kahn and K. P. Ho, "MIMO signal processing in mode-division multiplexing", *IEEE Signal Processing Magazine*, vol. 31, no. 2, pp. 25-34, Mar. 2014 (Invited).
18. S. Ö. Arık and J. M. Kahn, "Coupled-core multi-core fibers for spatial multiplexing", *IEEE Photonics Technology Letters*, vol. 25, no. 21, pp. 2054-2057, Nov. 2013.
19. S. Ö. Arık, D. Askarov and J. M. Kahn, "Effect of mode coupling on signal processing complexity in mode-division multiplexing", *Journal of Lightwave Technology*, vol. 31, no. 13, pp. 423-431, Feb. 2013.
20. H. M. Özaktaş, S. Ö. Arık and T. Coşkun, "Fundamental structure of Fresnel diffraction: longitudinal uniformity with respect to fractional Fourier order", *Optics Letters*, vol. 37, no. 1, pp. 103-105, Jan. 2012.
21. H. M. Özaktaş, S. Ö. Arık and T. Coşkun, "Fundamental structure of Fresnel diffraction: natural sampling grid and the fractional Fourier transform", *Optics Letters*, vol. 36, no. 13, pp. 2524-2526, Jul. 2011.

Conference Papers/Presentations:

1. S. Seo, S. Ö. Arık, J. Yoon, X Zhang, K Sohn, T Pfister, "Controlling neural networks with rule representations", *Conference on Neural Information Processing Systems (NeurIPS)*, Dec. 2021.
2. S. Ö. Arık and T. Pfister, "TabNet: Attentive interpretable tabular learning", *AAAI Conference on Artificial Intelligence (AAAI)*, Feb. 2021.
3. S. Ö. Arık, C. L. Li, J. Yoon, R. Sinha, A. Epshteyn et al. "Interpretable sequence learning for COVID-19 forecasting", *Conference on Neural Information Processing Systems (NeurIPS)*, Dec. 2020 (Spotlight).
4. L. Zhu, S. Ö. Arık, Y. Yang, and T. Pfister, "Learning to transfer learn: Reinforcement learning-based selection for adaptive transfer learning", *European Conference on Computer Vision*, Aug. 2020.
5. M. Gao, Z. Zhang, G. Yu, S. Ö. Arık, L. Davis, and T. Pfister, "Consistency-based semi-supervised active learning: towards minimizing labeling cost", *European Conference on Computer Vision (ECCV)*, Aug. 2020.
6. S. Ö. Arık, C. Li, M. Nikoltchev, R. Sinha, A. Epshteyn, J. Yoon, L. Le, V. Menon, S. Singh, Y. Sonthalia, H. Nakhost, L. Zhang (Google), E. Kanal and T. Pfister, "Interpretable Covid-19 forecasting", *ICML Workshop on Healthcare Systems, Population Health, and the Role of Health-Tech*, Jul. 2020.
7. Y. Liu and S. Ö. Arık, "Explaining deep neural networks using unsupervised clustering", *ICML Workshop on Human Interpretability in Machine Learning*, Jul. 2020.
8. B. Lim, S. Ö. Arık, N. Loeff and T. Pfister, "Time series interpretability using temporal fusion transformers", *ICML Workshop on Human Interpretability in Machine Learning*, Jul. 2020.
9. J. Yoon, S. Ö. Arık, and T. Pfister, "Data valuation using reinforcement learning", *International Conference on Machine Learning (ICML)*, Jul. 2020.
10. Z. Zhang, H. Zhang, S. Ö. Arık, H. Lee and T. Pfister, "Distilling effective supervision from severe label noise", *Conference on Computer Vision and Pattern Recognition (CVPR)*, Jun. 2020.
11. C. Xing, S. Ö. Arık, Z. Zhang and T. Pfister, "Distance-based learning from errors for confidence calibration", *International Conference on Learning Representations (ICLR)*, Apr. 2020.
12. S. Ö. Arık, and T. Pfister, "Attention-based prototypical learning", *ICLR Machine Learning in Real Life Workshop*, Apr. 2020.
13. Y. Zhou, P. Wang, S. Ö. Arık, H. Yu, S. Zawad, F. Yan, and G. Diamos, "EPNAS: Efficient progressive neural architecture search", *British Machine Vision Conference (BMVC)*, Sep. 2019.

14. S. Ö. Arık, J. Chen, K. Peng, and W. Ping, and Y. Zhou, "Neural voice cloning with a few samples", *Conference on Neural Information Processing Systems (NeurIPS)*, Dec. 2018 (*Spotlight*).
15. W. Ping, K. Peng, A. Gibiansky, S. Ö. Arık, A. Kannan, S. Narang, J. Raiman, and J. Miller, "Deep Voice 3: Scaling text-to-speech with convolutional sequence learning", *International Conference on Learning Representations (ICLR)*, Oct. 2017.
16. S. Ö. Arık, G. Damos, A. Gibiansky, J. Miller, K. Peng, W. Ping, J. Raiman, and Y. Zhou, "Deep Voice 2: Multi-speaker neural text-to-speech", *Conference on Neural Information Processing Systems (NeurIPS)*, Dec. 2017 (*Spotlight*).
17. S. Ö. Arık, M. Chrzanowski, A. Coates, G. Damos, A. Gibiansky, Y. Kang, X. Li, J. Miller, A. Ng, J. Raiman, S. Sengupta, and M. Shoenybi, "Deep Voice: Real-time neural text-to-speech", *International Conference on Machine Learning (ICML)*, Aug. 2017.
18. S. Ö. Arık, M. Kliegl, R. Child, J. Hestness, A. Gibiansky, C. Fougner, R. Prenger, and A. Coates, "Convolutional recurrent neural networks for small-footprint keyword spotting", *Interspeech*, Aug. 2017.
19. J. M. Kahn and S. Ö. Arık, "Mode-division multiplexing using direct detection and adaptive optical signal processing", *OSA Topical Meeting on Photonic Networks and Devices*, Jul. 2017 (*Invited*).
20. K. Choutagunta, S. Ö. Arık, M. Moradshahi and J. M. Kahn, "Optical MIMO signal processing for direct-detection mode-division multiplexing", *International Conference on Transparent Optical Networks*, Jul. 2017 (*Invited*).
21. A. C. J. Neto, C. E. Rothenberg, D. A. A. Mello, S. Ö. Arık, J. M. Kahn, "Scaling optical networks using full-spectrum spatial switching", *International Conference on High Performance Switching and Routing*, Jun. 2017.
22. O. Domingues, D. A. A. Mello, R. Silva, S. Ö. Arık, J. M. Kahn, "Capacity limits of space-division multiplexed submarine links subject to nonlinearities and power feed constraints", *Optical Fiber Communications Conference*, Mar. 2017.
23. S. Ö. Arık and J. M. Kahn, "Optical MIMO processing for direct-detection mode-division multiplexing", *Proceedings of European Conference on Optical Communications*, Sep. 2016 (*Invited*).
24. S. Ö. Arık and J. M. Kahn, "Direct-detection mode-division multiplexing enabled by phase retrieval", *IEEE Summer Topicals*, Jul. 2016.
25. S. Ö. Arık, K.-P. Ho and J. M. Kahn, "Group delay statistics and management in mode-division multiplexing", *Asilomar Conference on Signals, Systems and Computers*, Nov. 2015 (*Invited*).
26. J. M. Kahn, S. Ö. Arık and K. P. Ho "MIMO channel statistics and signal processing in mode-division multiplexing systems", *IEEE International Workshop on Signal Processing Advances in Wireless Communications*, Jun. 2015 (*Invited*).
27. S. Ö. Arık and J. M. Kahn, "MIMO DSP complexity in mode-division multiplexing systems", *Optical Fiber Communications Conference*, Mar. 2015 (*Invited*).
28. S. Ö. Arık and J. M. Kahn, "MIMO signal processing in mode-division multiplexing systems", *SPIE Photonics West Opto*, Feb. 2015 (*Invited*).
29. S. Ö. Arık and J. M. Kahn, "Roles of spectral and spatial aggregation in optical network scaling", *SPIE Photonics West Opto*, Feb. 2015 (*Invited*).
30. S. Ö. Arık and J. M. Kahn, "Adaptive MIMO signal processing in mode-division multiplexing", *IEEE Summer Topicals*, Jul. 2014 (*Invited*).
31. S. Ö. Arık, D. Millar, T. K.-Akino, K. Kojima and K. Parsons, "High-dimensional modulation for mode-division multiplexing", *Optical Fiber Communications Conference*, Mar. 2014.
32. D. Millar, T. K.-Akino, S. Ö. Arık, K. Kojima and K. Parsons, "Comparison of quaternary block-coding and sphere-cutting for high-dimensional modulation", *Optical Fiber Communications Conference*, Mar. 2014.
33. S. Ö. Arık, E. Vural and P. Frossard, "Alignment of uncalibrated images for multi-view classification", *IEEE International Conference on Image Processing*, pp. 2413-2416, Sep. 2011.

Patents:

1. J. Yoon, K. Sohn, C. Li. and S. Ö. Arık, "Self-trained one-class classification for unsupervised anomaly detection" (filed in Apr. 2021).
2. S. Seo, S. Ö. Arık, J. Yoon, M. Jin, and T. Pfister, "Controllable deep learning with rules" (filed in Oct. 2020).
3. S. Ö. Arık, C. Xing, Z. Zhang and T. Pfister, "Distance-based learning confidence model" (filed in Sep. 2020).
4. B. Lim, S. Ö. Arık, N. Loeff and T. Pfister, "Temporal fusion transformers for interpretable multi-horizon forecasting" (filed in Nov. 2019).
5. Z. Zhang, T. Pfister, S. Ö. Arık, and H. Zhang, "Robust neural network training to overcome severe label noises" (filed in Aug. 2019).
6. M. Gao, Z. Zhang, S. Ö. Arık, and T. Pfister, "Batch mode active learning with earlier start and semi-supervised sample consistency" (filed in Aug. 2019).
7. J. Yoon, S. Ö. Arık, and T. Pfister, "Data valuation using reinforcement learning" (filed in Aug. 2019).
8. J. Yoon, S. Ö. Arık, and T. Pfister, "Reinforcement learning-based local interpretable modeling" (filed in Aug. 2019).
9. L. Zhu, S. Ö. Arık, and T. Pfister, "Framework to learn to transfer learn" (filed in Jun. 2019).
10. S. Ö. Arık, and T. Pfister, "Interpretable tabular data learning" (filed in Jun. 2019).
11. S. Ö. Arık, and T. Pfister, "Attention-based prototypical learning" (filed in Jan. 2019).
12. S. Ö. Arık, H. Jun, E. Undersander, and G. Damos, "Spectrogram to waveform synthesis using convolutional generative

- adversarial networks" (filed in May 2018).
13. S. Ö. Arik, J. Chen, K. Peng, and W. Ping "Neural voice cloning with a few samples" (filed in Feb. 2018).
 14. S. Ö. Arik, W. Ping, K. Peng, A. Gibiansky, A. Kannan, S. Narang, J. Raiman, and J. Miller, "Systems and methods for neural text-to-speech using convolutional sequence learning" (filed in Oct. 2017).
 15. S. Ö. Arik, G. Damos, A. Gibiansky, J. Miller, K. Peng, W. Ping, J. Raiman, and Y. Zhou, "Systems and methods for multi-speaker neural text-to-speech" (filed in May 2017).
 16. S. Ö. Arik, M. Kliegl, R. Child, J. Hestness, A. Gibiansky, C. Fougner, R. Prenger, and A. Coates, "Convolutional recurrent neural networks for small-footprint keyword spotting" (filed in March 2017).
 17. S. Ö. Arik, M. Chrzanowski, A. Coates, G. Damos, A. Gibiansky, J. Miller, A. Ng, J. Raiman, S. Sengupta, M. Shoeybi, "Systems and methods for real-time neural text-to-speech" (filed in February 2017).

Computer Skills

Programming Languages: Python, Matlab, R, C/C++, Java

Special Expertise: Machine learning and big data frameworks

Achievements and Awards

- Received *Stanford Graduate Fellowship* - the most prestigious award offered by Stanford University for PhD studies (2011 - 2015)
- Received awards in trading algorithm development competitions by Quantiacs (2014-2015)
- Received *SPIE Scholarship in Optics and Photonics* - for achievements and potential contributions in the research fields of optics and photonics (2012)
- Ranked 2nd among the students of engineering faculty upon graduation from Bilkent University (2011)
- Ranked 13th in Turkey University Entrance Exam among 1.7M students and received numerous national fellowships (2007)

Major Media Appearances

- "Neural Models for Tabular Data", *The Data Exchange* (Jul. 2021)
- "Google begins to provide new Covid infection predictions", *Huffington Post Japan* (Nov. 2020)
- "Google and Harvard release COVID-19 prediction models", *Venture Beat* (Aug. 2020)
- "Google and Harvard team up against COVID", *AI in Healthcare* (Aug. 2020)
- "Baidu's voice cloning AI can swap genders and remove accents", *The Next Web* (Feb. 2018)
- "Who wanted a future in which AI can copy your voice and say things you never uttered? Who?!", *The Register* (Feb. 2018)
- "Creepy technology can mimic your voice with just 60 seconds of audio", *IFL Science* (Feb. 2018)
- "Baidu can clone your voice after hearing just a minute of audio", *New Scientist* (Feb. 2018)
- "AI voice cloning from a few seconds of voice sampling is real and rapidly improving", *Next Big Future* (Feb. 2018)
- "China's Google equivalent can clone voices after seconds of listening", *Futurism* (Feb. 2018)
- "Baidu's new system can learn to imitate every accent", *The Verge* (Oct. 2017)
- "Baidu's new text-to-speech system can master hundreds of accents", *The Verge* (May 2017)
- "Baidu's text-to-speech system mimics a variety of accents perfectly", *Engadget* (May 2017)
- "Baidu's Deep Voice can quickly synthesize realistic human speech", *Engadget* (Mar. 2017)
- "A groundbreaking new AI taught itself to speak in just a few hours", *Futurism* (Mar. 2017)
- "Baidu's artificial intelligence lab unveils synthetic speech system", *MIT Technology Review* (Mar. 2017)

Other Professional Activities

- Area Chair at Neural Information Processing Systems (NeurIPS), (Sep. 2021)
- Reviewer for >30 journals and conferences
- Keynote Speaker at *IEEE Future Technology Summit*, (Aug. 2021)
- Invited panelist at *NHI NCI Workshop on AI in Radiation Oncology*, (Apr. 2019)
- Invited panelist at *Blockchain Based Artificial Intelligence, Cryptocurrency and Blockchain Venture Summit* (Mar. 2018)