Esra Ataer-Cansizoglu

Machine Learning Engineer at Facebook
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EDUCATION

Northeastern University — Boston, MA
PhD in Electrical Engineering — *May 2015*
Thesis: Retinal Image Analytics: from vessel segmentation to computer-aided diagnosis of retinopathy of prematurity (ROP)

Boston University — Boston, MA
MA in Computer Science — *September 2009*
Thesis: An Information Fusion Approach for Multiview Feature Tracking

Bilkent University — Ankara, Turkey
MS in Computer Engineering — *July 2007*
Thesis: A New Representation for Matching Words
BS in Computer Engineering — *June 2005*

WORK EXPERIENCE

Meta — Boston, MA
Machine Learning Engineer — *Feb 2019 - Present*

- Facebook Creators (2023–Present):
  Leading a team of 5 MLEs on Reels recommendation systems, driving technical strategy, cross-functional alignment, and identifying and solving distribution challenges at scale.
- Reality Labs (2020–2023):
  2D/3D data processing for mapping pipelines, contributing to pedestrian navigation features in Ray-Ban Stories.

Wayfair — Boston, MA
Lead Machine Learning Engineer, Vision & Speech Platform — *Aug 2018 - Jan 2020*
Leading a team of engineers in multiple workstreams to provide an algorithmic understanding for room style estimation, complementary product recommendation and 3D room design.

- Room Style Estimation:
  Develop methods to predict style of a room image by learning from pairwise comparisons using deep neural networks with applications to recommendation and personalization. Combat with various data challenges including class imbalance and inter-expert variability.
- Complementary Product Recommendation:
  Develop techniques to provide cross-class product recommendation based on style compatibility. Use style information from context images to model compatibility of products from different categories.

Mitsubishi Electric Research Laboratories (MERL) — Cambridge, MA
Research Scientist — *June 2015 - Aug 2018*

- 3D Object Detection, Localization and Modeling:

  Worked 3D reconstruction of indoor environments using camera and depth sensors with applications to 3D object localization and modeling. Built a bin picking system to detect, localize and pick up objects using a robotic arm. The 3D reconstruction algorithms I developed are being used in multiple domains including indoor localization and factory automation.

- Face Super-resolution:

  Developed methods for super-resolving face images with magnification factors as big as 8 times. Designed a low-resolution face verification framework that aims to upsample faces by preserving identity information as opposed to state-of-the-art techniques hallucinating faces to yield visually appealing results.

Northeastern University Boston, MA

Graduate Research Assistant *Advisor: Deniz Erdogmus, PhD* *January 2010 - May 2015*

- Retinal Image Analysis, co-supervised by *Jayashree Kalpathy-Cramer, PhD*, in collaboration with Oregon Health & Science University, 2012-2015:

  Built the first complete framework for segmentation and tracing of the retinal vessels, followed by feature extraction and computer-aided diagnosis of retinopathy of prematurity (ROP) from colored retinal fundus images. ROP is the major cause of childhood blindness with a wide inter-expert variability in diagnosis. I detected vascular tree structure from the images by applying statistical pattern recognition methods and applied feature extraction and feature selection techniques to understand inter-expert variability. The system is being used by doctors at OHSU and has the potential to be used as a framework for training experts in developing countries.

- Segmentation of organs in biomedical images using principal curves/surfaces, 2010-2015:

  I developed methods using principal curves/surfaces as a way of denoising and dimensionality reduction. Due to its theorethical value, I succesfully applied the technique in multiple domains such as segmenting organs in biomedical images and tracing curvilinear structures in retinal images. I experimented with various image modalities including CT, MRI and fundus photographes.

- Lung Tumor Motion Analysis for Radiotherapy Treatment, in collaboration with Radiation Oncology Department, University of Maryland, School of Medicine, 2010-2011

  Developed a method to transfer region of interest from 4D CT to the treatment day X-ray images enabling tracking of tumor to increase radiation dose given to tumor while avoiding the critical organs.

Mitsubishi Electric Research Laboratories (MERL) Cambridge, MA

Intern *Supervisor: Yuchi Taguchi, PhD* *January - April 2013, January - April 2014*

- Tracking and RGB-D Camera Using Points and Planes, 2013:
  - Extended an existing RGB-D Simultaneous Localization and Mapping (SLAM) system to work more efficiently by incorporating a prediction-and-correction framework to the tracking system.
  - The proposed method involves a fast correspondence search for points and planes between a frame and a 3D model.
- 2D Camera Localization based on an External RGB-D SLAM System, 2014:
  - Developed a method to register 2D images with an existing 3D Model.
  - Applied the localization method to multiple retinal fundus images to 3D reconstruct human retina.

Massachusetts General Hospital, Radiation Oncology Boston, MA

Intern *Supervisor: Greg C. Sharp, PhD* *May - August 2010*

- Predicting migration of brain cancer cells using Diffusion Tensor Imaging (DTI), 2010-2011:
  - Constructed neuronal fiber pathways from DTI data to see if they provide possible routes for the spread of cancer cells.

– Got familiar with many biomedical image processing tools such as 3D Slicer, MRI Studio and TrackVis.

Boston University Boston, MA
Graduate Research Assistant *Advisor: Margrit Betke, PhD* *September 2007 - May 2009*

- An Information Fusion Approach for Multiview Feature Tracking:
  - Developed a facial feature tracking system to be used with multiple cameras to detect the tracking failures.
  - Proposed an automatic re-initialization technique in the case of tracking failures.
  - The system helps to improve the efficiency of Camera Mouse, which is a mouse replacement interface for users with severe motion impairments. `http://www.cameramouse.org`
- Object Tracking using Active Appearance Models (AAM): Designed an AAM and used it for tracking facial features in video sequences
- English Sentence Recognizer: Performed recognition, state path determination and model optimization on HMM

Bilkent University Ankara, Turkey
Graduate Research Assistant *Advisor: Pinar Duygulu, PhD* *September 2005 - June 2007*

- Indexing System for Handwritten Documents:
  - Developed a method to match words of manuscripts based on various feature representations involving bag-of-features approach.
  - Experimented with challenging manuscripts written in connected scripting languages such as Ottoman and Arabic.

Bilkent University Ankara, Turkey
Intern *June - August 2004*

- BoSS (Bilkent Online Survey System): Online survey conducting and management project, currently in use at Bilkent University

PUBLICATIONS

Peer-Reviewed Journals

1. Computer-based Image Analysis for Plus Disease Diagnosis in Retinopathy of Prematurity: Performance of the "i-ROP" system and Image Features Associated with Expert Diagnosis. Ataer-Cansizoglu E, Bolon-Canedo V, Campbell JP, Bozkurt A, Erdogmus D, Kalpathy-Cramer J, Patel S, Jonas K, Chan RVP, Ostmo S, Chiang MF. Translational Vision Science and Technology (TVST). 2016.

2. Plus Disease: Is It More Than Meets the ICROP? Insights about expert diagnosis from computer-based image analysis. Campbell JP, Ataer-Cansizoglu E, Bolon-Canedo V, Bozkurt A, Erdogmus D, Kalpathy-Cramer J, Patel S, Reynolds JD, Horowitz J, Hutcheson K, Shapiro M, Repka MX, Ferrone P, Drenser K, Martinez-Castellanos MA, Ostmo S, Jonas K, Chan RVP, Chiang MF. Investigative Ophthalmology & Visual Science. 2016; 57(12).

3. Plus Disease: Is It More Than Meets the ICROP? Campbell JP, Ataer-Cansizoglu E, Bolon-Canedo V, Bozkurt A, Erdogmus D, Kalpathy-Cramer J, Patel S, Reynolds JD, Horowitz J, Hutcheson K, Shapiro M, Repka MX, Ferrone P, Drenser K, Martinez-Castellanos MA, Ostmo S, Jonas K, Chan RVP, Chiang MF. Journal of American Association for Pediatric Ophthalmology and Strabismus (*JAAPOS*). 2016; 20(4).

4. Minor Surfaces are Boundaries of Mode-Based Clusters. Ataer-Cansizoglu E, Akcakaya M, Erdogmus D.IEEE Signal Processing Letters (SPL). 2015; 22(7):891-895.

5. Application of Machine Learning Principles to Analysis of Underlying Causes of Inter-Expert Disagreement in Retinopathy of Prematurity Diagnosis.Ataer-Cansizoglu E, Kalpathy-Cramer J, You S, Keck KM, Erdogmus D, Chiang MF. Methods of Information in Medicine. 2015; 54(1):93-102.

6. Dealing with inter-expert variability in retinopathy of prematurity: A machine learning approach. Bolon-Canedo V, Ataer-Cansizoglu E, Erdogmus D, Kalpathy-Cramer J, Fontenlo-Romero O, Alonso-Betanzos A, Chiang MF. Computer Methods and Programs in Biomedicine. 2015; 122(1):1-15.

7. Structure-based level set method for automatic retinal vasculature segmentation. Dizdaroglu B, Ataer-Cansizoglu E, Kalpathy-Cramer J, Keck KM, Chiang MF, Erdogmus D. EURASIP Journal on Image and Video Processing. 2014; 2014(1):1-26.

8. Manifold Learning by Preserving Distance Orders. Ataer-Cansizoglu E, Akcakaya M, Orhan U, Erdogmus D. Pattern Recognition Letters. 2013; 38:120-131.

9. Plus Disease Diagnosis in Retinopathy of Prematurity: Vascular Tortuosity as a Function of Distance from Optic Disc. Keck KM, Kalpathy-Cramer J, Ataer-Cansizoglu E, You S, Erdogmus D, Chiang MF. Retina. 2013; 33(8):1700-1707.

10. Contour-based Shape Representation Using Principal Curves. Pattern Recognition. Ataer-Cansizoglu E, Bas E, Kalpathy-Cramer J, Sharp GC, Erdogmus D. 2012; 46(4):1140-1150.

Peer-Reviewed Conferences

1. Super-resolution of Very Low-Resolution Faces from Videos. Ataer-Cansizoglu E, Jones M. British Machine Vision Conference (BMVC). 2018.

2. Active Descriptor Learning for Feature Matching. Kocanaogullari A, Ataer-Cansizoglu E. International Workshop on Compact and Efficient Feature Representation and Learning in Computer Vision (CEFRL), in conjunction with ECCV. 2018.

3. 3D Object Discovery and Modeling Using Single RGB-D Images Containing Multiple Object Instances. Abbeloos W, Caccamo S, Ataer-Cansizoglu E, Taguchi Y, Domae Y. International Conference on 3D Vision. 2017.

4. Joint 3D Reconstruction of a Static Scene and Moving Objects. Caccamo S, Ataer-Cansizoglu E, Taguchi Y. International Conference on 3D Vision. 2017.

5. Detecting and Grouping Identical Objects for Region Proposal Classification. Abbeloos W, Caccamo S, Ataer-Cansizoglu E, Taguchi Y, Feng C, Lee T. CVPR Workshop on Deep Learning for Robotic Vision. 2017.

6. Object Detection and Tracking in RGB-D SLAM Via Hierarchical Feature Grouping. Ataer-Cansizoglu E, Taguchi Y. IEEE International Conference on Intelligent Robot Systems (IROS). 2016.

7. Pinpoint SLAM: A Hybrid of 2D and 3D Simultaneous Localization and Mapping for RGB-D Sensors. Ataer-Cansizoglu E, Taguchi Y, Ramalingam S. IEEE International Conference on Robotics and Automation (ICRA). 2016.

8. Toward a severity index for ROP: An unsupervised approach. Tian P, Ataer-Cansizoglu E, Kalpathy-Cramer J, Ostmo S, Jonas K, Chan RVP, Campbell JP, Chiang MF, Erdogmus D. International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC). 2016; 1312-1315.

9. Analysis of Shape Assumptions in 3D Reconstruction of Retina from Multiple Fundus Images. Ataer-Cansizoglu E, Taguchi Y, Kalpathy-Cramer J, Chiang MF, Erdogmus D. IEEE International Symposium on Biomedical Imaging (ISBI). 2015; 1502-1505.

10. A GMM-based feature extraction technique for the automated diagnosis of Retinopathy of Prematurity. Bolon-Canedo V, Ataer-Cansizoglu E, Erdogmus D, Kalpathy-Cramer J, Chiang MF. IEEE International Symposium on Biomedical Imaging (ISBI). 2015; 1498-1501.

11. Calibration of Non-Overlapping Cameras Using an External SLAM System. Ataer-Cansizoglu E, Taguchi Y, Ramalingam S, Miki Y. International Conference on 3D Vision. 2014; 509-516.

12. Tracking an RGB-D Camera using Points and Planes. Ataer-Cansizoglu E, Taguchi Y, Ramalingam S, Garaas T. IEEE Workshop on Consumer Depth Cameras for Computer Vision (CDC4CV) (In Conjunction With) International Conference on Computer Vision (ICCV). 2013; 51-58.

13. A Mode-Based Clustering Algorithm without Mode-Seeking. Ataer-Cansizoglu E, Erdogmus D. IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP). 2012; 1925-1928.

14. Observer and feature analysis on diagnosis of retinopathy of prematurity. Ataer-Cansizoglu E, You S, Kalpathy-Cramer J, Keck KM, Chiang MF, Erdogmus D. IEEE International Workshop on Machine Learning for Signal Processing (MLSP). 2012; 1-6.

15. Retinal Vasculature Segmentation using Principal Spanning Forests. Bas E, Ataer-Cansizoglu E, Kalpathy-Cramer J, Erdogmus D. IEEE International Symposium on Biomedical Imaging (ISBI). 2012; 1792-1795.

16. Unsupervised Wrinkle Detection in Reflectance Confocal Microscopy Images of the Human Skin. Sourati J, Brooks DH, Dy JG, Ataer-Cansizoglu E, Erdogmus D. IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP). 2012; 705-708.

17. Level sets for retinal vasculature segmentation using seeds from ridges and edges from phase maps. Dizdaroglu B, Ataer-Cansizoglu E, Kalpathy-Cramer J, Keck K, Chiang MF, Erdogmus D. IEEE International Workshop on Machine Learning for Signal Processing (MLSP). 2012.

18. A SIFT-point distribution-based method for head pose estimation. Ghadarghadar N, Ataer-Cansizoglu E, Zhang P, Erdogmus D. IEEE International Workshop on Machine Learning for Signal Processing (MLSP). 2012.

19. Local Linear Approximation of Principal Curve Projections. Zhang P, Ataer-Cansizoglu E, Erdogmus D.IEEE International Workshop on Machine Learning for Signal Processing (MLSP). 2012.

20. Microvascular blood flow estimation in sublingual microcirculation videos based on a principal curve tracing algorithm. You S, Ataer-Cansizoglu E, Erdogmus D, Massey M, Shapiro N. IEEE International Workshop on Machine Learning for Signal Processing (MLSP). 2012.

21. Motion Flow Analysis in Cell Videos Using a Multi-Level Clustering Method. Ataer-Cansizoglu E, Ghadarghadar N, Zareian R, Bas E, Ruberti JW, Erdogmus D. International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC). 2011; 7767-7770.

22. Principal Curve Based Semi-Automatic Segmentation of Organs in 3D-CT. You S, Bas E, Ataer-Cansizoglu E, Kalpathy-Cramer J, Erdogmus D. International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC). 2011; 6220-6223.

23. Towards Respiration Management in Radiation Treatment of Lung Tumors: Transferring Regions of Interest from Planning CT to Kilovoltage X-Ray Images. Ataer-Cansizoglu E, Bas E, Yousuf MA, You S, D'Souza WD, Erdogmus D. International Conference of Engineering in Medicine and Biology (EMBC). 2010; 3101-3104.

24. An Information Fusion Approach for Multiview Feature Tracking. Ataer-Cansizoglu E, Betke M. International Conference on Pattern Recognition (ICPR). 2010; 1706-1709.

25. A Novel Application of Principal Surfaces for the Segmentation in 4D CT for Radiation Treatment Planning. You S, Ataer-Cansizoglu E, Erdogmus D, Tanyi J, Kalpathy-Cramer J. International Conference on Machine Learning and Applications (ICMLA). 2010; 758-763.

26. Movement and Recovery Analysis of a Mouse-Replacement Interface for Users with Severe Disabilities. Connor C, Yu E, Magee J, Cansizoglu E, Epstein S, Betke M. International Conference on Human-Computer Interaction. 2009; 493-502.

27. Matching Ottoman Words: An Image Retrieval Approach to Historical Document Indexing. Ataer E, Duygulu P. ACM International Conference on Image and Video Retrieval (CIVR). 2007; 341-347.

28. Matching Ottoman Words - Osmanlica Kelimeleri Esleme. Ataer E, Duygulu P. IEEE 15. Sinyal İşleme ve İletişim Uygulamaları Kurultayı (SIU). 2007. Turkish.

29. Retrieval of Ottoman Documents. Ataer E, Duygulu P. ACM SIGMM International Workshop on Multimedia Information Retrieval (MIR). 2006; 155-162.

30. PATIKAweb: A Web service for querying, visualizing and analyzing a graph-based pathway database. Aksay C, Arik F, Ataer E, Ayaz A, Babur O, Belviranli E, Cetintas A, Colak R, Cozen G, Demir E, Dilek A, Dogrusoz U, Erson EZ, Giral E, Kaya E, Yildirim H. International Conference on Intelligent Systems in Molecular Biology (ISMB). 2005.

Abstracts

1. Uncertainty in the diagnosis of Pre-plus Disease in Retinopathy of Prematurity. Loh AR, Ryan M, Abrahams K, Ataer-Cansizoglu E, Chan P, Berrocal A, Kalpathy-Cramer J, Chiang MF. American Association for Pediatric Ophthalmology and Strabismus (AAPOS) Meeting. 2015.

2. Functional modifications of retinal images in quantitative plus disease diagnosis of retinopathy of prematurity. Patel SN, Chan RVP, Ruggeri A, Poletti E, Ataer-Cansizoglu E, Kalpathy-Cramer J, Karyn J, Ostmo S, Chiang MF. The Association for Research in Vision and Ophthalmology (ARVO) Meeting. 2014.

3. Quantifying vascular tortuosity in retinopathy of prematurity: impact of segmentation method and vascular length. Lattin DJ, Aaker G, Ataer-Cansizoglu E, Keck KM, Gelman R, Kalpathy-Cramer J, Erdogmus D, Chiang MF. The Association for Research in Vision and Ophthalmology (ARVO) Meeting. 2013.

4. Computer-based image analysis for ROP: development of a quantitative index based on vascular tortuosity. Aaker G, Lattin D, Ataer-Cansizoglu E, Keck KM, Erdogmus D, Kalpathy-Cramer J, Chiang MF. The Association for Research in Vision and Ophthalmology (ARVO) Meeting. 2013.

5. Plus Disease Diagnosis In Retinopathy Of Prematurity: Vascular Tortuosity As A Function Of Distance From Optic Disc Center. Keck KM, Kalpathy-Cramer J, Ataer-Cansizoglu E, You S, Erdogmus D, Chiang MF. The Association for Research in Vision and Ophthalmology (ARVO) Meeting. 2012.

PATENTS

1. Ataer-Cansizoglu E, Taguchi Y, "Method and System for Detecting and Tracking Objects and SLAM with Hierarchical Feature Grouping." US Patent US20170161546 A1, issued June 8, 2017.

2. Ataer-Cansizoglu E, Taguchi Y, Ramalingam S, "System and Method for Hybrid Simultaneous Localization and Mapping of 2D and 3D Data acquired by sensors from a 3D scene." US Patent US20170161901 A1, issued June 8, 2017.

3. Taguchi Y, Ataer-Cansizoglu E, Ramalingam S, Miki Y, "Method for Calibrating Cameras with Non-Overlapping Views." US Patent US20160012588 A1, issued January 14, 2016.

4. Taguchi Y, Ataer-Cansizoglu E, Ramalingam S, Garaas T,"Tracking Poses of 3D Camera Using Points and Planes." US Patent US20140002597 A1, issued January 2, 2014.

AWARDS AND HONORS

- Northeastern University, Graduate Student Government Award for attendance at Medical Image Computing and Computer Assisted Intervention (MICCAI) Conference , 2014
- ACM's Women in Computing (ACM-W) scholarship for attendance at International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), 2010
- Full Scholarship including tuition and stipend from Northeastern University, 2010-2015
- Full Scholarship including tuition and stipend from Boston University, 2007-2009
- CRA-W Conference -The Computer Research Association's Committee on the Status of Women in Computing Research, 2009-2010
- Travel Grant from National Science Foundation of Turkey (TUBITAK) for attending International Conference on Image and Video Retrieval (CIVR), 2007
- Full scholarship from National Science Foundation of Turkey (TUBITAK) during MS studies Bilkent University, 2005 – 2007
- Ranked 35^{th} (Top 0.01%) in Graduate Student Examinations (ALES) in Turkey (Among 150.000 students taking the exam), 2005
- Full Scholarship including tuition, stipend, and accommodation during undergraduate study at Bilkent University, 2001 – 2005
- Ranked 25^{th} (Top 0.01%) in National University Entrance Exam (OSS) in Turkey (Among 1.500.000 people taking the exam), 2001
- Ranked 3^{rd} in Central Anatolia Region in Mathematical Contest of National Science Foundation of Turkey (TUBITAK), 2000

TEACHING EXPERIENCE

Boston University, Computer Science Department Boston, MA

- *Introduction to Internet Technologies & Web Development, Teaching Fellow* *Spring 2009*
  - Instructed three lab sections
  - Prepared lab assignments
  - Graded quizzes and homeworks
- *Database & Data Analysis, Teaching Fellow* *Fall 2007*
  - Instructed two lab sections
  - Graded quizzes and homeworks

Bilkent University, Department of Computer Engineering Ankara, Turkey

- *Database & Data Management, Teaching Assistant* *Spring 2007*
  - Held office hours to address individual students' questions and needs
  - Graded exams, projects and homeworks
- *Introduction to Computing in Engineering and Science, Teaching Assistant* *Fall 2006*
  - Instructed one lab section
  - Prepared lab assignments
  - Graded projects and homeworks

- *Algorithms and Programming I and II, Teaching Assistant* *Fall 2005 - Spring 2006*
  - Instructed two lab sections
  - Prepared lab assignments
  - Graded projects and homeworks

SERVICE

- Board Member, MS in Business Analytics Program, UMASS Lowell, 2015-present
- Organizing committee member, Center for Integrative Biomedical Computing (CIBC) Workshop, Northeastern University, 2012
- Program Committee member, IEEE International Workshop on Machine Learning for Signal Processing (MLSP), Santander, Spain, 2012
- Reviewer for
  - IEEE Transactions in Medical Imaging, 2014-present
  - Spatial Statistics, 2013-present
  - Signal, Image and Video Processing, 2012-present
  - Signal Processing Letters (SPL), 2012
  - Neurocomputing, 2012
  - International Workshop on Machine Learning for Signal Processing (MLSP), 2012
  - International Conference in Engineering in Medicine and Biology (EMBC), 2010-2012
  - International Joint Conference on Neural Networks (IJCNN), 2010-2011
  - International Conference of Computer Vision and Pattern Recognition (CVPR), 2008-2009
  - European Conference of Computer Vision (ECCV), 2008-2009

PROFESSIONAL MEMBERSHIPS

- Member of *IEEE*, 2010-present
- Member of *HKN Eta Kappa Nu*, 2011-present
- Member of *Medical Image Computing and Computer Assisted Intervention (MICCAI) Society*, 2014-present
- Member of *Girl Scouts of Eastern Massachusetts*, 2016-present
- Student Member of *IEEE Engineering in Medicine and Biology Society (EMBS)*, 2010-2015
- Member of *Women in Science and Engineering (WISE)*, Boston University, 2007-2009
- Member of Editors and Writers of *Bes Mevsim University Magazine*, Bilkent University, 2001-2003

COMPUTER SKILLS

Languages: C/C++, Python, Matlab, Java, LaTeX, Pascal, PHP, Perl, JSP, HTML/XML, CSS, SQL

Software/Tools: Tensorflow/Keras, Caffe, OpenCV, OpenGL, Eigen Library, Point Cloud Library (PCL), ITK, MS Visual Studio, Eclipse, MS Office, Adobe Photoshop, Gimp

Medical Imaging Tools: ImageJ, 3D Slicer, TrackVis, Diffusion ToolKit (DTK), FreeSurfer, MRI Studio, Plastimatch, Seg3D