MEHMET KEREM TURKCAN

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WORK EXPERIENCE

◇ **Columbia University,** New York, NY — Jul 2024 – Present
Associate Research Scientist

- Leading large-scale machine learning projects, maintaining high-performance computing resources, and collaborating with research teams spanning 5 institutions and 30+ principal investigators as part of the NSF-funded Center for Smart Streetscapes (CS3)
- Managing research projects to train urban multimodal models integrating camera and LiDAR data, and to deploy sensing models to >900 intersections in New York City
- Published research papers on generative models and computer vision in top-tier conferences like ICML 2025, SENSYS 2025, PerCom 2025, and UIST 2024, covering research topics such as multiobjective preference optimization for large vision models and their deployment on edge devices, building vision-assisted navigation agents for accessibility in urban spaces and LLM-based intelligent tutoring systems
- Received research grants from NVIDIA (Project: "Edge AI for Equitable and Safe Intersections in Urban Metropolises") and EmpireAI (Project: "AI Computing for Community, Health, Safety and Climate") to develop reliable next-generation frontier models for urban deployment
- Was selected as a finalist for the INRIX + MetroLab 2025 Challenge to discover novel solutions for modern transportation and traffic challenges in New York City
- Created and led an open-source 4-week engineering research training program on generative AI and computer vision, bringing state-of-the-art computer vision models to high school curricula as part of the Research Experience for Teachers (RET) outreach program

◇ **Columbia University,** New York, NY — Nov 2022 – Jul 2024
Postdoctoral Research Scientist

- Managed research projects on building digital twins of New York City street intersections using state-of-the-art computer vision and deep learning approaches, resulting in conference papers in venues like Computer Vision and Pattern Recognition Conference (CVPR) and IEEE Intelligent Vehicles Symposium (IEEE-IV)
- Received the winner award in IDC Government Insight's sixth annual Smart Cities North America Awards (SCNNA) in the transportation category
- Mentored 11 Master's students in various research projects for deep learning and computer vision
- Applied state-of-the-art computer vision models to robotic surgeries in a collaboration with surgeons at Northwell Health which resulted in a journal publication and an oral conference presentation
- Received the Columbia University Electrical Engineering Distinguished Teaching Award for the 2023-2024 academic year and the National Postdoc Appreciation Week Excellence Award

◇ **Columbia University,** United States — Nov 2022 – Dec 2023
Lecturer in Electrical Engineering

- Taught two full semester courses: ECBM E4040: Deep Learning & Neural Networks and EECS E6691: Advanced Deep Learning, preparing lectures, course material and assignments.
- Taught the VOAI 0003E: Neural Networks and Deep Learning course as a co-instructor for the CVN AI Executive certificate program during Fall 2022 and Summer 2023 semesters.

◇ **Columbia University,** United States — Jul 2023 – Aug 2023
Mentor

- Mentored three high school students over a period of six weeks during the summer, introducing them to the field of deep learning and its real-world application, as a member of the Engineering the Next Generation outreach program of the Columbia-led NSF Engineering Research Center for Smart Streetscapes.

EDUCATION

◇ **Columbia University,** United States — Jan 2017 – Oct 2022

- Ph.D. in Electrical Engineering, Research Area: Systems Biology and Neuroengineering
- Cumulative GPA: 4.10
- Herbert French Fellowship for the 2017-2018 Academic Year
- Helmsley Fellowship for the Drosophila Neurobiology: Genes, Circuits & Behavior 2019 laboratory/lecture course at Cold Spring Harbor Laboratory

- *Relevant Coursework*: Sparse Representation and High-Dimensional Geometry, Foundations of Graphical Models, Autonomous Multi-Agent Systems, Neural Control Engineering

◇ **Columbia University,** United States — Sep 2015 – Dec 2016

- M.Sc. in Computer Science, Machine Learning/Thesis Track
- Cumulative GPA: 3.97
- *Relevant Coursework*: Advanced Machine Learning, Bayesian Methods in Machine Learning, Neural Networks and Deep Learning, Introduction to Computational Learning Theory, Computer Graphics, Programming Languages and Translators, Analysis of Algorithms I

◇ **Istanbul Technical University,** Turkey — Sep 2011 – Jun 2015

- B.Sc. in Electronics and Communication Engineering
- Cumulative GPA: 3.75
- *Relevant Coursework:* Image Processing, Wireless Communication Networks, Data Communications, Digital Signal Processing Design and Applications, Advanced Physics Project Laboratory

TEACHING

◇ *Lecturer,* Columbia University — Fall 2023
- **ECBM E4040: Neural Networks and Deep Learning**

◇ *Lecturer,* Columbia University — Fall 2022, Summer 2023
- **VOAI 0003E: Neural Networks and Deep Learning**

◇ *Lecturer,* Columbia University — Spring 2023
- **EECS E6691: Advanced Deep Learning**

◇ *Course Assistant,* Columbia University — Spring 2020, Spring 2021
- **ECBM E4070: Computing with Brain Circuits of Model Organisms**

◇ *Teaching Assistant,* Columbia University — Spring 2018
- **ECBM E6070: Fruit Fly Brain as a Neuroinformation Processor**

◇ *Teaching Assistant,* Columbia University — Fall 2017
- **BMEB W4020: Computational Neuroscience: Circuits in the Brain**

◇ *Course Assistant,* Columbia University — Fall 2016
- **ECBM E4040: Neural Networks and Deep Learning**

TALKS

◇ *My Streetscape Photovoice Exhibit,* Center for Smart Streetscapes (CS3) at Columbia Engineering — Sep 2023
- AI Models for Smart Streetscapes

◇ *PyData Global,* Virtual — Nov 2020
- FlyBrainLab: An Interactive Open Computing Platform

◇ *Drosophila Neurobiology: Genes, Circuits & Behavior,* Cold Spring Harbor Laboratory — Jul 2018
- Building the Functional Map of the Fruit Fly Brain

PUBLICATIONS

◇ Published

- **Real-Time Video Analytics for Urban Safety: Deployment over Edge and End Devices**
  PAVE: real-time street-camera analytics split across edge and end devices for low-latency safety insights.
  Tenth ACM/IEEE Symposium on Edge Computing (SEC '25), 2025
  Mahshid Ghasemi, Yongjie Fu, Xinyu Ouyang, Peiran Wang, Mehmet Kerem Turkcan, Jhonatan Tavori, Sofia Kleisarchaki, T. Calmant, Levent Gürgen, Zoran Kostic, Xuan Di, Gil Zussman, Javad Ghaderi
- **Computer vision scoring of endoscopically traced line figures in an inanimate scope tip coordination training model**
  Automated computer vision-based scoring of endoscopy training tracings for assessing skill.
  Surgical Endoscopy, 2025
  Neil Mitra, Sanjeev Narasimhan, Mehmet Kerem Turkcan, Zoran Kostic, Yi-Ru Chen, Sarah Choksi, Elizabeth Nilsson-Sjolander, Pablo Palacios, Katie Carsky, Alya Riaz, Filippo Filicori, Richard L. Whelan

- **Loosely Coupled Oscillators as a Correlate of Behavioral Control Circuits Within the Central Complex of the Fruit Fly**
  Models fly sleep/arousal control circuits as loosely coupled oscillators using connectome-driven simulation.
  Neural Information Processing (ICONIP 2024) Proceedings, Lecture Notes in Computer Science, 2025
  Saul Garnell, Mehmet Kerem Turkcan, Maryam Doborjeh, Brian H. Smith, Paul Szyszka
- **Adaptive Data Collection for Robust Learning Across Multiple Distributions**
  Bandit-style data collection that allocates labeling budget across sources to improve worst-case robustness.
  Forty-second International Conference on Machine Learning (ICML), 2025
  Chengbo Zang, Mehmet Kerem Turkcan, Gil Zussman, Zoran Kostic, Javad Ghaderi
- **Distributed VLMs: Efficient Vision-Language Processing through Cloud-Edge Collaboration**
  Split VLM inference between edge vision and a cloud LLM for faster, cheaper multimodal serving.
  2025 IEEE International Conference on Pervasive Computing and Communications Workshops and other Affiliated Events (PerCom Workshops), 2025
  Yuyang Li, Devika Gumaste, Mehmet Kerem Turkcan, Javad Ghaderi, Gil Zussman, Zoran Kostic
- **StreetNav: Leveraging Street Cameras to Support Precise Outdoor Navigation for Blind Pedestrians**
  Repurposing street cameras to provide real-time navigation assistance for blind and low-vision pedestrians.
  Proceedings of the 37th Annual ACM Symposium on User Interface Software and Technology (UIST), 2024
  Gaurav Jain, Basel Hindi, Zihao Zhang, Koushik Srinivasula, Mingyu Xie, Mahshid Ghasemi, Daniel Weiner, Sophie Ana Paris, Xin Yi Therese Xu, Michael Malcolm, Mehmet Kerem Turkcan, Javad Ghaderi, Zoran Kostic, Gil Zussman, Brian A. Smith
- **Zero-Shot Image Tagging for Urban Traffic Intersection Scenes**
  Evaluation of vision models for zero-shot and few-shot object detection in urban environments.
  Visual Anomaly and Novelty Detection Workshop, CVPR 2024
  William Ho, Mehmet Kerem Turkcan, Javad Ghaderi, Gil Zussman, Zoran Kostic
- **Data-Driven Traffic Simulation for an Intersection in a Metropolis**
  A realistic simulation of New York City intersections using trajectory prediction models.
  Workshop on Populating Empty Cities: Virtual Humans for Robotics and Autonomous Driving, CVPR 2024
  Chengbo Zang, Mehmet Kerem Turkcan, Gil Zussman, Javad Ghaderi, Zoran Kostic
- **Evaluating Trajectory Forecasting Models for a New York City Street Intersection**
  Training trajectory prediction models for real-time behavior prediction in New York City intersections.
  2024 Columbia University Data Science Day
  Chengbo Zang, Mehmet Kerem Turkcan, Javad Ghaderi, Gil Zussman, Zoran Kostic
- **Real-time Camera Integration for Traffic Information Extraction and Visualization**
  A video analytics platform for real-time traffic monitoring in New York City.
  2024 Columbia University Data Science Day
  Mahshid Ghasemi, Mehmet Kerem Turkcan, Gil Zussman, Javad Ghaderi
- **Digital Twin for Pedestrian Safety Warning at a Single Urban Traffic Intersection**
  Deployment of a low-latency computer vision application for object detection, tracking, trajectory forecasting and safety warning generation.
  2024 IEEE Intelligent Vehicle Symposium (IV)
  Yongjie Fu, Mehmet Kerem Turkcan, Vikram Anantha, Zoran Kostic, Gil Zussman, Xuan Di
- **Examining the Influence of Varied Levels of Domain Knowledge Base Inclusion in GPT-based Intelligent Tutors**
  Investigating the effectiveness of integrating a knowledge bases with large language model-based intelligent tutors to increase response reliability.
  Educational Data Mining, 2024.
  Blake Castleman, Mehmet Kerem Turkcan

- **Surgical Phase Recognition in Inguinal Hernia Repair—AI-Based Confirmatory Baseline and Exploration of Competitive Models**
  Establishing the baseline accuracy of modern computer vision architectures for surgical phase recognition using 209 surgery videos.
  Bioengineering, 2023.
  Chengbo Zang, Mehmet Kerem Turkcan, Sanjeev Narasimhan, Yuqing Cao, Kaan Yarali, Zixuan Xiang, Skyler Szot, Feroz Ahmad, Sarah Choksi, Daniel P. Bitner, Filippo Filicori, Zoran Kostic
- **Towards Street Camera-based Outdoor Navigation for Blind Pedestrians**
  Developing a street camera-based navigation system that provides real-time auditory feedback to help blind and low-vision people.
  Proceedings of the 25th International ACM SIGACCESS Conference on Computers and Accessibility, 2023.
  Gaurav Jain, Basel Hindi, Mingyu Xie, Zihao Zhang, Koushik Srinivasula, Mahshid Ghasemi, Daniel Weiner, Xin Yi Therese Xu, Sophie Ana Paris, Chloe Tedjo, Josh Bassin, Michael Malcolm, Mehmet Kerem Turkcan, Javad Ghaderi, Zoran Kostic, Gil Zussman, Brian A Smith
- **A Programmable Ontology Encompassing the Functional Logic of the Drosophila Brain**
  An integrated NLP-driven exploration platform for question answering and document retrieval, and a computational library for connectome-realistic GPU-accelerated simulation and interrogation of the function of large-scale spiking neural circuits that takes into account the input space and the biologically relevant cell types.
  Frontiers in Neuroinformatics, 2022.
  Aurel A. Lazar*, Mehmet Kerem Turkcan*, Yiyin Zhou* (*: Alphabetical Order)
- **A circuit library for exploring the functional logic of massive feedback loops in Drosophila brain.**
  Cosyne 2022, March 17-20, 2022, Lisbon, Portugal.
  Querying the connectome to find and generate interactive circuits of feedback pathways and understanding those circuits through their responses to manipulations.
  Mehmet Kerem Turkcan, Yiyin Zhou, Aurel A. Lazar
- **FlyBrainLab: Accelerating the Discovery of the Functional Logic of the Drosophila Brain in the Connectomic/Synaptomic Era**
  eLife, 2021.
  An interactive computing platform to accelerate the understanding of the functional logic of the fly brain.
  Aurel A. Lazar*, Tingkai Liu*, Mehmet Kerem Turkcan*, Yiyin Zhou* (*: Alphabetical Order)
- **Visualization and Graph Exploration of the Fruit Fly Brain Datasets with NeuroNLP++**
  Neuromatch 4.0, December 1-2, 2021, Online.
  An integrated machine learning application and accompanying frontend that utilizes modern advances in natural language processing for an ontological search engine and processes users' queries to retrieve and visualize neurons in a connectomics dataset as well as the relevant terms in a brain ontology.
  Aurel A. Lazar*, Mehmet Kerem Turkcan*, Yiyin Zhou* (*: Alphabetical Order)
- **Untangling the Graph Structure of Drosophila Brain Datasets with Open Source FlyBrainLab Utility Libraries**
  Society of Neuroscience, November 8-11, 2021, Online.
  A set of open source utility libraries and benchmark tasks integrating node embeddings, classification, clustering and community detection algorithms targeting neuroscience datasets written in Python to facilitate the exploration of the graph structure of fruit fly brain circuits from raw, large-scale connectomics and synaptomics datasets.
  Aurel A. Lazar*, Mehmet Kerem Turkcan*, Yiyin Zhou* (*: Alphabetical Order)
- **Interrogating the Functional Logic of Drosophila Brain Circuits at Single-Synapse Scale**
  Society of Neuroscience , November 8-11, 2021, Online.
  A new paradigm in which the modeling emphasis in connectome-based circuit simulations is shifted from communicating neurons to the interactions between blocks of synapses with simulations to support different levels of abstraction.
  Aurel A. Lazar*, Mehmet Kerem Turkcan*, Yiyin Zhou* (*: Alphabetical Order)

- **NeuroNLP Gene Match—An open source genetic data visualizer and explorer**
  Neurobiology of Drosophila, 2021.
  A 3D environment for jointly exploring the morphology, connectome, synaptome and gene expression datasets and matching large microscopy volumes against neural circuits.
  Aurel A. Lazar*, Mehmet Kerem Turkcan*, Yiyin Zhou* (*: Alphabetical Order)
- **Generating Executable Mushroom Body and Lateral Horn Circuits from the Hemibrain Dataset with FlyBrainLab**
  CNS*2020, 2020.
  Building executable neural circuits for neuropils associated with learned and innate memories using recently-released single-synapse-scale connectomics data.
  Aurel A. Lazar*, Mehmet Kerem Turkcan*, Yiyin Zhou* (*: Alphabetical Order)
- **A Gallery of the Artificial**
  NeurIPS Creativity Workshop, 2019.
  Portrait art generation through StyleGAN and heavy training time augmentation.
  Mehmet Kerem Turkcan
- **Common SNP-based Haplotype Analysis of the 9p21.3 Gene Locus as Predictor of Coronary Artery Disease in Tanzanian Population**
  Cellular and Molecular Biology (Noisy-le-Grand, France), 2019.
  A study of the association of the 9p21.3 locus with Coronary Artery Disease in the Tanzanian population.
  Gokce Akan, Peter Kisenge, Tulizo Shemu Sanga, Erasto Mbugi, Ismael Adolf, Mehmet Kerem Turkcan, Mohammed Janabi, Fatmahan Atalar
- **Face-looking Image Recognition**
  2019 27th Signal Processing and Communications Applications Conference (SIU), 2019.
  A generalizable approach for cross-modal face matching via deep transfer learning based on integrating features from multiple pretrained networks with different architectures trained on ImageNet.
  Mehmet Kerem Turkcan, Ege Çetin, Tayfun Akgül
- **Threatsim: Resolve Threats to Manufacturing Industries using Reinforcement Learning**
  Columbia University Data Science Day, 2017.
  Reinforcement learning to optimize the planning of preventive maintenance and to detect threats.
  Kartikeya Upasani, Mehmet Kerem Turkcan, Albert Boulanger
- **Generation of $1/f^{\alpha}$ Noise via Frequency Scaling**
  EMO Journal of Electrical, Electronics, Computers, Biomedical and Control Engineering, 4(8), 2014.
  We show that a scale transform in frequency domain can be utilized to generate noise with differing $1/f$ statistics.
  Mehmet Kerem Turkcan, Tayfun Akgül

◇ Preprints

- **AI-Powered CPS-Enabled Urban Transportation Digital Twin: Methods and Applications**
  A CPS-enabled, AI-powered digital-twin architecture for urban transportation: pipeline, methods, and use cases.
  arXiv preprint, 2025
  Yongjie Fu, Mehmet Kerem Turkcan, Mahshid Ghasemi, Zhaobin Mo, Chengbo Zang, Abhishek Adhikari, Zoran Kostic, Gil Zussman, Xuan Di
- **Towards Suturing World Models: Learning Predictive Models for Robotic Surgical Tasks**
  Diffusion-based video world models for fine-grained robotic surgical suturing actions.
  arXiv preprint, 2025
  Mehmet Kerem Turkcan, Mattia Ballo, Filippo Filicori, Zoran Kostic
- **Boundless: Generating Photorealistic Synthetic Data for Object Detection in Urban Streetscapes**
  Photorealistic data generation software for object detection and segmentation.
  Mehmet Kerem Turkcan, Ian Li, Chengbo Zang, Gil Zussman, Javad Ghaderi, Zoran Kostic
- **Constellation: Benchmarking High-Altitude Object Detection for an Urban Intersection**
  Release of an object detection dataset for high-altitude object detection.
  Mehmet Kerem Turkcan, Chengbo Zang, Sanjeev Narasimhan, Gyung Hyun Je, Bo Yu, Mahshid Ghasemi, Gil Zussman, Javad Ghaderi, Zoran Kostic

- **Data-Driven Traffic Simulation of A New York City Intersection**
  Building a digital twin of a traffic intersection at microscopic scale for New York City.
  Chengbo Zang, Mehmet Kerem Turkcan, Javad Ghaderi, Gil Zussman, Zoran Kostic
- **The Fruit Fly Brain Observatory: From Structure to Function**
  The next generation open-source platform to support open, collaborative Drosophila neuroscience research.
  Nikul H. Ukani, Chung-Heng Yeh, Adam Tomkins, Yiyin Zhou, Dorian Florescu, Carlos Luna Ortiz, Yu-Chi Huang, Cheng-Te Wang, Mehmet Kerem Turkcan, Tingkai Liu, Paul Richmond, Chung-Chuan Lo, Daniel Coca, Ann-Shyn Chiang, Aurel A. Lazar
- **Using an Ancillary Neural Network to Capture Weekends and Holidays in an Adjoint Neural Network Architecture for Intelligent Building Management**
  A new forecasting network architecture for intelligent building management to capture uncertainty and inject extra information.
  Zhicheng Ding, Mehmet Kerem Turkcan, Albert Boulanger

PRE-PHD GRADUATE RESEARCH EXPERIENCE

◇ *Graduate Research Assistant* Sep – Dec 2016
Center for Computational Learning Systems at Columbia University New York, United States
- Fully funded final semester of the MSc through a deep learning project with Con Edison.
- Applied cutting edge deep learning algorithms for object detection/segmentation given thermal camera images to find manholes at risk.
- Developed the front-end and the back-end convolutional neural network architecture for object detection, curated and labeled a dataset by hand to solve the problem, and used transfer learning to achieve a high testing set performance.

◇ *Graduate Researcher* May – Sep 2016
The Earth Institute New York, United States
- Developed high-performing deep learning models to control solar-powered microgrids in Africa by generating power limit schedules for the customers in the microgrid under varying conditions.

◇ *Graduate Researcher* Jan – May 2016
Center for Computational Learning Systems at Columbia University New York, United States
- Designed and implemented machine learning algorithms for intelligent building management applications.

◇ *R&D Specialist* May – Aug 2015
ArtGe Technologies (Now Arvis) Istanbul, Turkey
- Designed and implemented scalable and efficient face recognition systems (based on deep convolutional networks as well as older approaches) with an additional focus on the improvement of user experience.
- Focused on improving face recognition when the quality of input data is variable, in order to adapt state of the art approaches to quickly changing and challenging environments such as stadiums.
- Benchmarked the developed systems against competing approaches on standard tasks as well as custom benchmarks based on privately collected data.

◇ *Student Intern* Summer 2014
ArtGe Technologies (Now Arvis) Istanbul, Turkey
- Implemented machine learning algorithms to perform automatic agriculture related data extraction from images, as part of the TARBIL (Agricultural Monitoring and Information System) Project funded by the Turkish Ministry of Food, Agriculture and Livestock.
- Designed, implemented and benchmarked a novel regression approach for estimating crop heights from arbitrarily placed, low quality stereo camera installations.

UNDERGRADUATE RESEARCH EXPERIENCE

◇ *Undergraduate Scholar* Mar – Dec 2014
Istanbul Technical University Signal Processing Laboratory Istanbul, Turkey
- Worked on a TUBITAK (The Scientific and Technological Research Council of Turkey) backed research project titled "Towards Automated Face Recognition: Sketch/Caricature-Photo Matching Using Caricature Making Techniques".
- Designed, implemented and evaluated a new metric learning algorithm for cross-modal face recognition.

REVIEWING EXPERIENCE

- ◇ Mobile Computing And Networking (MobiCom 2024)
- ◇ CVPR 2026
- ◇ IEEE Transactions on Very Large Scale Integration Systems
- ◇ Electronics (MDPI)
- ◇ Smart Cities (MDPI)

TECHNICAL SKILLS

- ◇ **Programming Languages:** Python, C/C++, MATLAB, Typescript, Javascript, HTML, CSS
- ◇ **Libraries/Platforms:** CUDA, TensorFlow, Jax, PyTorch, Keras, OpenGL, Unreal Engine
- ◇ **Design Software:** LaTeX, Figma, Photoshop, Illustrator, InDesign, Premiere