

# MEHMET KEREM TURKCAN

keremturkcan.com ◊ mkt2126@columbia.edu

## EDUCATION

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- ◊ **Columbia University**, United States January 2017 – October 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
  - *Relevant Coursework*: Systems Biology: Design Principles for Biological Circuits, Sparse Representation and High-Dimensional Geometry, Introduction to Genomic Information Science and Technology, Foundations of Graphical Models, Autonomous Multi-Agent Systems, Neural Control Engineering
  - *Summer Course*: Drosophila Neurobiology: Genes, Circuits & Behavior (laboratory/lecture course) 2019 at Cold Spring Harbor Laboratory. Awarded the Helmsley Fellowship.
- ◊ **Columbia University**, United States September 2015 – December 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 2011 – 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

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- ◊ *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&LECTURES

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- ◊ *FlyBrainLab: An Interactive Open Computing Platform*, PyData Global November 2020
  - FlyBrainLab as a Platform for Centralizing Computational Research on Drosophila Neural Circuits
- ◊ *Drosophila Neurobiology: Genes, Circuits & Behavior*, Cold Spring Harbor Laboratory July 2018
  - Building the Functional Map of the Fruit Fly Brain

## PUBLICATIONS

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- ◊ PUBLISHED
  - **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 K. Turkcan\*, Yiyin Zhou\* (\*: Alphabetical Order)

- **FlyBrainLab: Accelerating the Discovery of the Functional Logic of the Drosophila Brain in the Connectomic/Synaptic 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 K. 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 K. Turkcan, Yiyin Zhou, Aurel A. Lazar
- **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 K. 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 K. 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 K. 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 K. 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 K. 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 K. 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 K. 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 K. 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 K. 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 K. Turkcan, Tayfun Akgül

◇ PREPRINTS

- **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 K. 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 K. Turkcan, Albert Boulanger

## UNDERGRADUATE RESEARCH

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◇ *Undergraduate Scholar*

March – December 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".

- Focused on the applications of machine learning and the design of potentially novel metric learning methods for face and sketch recognition problems.

- Designed, implemented and evaluated a new metric learning algorithm for cross-modal face recognition.

## WORK EXPERIENCE

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◇ *Graduate Research Assistant*

September – December 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 – September 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*

January – May 2016

**Center for Computational Learning Systems at Columbia University**

New York, United States

- Designed and implemented machine learning algorithms to target structures requiring repairs in Con Edison infrastructure using features extracted from thermal images.

◇ *R&D Specialist*

May – August 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 throughout Turkey.

**TECHNICAL SKILLS**

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◇ **Programming Languages:** Python, C/C++, MATLAB, Typescript, Javascript, HTML, CSS

◇ **Libraries/Platforms:** CUDA, TensorFlow, Jax, PyTorch, Theano, OpenAI Gym, Keras, OpenGL, Unreal Engine

◇ **Design Software:** LaTeX, Photoshop, Illustrator, InDesign