

# Burak Kakillioglu

bkakilli.github.io \* Syracuse, NY

## Profile

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PhD on 3D computer vision with significant image processing and machine learning expertise. Strong personal enthusiasm and professional experience with autonomous robotic systems. A multitude of graduate level software engineering courses alongside with an Electrical Engineering degree (B.S). Notable experience on common DevOps practices, such as Git and Docker. Ability to work on broad range of hardware, OS, software languages and tools. Detailed, dedicated and proactive personality.

## Experience

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**Motorola Solutions Inc.**, Boston, MA Jun 2021-Present  
*Senior Machine Learning Engineer*

**Automodality Inc.**, San Rafael, CA Nov 2019-May 2020 / Jan 2017-Dec 2017  
*3D Computer Vision Intern / RA*

- Contributed to the development of 3D lidar point cloud segmentation on Jetson TX2 for perception-localization module of aerial asset inspection vehicle
- Developed a 3D localization algorithm using stereo camera for the aerial bridge inspection vehicle

**SRI International**, Princeton, NJ May 2019-Aug 2019  
*3D Computer Vision Intern*

- Developed 3D segmentation algorithm for 3D point clouds from lidar and stereo cameras for Automatic Volumetric (Tree) Log Measurement
- Implemented a framework to combine 2D and 3D tree log segmentation
- Implemented the backend of Automatic Log Measurement software

**Syracuse University**, Syracuse, NY Aug 2015-Present  
*Research Assistant*

- Researcher and author on several projects and publications (details below)

## Education

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**Syracuse University**, Syracuse, NY Aug 2015-Present  
*PhD, Electrical and Computer Engineering, 3.90*  
Advisor: Senem Velipasalar  
Thesis: Computer Vision Applications for Autonomous Aerial Vehicles

**Bilkent University**, Ankara, Turkey Sept 2011-Jun 2015  
*BS, Electrical and Electronics Engineering*

## Technical Skills

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- **Python, C/C++**, MATLAB, Java, C#, web languages, HDL, Assembly
- **PyTorch**, Tensorflow, **Numpy**, OpenCV, **Open3D**, **ROS**, PCL
- **Linux** (daily, experienced), Windows, OSX, Android
- **Jetson**, **Raspberry Pi**, PX4, Arduino (derivatives), FPGA

- **Git, Docker, Swarm, Continuous Integration, Full stack web/API development**

## Projects

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### Microcam

*A system of platforms that detects human presence for substantial improvement in HVAC efficiency (ARPA-E)*

- Contributed to the model development of person detection model with Tensorflow on Raspberry Pi with 95%+ accuracy (day and night with near-infrared images)
- Contributed to generation of Near-Infrared images using transfer learning with Cyclegan
- Designed and trained an audio classifier for human presence detection using a MEMS microphone with 95%+ accuracy
- Implemented the object-oriented Microcam package in Python which runs on Raspberry Pi
- Implemented the internal communication protocol (bluetooth)
- Implemented the API and backend (Flask) as well as the frontend (Bootstrap) of the UI

### AirBEM

*An intelligent aerial vehicle platform for auditing thermal deficiencies for building energy retrofits (ARPA-E)*

- Contributed to model development of semantic segmentation for thermal anomaly detection
- Designed a performance metric for benchmarking the thermal anomaly detection applications
- Designed a thermal leakage segmentation method with adaptive thresholding using thermal images

### 3D Computer Vision

*Several algorithms and machine learning models for 3D aerial vehicle vision (PhD Study)*

- Currently developing a hierarchical graph network for semantic scene segmentation on Pytorch
- Developed a memory-efficient capsule network for 3D object classification
- Designed a door detection and safe landing area detection methods for indoor UAVs

## Selected Publications

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[J1] **B. Kakillioglu**, A. Ren, Y. Wang and S. Velipasalar, "3D Capsule Networks for Object Classification With Weight Pruning," in IEEE Access, vol. 8, pp. 27393-27405, 2020

[J2] T. Rakha, A. Liberty, A. Gorodetsky, **B. Kakillioglu** and S. Velipasalar, "Heat Mapping Drones: An Autonomous Computer-Vision-Based Procedure for Building Envelope Inspection Using Unmanned Aerial Systems (UAS)," 2018 Technology|Architecture + Design, 2:1, 30-44

[C1] **B. Kakillioglu**, J. Wang, S. Velipasalar, A. Janani and E. Koch, "3D Sensor-Based UAV Localization for Bridge Inspection," 2019 53rd Asilomar Conference on Signals, Systems, and Computers, Pacific Grove, CA, USA, 2019, pp. 1926-1930.

[C2] **B. Kakillioglu**, S. Velipasalar, and T. Rakha. "Autonomous heat leakage detection from unmanned aerial vehicle-mounted thermal cameras." In Proceedings of the 12th International Conference on Distributed Smart Cameras, pp. 1-6. 2018.

[C3] **B. Kakillioglu** and S. Velipasalar, "Autonomous altitude measurement and landing area detection for indoor UAV applications," 2016 13th IEEE International Conference on Advanced Video and Signal Based Surveillance (AVSS), Colorado Springs, CO, 2016, pp. 166-172.

[C4] **B. Kakillioglu**, K. Ozcan and S. Velipasalar, "Doorway detection for autonomous indoor navigation of unmanned vehicles," 2016 IEEE International Conference on Image Processing (ICIP), Phoenix, AZ, 2016, pp. 3837-3841.