

CONTACT  
INFORMATION

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## INTEREST

Broadly, I am interested in designing machine learning algorithms which can process large-amount of multi-modal information with no/weak supervision. I have designed algorithms which scaled to tens of thousands of videos, point clouds with hundreds of millions of points and deployed them in robots, mobile devices and homes. I mostly worked on classification/parsing/segmentation problems in robot perception and mobile multimedia, using graphical models, metric learning and deep learning. In general, I am interested in any problem related to machine learning and large-scale data.

## EDUCATION

**Cornell University**, Ithaca, NY

December 2016

PhD in Computer Engineering

GPA: 4.00/4.00

Advisor: Ashutosh Saxena

Thesis: Learning from large-scale visual data for robots.

**Middle East Technical University**, Ankara, Turkey

June 2012

BS and MS in Electrical and Electronics Engineering

GPA: 3.93(MS), 3.88(BS)/4.00

Advisor: Aydın Alatan

An Efficient Graph-Theoretical Approach for Interactive Mobile Image & Video Segmentation

HONOURS  
AND AWARDS

NIPS 2017 - Bayesian Deep Learning Workshop Paper Award

2017

10 Breakthrough Technologies in 2016 by MIT Technology Review (Robots sharing knowledge)

2016

Jacobs Scholar Fellowship

2013

METU Best Master Thesis Award

2013

IEEE-eXtreme Programming Competition 5.0, (1st place Nationwide, 8th place Europe)

2012

METU Electrical Engineering Bachelor Thesis Award

2010

XPLORE New Automation Award (Top 17 projects worldwide in the category of recreation)

2009

IEEE Foundation Grant Recipient

2009

Dr Bulent Kerim Altay Award (given by the METU EE Department to the student who ranks first in his/her class)

2006 – 2007

National Olympiad in Informatics (Regional degree - 1st place)

2004

PROFESSIONAL  
EXPERIENCE

**Intel Labs**, Munich, Germany

February 2018 – Present

Post-Doctoral Researcher

Advised by Vladlen Koltun.

Worked on machine learnings which goes beyond supervised learning using smart teachers. Developed a Bayesian deep learning method which can utilize any privileged information while training an arbitrary neural network. Theoretically showed that it is possible to learn with  $\mathcal{O}(n)$  rate (in generalization error sense) using privileged information in oracle sense. (*in CVPR 2018*).

Developed a multi-objective optimization based method for multi-task learning. The resulting method provably finds a Pareto optimal point of given tasks (*in Submission*).

Developed a domain generalisation method using distributionally robust optimization. The proposed method learns an ensemble of models such that each correspond to different bias variance trade-off. In test time, the developed method selects and uses the right bias-variance trade-off (*in Submission*).

**Brain of Things** (<http://caspar.ai>), Redwood City, CA  
Machine Learning Consultant

December 2015 – July 2016

Interviewed engineers, designed system architectures and helped scaling the company from 1 house to 100+ houses all over California.

On the technical side; developed a multi-sensor machine learning algorithm which can track humans in a smart-environment using motion sensors and cameras. And, developed machine learning algorithms to learn human preferences in a smart environment.

**Artificial Intelligence Laboratory**, Stanford University, CA  
Post Doctoral Researcher (December 2016 - December 2017)  
Visiting Scholar (August 2014 - December 2016)

August 2014 – December 2017

Advised by Prof. Silvio Savarese.

Developed a structured parsing algorithm which can parse large point clouds of buildings into its semantic elements near real time. (*in CVPR 2016*).

Developed a large-scale, unsupervised video understanding framework using category specific youtube videos. The resulting algorithm can parse large collection of videos by discovering the underlying activities. (*in ICCV 2015*).

Worked on the geometrical understanding of deep learning architectures. Studied the geometry of feature spaces learned by convolutional neural networks (CNNs) which resulted in a theoretical understanding of generalization properties of CNNs *in ICLR 2018*. Further extended these results to transfer learning problems and developed a domain adaptation (*in NIPS 2016*) and active learning algorithm (*in ICLR 2018*) with theoretical guarantees.

**Robot Learning Research Group**, Cornell University, Ithaca, NY  
Research Assistant

August 2013 – December 2016

Advised by Prof. Ashutosh Saxena.

Studied graphical models from an efficiency perspective. Developed a geometric framework for efficient and explicit approximations of probability distributions over high dimensional spaces. Using the developed geometric understanding, proposed a novel inference mechanism -rCRF- in order to efficiently, accurately and explicitly represent a belief over any CRF model using structured diversity (*in RSS 2015 and an invited talk at AAAI 2016*). Further extended the developed geometric approach to efficient learning algorithm for graphical models with hidden nodes and non-parametric priors (*in the process of submission*).

Designed a large-scale multi-modal processing and storage system which scales to millions of videos, images and text as a part of the RoboBrain ([www.robobrain.me](http://www.robobrain.me)) project (*in ISRR 2015*).

**Multimedia Research Group**, METU, Ankara, Turkey  
Research Assistant

February 2011 – August 2013

*Worked in collaboration with Nokia Research Center, Tampere.*

Advised by Prof. Aydın Alatan (METU) and Dr. Kemal Ugur (Nokia Research Center, Tampere).

Developed an efficient interactive video segmentation algorithm via Markov random field energy propagation. Proposed a dynamic method to reuse residual-flows in filtering scenario for time efficiency (*in Transaction on Multimedia 2013*).

Developed a method efficiently solving interactive image segmentation problem via dynamic and iterative graph-cuts. Furthermore, improved the robustness of the method via automatic correction of user interaction errors (*in ACM-MM-W 2012, ICIP 2012*).

Involved in patent application and deployed part of the developed algorithms to production on Nokia N9.

**Siemens Corporate Research**, Princeton, NJ  
Research Intern in Imaging, Analytics and Informatics Department  
Advised by Dr. Bogdan Georgescu and Dr. Yang Wang

August 2010 – February 2011

Contributed to the development of the LVA(Left Ventricle Anatomy) software. Developed a learning based method for automatic classification of volume contrast echocardiography data.

**Signal Processing Laboratory 4**, EPFL, Switzerland  
Research Intern  
Advised by Prof. Pascal Frossard

July 2009 – September 2009

Worked on the similarity analysis of observations under affine projections. Developed a distance metric to be used in multi-view classification problems. Implemented and tested proposed distance metric in graph based multi-view object classification algorithm.

#### PRE-PRINTS

O. Sener, V. Koltun. Multi-Task Learning as Multi-Objective Optimization. In *Submission*.

R. Volpi\*, H. Namkoong\*, O. Sener, J. Duchi, V. Murino, S. Savarese. Generalizing to Unseen Domains via Adversarial Data Augmentation. In *Submission*.

H. Wang, S. Pirk, O. Sener, E. Yumer, V. Kim, L. Guibas. Learning to Generate Multi-Step Human-Object Interactions from Videos. In *Submission*.

#### PEER-REVIEWED PUBLICATIONS

O. Sener, S. Savarese. Active Learning for Convolutional Neural Networks: A Core-Set Approach. In *International Conference on Learning Representations, ICLR 2018*.

J. Lambert\*, O. Sener\*, S. Savarese. Deep Learning under Privileged Information Using Heteroscedastic Dropout. In *Computer Vision and Pattern Recognition, CVPR 2018 (spotlight oral)*.

T. Standley, O. Sener, D. Chen, S. Savarese. Estimating the Mass of an Object from Its Image. In *Conference on Robot Learning, CORL 2017*.

R. Luo, O. Sener, S. Savarese. Scene Semantic Reconstruction from Egocentric RGB-D-Thermal Videos. In *3D Vision, 3DV 2017*.

O. Sener, H. O. Song, A. Saxena, S. Savarese. Learning Transferrable Representations for Unsupervised Domain Adaptation. In *Neural Information Processing Systems, NIPS 2016*.

I. Armeni, O. Sener, A. Zamir, S. Savarese. 3D Semantic Parsing of Large-Scale Indoor Spaces. In *Computer Vision and Pattern Recognition, CVPR 2016 (oral)*.

O. Sener, A. Zamir, S. Savarese, A. Saxena. Unsupervised Semantic Parsing of Video Collections. In *International Conference on Computer Vision, ICCV 2015*.

O. Sener, A. Saxena. rCRF: Recursive Estimation of the Beliefs over CRFs for Activity Analysis in RGB-D Videos. In *Robotics Science and Systems, RSS 2015*.

C. Wu, J. Zhang, O. Sener, B. Selman, S. Savarese, A. Saxena. Watch-n-Patch: Unsupervised Learning of Actions and Relations. In *Pattern Analysis and Machine Intelligence, IEEE Transactions on*, vol. PP, no. 99, pp.

A. Saxena, A. Jain, O. Sener, A. Jami, DK. Misra, HS. Koppula. RoboBrain: Large-Scale Knowledge Engine for Robots. In *International Symposium on Robotics Research, ISRR 2015*.

O. Sener, K. Ugur, A. A. Alatan. Efficient MRF Energy Propagation for Video Segmentation via Bilateral Filters. In *Multimedia, IEEE Transactions on*, vol. 16, no. 5, pp. 1292–1302, Aug 2014.

Y. Aksoy, O. Sener, A. A. Alatan, K. Ugur. Interactive 2d-3d image conversion for mobile devices. In *IEEE International Conference on Image Processing*, 2012.

O. Sener, K. Ugur, A. A. Alatan. Error-tolerant interactive image segmentation using dynamic and iterated graph-cuts. In *Proceedings of the 2nd international workshop on Interactive multimedia on mobile and portable devices*, ACM Multimedia Workshop.

O. Sener, K. Ugur, A. A. Alatan. Robust interactive segmentation via coloring. In *Proceedings of the 1st International Workshop on Visual Interfaces for Ground Truth Collection in Computer Vision Applications*, ACM AVI 2012 Workshop.

PATENTS	<p>I. Armeni, O. Sener, A. R. Zamir, M. Fischer, and S. Savarese. Systems and Methods for Performing Three-Dimensional Semantic Parsing of Indoor Spaces. United States Patent Application</p> <p>A. Saxena, HS. Koppula, C. Wu, and O. Sener. Automatically learning and controlling connected devices. United States Patent Application, 20160248847</p> <p>K. Ugur, O. Sener, E. Gundogdu, and A. Alatan. Interactive Image/Video Segmentation For Mobile 2D/3D Conversion. International Patent Application, WO 2013144418 A1</p>		
RELATED COURSEWORK	<p><b>Machine Learning:</b> Advanced Topics in Machine Learning<sup>c</sup>, Algorithmic Perspective on Machine Learning<sup>s</sup>, Hierarchies of Integer Programming Relaxations<sup>s</sup>, Pattern Recognition<sup>m</sup>, Artificial Intelligence<sup>m</sup>, Statistical Techniques in Mobile Robotics<sup>m</sup></p> <p><b>Probability and Stochastic Processes:</b> Measure Theoretic Probability<sup>c</sup>, Applied Stochastic Processes<sup>c</sup>, Signal Analysis and Processing<sup>m</sup>, Adaptive Signal Processing<sup>m</sup>, Information Theory<sup>m</sup></p> <p><b>Analysis and Algebra:</b> Analysis<sup>c</sup>, Matrix Computations<sup>c</sup>, Linear System Theory<sup>m</sup>, Functional Analysis and Operator Theory with App.<sup>m</sup></p> <p><i>Offered by <sup>s</sup>Stanford University, <sup>c</sup>Cornell University and <sup>m</sup>Middle East Technical University.</i></p>		
TEACHING EXPERIENCE	<p><b>Cornell University</b>, Ithaca, NY January 2014 – May 2014  Department of Electrical and Computer Engineering  Teaching Assistant for Embedded Systems</p> <p><b>Anonymous Student Evaluations (Average Rating: 4.33/5.0)</b>  <i>"Great attitude, clear command over material. Carefully and clearly explains concepts."</i></p> <p><i>"Ozan is very attentive to students who come to his office hours. He is quick to identify problems and guide students to the right solution. He knows when there are a lot of students waiting for help and does his best to attend to as many as he can."</i></p> <p><i>"Explained lab-related concepts well. Friendly and personable guy."</i></p> <p><i>"A very effective communicator and is able to explain things very clearly."</i></p> <p><b>Middle East Technical University</b>, Ankara, Turkey January 2012 – June 2013  Department of Electrical and Electronics Engineering  Teaching Assistant for Digital Signal Processing, Computer Architecture and Data Structures</p>		
PROFESSIONAL ACTIVITIES	<p><b>Service:</b> Reviewer for NIPS, ICCV, CVPR, ICRA, WACV, Signal Processing Letters, T-MM, T-PAMI, CVIU. Organizer for Workshop on Negative Results in Computer Vision in conjunction CVPR 2017.</p> <p><b>Memberships:</b> Student member of IEEE (since 2006) and ACM (since 2008)</p> <p><b>Leadership:</b> Chairperson of IEEE Computer Society METU Student Branch (2007-2008)</p>		
SKILLS	<p>Python (proficient packages: Tensorflow and Numpy), C/C++ (proficient libraries: OpenCV and Boost), Matlab, <math>\text{\LaTeX}</math>, Git, GNU/Linux (personal usage and system administration on Debian based distros).</p>		
INTERESTS	<p><b>Juggling</b> (performed at METU Juggling Convention 2011&amp;2012, attended European Juggling Convention 2011&amp;2012, Founded Cornell Juggling Club), <b>Math Puzzles &amp; Games</b> (game designer for EU Youth Action Project - Puzzle Puzzle 2007, finalist for World Puzzle Federation - Turkey Competition ).</p>		
CITIZENSHIP	Turkish	LANGUAGE English and Turkish	DATE OF BIRTH September 07, 1988