Ozan Sener,

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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 December 2015 – July 2016
Machine Learning Consultant

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 August 2014 – December 2017
Post Doctoral Researcher (December 2016 - December 2017)
Visiting Scholar (August 2014 - December 2016)

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 August 2013 – December 2016
Research Assistant

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*) project *(in ISRR 2015)*.

Multimedia Research Group, METU, Ankara, Turkey February 2011 – August 2013
Research Assistant

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 — August 2010 – February 2011
Research Intern in Imaging, Analytics and Informatics Department
Advised by Dr. Bogdan Georgescu and Dr. Yang Wang

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

PRE-PRINTS

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

SELECTED 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)*.

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

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*.

PATENTS

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

A. Saxena, HS. Koppula, C. Wu, and O. Sener. Automatically learning and controlling connected devices. United States Patent Application, 20160248847

K. Ugur, O. Sener, E. Gundogdu, and A. Alatan. Interactive Image/Video Segmentation For Mobile 2D/3D Conversion. International Patent Application, WO 2013144418 A1

RELATED COURSEWORK

Machine Learning: Advanced Topics in Machine Learning [c], Algorithmic Perspective on Machine Learning [s], Hierarchies of Integer Programming Relaxations [s], Pattern Recognition [m], Artificial Intelligence [m], Statistical Techniques in Mobile Robotics [m]

Probability and Stochastic Processes: Measure Theoretic Probability [c], Applied Stochastic Processes [c], Signal Analysis and Processing [m], Adaptive Signal Processing [m], Information Theory [m]

Analysis and Algebra: Analysis [c], Matrix Computations [c], Linear System Theory [m], Functional Analysis and Operator Theory with App. [m]

Offered by [s]Stanford University, [c]Cornell University and [m]Middle East Technical University.

SKILLS

Python (proficient packages: Tensorflow and Numpy), C/C++ (proficient libraries: OpenCV and Boost), Matlab, LaTeX, Git, GNU/Linux (personal usage and system administration on Debian based distros).

INTERESTS

Juggling (performed at METU Juggling Convention 2011&2012, attended European Juggling Convention 2011&2012, Founded Cornell Juggling Club), **Math Puzzles & Games** (game designer for EU Youth Action Project - Puzzle Puzzle 2007, finalist for World Puzzle Federation - Turkey Competition).

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