Ilja Kuzborskij

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My current research interest is in data-dependent analysis of learning algorithms. In particular I am interested in analysis of deep learning problems, stochastic optimization, online learning, nonparametric prediction, and efficient forms of transfer learning.

EDUCATION

École polytechnique fèdèrale de Lausanne (EPFL)　　2012 -
PhD student, Electrical Engineering
Thesis: *Hypothesis Transfer Learning*
Advisors: Prof. Barbara Caputo and Prof. Francesco Orabona

University of Edinburgh　　2010 - 2011
MSc Artificial Intelligence
Thesis: *Large-Scale Pattern Mining of Computer Program Source Code*
Advisor: Prof. Charles Sutton

EXPERIENCE

IST Austria (Scientific Visitor)　　Oct 2016 - Apr 2017
Data-Dependent Generalization Bounds for Non-convex Problems
Advisor: Prof. Christoph Lampert

Analyzed learning ability of SGD algorithm widely used in deep learning in a data-dependent setting. Derived theory which motivates new transfer learning algorithms, and wrote efficient software to compute top Hessian eigenvalue of deep neural nets.

EPFL and Idiap Research Institute (PhD student)　　Sep 2012 - present
Hypothesis Transfer Learning
Advisor: Prof. Barbara Caputo and Prof. Francesco Orabona

Designed and analyzed efficient transfer learning algorithms that can learn much faster by leveraging on auxiliary pre-trained models. Developed new theory that corroborates success of many previous works in the area, and designed novel algorithms that are able to learn efficiently by reusing thousands of auxiliary models.
Designed and analyzed online and stochastic locally-linear learning algorithms.

University of Rome La Sapienza (Research Assistant)　　Oct 2014 - present
Hypothesis Transfer Learning and Locally-Linear Learning
Advisor: Prof. Barbara Caputo

In collaboration with Prof. Nicolò Cesa-Bianchi designed and analyzed online learning algorithm that learns in rich (nonparametric) environments, and simultaneously reduces curse of dimensionality. Designed and analyzed randomized greedy transfer learning algorithms that can learn faster by leveraging on auxiliary models.

Toyota Technological Institute at Chicago (Intern) Summer 2013

Hypothesis Transfer Learning

Supervisor: Prof. Francesco Orabona

Analyzed the family of transfer learning algorithms that learn by reusing auxiliary pre-trained models induced from previous tasks. Identified key quantitative characteristics of relatedness between new and previous tasks, and developed theory explicitating this quantity, supporting theoretically many previous works in the literature.

Idiap Research Institute (Intern) Jan 2012 - Sep 2012

Electromyography Classification with Large Number of Grasps

Supervisor: Prof. Barbara Caputo

Conducted evaluation on feasibility of recognition of 52 hand grasps from surface electromyography to investigate potential application in robotic hand prosthetics.

CERN (Intern) Summer 2009

Supervisor: Dr. Vincenzo Innocente

Developed a domain-specific information retrieval and natural language-based system for semi-automatic software error resolution used in the CMS experiment.

PUBLICATIONS

Journal Papers

I. Kuzborskij and F. Orabona. Fast Rates by Transferring from Auxiliary Hypotheses. *Machine Learning, Springer, 2017.*

I. Kuzborskij, F. Orabona, and B. Caputo. Scalable Greedy Algorithms for Transfer Learning. *Computer Vision and Image Understanding, Elsevier, 2016.*

M. Atzori, A. Gijsberts, **I. Kuzborskij**, S. Heynen, A. Mittaz Hager, O. Deriaz, C. Castellini, H. Müller, and B. Caputo. Characterization of a Benchmark Database for Myoelectric Movement Classification. *IEEE Transactions on Neural Systems and Rehabilitation Engineering (TNSRE)*, 2014.

Peer Reviewed Conferences

I. Kuzborskij and N. Cesa-Bianchi. Nonparametric Online Regression while Learning the Metric. *To appear in Conference on Neural Information Processing Systems (NIPS), 2017.*

I. Kuzborskij, F. M. Carlucci, and B. Caputo. When Naïve Bayes Nearest Neighbors Meet Convolutional Neural Networks. In *Computer Vision and Pattern Recognition (CVPR)*, 2016.

I. Kuzborskij, B. Caputo, and F. Orabona. Transfer Learning through Greedy Subset Selection. In *International Conference on Image Analysis and Processing (ICIAP)*, Oral presentation, **Best Paper Award**, 2015.

I. Kuzborskij and F. Orabona. Stability and Hypothesis Transfer Learning. In *International Conference on Machine Learning (ICML)*, 2013.

I. Kuzborskij, F. Orabona, and B. Caputo. From N to N+1: Multiclass Transfer Incremental Learning. In *Computer Vision and Pattern Recognition (CVPR)*, 2013.

I. Kuzborskij, A. Gijsberts, and B. Caputo. On the Challenge of Classifying 52 Hand Movements from Surface Electromyography. In *Engineering in Medicine and Biology Society (EMBC)*, 2012.

Technical Reports

I. Kuzborskij and C. H. Lampert. Data-Dependent Stability of Stochastic Gradient Descent. *arXiv preprint arXiv:1703.01678, 2017.*

ACTIVITIES

Reviewer

International Conference on Machine Learning (ICML)	2014-2017
Conference on Neural Information Processing Systems (NIPS)	2017
Journal of Machine Learning Research (JMLR)	2017
Conference On Learning Theory (COLT)	2017
International Conference on Artificial Intelligence and Statistics (AISTATS)	2016/17
International Conference on Algorithmic Learning Theory (ALT)	2016
Elsevier Journal on Computer Vision and Image Understanding (CVIU)	2015-2017

Teaching

Artificial Intelligence and Machine Learning 2015/16
Class of 176 student, TA and substitute for ML part, designed homework assignments, graded reports.

HONORS	Best Paper Award	
	at the International Conference on Image Analysis and Processing	2015
	Postgraduate Tuition Award, Student Awards Agency for Scotland	2010

TECHNICAL SKILLS

Machine Learning: empirical risk minimization, neural networks, SVMs, regularization, kernel methods, locally-linear methods, feature selection.

Optimization: (Stochastic) gradient methods, proximal methods, elements of submodular optimization.

Learning theory: algorithmic stability, concentration bounds, uniform deviation bounds, Rademacher complexity, tools from online and nonparametric analysis.

Programming: python (numpy, scipy, scikit-learn), C++, grid computation (SGE / MapReduce).

REFEREES

Prof. Barbara Caputo
University of Rome La Sapienza
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Prof. Francesco Orabona
Stony Brook University
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Prof. Nicolò Cesa-Bianchi
Università degli Studi di Milano
nicolo.cesa-bianchi@unimi.it

Prof. Christoph H. Lampert
IST Austria
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