Learning Theory - Candidate Papers for Final Project

Spring 2019

Latest version: April 5, 2019 (first version: February 14, 2019)

1 One-Person Projects

1.1 PAC-Learning, General

1. *PAC Learning with Irrelevant Attributes*, Aditi Dhagat and Lisa Hellerstein

2. *Learning boolean functions in an infinite attribute space*, Avrim Blum
   (Happy to discuss this as a two-person project if you intend to provide more details on the proofs.)

3. *Attribute-Efficient Evolvability of Linear Functions*, Elaine Angelino and Varun Kanade
   (I am happy to discuss this as a multi-person project as well.)

4. *Smart PAC-Learners*, Hans U. Simon
   (I am happy to discuss this as a multi-person project as well.)

5. *Lower bounds for PAC learning with queries*, György Turán

1.2 PAC-Learning, Noise


2. *On Learning Conjunctions with Malicious Noise*, Yishay Mansour and Michal Parnas

   (I am happy to discuss this as a multi-person project; an extended version is available here.)

4. *Statistical queries and faulty PAC oracles*, Scott E. Decatur


1.3 PAC-Learning, Distribution-Dependent Learning and Nonuniform Learnability

1. *Learnability with respect to fixed distributions*, Gyora M. Benedek and Alon Itai

2. *Nonuniform Learnability*, Gyora M. Benedek and Alon Itai

1.4 Active Learning

1. *Two faces of active learning*, Sanjoy Dasgupta

2. *Coarse sample complexity bounds for active learning*, Sanjoy Dasgupta

3. *Analysis of a greedy active learning strategy*, Sanjoy Dasgupta

4. *Diameter-Based Active Learning*, Christopher Tosh and Sanjoy Dasgupta
   (I am happy to discuss this as a multi-person project.)
1.5 Teaching
1. *Curriculum Learning*, Yoshua Bengio, Jérôme Louradour, Ronan Collobert, and Jason Weston

2. *Teaching with IMPACT*, Carl Trimbach and Michael L. Littman. There is also a preliminary version of that paper [here](#). (I am happy to discuss this as a multi-person project as well.)


1.6 Analogical Reasoning
1. *Analogical classification: A new way to deal with examples*, Myriam Bounhas, and Henri Prade and Gilles Richard


1.7 Target Changes During Learning
1. *Tracking Drifting Concepts By Minimizing Disagreements*, David P. Helmbold and Philip M. Long


1.8 Local Search Methods
1. *Perhaps Not a Free Lunch But At Least a Free Appetizer*, Stefan Droste, Thomas Jansen and Ingo Wegener

2. *Real royal road functions – where crossover is provably essential*, Thomas Jansen and Ingo Wegener

3. *PAC Learning and Genetic Programming*, Timo Kötzing, Frank Neumann, and Reto Spöhel


5. *On the Choice of the Mutation Probability for the (1+1) EA*, Thomas Jansen and Ingo Wegener


1.9 Levels-Based Optimization

2. *General Lower Bounds for the Running Time of Evolutionary Algorithms*, Dirk Sudholt (I am happy to discuss this as a multi-person project as well; an extended version is available on arXiv.)

1.10 Recommender Systems
1. *Learning the parts of objects by non-negative matrix factorization*, Daniel D. Lee and H. Sebastian Seung (implementation and experiments needed)

2. *Pairwise Interaction Tensor Factorization for Personalized Tag Recommendation*, Steffen Rendle and Lars Schmidt-Thieme

3. *Challenging the Long Tail Recommendation*, Hongzhi Yin, Bin Cui, Jing Li, Junjie Yao, and Chen Chen
1.11 Helpful

1. *Sorting and Selection with Imprecise Comparisons*, Miklós Ajtai, Vitaly Feldman, Avinatan Hassidim, and Jelani Nelson
   (I am happy to discuss this as a multi-person project for the extended version that is available on arXiv.)

2. *An Elementary Proof of a Theorem of Johnson and Lindenstrauss*, Sanjoy Dasgupta and Anupam Gupta

1.12 Various


2. *Learning to Classify Incomplete Examples*, Dale Schuurmans and Russell Greiner

3. *A Confidence-Based Approach for Balancing Fairness and Accuracy*, Benjamin Fish, Jeremy Kun and Ádám D. Lelkes


5. *A Complete and Tight Average-Case Analysis of Learning Monomials*, Rüdiger Reischuk and Thomas Zeugmann

6. *Combining Labeled and Unlabeled Data with Co-Training*, Avrim Blum and Tom Mitchell
   (There is a related video lecture by Tom Mitchell here. Co-training is mentioned in the second part, but the entire lecture is very nice and relevant.)

2 Multi-Person Projects (2 to 3 People)

2.1 PAC-Learning, General

1. *Crowdsourced PAC Learning under Classification Noise*, Shelby Heinecke and Lev Reyzin


3. *Efficient PAC Learning from the Crowd*, Pranjal Awasthi, Avrim Blum, Nika Haghtalab and Yishay Mansour

4. *The Optimal Sample Complexity of PAC Learning*, Steve Hanneke

5. *Improved Algorithms for Collaborative PAC Learning*, Huy Lê Nguyên and Lydia Zakynthinou

2.2 PAC-Learning, Noise

1. *Learning From Noisy Examples*, Dana Angluin and Philip Laird

2. *PAC learning with nasty noise*, Nader H. Bshouty, Nadav Eiron and Eyal Kushilevitz

2.3 PAC-Learning, Distribution-Dependent Learning and Nonuniform Learnability


2. *Exact learning of random DNF over the uniform distribution*, Linda Sellie
2.4 Robustness and Security

1. *Can Adversarially Robust Learning Leverage Computational Hardness?*, Saeed Mahloujifar and Mohammad Mahmoody

2. *Multi-party Poisoning through Generalized p-Tampering*, Saeed Mahloujifar, Mohammad Mahmoody, and Ameer Mohammed


4. *Evading classifiers in discrete domains with provable optimality guarantees*, Bogdan Kulynych, Jamie Hayes, Nikita Samarin, and Carmela Troncoso

5. *Theoretical evidence for adversarial robustness through randomization: the case of the Exponential family*, Rafael Pinot, Laurent Meunier, Alexandre Araujo, Hisashi Kashima, Florian Yger, Cédric Gouy-Pailler, and Jamal Atif

6. *Learning and inference in the presence of corrupted inputs*, Uriel Feige, Yishay Mansour, and Robert E. Schapire

7. *Adversarial Online Learning with noise*, Alon Resler and Yishay Mansour

2.5 Active Learning

1. *Improving Generalization with Active Learning*, David Cohn, Les Atlas and Richard Ladner

2. *Efficient Semi-supervised and Active Learning of Disjunctions*, Maria-Florina Balcan, Christopher Berlind, Steven Ehrlich and Yingyu Liang

3. *Teaching Dimension and the Complexity of Active Learning*, Steve Hanneke

2.6 Query Learning

1. *Learning with Queries but Incomplete Information*, Robert H. Sloan and György Turán

2. *Malicious Omissions and Errors in Answers to Membership Queries*, Dana Angluin, Martins Krikis, Robert H. Sloan and György Turán

3. *Learning Conjunctions of Horn Clauses*, Dana Angluin, Michael Frazier and Leonard Pitt

4. *Learning Monotone DNF with an Incomplete Membership Oracle*, Dana Angluin and Donna K. Slonim

2.7 Teaching


2. *On the Complexity of Teaching*, Sally A. Goldman and Michael J. Kearns


2.8 Analogical Reasoning

1. *Analogical Dissimilarity: Definition, Algorithms and Two Experiments in Machine Learning*, Laurent Miclet, Sabri Bayoudh, and Arnaud Delhay
2.9 Target Changes During Learning

1. Learning Switching Concepts, Avrim Blum and Prasad Chalasani

2. Evolution with Drifting Targets, Varun Kanade, Leslie G. Valiant and Jennifer Wortman Vaughan

2.10 Local Search Methods

1. Running Time Analysis of the (1+1)-EA for OneMax and LeadingOnes under Bit-wise Noise, Chao Qian, Chao Bian, Wu Jiang, Ke Tang
   (There is an extended version with potentially more information on arXiv.)

2.11 Recommender Systems

1. Studying Recommendation Algorithms by Graph Analysis, Batul J. Mirza, Benjamin J. Keller, and Naren Ramakrishnan

2.12 Helpful

1. The Geometry of Generalized Binary Search, Robert D. Nowak

2. Mick Gets Some (the Odds Are on His Side), Vasek Chvátal and Bruce A. Reed

2.13 Various


2. Solving the multiple instance problem with axis-parallel rectangles, Thomas G. Dietterich, Richard H. Lathrop, and Tomás Lozano-Pérez

3. Fuzzy Decision Trees: Issues and Methods, Cezary Z. Janikow

4. Exploring learnability between exact and PAC, Nader H. Bshouty, Jeffrey C. Jackson and Christino Tamon

5. Learning with Attribute Costs, Haim Kaplan, Eyal Kushilevitz and Yishay Mansour

6. Learning by Distances, Shai Ben-David, Alon Itai, and Eyal Kushilevitz

7. Partial observability and learnability, Loizos Michael

8. Distributed Learning, Communication Complexity and Privacy, Maria-Florina Balcan, Avrim Blum, Shai Fine, and Yishay Mansour

9. Property Testing and Its Connection to Learning and Approximation, Oded Goldreich, Shafi Goldwasser, and Dana Ron
   (Only up to and including Section 4; that is, Part I of the paper in the first 23 pages.)