



# COLT 2017 Amsterdam

**Conference on Learning Theory**

July 7–10, 2017

Oudemanhuispoort 4–6  
University of Amsterdam  
The Netherlands



## Foreword

### Welcome to the 30th edition of the Conference on Learning Theory!

This year we will enjoy 2 invited talks, 18 long talks (20 min), 55 short talks (10 min) and on Saturday a poster session with 46 posters. We thank the plenary speakers, Scott Aaronson and Andrea Montanari, for their participation and we also thank and congratulate the different authors for their contributions.

Satyen Kale and Ohad Shamir  
program chairs

Welcome to Amsterdam! We are happy to show you its historic city centre on Saturday during the canal boat trip, which will take us to the I Dock restaurant for the conference banquet. Please be ready for **boarding at 18:30**. Feel free to approach us if you have any practical questions.

Wouter Koolen and Tim van Erven  
local arrangements chairs

### WiFi

If your home institution participates in Eduroam internet roaming, use the *Eduroam* network with your home institution's credentials, which provides the best connection. Otherwise use *UvA Open Wi-Fi*, which does not require a password.

### Q&A about Amsterdam

**Should I tip & how much?** In the Netherlands, prices include taxes and service, but leaving a small tip (5–10% of the total bill including taxes) is very common.

**Why is my credit card not accepted?** The Netherlands uses its own debit card system (called PIN). Many restaurants and larger shops do accept VISA and MasterCard, but check beforehand.

**What should I buy my family?** Stroopwafels (if you love them), drop (if you don't), cheese (Old Amsterdam is nice) or tulips. Get any of the first three from a supermarket like Albert Heijn. For tulips, there is a flower market near the Muntplein (very close to the conference venue). In a pinch on your way to the airport, check out the IAmsterdam Store in the back of Amsterdam Central Station.

## Getting Around

The conference venue is within walking distance from *tram stop Spui (Rokin)* for tram lines 4, 9, 14 and 24 and from metro stops *Waterlooplein* and *Nieuwmarkt* for metro lines 51, 53 and 54.

tram, bus, metro	plan your trip with Google maps; buy one-hour tickets for €2.90 at stations and in trams (but not in buses)
bicycle rent	see conference website
taxi	<a href="http://www.tcataxi.nl/en">www.tcataxi.nl/en</a> (+31 20 7 777 777) or use Uber
city portal for visitors	<a href="http://www.iamsterdam.com">www.iamsterdam.com</a>

For more information, see the conference website under *Venues* → *Directions*. The city also runs a portal with lots of information for visitors via [www.iamsterdam.com](http://www.iamsterdam.com).

## Organizers

### Program Chairs

Satyen Kale (Google)  
Ohad Shamir (Weizmann Institute of Science)

### Local Arrangements Chairs

Tim van Erven (Leiden University)  
Wouter Koolen (CWI, Amsterdam)

### Program Committee

Jacob Abernethy (University of Michigan)  
Alekh Agarwal (Microsoft Research)  
Shivani Agarwal (University of Pennsylvania)  
Shipra Agrawal (Columbia University)  
Anima Anandkumar (University of California Irvine)  
Peter Auer (Montanuniversitaet Leoben)  
Pranjal Awasthi (Rutgers University)  
Shai Ben-David (University of Waterloo)  
Alina Beygelzimer (Yahoo! Research)  
Guy Bresler (MIT)  
Sebastien Bubeck (Microsoft Research)  
Nicolò Cesa-Bianchi (University of Milan)  
Kamalika Chaudhuri (UC San Diego)  
Arnak Dalalyan (ENSAE)  
Amit Daniely (Hebrew University)  
Ilias Diakonikolas (University of Southern California)  
Alina Ene (Boston University)  
Dan Garber (Toyota Technological Institute, Chicago)  
Rong Ge (Duke University)

Claudio Gentile (Universita degli Studi dell'Insubria)  
Andras Gyrgy (Imperial College London)  
Steve Hanneke  
Moritz Hardt (Google)  
Elad Hazan (Princeton University)  
Daniel Hsu (Columbia University)  
Prateek Jain (Microsoft Research)  
Varun Kanade (Oxford University)  
Zohar Karnin (Yahoo Labs)  
Emilie Kaufmann (CRISTAL)  
Aryeh Kontorovich (Ben-Gurion University)  
Wouter Koolen (CWI, Amsterdam)  
Tomer Koren (Google)  
Samory Kpotufe (Princeton University)  
Phil Long (Sentient Technologies)  
Gabor Lugosi (ICREA and Pompeu Fabra University)  
Shie Mannor (Technion)  
Yishay Mansour (Tel-Aviv University and Microsoft)  
Mehryar Mohri (Courant Institute and Google Research)

## Foreword

Francesco Orabona (Stony Brook University)  
David Pal (Yahoo Labs)  
Vianney Perchet (ENS Paris-Saclay)  
Pradeep Ravikumar (Carnegie Mellon University)  
Philippe Rigollet (MIT)  
Aaron Roth (University of Pennsylvania)  
Sivan Sabato (Ben Gurion University)  
Rocco Servedio (Columbia University)  
Hans Ulrich Simon (Ruhr-Universität Bochum)  
Nati Srebro (Toyota Technological Institute Chicago)

### Publications Chair

Kamalika Chaudhuri (UC San Diego)

### Webmaster

Philippe Rigollet (MIT)

### Women in ML Theory Lunch

Kamalika Chaudhuri (UC San Diego)  
Lydia Fischer (HONDA Research Institute Europe)

### Organizational Support



UNIVERSITEIT VAN AMSTERDAM

Karthik Sridharan (Cornell University)  
Csaba Szepesvari (University of Alberta)  
Matus Telgarsky (University of Illinois at Urbana-Champaign)  
Ambuj Tewari (University of Michigan)  
Ruth Urner (Max Planck Institute for Intelligent Systems)  
Tim van Erven (Leiden University)  
Yihong Wu (Yale University)  
Sandra Zilles (University of Regina)

### Open Problems Chair

Elad Hazan (Princeton University)

### Volunteers

Rianne de Heide (CWI, Amsterdam)  
Dirk van der Hoeven (Leiden University)  
Raphaël Deswarte (École Polytechnique)  
Jonas Haslbeck (University of Amsterdam)

## Thanks to Our Sponsors

We gratefully acknowledge the generous support of our sponsors, which has made it possible to keep the registration fees at the same levels as previous years:

Adobe  
Intel  
Microsoft  
Google  
IBM Research  
The Voleon Group

Mobileye  
Machine Learning Journal  
The City of Amsterdam  
Mark Fulk Foundation  
Textkernel

## Program at a Glance

<i>Thursday</i>	18:00–20:00	welcome reception + registration
<i>Friday</i>	08:00–10:00	registration
	08:55–18:00	sessions in room D0.08
	12:35–14:30	women in ML theory lunch in room A0.09
<i>Saturday</i>	08:30–09:00	registration
	09:00–15:40	sessions in room D0.08
	13:50–14:50	business meeting in room D0.08
	15:40–18:00	posters in Atrium building
	18:30–23:00	canal boat trip + banquet
<i>Sunday</i>	08:30–09:00	registration
	09:00–18:30	sessions in room D0.08
<i>Monday</i>	09:00–12:35	sessions in room D0.08

## Thursday, July 6th

**18:00–20:00 Welcome Reception and Registration**

## Friday, July 7th

**08:00–10:00 Registration**

**08:55–09:00 Opening Remarks**

**09:00–10:00 Session 5: Adaptivity and Human-centric Learning**

- 09:00 Generalization for Adaptively-chosen Estimators via Stable Median. *Vitaly Feldman and Thomas Steinke.*
- 09:20 Learning Non-Discriminatory Predictors. *Blake Woodworth, Suriya Gunasekar, Mesrob I. Ohannessian and Nathan Srebro.*
- 09:40 The Price of Selection in Differential Privacy. *Mitali Bafna and Jonathan Ullman.*
- 09:50 Efficient PAC Learning from the Crowd. *Pranjal Awasthi, Avrim Blum, Nika Haghtalab and Yishay Mansour.*

**10:00–10:20 Coffee Break**

**10:20–11:20 Session 6: Langevin Dynamics and Non-Convex Optimization**

- 10:20 A Hitting Time Analysis of Stochastic Gradient Langevin Dynamics (**Best Paper Award**).  
*Yuchen Zhang, Percy Liang and Moses Charikar.*
- 10:40 Non-Convex Learning via Stochastic Gradient Langevin Dynamics: A Nonasymptotic Analysis. *Maxim Raginsky, Alexander Rakhlin and Matus Telgarsky.*
- 10:50 Further and stronger analogy between sampling and optimization: Langevin Monte Carlo and gradient descent. *Arnak Dalalyan.*
- 11:00 Sampling from a log-concave distribution with compact support with proximal Langevin Monte Carlo. *Nicolas Brosse, Alain Durmus, Eric Moulines and Marcelo Pereyra.*
- 11:10 Fast Rates for Empirical Risk Minimization of Strict Saddle Problems. *Alon Gonen and Shai Shalev-Shwartz.*

**11:20–11:35 Coffee Break**

**11:35–12:35 Session 7: Invited Talk: Scott Aaronson (UT Austin)**

**12:35–14:30 Lunch Break (including Women in Machine Learning Theory Lunch in room A0.09)**

**14:30–15:30 Session 8: Unsupervised Learning**

- 14:30 Sample complexity of population recovery. *Yury Polyanskiy, Ananda Theertha Suresh and Yihong Wu.*
- 14:50 Noisy Population Recovery from Unknown Noise. *Shachar Lovett and Jiapeng Zhang.*
- 15:00 Learning Multivariate Log-concave Distributions. *Ilias Diakonikolas, Daniel Kane and Alistair Stewart.*
- 15:10 Ten Steps of EM Suffice for Mixtures of Two Gaussians. *Constantinos Daskalakis, Manolis Zampetakis and Christos Tzamos.*
- 15:20 The Hidden Hubs Problem. *Ravi Kannan and Santosh Vempala.*

**15:30–16:00 Coffee Break**

**16:00–17:00 Session 9: Bandits I**

- 16:00 Sparse Stochastic Bandits. *Joon Kwon, Vianney Perchet and Claire Vernade.*
- 16:10 An Improved Parametrization and Analysis of the EXP3++ Algorithm for Stochastic and Adversarial Bandits. *Yevgeny Seldin and Gabor Lugosi.*

- 16:20 Corraling a Band of Bandit Algorithms. *Alekh Agarwal, Haipeng Luo, Behnam Neyshabur and Robert Schapire.*
- 16:30 Lower Bounds on Regret for Noisy Gaussian Process Bandit Optimization. *Jonathan Scarlett, Ilija Bogunovic and Volkan Cevher.*
- 16:40 Towards Instance Optimal Bounds for Best Arm Identification. *Lijie Chen, Jian Li and Mingda Qiao.*
- 16:50 Bandits with Movement Costs and Adaptive Pricing. *Tomer Koren, Roi Livni and Yishay Mansour.*

**17:00–17:20 Coffee Break**

**17:20–17:40 Session 10: Online Learning with Partial Feedback**

- 17:20 Tight Bounds for Bandit Combinatorial Optimization. *Alon Cohen, Tamir Hazan and Tomer Koren.*
- 17:30 Online Nonparametric Learning, Chaining, and the Role of Partial Feedback. *Nicolò Cesa-Bianchi, Pierre Gaillard, Claudio Gentile and Sébastien Gerchinovitz.*

**17:40–18:00 Session 11: Open Problems Session**

**Saturday, July 8th**

**08:30–09:00 Registration**

**09:00–10:00 Session 13: Robustness**

- 09:00 Adaptivity to Noise Parameters in Nonparametric Active Learning. *Andrea Locatelli, Alexandra Carpentier and Samory Kpotufe.*
- 09:20 Computationally Efficient Robust Estimation of Sparse Functionals. *Simon Du, Sivaraman Balakrishnan, Jerry Li and Aarti Singh.*
- 09:30 Robust Proper Learning for Mixtures of Gaussians via Systems of Polynomial Inequalities. *Jerry Li and Ludwig Schmidt.*
- 09:40 Ignoring Is a Bliss: Learning with Large Noise Through Reweighting-Minimization. *Daniel Vainsencher, Shie Mannor and Huan Xu.*
- 09:50 Thresholding based Efficient Outlier Robust PCA. *Yeshwanth Cherapanamjeri, Prateek Jain and Praneeth Netrapalli.*

**10:00–10:20 Coffee Break**

**10:20–11:20 Session 14: Combinatorial Optimization in Learning**

- 10:20 Solving SDPs for synchronization and MaxCut problems via the Grothendieck inequality. *Song Mei, Theodor Misiakiewicz, Andrea Montanari and Roberto Oliveira.*
- 10:40 Learning-Theoretic Foundations of Algorithm Configuration for Combinatorial Partitioning Problems. *Maria-Florina Balcan, Vaishnavh Nagarajan, Ellen Vitercik and Colin White.*
- 10:50 Greed Is Good: Near-Optimal Submodular Maximization via Greedy Optimization. *Moran Feldman, Christopher Harshaw and Amin Karbasi.*
- 11:00 Submodular Optimization under Noise. *Avinatan Hassidim and Yaron Singer.*
- 11:10 Correspondence retrieval. *Alexandr Andoni, Daniel Hsu, Kevin Shi and Xiaorui Sun.*

**11:20–11:35 Coffee Break**

**11:35–12:35 Session 15: Online Learning**

- 11:35 Online Learning Without Prior Information (**Best Student Paper Award**). *Ashok Cutkosky and Kwabena Boahen.*
- 11:55 On Equivalence of Martingale Tail Bounds and Deterministic Regret Inequalities. *Alexander Rakhlin and Karthik Sridharan.*
- 12:15 Fast rates for online learning in Linearly Solvable Markov Decision Processes. *Gergely Neu and Vicenç Gómez.*
- 12:25 ZIGZAG: A new approach to adaptive online learning. *Dylan Foster, Alexander Rakhlin and Karthik Sridharan.*

**12:35–13:50 Lunch Break**

**13:50–14:50 Session 16: Business Meeting**

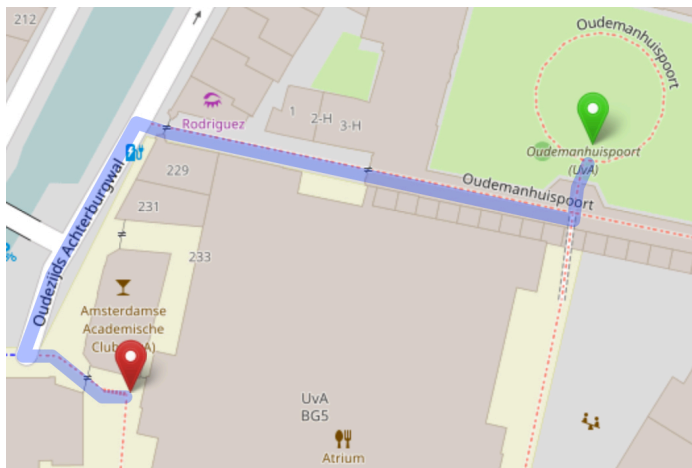
**14:50–15:40 Session 17: PAC Learning**

- 14:50 Efficient Co-Training of Linear Separators under Weak Dependence. *Avrim Blum and Yishay Mansour.*
- 15:10 Effective Semisupervised Learning on Manifolds. *Amir Globerson, Roi Livni and Shai Shalev-Shwartz.*
- 15:20 Quadratic Upper Bound for Recursive Teaching Dimension of Finite VC Classes. *Lunjia Hu, Ruihan Wu, Tianhong Li and Liwei Wang.*
- 15:30 Learning Disjunctions of Predicates. *Nader Bshouty, Dana Drachler Cohen, Martin Vechev and Eran Yahav.*



### 15:40–18:00 Session 18: Posters (including coffee)

The poster session is in the Atrium building, around the corner from the main conference venue. Poster presenters can put up their posters from 12:15. Pins will be provided.



Coffee and snacks will be served during the poster session.

### Posters

1. Learning Non-Discriminatory Predictors. *Blake Woodworth, Suriya Gunasekar, Mesrob I. Ohannessian and Nathan Srebro.*
2. Efficient PAC Learning from the Crowd. *Pranjal Awasthi, Avrim Blum, Nika Haghtalab and Yishay Mansour.*
3. Non-Convex Learning via Stochastic Gradient Langevin Dynamics: A Nonasymptotic Analysis. *Maxim Raginsky, Alexander Rakhlin and Matus Telgarsky.*
4. Further and stronger analogy between sampling and optimization: Langevin Monte Carlo and gradient descent. *Arnak Dalalyan.*
5. Sampling from a log-concave distribution with compact support with proximal Langevin Monte Carlo. *Nicolas Brosse, Alain Durmus, Eric Moulines and Marcelo Pereyra.*
6. Ten Steps of EM Suffice for Mixtures of Two Gaussians. *Constantinos Daskalakis, Manolis Zampetakis and Christos Tzamos.*
7. Sparse Stochastic Bandits. *Joon Kwon, Vianney Perchet and Claire Vernade.*
8. An Improved Parametrization and Analysis of the EXP3++ Algorithm for Stochastic and Adversarial Bandits. *Yevgeny Seldin and Gabor Lugosi.*
9. Corraling a Band of Bandit Algorithms. *Alekh Agarwal, Haipeng Luo, Behnam Neyshabur and Robert Schapire.*
10. Lower Bounds on Regret for Noisy Gaussian Process Bandit Optimization. *Jonathan Scarlett, Ilija Bogunovic and Volkan Cevher.*
11. Towards Instance Optimal Bounds for Best Arm Identification. *Lijie Chen, Jian Li and Mingda Qiao.*
12. Tight Bounds for Bandit Combinatorial Optimization. *Alon Cohen, Tamir Hazan and Tomer Koren.*

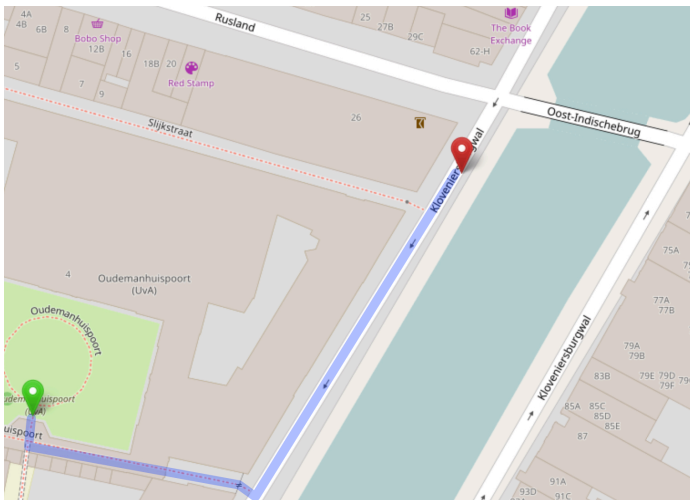
13. Online Nonparametric Learning, Chaining, and the Role of Partial Feedback. *Nicolò Cesa-Bianchi, Pierre Gaillard, Claudio Gentile and Sébastien Gerchinovitz.*
14. Computationally Efficient Robust Sparse Estimation in High Dimensions. *Sivaraman Balakrishnan, Simon S. Du, Jerry Li, Aarti Singh.*
15. Robust Proper Learning for Mixtures of Gaussians via Systems of Polynomial Inequalities. *Jerry Li and Ludwig Schmidt.*
16. Ignoring Is a Bliss: Learning with Large Noise Through Reweighting-Minimization. *Daniel Vainsencher, Shie Mannor and Huan Xu.*
17. Thresholding based Efficient Outlier Robust PCA. *Yeshwanth Cherapanamjeri, Prateek Jain and Praneeth Netrapalli.*
18. Solving SDPs for synchronization and MaxCut problems via the Grothendieck inequality. *Song Mei, Theodor Misiakiewicz, Andrea Montanari and Roberto Oliveira.*
19. Learning-Theoretic Foundations of Algorithm Configuration for Combinatorial Partitioning Problems. *Maria-Florina Balcan, Vaishnavh Nagarajan, Ellen Vitercik and Colin White.*
20. Greed Is Good: Near-Optimal Submodular Maximization via Greedy Optimization. *Moran Feldman, Christopher Harshaw and Amin Karbasi.*
21. Submodular Optimization under Noise. *Avinatan Hassidim and Yaron Singer.*
22. Correspondence retrieval. *Alexandr Andoni, Daniel Hsu, Kevin Shi and Xiaorui Sun.*
23. Fast rates for online learning in Linearly Solvable Markov Decision Processes. *Gergely Neu and Vicenç Gómez.*
24. ZIGZAG: A new approach to adaptive online learning. *Dylan Foster, Alexander Rakhlin and Karthik Sridharan.*
25. Quadratic Upper Bound for Recursive Teaching Dimension of Finite VC Classes. *Lunjia Hu, Ruihan Wu, Tianhong Li and Liwei Wang.*
26. Learning Disjunctions of Predicates. *Nader Bshouty, Dana Drachler Cohen, Martin Vechev and Eran Yahav.*
27. On Learning versus Refutation. *Salil Vadhan.*
28. Multi-Observation Elicitation. *Sebastian Casalaina-Martin, Rafael Frongillo, Tom Morgan and Bo Waggoner.*
29. Testing Bayesian Networks. *Clément Canonne, Ilias Diakonikolas, Daniel Kane and Alistair Stewart.*
30. Two-Sample Tests for Large Random Graphs using Network Statistics. *Debarghya Ghoshdastidar, Ulrike von Luxburg, Maurilio Gutzeit and Alexandra Carpentier.*
31. Empirical Risk Minimization for Stochastic Convex Optimization:  $O(1/n)$ - and  $O(1/n^2)$ -type of Risk Bounds. *Lijun Zhang, Tianbao Yang and Rong Jin.*
32. Stochastic Composite Least-Squares Regression with convergence rate  $O(1/n)$ . *Nicolas Flammarion and Francis Bach.*
33. A Unified Analysis of Stochastic Optimization Methods Using Jump System Theory and Quadratic Constraints. *Bin Hu, Peter Seiler and Anders Rantzer.*
34. Memory and Communication Efficient Distributed Stochastic Optimization with Minibatch Prox. *Jialei Wang, Weiran Wang and Nathan Srebro.*
35. The Sample Complexity of Optimizing a Convex Function. *Eric Balkanski and Yaron Singer.*
36. Nearly Optimal Sampling Algorithms for Combinatorial Pure Exploration. *Lijie Chen, Anupam Gupta, Jian Li, Mingda Qiao and Ruosong Wang.*
37. Thompson Sampling for the MNL-Bandit. *Shipra Agrawal, Vashist Avadhanula, Vineet Goyal and Assaf Zeevi.*
38. On the Ability of Neural Nets to Express Distributions. *Holden Lee, Rong Ge, Tengyu Ma, Andrej Risteski and Sanjeev Arora.*
39. Surprising properties of dropout in deep networks. *David Helmbold and Phil Long.*
40. Reliably Learning the ReLU in Polynomial Time. *Surbhi Goel, Varun Kanade, Adam Klivans and Justin Thaler.*

41. Nearly-tight VC-dimension bounds for neural networks. *Nicholas Harvey, Christopher Liaw and Abbas Mehrabian.*
42. Homotopy Analysis for Tensor PCA. *Anima Anandkumar, Yuan Deng, Rong Ge and Hossein Mobahi.*
43. Matrix Completion from  $O(n)$  Samples in Linear Time. *David Gamarnik, Quan Li and Hongyi Zhang.*
44. High-Dimensional Regression with Binary Coefficients. Estimating Squared Error and a Phase Transition. *Ilias Zadik and David Gamarnik.*
45. Rates of estimation for determinantal point processes. *Victor-Emmanuel Brunel, Ankur Moitra, Philippe Rigollet and John Urschel.*
46. A second-order look at stability and generalization. *Andreas Maurer.*

## 18:40–23:00 Canal Boat Trip and Banquet

### Canal Boat Trip

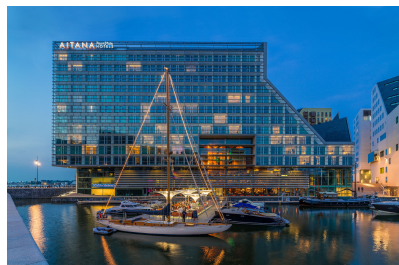
Four boats will leave the jetty at Kloveniersburgwal and Rusland at 18:40, around the corner from the conference venue. They will drop you off at I Dock restaurant between 19:45 and 20:15.



*Sunday, July 9th*

## I Dock Restaurant

The banquet starts around 20:00 at I Dock Restaurant. The address is IJdok 4, within walking distance of Amsterdam Central Station:



The banquet ends around 23:00. Returning to your hotel is on your own.

## Sunday, July 9th

### 08:30–09:00 Registration

### 09:00–10:00 Session 20: Complexity of Learning

- 09:00 A General Characterization of the Statistical Query Complexity. *Vitaly Feldman.*
- 09:20 Mixing Implies Lower Bounds for Space Bounded Learning. *Michal Moshkovitz and Dana Moshkovitz.*
- 09:40 On Learning versus Refutation. *Salil Vadhan.*
- 09:50 Inapproximability of VC Dimension and Littlestone's Dimension. *Pasin Manurangsi and Aviad Rubinfeld.*

### 10:00–10:20 Coffee Break

**10:20–11:20 Session 21: Property Testing and Elicitation**

- 10:20 Memoryless Sequences for Differentiable Losses. *Rafael Frongillo and Andrew Nobel.*  
10:40 Multi-Observation Elicitation. *Sebastian Casalaina-Martin, Rafael Frongillo, Tom Morgan and Bo Waggoner.*  
10:50 Testing Bayesian Networks. *Clément Canonne, Ilias Diakonikolas, Daniel Kane and Alistair Stewart.*  
11:00 Square Hellinger Subadditivity for Bayesian Networks and its Applications to Identity Testing. *Constantinos Daskalakis and Qinxuan Pan.*  
11:10 Two-Sample Tests for Large Random Graphs using Network Statistics. *Debarghya Ghoshdastidar, Ulrike von Luxburg, Maurilio Gutzeit and Alexandra Carpentier.*

**11:20–11:35 Coffee Break**

**11:35–12:35 Session 22: Invited Talk: Andrea Montanari (Stanford)**

**12:35–14:30 Lunch Break**

**14:30–15:30 Session 23: Stochastic Optimization**

- 14:30 Empirical Risk Minimization for Stochastic Convex Optimization:  $O(1/n)$ - and  $O(1/n^2)$ -type of Risk Bounds. *Lijun Zhang, Tianbao Yang and Rong Jin.*  
14:50 Stochastic Composite Least-Squares Regression with convergence rate  $O(1/n)$ . *Nicolas Flammarion and Francis Bach.*  
15:00 A Unified Analysis of Stochastic Optimization Methods Using Jump System Theory and Quadratic Constraints. *Bin Hu, Peter Seiler and Anders Rantzer.*  
15:10 Memory and Communication Efficient Distributed Stochastic Optimization with Mini-batch Prox. *Jialei Wang, Weiran Wang and Nathan Srebro.*  
15:20 The Sample Complexity of Optimizing a Convex Function. *Eric Balkanski and Yaron Singer.*

**15:30–16:00 Coffee Break**

**16:00–17:00 Session 24: Bandits II**

- 16:00 The Simulator: Understanding Adaptive Sampling in the Moderate-Confidence Regime. *Max Simchowitz, Kevin Jamieson and Benjamin Recht.*  
16:20 Learning with Limited Rounds of Adaptivity: Coin Tossing, Multi-Armed Bandits, and Ranking from Pairwise Comparisons. *Arpit Agarwal, Shivani Agarwal, Sepehr Assadi and Sanjeev Khanna.*

Monday, July 10th

16:40 Nearly Optimal Sampling Algorithms for Combinatorial Pure Exploration. *Lijie Chen, Anupam Gupta, Jian Li, Mingda Qiao and Ruosong Wang.*

16:50 Thompson Sampling for the MNL-Bandit. *Shipra Agrawal, Vashist Avadhanula, Vineet Goyal and Assaf Zeevi.*

**17:00–17:20 Coffee Break**

**17:20–18:30 Session 25: Impromptu Talks**

**Monday, July 10th**

**09:00–10:00 Session 26: Neural Networks**

09:00 On the Ability of Neural Nets to Express Distributions. *Holden Lee, Rong Ge, Tengyu Ma, Andrej Risteski and Sanjeev Arora.*

09:20 Depth Separation for Neural Networks. *Amit Daniely.*

09:30 Surprising properties of dropout in deep networks. *David Helmbold and Phil Long.*

09:40 Reliably Learning the ReLU in Polynomial Time. *Surbhi Goel, Varun Kanade, Adam Klivans and Justin Thaler.*

09:50 Nearly-tight VC-dimension bounds for neural networks. *Nicholas Harvey, Christopher Liaw and Abbas Mehrabian.*

**10:00–10:20 Coffee Break**

**10:20–11:20 Session 27: Learning with Matrices and Tensors**

10:20 Exact tensor completion with sum-of-squares. *Aaron Potechin and David Steurer.*

10:40 Fast and robust tensor decomposition with applications to dictionary learning. *Tselil Schramm and David Steurer.*

10:50 Homotopy Analysis for Tensor PCA. *Anima Anandkumar, Yuan Deng, Rong Ge and Hossein Mobahi.*

11:00 Fundamental limits of symmetric low-rank matrix estimation. *Marc Lelarge and Léo Miolane.*

11:10 Matrix Completion from  $O(n)$  Samples in Linear Time. *David Gamarnik, Quan Li and Hongyi Zhang.*

**11:20–11:35 Coffee Break**

### 11:35–12:35 Session 28: Statistical Learning Theory

- 11:35 Estimating Squared Error and a Phase Transition.. *Ilias Zadik and David Gamarnik. High-Dimensional Regression with Binary Coefficients.*
- 11:55 Rates of estimation for determinantal point processes. *Victor-Emmanuel Brunel, Ankur Moitra, Philippe Rigollet and John Urschel.*
- 12:05 Predicting with Distributions. *Michael Kearns and Zhiwei Steven Wu.*
- 12:15 A second-order look at stability and generalization. *Andreas Maurer.*
- 12:25 Optimal learning via local entropies and sample compression. *Nikita Zhivotovskiy.*

## Things to Do after the Conference

### Museums

The most famous museums are the *Rijksmuseum*, the *Stedelijk museum* and the *Van Gogh museum*. You cannot go wrong with any of these.

### Shopping

The main shopping street is the Kalverstraat near the conference venue. Shops normally open 10:00–18:30 every day, except on Sundays and Mondays when they open at 12:00. A nice variety of smaller shops may be found on the Haarlemmerstraat, which starts within walking distance of Central Station.

### Relaxing

- Take a free ferry from the back of Amsterdam Central Station to *NDSM werf* (the left-most ferry, leaving every 30 mins) and turn right to sit on the waterfront at *Pllek* bar/restaurant ([www.pllek.nl](http://www.pllek.nl), TT Neveritaweg 59).
- For a larger beach with an arty vibe, visit *Roest* bar ([www.amsterdamroest.nl](http://www.amsterdamroest.nl), Jacob Bontiusplaats). Then head over to *Brewery 't IJ* ([www.brouwerijhetij.nl](http://www.brouwerijhetij.nl), Funenkade 7), situated under an old windmill, to sample some of their locally brewed beers.

### Historic Sites Outside Amsterdam

These historic sites are both at around 1h by public transport:

- Muiderslot castle: [www.muiderslot.nl/en/](http://www.muiderslot.nl/en/)
- Traditional windmills: [www.dezaanseschans.nl/en/](http://www.dezaanseschans.nl/en/)

## Food and Drinks

The conference venue is in the middle of the city centre, so you will find restaurants and bars in any direction. There are clusters of restaurants in the Spuistraat and Spui, around the Nieuwmarkt and around the Rembrandtplein. Almost all restaurants will offer at least one vegetarian option. Find restaurant reviews via [www.thefork.com](http://www.thefork.com). Here is a diverse selection of nearby places that stand out for one reason or the other:

### Sit Down

- *Kantjil & de Tijger* (Indonesian, 7 mins walk) – Spuistraat 291.  
[www.kantjil.nl/en](http://www.kantjil.nl/en).  
Get the *rijsttafel* (two persons minimum).
- *Haesje Claes* (Dutch, 8 mins walk) – Spuistraat 273-275.  
[www.haesjeclaes.nl](http://www.haesjeclaes.nl).  
Traditional Dutch food.
- *La Margarita* (Mexican, 3 mins walk) – Langebrugsteeg 6.  
[www.mexican.nl](http://www.mexican.nl).  
Tasty Mexican food with upstairs group seating area.
- *Golden Temple* (Indian Vegetarian, 14 mins walk) – Utrechtsestraat 126.  
[restaurantgoldentemple.com](http://restaurantgoldentemple.com).  
A little eccentric, but has a good reputation. Fully vegetarian.
- *Pianeta Terra* (Organic Italian, 9 mins walk) – Beulingstraat 7.  
[www.pianetaterra.nl](http://www.pianetaterra.nl).  
Fancy, very good food.
- *Café De Pont* (Outdoor charcoal grill, 25 mins by public transport) – Buiksloterweg 3.  
[cafedepond.nl](http://cafedepond.nl).  
Behind Amsterdam Central Station take the free ferry toward “Buiksloterweg”. The cafe is right there where you land. Many small dishes, good for sharing.

### Take Away

- *Soup en Zo* (Soup, 7 mins walk) – Jodenbreestraat 94.  
[souponzo.nl](http://souponzo.nl).  
Small take-away place serving very good soup that is quite filling.
- *Maoz Vegetarian* (Falafel, etc., 7 mins walk) – Muntplein 1.  
[www.maozusa.com/restaurants/locations/amsterdam](http://www.maozusa.com/restaurants/locations/amsterdam).  
Tiny take-away place that serves vegetarian middle eastern food like falafel.



- *Vlaams Friteshuis Vleminckx* (Belgian fries, 7 mins walk) – Voetboogstraat 33.  
[vleminckxdesausmeester.nl/en](http://vleminckxdesausmeester.nl/en).

### Bars

For drinks, *the Nieuwmarkt* has several nice bars. Some other noteworthy places:

- *Café De Jaren* (Sandwiches for lunch, fancy pub food in the evening, 3 mins walk) – Nieuwe Doelenstraat 20.  
[www.cafedejaren.nl/en](http://www.cafedejaren.nl/en).  
Slow service and food nothing special, but beautiful waterfront terrace when not full.  
Go here for drinks during the day.
- *Whiskycafé L&B* (40 year old whisky bar, 17 mins walk) – Korte Leidsedwardsstraat 82.  
[www.whiskyproeverijen.nl](http://www.whiskyproeverijen.nl).







**Adobe**

