

39th Conference on Uncertainty in Artificial Intelligence
Pittsburgh, PA, USA
31st July – 4th August, 2023

uai2023



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UAI 2023 – Program

Please note that all dates and times are EST (Eastern Standard Time). The conference is hybrid; most presentations, as well as poster sessions on Tuesday and Thursday will be in-person, however some presenters will be virtual. In addition, there will be a virtual poster session on Wednesday. All sessions of the main conference take place in **McConomy Auditorium, Jared L. Cohon University Center, Carnegie Mellon University, Pittsburgh, USA**. Below is a summary of the program schedule. For details, please refer to the daily schedules that follow.

UAI 2023 SCHEDULE

Time	31-Jul (Mon) Tutorials	1-Aug (Tue) Main conference day 1	2-Aug (Wed) Main conference day 2	3-Aug (Thurs) Main conference day 3	4-Aug (Fri) Workshops	
9:00	<p>Tutorials</p> <p>Connan Room, McKenna, Peter, and Wright Room, McConomy Auditorium</p> <p>Opening Reception Simmons A/B in Tepper Quad</p>	Keynote: Alexandra Chouldechova McConomy Auditorium	Oral Session 3 Causal inference and missing data McConomy Auditorium	Keynote: Caroline Uhler McConomy Auditorium	<p>Workshops</p> <p>Studio Theater, McKenna, Peter, and Wright Room, Connan Room, McConomy Auditorium</p> <p>Lunch (boxed lunch)</p>	
10:00		Coffee break (30 minutes) Connan Room		Coffee break (20 minutes) Connan Room		Coffee break (30 minutes) Connan Room
10:30		Oral Session 1 Neural networks and Deep Learning McConomy Auditorium				Virtual Poster Session https://tinyurl.com/UAI23VirtualPosters
10:40			Spotlight Session 1 McConomy Auditorium	Spotlight Session 3 McConomy Auditorium		
11:00		Lunch (boxed lunch)	Lunch (boxed lunch)	Lunch (boxed lunch)		
11:30						Oral Session 2 Uncertainty quantification and calibration McConomy Auditorium
12:10		Spotlight Session 2 McConomy Auditorium	Coffee break (20 minutes) Connan Room	Spotlight Session 4 McConomy Auditorium		
12:30		Coffee break (30 minutes) Connan Room	Keynote: Victor Chernozhukov McConomy Auditorium	Coffee break (30 minutes) Connan Room		
14:00		In-person Poster Session 1 Rangos Hall		Town Hall and Best Paper Awards McConomy Auditorium		In-person Poster Session 2 Rangos Hall
15:00			Break/walk to banquet			
15:30		Banquet Phipps Conservatory and Botanical Gardens	Banquet Phipps Conservatory and Botanical Gardens	Banquet Phipps Conservatory and Botanical Gardens		
15:40						
16:00						
16:30						
17:00						
18:15						
18:30						
19:00						
19:30						
20:00						
21:00						

31 JULY (Tutorial Day)

Towards Causal Foundations of Safe AI. James Fox, Tom Everitt.

Online Optimization Meets Federated Learning. Aadirupa Saha, Kumar Kshitij Patel.

Structure Learning Using Benchpress. Felix L. Rios, Giusi Moffa, Jack Kuipers.

Data Compression With Machine Learning. Karen Ullrich, Yibo Yang, Stephan Mandt.

Causal Representation Learning. Dhanya Sridhar, Jason Hartford.

31 July – 09:00-10:15

- Connan Room: Towards Causal Foundations of Safe AI
- McKenna, Peter, and Wright Room: Causal Representation Learning

31 July – 10:15-10:30 – Coffee break (Rangos Hall)

31 July – 10:30-11:30

- Connan Room: Towards Causal Foundations of Safe AI
- McKenna, Peter, and Wright Room: Causal Representation Learning

31 July – 12:00-13:30 – Lunch (Rangos Hall)

31 July – 13:30-15:15

- McConomy Auditorium: Structure Learning With Benchpress

31 July – 15:30-16:00 – Coffee break (Rangos Hall)

31 July – 16:00-18:00

- McConomy Auditorium: Data Compression With Machine Learning

31 July – 16:00-18:30

- Connan Room: 6. Online Optimization Meets Federated learning

31 July – 18:30-20:00 – Opening reception

1 AUG (Main Conference Day 1, McConomy Auditorium)

1 Aug – 09:00-09:05 – Opening remarks by Richard Scheines and Peter Spirtes.

1 Aug – 09:05-10:05 – Keynote by Alexandra Chouldechova: *Algorithms in Unjust Systems* (session chair: Peter Spirtes).

1 Aug – 10:05-10:30 – Coffee break (Connan Room)

1 Aug – 10:30-12:10 – Oral session 1: Neural networks and deep learning (session chair: Nevin L. Zhang).

- **129: *MixupE: Understanding and Improving Mixup from Directional Derivative Perspective.*** Yingtian Zou, Vikas Verma, Sarthak Mittal, Wai Hoh Tang, Hieu Pham, Juho Kannala, Yoshua Bengio, Arno Solin, Kenji Kawaguchi (*presented virtually*).

Discussant: Yan Yan (Washington State University)

- **233: *Neural Probabilistic Logic Programming in Discrete-Continuous Domains.*** Lennert De Smet, Pedro Zuidberg Dos Martires, Robin Manhaeve, Giuseppe Marra, Angelika Kimmig, Luc De Raedt (*presented in person*).

Discussant: Zhe Zheng (UCLA)

- **402: *An Improved Variational Approximate Posterior for the Deep Wishart Process.*** Sebastian W. Ober, Ben Anson, Edward Milsom, Laurence Aitchison (*presented in person*).

Discussant: Dario Azzimonti (IDSIA)

- **517: *On Minimizing the Impact of Dataset Shifts on Actionable Explanations.*** Anna P. Meyer, Dan Ley, Suraj Srinivas, Himabindu Lakkaraju (*presented in person*).

Discussant: Nevin L. Zhang (The Hong Kong University of Science and Technology)

1 Aug – 12:10-12:30 – Spotlight session 1 (session chair: Nicolas Gisolfi, all spotlights virtual)

- **91 *Quasi-Bayesian Nonparametric Density Estimation via Autoregressive Predictive Updates*** – Sahra Ghalebikesabi, Christopher C. Holmes, Edwin Fong, Briec Lehmann.
- **190 *Conditional Counterfactual Causal Effect for Individual Attribution*** – Ruiqi Zhao, Lei Zhang, Shengyu Zhu, Zitong Lu, Zhenhua Dong, Chaoliang Zhang, Jun Xu, Zhi Geng, Yangbo He.
- **196 *Random Reshuffling with Variance Reduction: New Analysis and Better Rates*** – Grigory Malinovsky, Alibek Sailanbayev, Peter Richtárik.
- **227 *Multi-View Graph Contrastive Learning for Solving Vehicle Routing Problems*** – Yuan Jiang, Zhiguang Cao, Yaixin Wu, Jie Zhang.
- **303 *MFA: Multi-scale Feature-aware Attack for Object Detection*** – Wen Chen, Yushan Zhang, Zhiheng Li, Yuehuan Wang.
- **325 *Incentivising Diffusion while Preserving Differential*** – Fengjuan Jia, Mengxiao Zhang, Jiamou Liu, Bakh Khoussainov.
- **472 *Residual-Based Error Bound for Physics-Informed Neural Networks*** – Shuheng Liu, Xiyue Huang, Pavlos Protopapas.
- **617 *On the Informativeness of Supervision Signals*** – Iliia Sucholutsky, Ruairidh McLennan Battleday, Katherine M. Collins, Raja Marjeh, Joshua Peterson, Pulkit Singh, Umang Bhatt, Nori Jacoby, Adrian Weller, Thomas L. Griffiths.

1 Aug – 12:30-14:00 – Lunch (boxed lunch, Rangos Hall)

1 Aug – 14:00-15:40 – Oral session 2: Uncertainty quantification and calibration (session chair: Daniel Andrade).

- **482:** *Is the Volume of a Credal Set a Good Measure for Epistemic Uncertainty?* Yusuf Sale, Michele Caprio, Eyke Hüllermeier (presented in person).

Discussant: Danie Andrade (Hiroshima University).

- **374:** *Quantifying Aleatoric and Epistemic Uncertainty in Machine Learning: Are Conditional Entropy and Mutual Information Appropriate Measures?* Lisa Wimmer, Yusuf Sale, Paul Hofman, Bernd Bischl, Eyke Hüllermeier (presented in person).

Discussant: Mashta Itkina (Stanford).

- **631:** *Parity Calibration.* Youngseog Chung, Aaron Rumack, Chirag Gupta (presented in person).

Discussant: Lucas Clarte (EPFL).

- **256:** *Human-in-the-Loop Mixup.* Katherine M. Collins, Umang Bhatt, Weiyang Liu, Vihari Piratla, Ilia Sucholutsky, Bradley C. Love, Adrian Weller (presented virtually).

Discussant: Linjun Zhang (Rutgers).

1 Aug – 15:40-16:00 – Spotlight session 2 (session chair: Taposh Banerjee, first 5 presentations virtual, last 4 presentations in person)

- **651** *Adaptivity Complexity for Causal Graph Discovery* – Davin Choo, Kirankumar Shiragur.
- **707** *Phase-shifted Adversarial Training* – Yeachan Kim, Seongyeon Kim, Ihyeok Seo, Bonggun Shin.
- **804** *Fast Proximal Gradient Descent for Support Regularized Sparse Graph* – Dongfang Sun, Yingzhen Yang.
- **56** *Stochastic Generative Flow Networks* – Ling Pan, Dinghuai Zhang, Moksh Jain, Longbo Huang, Yoshua Bengio.
- **654** *Dirichlet Proportions Model for Hierarchically Coherent Probabilistic Forecasting* – Abhimanyu Das, Weihao Kong, Biswajit Paria, Rajat Sen.
- **186** *Inference for Mark-Censored Temporal Point Processes* – Alex James Boyd, Yuxin Chang, Stephan Mandt, Padhraic Smyth.
- **643** *Testing Conventional Wisdom (of the Crowd)* – Noah Burrell, Grant Schoenebeck.
- **297** *Validation of Composite Systems by Discrepancy Propagation* – David Reeb, Kanil Patel, Karim Said Barsim, Martin Schiegg, Sebastian Gerwin.
- **480** *Investigating a Generalization of Probabilistic Material Implication and Bayesian Conditional* – Michael Jahn, Matthias Scheutz.

1 Aug – 16:00-16:30 – Coffee break (Connan Room)

1 Aug – 16:30-19:30 – Poster session 1 (Rangos Hall)

Posters: 8, 35, 88, 100, 136, 143, 219, 220, 236, 247, 251, 281, 288, 290, 307, 328, 332, 356, 368, 370, 375, 387, 392, 394, 396, 406, 407, 420, 421, 433, 434, 437, 443, 445, 449, 457, 460, 462, 467, 470, 495, 499, 531, 536, 540, 541, 549, 552, 560, 566, 571, 583, 587, 589, 598, 601, 663, 672, 713, 731, 741, 748, 750, 757, 773, 777, 793.

Spotlights: 186, 297, 643, 480.

Orals: 95, 233, 249, 374, 402, 482, 486, 517, 597, 631.

2 AUG (Main Conference Day 2, McConomy Auditorium)

2 Aug – 09:00-10:40 – Oral session 3: Causal inference and missing data (*session chair: Negar Kiyavash*).

- **504:** *Establishing Markov Equivalence in Cyclic Directed Graphs*. Tom Claassen, Joris Mooij (*presented virtually*).

Discussant: Arnab Bhattacharya (National University of Singapore).

- **597:** *On Testability and Goodness of Fit Tests in Missing Data Models*. Razieh Nabi, Rohit Bhattacharya (*presented in person*).

Discussant: Karthika Mohan (Oregon State).

- **486:** *Functional Causal Bayesian Optimization*. Limor Gultchin, Virginia Aglietti, Alexis Bellot, Silvia Chiappa (*presented in person*).

Discussant: Rohit Bhattacharya (Williams College).

- **249:** *Partial Identification of Dose Responses with Hidden Confounders*. Myrl G Marmarelis, Greg Ver Steeg, Andrew Jesson, Elizabeth Haddad, Neda Jahanshad, Aram Galstyan (*presented in person*).

Discussant: Qingyuan Zhao (Cambridge).

2 Aug – 10:40-11:00 – Coffee break (Connan Room)

2 Aug – 11:00-12:30 – Virtual poster session

Posters: 11, 24, 31, 34, 42, 82, 85, 116, 139, 142, 153, 155, 159, 205, 212, 213, 217, 234, 243, 246, 250, 268, 277, 298, 309, 310, 320, 322, 341, 358, 397, 442, 458, 465, 496, 505, 520, 537, 558, 576, 580, 590, 596, 604, 606, 608, 632, 648, 665, 676, 677, 688, 695, 696, 704, 732, 756, 775, 780.

Spotlights: 91, 190, 196, 227, 303, 325, 472, 617, 651, 654, 707, 804.

Orals: 129, 256, 380, 447, 504.

2 Aug – 12:30-14:00 – Lunch (boxed lunch, Rangos Hall)

2 Aug – 14:00-15:40 – Oral session 4: Modelling and learning (*session chair: Gugan Thoppe*).

- **432:** *Learning from Low Rank Tensor Data: A Random Tensor Theory Perspective*. Mohamed El Amine Seddik, Malik Tiomoko, Alexis Decurninge, Maxime Guillaud, Maxim Panov (*presented in person*).

Discussant: Goutham Rajendran (CMU).

- **621:** *Keep-Alive Caching for the Hawkes process*. Sushirdeep Narayana, Ian A. Kash (*presented in person*).

Discussant: Hongyi Wang (CMU).

- **701:** *Conditional Abstraction Trees for Sample-Efficient Reinforcement Learning*. Mehdi Dadvar, Rashmeet Kaur Nayyar, Siddharth Srivastava (*presented in person*).

Discussant: Bingshan Hu (University of Alberta).

- **380: *Provably Efficient Adversarial Imitation Learning with Unknown Transitions.*** Tian Xu, Ziniu Li, Yang Yu, Zhi-Quan Luo (*presented virtually*).

Discussant: Nived Rajaraman (UC Berkeley).

2 Aug – 15:40-16:10 – Coffee break (Connan Room)

2 Aug – 16:10-17:10 – Keynote by Victor Chernozhukov: *Long story short: omitted variable bias in causal machine learning* (session chair: Ilya Shpitser).

2 Aug – 17:30-18:30 – Townhall and Best Paper Awards

2 Aug – 18:30-19:00 – Break / walk to banquet

2 Aug – 19:00-21:00 – Banquet (Phipps Conservatory and Botanical Gardens)

3 AUG (Main Conference Day 3, McConomy Auditorium)

3 Aug – 09:00-10:00 – Keynote by Caroline Uhler: *Causal Representation Learning and Optimal Intervention Design* (session chair: Daniel Malinsky).

3 Aug – 10:00-10:30 – Coffee break (Connan Room)

3 Aug – 10:30-12:10 – Oral session 5: Methods for intractable learning problems (session chair: Yan Yan).

- **447:** *Meta-learning Control Variates: Variance Reduction with Limited Data.* Zhuo Sun, Chris J. Oates, Francois-Xavier Briol (presented virtually).

Discussant: Viplov Arora (SISSA).

- **149:** *The Shrinkage-Delinkage Trade-off: An Analysis of Factorized Gaussian Approximations for Variational Inference.* Charles Margossian, Lawrence K. Saul (presented in person).

Discussant: Ryan Giordano (MIT).

- **95:** *Towards Physically Reliable Molecular Representation Learning.* Seunghoon Yi, Youngwoo Cho, Jinhwan Sul, Seung Woo Ko, Soo Kyung Kim, Jaegul Choo, Hongkee Yoon, Joonseok Lee (presented in person).

Discussant: Chong Liu (UC Santa Barbara).

- **342:** *Revisiting Bayesian Network Learning with Small Vertex Cover.* Juha Harviainen, Mikko Koivisto (presented in person).

Discussant: Christian Komusiewicz (University of Jena)

3 Aug – 12:10-12:30 – Spotlight session 3 (session chair: Jacob Runge).

- **79 BISCUIT:** *Causal Representation Learning from Binary Interactions* – Phillip Lippe, Sara Magliacane, Sindy Löwe, Yuki M Asano, Taco Cohen, Efstratios Gavves.
- **257** *Composing Efficient, Robust Tests for Policy Selection* – Dustin Morrill, Thomas Walsh, Daniel Hernandez, Peter R. Wurman, Peter Stone.
- **294** *Nyström M-Hilbert-Schmidt Independence Criterion* – Florian Kalinke, Zoltán Szabó.
- **354 JANA:** *Jointly Amortized Neural Approximation of Complex Bayesian Models* – Stefan T. Radev, Marvin Schmitt, Valentin Pratz, Umberto Picchini, Ullrich Koethe, Paul Buerkner.
- **476** *Causal Inference With Outcome-Dependent Missingness And Self-Censoring* – Jacob Morris Chen, Daniel Malinsky, Rohit Bhattacharya.
- **516 CUE:** *An Uncertainty Interpretation Framework for Text Classifiers Built on Pre-Trained Language Models* – Jiazheng Li, Zhaoyue Sun, Bin Liang, Lin Gui, Yulan He.
- **556** *Fast and Scalable Score-Based Kernel Calibration Tests* – Pierre Glaser, David Widmann, Fredrik Lindsten, Arthur Gretton.
- **559** *"Private Prediction Strikes Back!" Private Kernelized Nearest Neighbors with Individual Rényi Filter* – Yuqing Zhu, Xuandong Zhao, Chuan Guo, Yu-Xiang Wang.

3 Aug – 12:30-14:00 – Lunch (boxed lunch, Rangos Hall)

3 Aug – 14:00-15:40 – Oral session 6: Probabilistic circuit models (session chair: Rina Dechter).

- **430:** *Local Message Passing on Frustrated Systems*. Luca Schmid, Joshua Brenk, Laurent Schmalen (presented in person).

Discussant: KiJung Yoon (Hanyang University).

- **353:** *On Inference and Learning With Probabilistic Generating Circuits*. Juha Harviainen, Vaidyanathan Peruvemba Ramaswamy, Mikko Koivisto (presented in person).

Discussant: YooJung Choi (Arizona State).

- **526:** *Probabilistic Flow Circuits: Towards Unified Deep Models for Tractable Probabilistic Inference*. Sahil Sidheekh, Kristian Kersting, Sriraam Natarajan (presented in person).

Discussant: Martin Trapp (Aalto University).

- **118:** *Probabilistic Circuits That Know What They Don't Know*. Fabrizio Ventola, Steven Braun, Zhongjie Yu, Martin Mundt, Kristian Kersting (presented in person).

Discussant: Sebastian Tschiatschek (University of Vienna).

3 Aug – 15:40-16:00 – Spotlight session 4 (session chair: Christopher Quinn).

- **41** *Inference and Sampling of Point Processes from Diffusion Excursions* – Ali Hasan, Yu Chen, Yuting Ng, Mohamed Abdelghani, Anderson Schneider, Vahid Tarokh.
- **261** *Studying the Effect of GNN Spatial Convolutions On The Embedding Space's Geometry* – Claire Donnat, So Won Jeong.
- **747** *A Decoder Suffices for Query-Adaptive Variational Inference* – Sakshi Agarwal, Gabriel Hope, Ali Younis, Erik B. Sudderth.
- **658** *Aligned Diffusion Schrödinger Bridges* – Vignesh Ram Somnath, Matteo Pariset, Ya-Ping Hsieh, Maria Rodriguez Martinez, Andreas Krause, Charlotte Bunne.
- **611** *Bayesian Inference Approach for Entropy Regularized Reinforcement Learning with Stochastic Dynamics* – Argenis Arriojas, Jacob Adamczyk, Stas Tiomkin, Rahul V Kulkarni.
- **797** *Inference for Probabilistic Dependency Graphs* – Oliver Ethan Richardson, Joseph Halpern, Christopher De Sa.
- **764** *Robust Gaussian Process Regression with the Trimmed Marginal Likelihood* – Daniel Andrade, Akiko Takeda.

3 Aug – 16:00-16:30 – Coffee break (Connan Room)

3 Aug – 16:30-19:30 – Poster session 2 (Rangos Hall)

Posters: 39, 40, 45, 46, 47, 67, 80, 84, 105, 114, 127, 130, 138, 144, 147, 150, 184, 189, 211, 214, 216, 235, 240, 255, 272, 273, 306, 351, 390, 466, 477, 494, 500, 503, 507, 521, 524, 527, 529, 530, 551, 554, 555, 561, 567, 579, 584, 594, 595, 605, 607, 636, 644, 646, 657, 669, 679, 722, 753, 761, 789.

Spotlights: 41, 79, 257, 261, 294, 354, 476, 516, 556, 559, 611, 658, 747, 764, 797.

Orals: 118, 149, 342, 353, 430, 432, 526, 621, 701.

4 AUG (Workshop Day)

Workshops will be held on August 4th following the main conference (in four different rooms, McConomy Auditorium, Connan Room, McKenna, Peter, and Wright Room, and Studio Theater). Boxed lunch will be provided, in Rangos Hall. For any questions, please contact the Workshop Chairs (uai2023chairs+workshops@gmail.com). The list of accepted workshops is below.

The History and Development of Search Methods for Causal Structure

Organizing committee:

- Jiji Zhang (Chinese University of Hong-Kong)
- Richard Scheines (Carnegie Mellon University)
- Fredrick Eberhardt (California Institute of Technology)
- Biwei Huang (University of California, San Diego)
- Shohei Shimizu (Shiga University)
- Ricardo Silva (University College London)
- Peter L. Spirtes (Carnegie Mellon University)
- Joseph Ramsey (Carnegie Mellon University)
- Clark Glymour (Carnegie Mellon University)

Room: McConomy Auditorium.

Epistemic Uncertainty in Artificial Intelligence

Organizing committee:

- Fabio Cuzzolin (Oxford Brookes University)
- Mathijs Spaan (Delft University of Technology)
- Keivan Shariatmadar (KU Leuven)
- Maryam Sultana (Oxford Brookes University)
- Kaizheng Wang (KU Leuven)
- Shireen Kudukkil Manchingal (Oxford Brookes University)

Room: Connan Room.

Tractable Probabilistic Modelling: Building Bridges

Organizing committee:

- YooJung Choi (Arizona State University)
- Eric Nalisnick (University of Amsterdam)
- Martin Trapp (Aalto University)
- Fabrizio Ventola (TU Darmstadt University)
- Antonio Vergari (University of Edinburgh)

Room: McKenna, Peter, and Wright Room.

Causal Inference for Time Series Data

Organizing committee:

- Jakob Runge (Technische Universität Berlin)
- Urmi Ninad (Technische Universität Berlin)
- Jonas Wahl (Technische Universität Berlin)

- Andreas Gerhardus (German Aerospace Center)
- Sara Magliacane (University of Amsterdam)
- Charles Assaad (EasyVista)
- Tom Claasen (Radboud University)
- Clark Glymour (Carnegie Mellon University)

Room: Studio Theater.