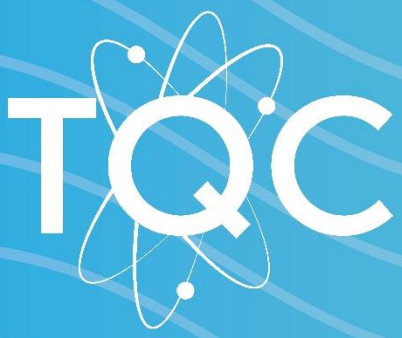

17TH CONFERENCE ON
Theory of Quantum Computation, Communication and Cryptography

The University of Illinois Urbana-Champaign

July 11-15, 2022

tqc2022-conference.iquist.illinois.edu

The Grainger College of Engineering
UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

TABLE OF CONTENTS

Conference Committees.....3

Sponsors.....4

Schedule At-A-Glance.....5

Facility Map.....6

Conference Information.....7

Conference Excursions.....8

Conference Schedule.....9

Poster Session Program.....18

Invited Speaker Abstracts.....22

Things To Do In The Area.....24

COVID-19 Testing Options.....26

CONFERENCE COMMITTEES

Program committee:

- François Le Gall (Nagoya University – chair)
- Tomoyuki Morimae (Kyoto University – co-chair)
- Dominic Berry (Macquarie University)
- Mario Berta (AWS Center for Quantum Computing & Imperial College London)
- Dan Browne (University College London)
- Francesco Buscemi (Nagoya University)
- Marco Cerezo (Los Alamos National Laboratory)
- Kai-Min Chung (Academia Sinica)
- Wim van Dam (University of California, Santa Barbara)
- Jens Eisert (Freie Universität Berlin)
- David Elkouss (QuTech)
- Bill Fefferman (The University of Chicago)
- Zoe Holmes (Los Alamos National Laboratory)
- Isaac Kim (Stanford)
- Robert Koenig (Technische Universität München)
- Richard Kueng (Johannes Kepler University Linz)
- Sophie Laplante (Université de Paris)
- Felix Leditzky (University of Illinois at Urbana-Champaign)
- Tongyang Li (Peking University)
- Qipeng Liu (Simons Institute for the Theory of Computing)
- Frédéric Magniez (CNRS)
- Christian Majenz (Technical University of Denmark)
- Carl Miller (NIST and University of Maryland)
- Ashwin Nayak (University of Waterloo)
- Nelly Ng (Nanyang Technological University)
- Harumichi Nishimura (Nagoya University)
- Michał Oszmaniec (CTP PAS)
- Anna Pappa (Technische Universität Berlin)
- Simon Perdrix (Inria LORIA)
- Stefano Pironio (Université libre de Bruxelles)
- Patrick Rebentrost (CQT)
- Ben Reichardt (University of Southern California)
- Yuval Rishu Sanders (University of Technology Sydney)
- Norbert Schuch (University of Vienna)
- Yuan Su (Google Quantum AI)
- Aarthi Sundaram (Microsoft)
- Penghui Yao (Nanjing University)

Local Organizing Committee:

- Eric Chitambar (UIUC – chair)
- Emily Edwards (UIUC)
- Kim Gudeman (UIUC)
- Hillary Isaksen (Hillary Rae Events)
- Felix Leditzky (UIUC)
- Michelle Marquart (UIUC)
- Hannah Stites (UIUC)
- Timmi Turley (UIUC)

Student Volunteers

- Sujeet Bhalero
- Mayank Bhatia
- Mason Camp
- Amanda Gatto Lamas
- Ian George
- Sarah Hagen
- Greg Hamilton
- Chloe Kim
- Mike Nelson
- Abhinav Surendra
- April Zhang
- Yujie Zhang

Community Support Contacts:

- Eric Chitambar (UIUC)
- Felix Leditzky (UIUC)
- Anne Broadbent (Ottawa)
- Zoe Holmes (Los Alamos)
- Francois Le Gall (Nagoya University)

TQC Steering Committee:

- Marco Tomamichel (NUS – chair)
- Gorjan Alagic (Maryland)
- Andris Ambainis (Latvia)
- Eric Chitambar (UIUC)
- Steve Flammia (Sydney)
- Stacey Jeffery (QuSoft, CWI)
- Min-Hsiu Hsieh (Hon Hai)
- Laura Mančinska (Copenhagen)

TQC 2022 SPONSORS

CHICAGO QUANTUM EXCHANGE

FOXCONN 鴻海科技集團

IBM

ILLINOIS
Illinois Quantum Information Science & Technology Center
GRAINGER COLLEGE OF ENGINEERING

JOINT CENTER FOR QUANTUM INFORMATION AND COMPUTER SCIENCE

UNIVERSITY OF WATERLOO | IQC Institute for Quantum Computing

SCHEDULE AT A GLANCE

TIME	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
8:00	Registration	Registration	Registration	Registration	Registration
8:50	Welcome				
9:00	Invited Talk	Invited Talk	Invited Talk	Shannon Theory II	Invited Talk
9:45	Measurements & Sampling	Cryptography I	Entanglement		Complexity Theory III
10:00					
10:35	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break
11:00	Quantum Error Correction	Hamiltonians	Complexity Theory II	Algorithms II & Estimation	QML, Algorithms, Computation
noon					
12:40	Lunch	Lunch	Lunch	Lunch	
12:45					Closing
13:00					Lab Tours/ Excursions
14:00					
14:10	Complexity Theory I	Algorithms I	Quantum Computation & Shannon Theory I	Cryptography II	
15:00					
15:50	Conference Photo	Coffee Break		Coffee Break	
16:00	Poster Session				
16:15		Quantum Machine Learning	Excursions/ Free Afternoon	Foundations	
17:00					
17:30		Outstanding Paper Award			
18:00					
18:30			Conference Dinner		
19:00					
20:00					
20:30					
21:00					
21:30					

FACILITY MAP

CONFERENCE INFORMATION

Oral Sessions
iHotel and Conference Center
1900 S. First St.
Champaign, IL 61820

All talks will be held at the iHotel and Conference Center in Illinois Ballroom A. Invited talks will be 40 minutes plus 5 minutes for questions. Contributed talks will be 25 minutes (inclusive of questions).

Poster Session
Siebel Center for Design
1208 S. Fourth St.
Champaign, IL 61820

A poster session will take place Monday, July 11, 2022, from 4:00-6:00pm at the Siebel Center for Design in the Lower Lobby, only a 20 minute walk from the conference center. Come and enjoy hors d'oeuvres, drinks, and live music while viewing poster presentations and connecting with others in the TQC community.

A full listing of accepted posters can be found on starting on page 21. The available space on the poster boards for each poster is 48in wide x 60in tall (122 cm x 182 cm). Each presenter will be assigned a spot based on the submission number.

Coffee Breaks
Coffee and light refreshments will be offered Monday-Friday mornings, plus Tuesday and Thursday afternoons in the lobby outside of Illinois Ballroom B.

Lunch
Boxed lunch will be offered at the conference center Monday-Thursday, from 12:40-2:10pm, and will be available in the lobby outside of Illinois Ballroom B.

Conference Dinner
The conference dinner will take place on Wednesday, July 13, 2022, from 6:30-9:30pm at the iHotel and Conference Center in Illinois Ballroom B.

CONFERENCE EXCURSIONS

WEDNESDAY

Chado, The Way of Tea at Japan House – 4:30-5:30 PM

Experience a moment of tranquility at Japan House! Chado, or the Way of Tea, is one of the most ancient and revered arts of Japan, and is at the very heart of Japan House's mission. Watch and participate in a traditional Japanese tea ceremony to learn about Japan House on the campus of the University of Illinois Urbana-Champaign and the history of this 500 year old art form. Guests will enjoy a bowl of matcha and eat a wagashi (traditional Japanese sweet) as part of the tea ceremony. Participation costs $15/person and pre-registration is required as spots are limited.

University of Illinois Arboretum Guided Tour – 5:00-6:00 PM

Join Arboretum horticulturist Diane Anderson for a walking tour of the Arboretum at the University of Illinois. Gardens that you will see include the American Hosta Society National Display Garden of hosta and shade companion plants, the pond walkway garden and the azumaya donated by Nick Offerman in honor of Professor Shozo Sato, the gardens at Japan House, the Golden Grove of Magnolia, various wedding venues, and the Hartley Selections trial and display garden. The tour will end at the Master Gardener Idea Garden. Participation is free; however, pre-registration is required as spots are limited.

There is no charge for the tour. Donations to support the gardens can be made to the University of Illinois Arboretum at http://arboretum.illinois.edu/giving/GiveNow.php

Krannert Art Museum Guided Tour – 5:00-6:00 PM

The Art + Language Tour at the Krannert Art Museum will engage visitors in thinking about the relationship between images and language which will inform their experience with our art collection. The group will be led through engaging discussions and small group activities centered around artworks in the exhibitions Art Since 1948, Encounters: The Arts of Africa, and other galleries in the museum. No prior art experience required; come as you are! Participation costs $15/person and pre-registration is required as spots are limited.

FRIDAY

IQUIST Laboratory Tours - Afternoon

The Illinois Quantum Information Science and Technology Center (IQUIST) brings together physicists, electrical engineers, computer scientists, mathematicians, entrepreneurs, and other experts to accelerate growing efforts in quantum information science at the University of Illinois Urbana-Champaign. Join us after the conference concludes for a tour of the newly renovated IQUIST laboratories, including the quantum testbed. Participation is free; however, sign-ups are required.

ALL WEEK

LabEscape – Evenings

World-renowned quantum physicist Professor Alberta Pauline Schrödenberg is quarantining and desperately needs your help — the fate and security of the entire world hang in the balance. You'll have to search her lab, solve mind-blowing puzzles to reveal clues, and hopefully find a way to complete your mission - saving us all! As featured in The New York Times, this APS- and NSF-funded outreach project is, we believe, the world's first science-based 'escape-room', in which all the puzzles involve various physics phenomena. They've run nearly 9000 Agents through, including ~1000 scientists (at the annual AAPT meeting in DC, the APS meeting in Boston, and the DAMOP meeting in Milwaukee), and received nearly all 5-star ratings, with many participants saying LabEscape was the best escape room they'd ever done.

LabEscape will be available FREE for TQC 2022 attendees each evening throughout the week. Create a team of 4-7 Agents (or join someone else's) and sign up online: https://my.physics.illinois.edu/extranet/labescape/tqc2022/

CONFERENCE SCHEDULE

MONDAY, JULY 11, 2022

8:00 am — Registration
North Entrance – iHotel & Conference Center

8:50 am — Welcome
Illinois Ballroom A – iHotel & Conference Center

Session I – Measurements & Sampling
Chair: Daniel Stilck Franca
Illinois Ballroom A

9:00 am — Invited Talk: Robert Huang, California Institute of Technology
"Quantum advantage in learning from experiments"

9:45 am — Luke Schaeffer, University of Waterloo
"Sample-optimal classical shadows for pure states"

10:10 am — Steven Flammia, AWS Center for Quantum Computing
"Averaged Circuit Eigenvalue Sampling"

10:35 am — Coffee Break
Illinois Ballroom B

Session II – Quantum Error Correction
Chair: Min-Hsiu Hsieh
Illinois Ballroom A

11:00 am — Michael Beverland, Microsoft
"Two-dimensional implementations of quantum LDPC codes"

11:25 am — Michael Beverland, Microsoft
"Improved quantum error correction using soft information"

11:50 am — Joschka Roffe, Free University Berlin
"Bias-tailored quantum LDPC codes"

12:15 pm — Eddie Schoute, Los Alamos National Laboratory
"Surface code compilation via edge-disjoint paths"

MONDAY, JULY 11, 2022 CONTINUED

12:40 pm — Lunch
Illinois Ballroom B

Session III – Complexity Theory I
Chair: Stephen Fenner
Illinois Ballroom A

2:10 pm — Chris Cade, QuSoft, University of Amsterdam
"Complexity of supersymmetric systems and the cohomology problem"

2:35 pm — Dorian Rudolph, Paderborn University
"On polynomially many queries to NP or QMA oracles"

3:00 pm — Arjan Cornelissen, QuSoft, University of Amsterdam
"Improved Quantum Query Upper Bounds Based on Classical Decision Trees"

3:25 pm — Francisco Escudero Gutiérrez, QuSoft CWI
"On Converses to the Polynomial Method"

3:50 pm — **Conference Photograph**

4:00 pm — Poster Session & Reception
Siebel Center for Design
1208 S. Fourth St.
Champaign, IL 61820

6:00 pm — Poster Session Concludes

Excursions
LabEscape – 6:00 pm, 7:30pm, 9:00 pm, 10:15 pm

TUESDAY, JULY 12, 2022

8:00 am — Registration
North Entrance – iHotel & Conference Center

Session IV – Cryptography I
Chair: TBD
Illinois Ballroom A

9:00 am — Invited Talk: Prabhanjan Ananth, University of California, Santa Barbara
"Cryptographic Explorations of Pseudorandom Quantum States"

9:45 am — Andreas Bluhm, QMATH, University of Copenhagen (VIRTUAL)
"Position-based cryptography: Single-qubit protocol secure against multi-qubit attacks"

10:10 am — Sam Cree, Stanford University
"Code-routing: a new attack on position-verification"

10:35 am — Coffee Break
Illinois Ballroom B

Session V – Hamiltonians
Chair: Sergii Stelchuk
Illinois Ballroom A

11:00 am — Harriet Apel, University College London
"Holographic duality between local Hamiltonians from random tensor networks"

11:25 am — Li Gao, University of Houston
"Rapid thermalization of 1D commuting Hamiltonians"

11:50 am — Daniel Stilck França, Inria Lyon
"Efficient and robust estimation of many-qubit Hamiltonians"

12:15 pm — Anirban Chowdhury, University of Waterloo
"On the complexity of quantum partition functions"

12:40 pm — Lunch
Illinois Ballroom B

TUESDAY, JULY 12, 2022 CONTINUED

Session VI – Algorithms I
Chair: Simon Apers
Illinois Ballroom A

2:10 pm — William Huggins, Google Quantum AI
"Nearly Optimal Quantum Algorithms for Estimating Multiple Expectation Values"

2:35 pm — Enrique Cervero, Copenhagen University
"Weak Schur sampling with logarithmic quantum memory"

3:00 pm — Alexander Poremba, California Institute of Technology
"Improved Approximation Algorithms for Fidelity Estimation"

3:25 pm — João F. Doriguello, National University of Singapore
"Quantum algorithm for stochastic optimal stopping problems with applications in finance"

3:50 pm — Coffee Break
Illinois Ballroom B

Session VII – Quantum Machine Learning
Chair: TBD
Illinois Ballroom A

4:15 pm — Alicia Magann, Sandia National Laboratories
"Feedback-based quantum optimization"

4:40 pm — Carlos Ortiz Marrero, Pacific Northwest National Lab
"Training quantum neural networks with an unbounded loss function"

5:05 pm — Sergii Strelchuk, University of Cambridge
"Speeding up Learning Quantum States through Group Equivariant Convolutional Quantum Ansatze"

5:30 pm — Leo Zhou, California Institute of Technology
"The Quantum Approximate Optimization Algorithm at High Depth for MaxCut on Large-Girth Regular Graphs and the Sherrington-Kirkpatrick Model"
OUTSTANDING PAPER AWARD

6:00 pm — Session Concludes

Excursions
Lab Escape – 9:15 pm

WEDNESDAY, JULY 13, 2022

8:00 am — Registration
North Entrance – iHotel & Conference Center

Session VIII – Entanglement
Chair: Michael Beverland
Illinois Ballroom A

9:00 am — Invited Talk: Ludovico Lami, University of Ulm, Germany
"Irreversibility of quantum resources, from entanglement to magic"

9:45 am — Sumeet Khatri, Freie Universität Berlin
"Policies for elementary links in a quantum network"

10:10 am — Ludovico Lami, University of Ulm, Germany
"Attainability and lower semi-continuity of the relative entropy of entanglement, and variations on the theme"

10:35 am — Coffee Break
Illinois Ballroom B

Session IX – Complexity Theory II
Chair: Luke Shaeffer
Illinois Ballroom A

11:00 am — Gregory Rosenthal, University of Toronto
"Query and Depth Upper Bounds for Quantum Unitaries via Grover Search"

11:25 am — Suchetan Dontha, University of Maryland College Park
"Approximating Output Probabilities of Shallow Quantum Circuits which are Geometrically-local in any Fixed Dimension"

11:50 am — Di Fang, University of California, Berkeley
"Time-dependent Hamiltonian Simulation of Highly Oscillatory Dynamics and superconvergence for the Schrödinger equation"

12:15 pm — Chinmay Nirkhe, University of California, Berkeley and IBM Quantum
"The Parameterized Complexity of Quantum Verification"

12:40 pm — Lunch
Illinois Ballroom B

WEDNESDAY, JULY 13, 2022 CONTINUED

Session X – Quantum Computation & Shannon Theory I
Chair: Ian George
Illinois Ballroom A

2:10 pm — Hammam Qassim, Keysight Technologies
"Improved upper bounds on the stabilizer rank of magic states"

2:35 pm — John van de Wetering, University of Oxford
"Classical simulation of quantum circuits with partial and graphical stabiliser decompositions"

3:00 pm — Lia Yeh, University of Oxford
"Qutrit metaplectic gates are a subset of Clifford+T"

3:25 pm — Christoph Hirche, TUM & NUS
"Bounding quantum capacities via partial orders and complementarity"

3:50 pm — Christoph Hirche, TUM & NUS
"Quantum Differential Privacy: An Information Theory Perspective"

4:15 pm — Session Concludes

Excursions
Chado, The Way of Tea at Japan House – 4:30 pm
Krannert Art Museum Guided Tour – 5:00 pm
University of Illinois Arboretum Guided Tour – 5:00 pm
LabEscape – 5:00 pm

6:30 pm — Conference Dinner
Illinois Ballroom B

9:30 pm — Dinner Concludes

Excursions
Lab Escape – 8:45 pm, 10:00 pm

THURSDAY, JULY 14, 2022

8:00 am — Registration
North Entrance – iHotel & Conference Center

Session XI – Shannon Theory II
Chair: Ludovico Lami
Illinois Ballroom A

9:00 am — Xuanqiang Zhao, Institute for Quantum Computing, Baidu Research
"Information recoverability of noisy quantum states"

9:25 am — Zahra Baghali Khanian, Technical University of Munich
"Quantum Rate Distortion Theory for Mixed States"

9:50 am — Felix Huber, Jagiellonian University Krakow
"Dimension-free entanglement detection in multipartite Werner states"

10:15 am — Dmitry Grinko, QuSoft, University of Amsterdam
"Linear programming with unitary-equivariant constraints"

10:35 am — Coffee Break
Illinois Ballroom B

Session XII – Algorithms II & Estimation
Chair: Hakop Pashayan
Illinois Ballroom A

11:00 am — Simon Apers, CNRS, IRIF
"Quadratic speedup for spatial search by continuous-time quantum walk"

11:25 am — Jevgēnijs Vihrovs, University of Latvia
"Quantum speedups for treewidth"

11:50 am — Anthony Polloreno, JILA - University of Colorado
"Opportunities and Limitations in Broadband Sensing"

12:15 pm — Shih-Han Hung, University of Texas at Austin
"Classical verification of quantum depth"

12:40 pm — Lunch
Illinois Ballroom B

THURSDAY, JULY 14, 2022 CONTINUED

Session XIII – Cryptography II
Chair: Prabhanjan Ananth
Illinois Ballroom A

2:10 pm — Jamie Sikora, Virginia Tech
"A constant lower bound for any quantum protocol for secure function evaluation"

2:35 pm — Amit Behera, Ben Gurion University
"Noise-Tolerant Quantum Tokens for MAC"

3:00 pm — Tony Metger, ETH Zurich
"Quantum cryptography with classical communication: parallel remote state preparation for copy-protection, verification, and more"

3:25 pm — Naresh Goud Boddu, Centre for quantum technologies
"Quantum secure non-malleable-extractors"

3:50 pm — Coffee Break
Illinois Ballroom B

Session XIV – Foundations
Chair: Jamie Sikora
Illinois Ballroom A

4:15 pm — Martti Karvonen, University of Ottawa
"Neither Contextuality nor Nonlocality Admits Catalysts"

4:40 pm — Michael Zurel, University of British Columbia
"Hidden Variable Model for Quantum Computation with Magic States on Any Number of Qudits of Any Dimension"

5:05 pm — Pei Zeng, University of Chicago
"Quantum Complementarity Approach to Device-Independent Security"

5:30 pm — Xinan Chen, University of Illinois, Urbana-Champaign
"Information Carried by a Single Particle in Multiple-Access Channels"

5:55 pm — Session Concludes

Excursions
Lab Escape – 9:45 pm

FRIDAY, JULY 15, 2022

8:00 am — Registration
North Entrance – iHotel & Conference Center

Session XV – Complexity Theory III
Chair: Eric Chitambar
Illinois Ballroom A

9:00 am — Invited Talk: Adam Bouland, Stanford University
"An inverse-free Solovay-Kitaev algorithm"

9:45 am — Michal Oszmaniec, CFT PAN
"Saturation and recurrence of quantum complexity for random quantum circuits"

10:10 am — Subhasree Patro, Centrum Wiskunde en Informatica
"Memory Compression with Quantum Random-Access Gates"

10:35 am — Coffee Break
Illinois Ballroom B

Session XVI – Quantum Machine Learning, Algorithms, Computation
Chair: Felix Leditzky
Illinois Ballroom A

11:00 am — Matthias C. Caro, Freie Universität Berlin
"Generalization guarantees for variational quantum machine learning"

11:25 am — Changpeng Shao, University of Bristol
"Quantum algorithms for learning a hidden graph"

11:50 am — Ala Shayeghi, INRIA Lyon – ENS Lyon
"A lower bound on the space overhead of fault-tolerant quantum computation"

12:15 pm — Closing Remarks

Excursions
LabEscape - 1:15 pm, 2:45 pm, 4:15 pm, 5:45 pm, 7:15 pm, 8:45 pm
IQUIST Laboratory Tours – 2:00-4:00 pm

POSTER SESSION PROGRAM

Siebel Center for Design
1208 S. Fourth St.
Champaign, IL 61820

Algorithms

1. Avah Banerjee, Missouri University of Science and Technology
   "Discrete Quantum Walks on the Symmetric Group"
2. Chris Cade, QuSoft, UvA
   "Estimating polynomial quantum speedups beyond asymptotic analysis"
3. Fatima Ezahra Chrit, Georgia Institute of Technology
   "Quantum lattice algorithms for solving partial differential equations"
4. Hyeokjea Kwon, Korea Advanced Institute of Science and Technology
   "Entanglement and information flow in quantum amplitude amplification algorithms"
5. Romy Minko, University of Bristol
   "An algorithm for shorter quantum circuits inspired by quantum cryptanalysis"
6. Stephen Fenner, Rabins Wosti, University of South Carolina
   "Implementing the fanout operation with simple pairwise interactions"
7. Arthur Braida, LIFO & Atos
   "CONSTANT-TIME QA : Guaranteed Approximation for MaxCut"
8. Pei Zeng, University of Chicago
   "Universal Efficient Ground State Algorithm based on Random Sampling"

Complexity Theory

9. Nicholas LaRacuente, University of Chicago
   "Quantum Oracle Separations from Complex but Easily Specified States"

Cryptography

10. Naresh Goud Boddu, Centre for Quantum Technologies
    "Quantum secure non-malleable codes in the split-state model"

Computation & Quantum Error Correction

11. Changchun Zhong, University of Chicago
    "The full and half matching condition for quantum transduction"
12. Thomas Scruby, Okinawa Institute of Science and Technology
    "Non-Pauli Errors in the Three-Dimensional Surface Code"

POSTER SESSION PROGRAM CONTINUED

13. Harshavardhan Reddy Nareddula, Southern Illinois University, Carbondale
    "Quantum Error Correction in the Affine Map Picture"

14. Petr Mishchenko, NTT Social Informatics Laboratories
    "Secure multi-party quantum computation based on triply-even quantum error-correcting codes"

15. John Vining and Howard Blair, Syracuse University
    "Wave Functions on Convergence Spaces: Hybrid Quantum Computing"

Mathematical Methods

16. Jack Davis, Institute of Quantum Computing
    "Stellar representation of extremal Wigner-negative spin states"

17. Piotr Dulian, Center for Theoretical Physics of the Polish Academy of Sciences
    "Matrix concentration inequalities and efficiency of random universal sets of quantum gates"

Shannon Theory

18. Akshay Seshadri, University of Colorado Boulder
    "On the separation of correlation-assisted sum capacities of multiple access channels"

19. Alexander Streltsov, University of Warsaw
    "Entanglement catalysis for quantum states and noisy channels"

20. Dhruv Devulapalli, QuICS, University of Maryland
    "Quantum Routing with Teleportation"

21. Min Namkung, Kyung Hee University
    "Indirect measurement for optimal quantum communication enhanced by binary non-standard coherent states"

22. Min Namkung, Kyung Hee University
    "Enhanced optimal quantum communication by a generalized phase-shift-keying coherent signal"

23. Kabgyun Jeong, Seoul National University
    "Quantum Rényi entropy functionals for bosonic Gaussian systems"

24. Donghoon Ha,
    "Locking and unlocking of quantum nonlocality without entanglement in local discrimination of quantum states"

Resource Theories

25. Gaurav Saxena, University of Calgary
    "Quantifying dynamical magic with completely stabilizer preserving operations as free"

26. Gaurav Saxena, University of Calgary
    "Probabilistic Distillation of Dynamical Coherence"

POSTER SESSION PROGRAM CONTINUED

27. Michael Zurel, University of British Columbia & Stewart Blusson Quantum Matter Institute
    "The role of cohomology in quantum computation with magic states"

28. Arshag Danageozian, Louisiana State University
    "Thermodynamic constraints on quantum information gain and error correction: A triple trade-off"

Quantum Machine Learning

29. Eunok Bae, Hanyang University
    "Recursive Quantum Approximate Optimization Algorithm for MAX-CUT problem on Complete graphs"

Estimation & Measurements

30. Ariel Shlosberg, JILA, University of Colorado Boulder
    "Adaptive estimation of quantum observables"

31. Arik Avagyan, National Institute of Standards and Technology/University of Colorado Boulder
    "Multi-mode Gaussian State Analysis with Total Photon Counting"

32. Dongjin Lee, Korea Advanced Institute of Science and Technology
    "Constructing Entanglement Witnesses Robust to Detector Errors"

33. Raphael Brieger, University of Dusseldorf
    "Compressive gate set tomography"

34. Sanjaya Lohani, University of Illinois Chicago
    "A Hardware-Aware Approach to Improving Quantum State Tomography"

35. Seungchan Seo, Korea Advanced Institute of Science and Technology
    "Mitigation of Crosstalk Errors in a Quantum Measurement and Its Applications to Certifying Entanglement-Generating Circuits"

36. Shawn Gellar, National Institute of Standards and Technology Boulder
    "Improving quantum state detection with adaptive sequential observations"

37. Hossein Dehghani, Joint quantum institute at University of Maryland
    "Neural network decoders for measurement induced phase transitions"

Simulation

38. Marco Cattaneo, University of Helsinki
    "Quantum simulation of dissipative collective effects on noisy quantum computers"

39. Michael Garn, Brunel University London
    "Efficient classical simulation of cluster state quantum circuits with alternative inputs"

40. Sangchul Oh, Purdue University
    "Non-Randomness of Google's Quantum Supremacy Benchmark"

41. Cameron Calcluth, Chalmers University of Technology
    "The vacuum provides quantum advantage to otherwise simulatable architectures"

Foundations

42. Selman Ipek, Bilkent University
    "Simplicial Quantum Contextuality"

43. Hanwool Lee, Korea Advanced Institute of Science and Technology (KAIST)
    "Contextual advantages and certification for maximum confidence discrimination"

Entanglement

44. Ian Nordurft, University of Illinois Chicago
    "Polarization Entanglement Generation by Quantum Zeno Dynamics"

INVITED SPEAKER ABSTRACTS

In order of appearance in program

Invited Speaker: Robert Huang
Title: *Quantum advantage in learning from experiments*
Abstract: Quantum technology promises to revolutionize how we learn about the physical world. An experiment that processes quantum data with a quantum computer could have substantial advantages over conventional experiments in which quantum states are measured and outcomes are processed with a classical computer. We proved that quantum machines could learn from exponentially fewer experiments than the number required by conventional experiments. This exponential advantage is shown for predicting properties of physical systems, performing quantum principal component analysis, and learning about physical dynamics. Furthermore, the quantum resources needed for achieving an exponential advantage are quite modest in some cases. Conducting experiments with 40 superconducting qubits and 1300 quantum gates, we demonstrated that a substantial quantum advantage is possible with today's quantum processors.

Invited Speaker: Prabhanjan Ananth
Title: *Cryptographic Explorations of Pseudorandom Quantum States*
Abstract: Pseudorandom quantum states (PRS), introduced by Ji, Liu, and Song (Crypto'18), are efficiently computable quantum states that are computationally indistinguishable from Haar random states. PRS has found applications in physics and quantum machine learning. In this talk, I'll discuss new variants of PRS, new constructions of PRS, and its connections to cryptography. In light of a recent result by Kretschmer (TQC'20) who demonstrated the existence of an oracle with respect to which PRS exists but one-way functions do not, our results open up the possibility of basing cryptography, using quantum resources, on assumptions weaker than one-way functions. My talk is based on joint works with Aditya Gulati, Luowen Qian, and Henry Yuen.

Invited Speaker: Ludovico Lami
Title: *Irreversibility of quantum resources, from entanglement to magic*
Abstract: A remarkable feature of classical thermodynamics is that work and heat can be reversibility interconverted. This is the key reason why there exists a single thermodynamical function, the entropy, that governs transformations of isolated systems. Here we investigate the problem of reversibility in quantum resource theories, adopting a first-principle-based, axiomatic approach. Applying this general toolset to two of the most practically important resources, we find that the theories of entanglement manipulation and qudit magic-state quantum computation are both asymptotically irreversible, and thus fundamentally different from classical and quantum thermodynamics. In the case of entanglement, irreversibility holds under all non-entangling operations, and it implies that no unique entanglement measure "to rule them all" can exist. In the case of qudit magic, we prove irreversibility under all operations that preserve the set of states with positive Wigner function — in particular, under all stabiliser operations, which are built from Clifford unitaries, Pauli measurements, and stabiliser ancillae. Our main technical tool is the introduction of a general technique called "tempering", which allows us to construct lower bounds to the asymptotic cost of producing a given noisy quantum state from pure resources.

INVITED SPEAKER ABSTRACTS CONTINUED

Invited Speaker: Adam Bouland
Title: *An inverse-free Solovay-Kitaev algorithm*
Abstract: The Solovay-Kitaev algorithm is a fundamental result in quantum computation. It gives an algorithm for efficiently compiling arbitrary unitaries using universal gate sets: any unitary can be approximated by short gates sequences, whose length scales merely poly-logarithmically with accuracy. As a consequence, the choice of gate set is typically unimportant in quantum computing. However, the Solovay-Kitaev algorithm requires the gate set to be inverse-closed. It has been a longstanding open question if efficient algorithmic compilation is possible without this condition. In this work, we provide the first inverse-free Solovay-Kitaev algorithm, which makes no assumption on the structure within a gate set beyond universality, answering this problem in the affirmative, and providing an efficient compilation algorithm in the absence of inverses for both SU(d) and SL(d,C). The algorithm works by showing that approximate gate implementations of the generalized Pauli group can self-correct their errors.

THINGS TO DO IN THE AREA

Elevate Trampoline Park - Elevate Trampoline Park is a 30000-square-foot indoor activity center in Champaign, offering everything from trampolines, parkour, foam pits and much more

Skateland - For over 40 years, Skateland has been entertaining families. They offer Laser Zone Laser Tag as an added attraction. The arcade will provide hours of entertainment where you will no doubt win lots of tickets to redeem at the Stuff Shop. After a hard day of fun and play, nothing satisfies like a cold drink and a slice of homemade pizza. Kids of all ages will love skating at Skateland.

Savoy 16 Movie Theater - IMAX, 3D, Reserved Seating, Advance Ticketing, Bargain Tuesdays & More.

Champaign-Urbana Adventures in Time & Space - YOU HAVE ONE HOUR TO SAVE THE WORLD! Located in downtown Urbana, Illinois, these escape rooms make for a great activity. Teams of 2-10 players have 60 minutes to find clues, complete puzzles, discover secret doors, and solve a greater mystery. Each of our adventures takes place in a different setting and time period. From dispelling evil spirits in a haunted cabin to foiling the plot of a tyrannical wizard, the scenarios are designed to make players feel like they are living out a movie!

University of Illinois Ice Arena - Located at 406 East Armory Avenue in Champaign, this campus facility caters to skaters of all ages and level of skill. It has open public skating available several times throughout the week, including lunchtime skates (perfect for days off school) and weekends.

The Pottery Place: Paint Your Own Pottery - The Pottery Place is open for customers! Whether you want to create your own gifts, are looking for a unique party idea, or just enjoy painting pottery, The Pottery Place is a relaxing, inspiring space to gather and create! Take and Make Kits are now available for at home painting!

Museums - There's a lot to learn and discover at our area museums and attractions. From interactive museums to supercomputers, we're filled with a lot of "fun facts" to take home and impress your family https://www.visitchampaigncounty.org/things-to-do/museums-and-technology

Urbana's Market at the Square - Join thousands of residents and visitors in Downtown Urbana every Saturday, 7 AM to noon, from May through October, to celebrate everything local! Since 1979, Urbana's Market at the Square has been a mainstay for Urbana and the surrounding area by connecting the community with local growers and artisans. Shop one of the best selections of made- and grown-in-Illinois products including: produce, meat, dairy, honey, local beer and wine, flowers, handmade art and crafts, and more. Saturday morning at Urbana's Market at the Square is one of our city's signature institutions! It's a great way to kick off your weekend.

Shopping at Marketplace Mall & North Prospect - Market Place Shopping Center is an enclosed shopping mall located in Champaign, Illinois, US. The mall's anchor stores are Dick's Sporting Goods, Field & Stream, JCPenney, Macy's, and Costco Wholesale. It is the second largest enclosed shopping mall in Central Illinois. North Prospect also hosts stores such as TJMaxx, HomeGoods, Hobby Lobby, and more!

THINGS TO DO IN THE AREA

University of Illinois Arboretum - The Arboretum's gardens, collections, and habitats are transforming 160 acres of the University's south campus in Urbana-Champaign into an exceptional "living laboratory" for students in plant sciences and fine and applied arts, as well as an oasis of natural beauty open to the public. The gardens are open dawn to dusk spring through fall. Traditional Japanese gardens surround Japan House. These gardens are very different than Western gardens, with a focus on the natural landscape, utilizing plants, rustic stone, and water. Instead of bright color and symmetry, these gardens focus on green foliage and natural shapes of plants. The design of the gardens creates an extraordinarily peaceful and tranquil environment.

Champaign County Forest Preserve - The CCFP operates seven forests covering almost 4,000 acres in Champaign County and serves a wide range of offerings from trails, to splash pads, to night sky viewings and much more.

Art Walk at Meadowbrook Park - We invite you to visit Meadowbrook Park, located at Windsor Road and Race Street in Urbana, Illinois. Meadowbrook Park's 130 acres offer a myriad of recreational opportunities. Whether your interest is art, walking, cycling, natural areas, family fun, or simply enjoying the variety of gardens we have here, you won't forget how much fun you had at Meadowbrook Park.

The Literary: **Books & Brunch & Coffee & Wine**- Downtown Champaign's book bar. Worth a stop for unique gifts, good drinks, and great books!

The Fire Doll Artisan Chandlery - features an exciting retail and studio experience for candle lovers! Come visit us during normal business hours to watch candles being made while perusing a wide variety of handmade artisan candles, wax melts, and more! You will also find a lovely selection of artisan candle accessories, bath & body products, stationery, and much much more... all from woman-owned businesses both local and around the globe. We also host a Candle Happy Hour thrice weekly on Wednesdays, Thursdays, and Fridays from 6:30pm - 8:00pm! Reservations are required.

Alto Vineyards: Wine Tasting - The second location of Alto Vineyards, one of the largest and most award-winning wineries in Illinois. Come in any time for $5.00 walk-in wine tastings and unique wine-related gifts. Taste a few wines and relax in beautiful country setting just outside of Champaign, IL.

Prairie Fruits Farm & Creamery: Goat cheese tastings and visits with the goats - While we welcome visitors, we are, first and foremost, a diverse working farm. During the height of our production and marketing season (March through December), we are busy making cheese, taking care of the goats, tending the orchard, selling cheese and fruits at farmers' markets and hosting farm dinners and other farm events. During our farm's open hours, visitors can walk around the farm, visit with the goats, pick fruits when in season, and see the cheese making process through our viewing window.

Illinois Amish Country – plan for an afternoon. Arcola, Arthur, Sullivan and Tuscola invite you to travel back. Travel back to a simpler time, where craftsmen and artisans create beauty with their hands. Travel back for heirloom antiques and unique shops. Travel back for one-of-a-kind recreation and dining experiences that will appeal to your whole family.

COVID-19 TESTING OPTIONS

Champaign-Urbana Public Health District
The C-UPHD website contains information about testing locations in the Champaign-Urbana community.

Walgreens Pharmacy
Type: PCR and rapid antigen available

Locations:
-302 E. University Ave. Urbana, IL 61802
-1509 S Neil St Champaign, IL 61820
-1713 W Springfield Ave Champaign, IL 61821
-1801 Philo Rd. Urbana, IL 61802
-841 Bloomington Rd Champaign, IL 61820
-2402 Village Green Pl. Champaign, IL 61822

You must set up an appointment at the above link and select the type of test and location. These are DRIVE THROUGH ONLY so you must be in a vehicle and access testing through the drive-through. Rapid antigen results within 2 hours, PCR results within 48 hours.

CVS Pharmacy
Type: PCR and rapid antigen available

Locations:
1818 South Philo Road, Urbana, IL 61802
107 West Green Street, Champaign, IL 61820

You must set up an appointment at the above link and select the type of test and location. These are DRIVE THROUGH ONLY so you must be in a vehicle and access testing through the drive-through. Rapid antigen results within hours, PCR results within 1-2 days.

Rapid Antigen Tests
Many local stores carry at-home rapid antigen COVID tests, such as the above pharmacies. Places within walking distance of the hotels and MRL include:
Walgreens 407 E Green St Champaign, IL 61820
Campustown Target 603 E Green St. Champaign, IL 61820 Endcap of aisle E11
County Market 331 E Stoughton Champaign, IL 61820