HQAN Hybrid Quantum Architectures and Networks

ANNUAL RETREAT 2023

University of Illinois Urbana-Champaign

July 20-21, 2023

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SCHEDULE AT A GLANCE

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<tr><td>9:00</td><td rowspan="2">Executive Overview</td><td colspan="2">Research Highlight</td></tr>
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<tr><td>10:40</td><td>Coffee Break</td></tr>
<tr><td>11:00</td><td>Overview of Y3 Activities</td></tr>
<tr><td>13:15</td><td>Lunch</td><td colspan="2" rowspan="2">Lunch</td></tr>
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FACILITY MAP

**Note only the first floor is pictured*

Registration and Food Service

Main Sessions

Restrooms

RETREAT INFORMATION

RETREAT LOCATION

1320 Digital Computer Laboratory
University of Illinois Urbana-Champaign
1304 W. Springfield Ave.
Urbana, IL 61801

POSTER SESSION

A poster session will take place Thursday, July 20, 2023, from 3:30-5:00pm in the basement of the Digital Computer Laboratory. Light refreshments will be served. A full listing of posters can be found on pages 6-7. The available space on the poster boards for each poster is just under 48in x 48in.

BREAKFAST

Continental breakfast will be provided on both days from 8:30-9:00 AM.

LUNCH

A buffet-style lunch will be provided on Thursday, July 20, and boxed lunches will be provided on Friday, July 21.

SOCIAL

There will be a social held at Riggs Beer Company (1901 S. High Cross Rd., Urbana, IL 61802) on Thursday, July 20, from 6:00-8:00 PM. Each attendee will receive two drink tickets at registration, and pizza will be provided for those in attendance. **Transportation will not be provided**.

SCAVENGER HUNT

Join us for the NSF HQAN Retreat Scavenger Hunt, where participants will form teams and embark on a quest to capture photos at numerous on-campus spots. The winners will be chosen based on the count of locations photographed and the inventive flair displayed in their pictures. Following the scavenger hunt, we will gather for a picnic lunch at the enchanting University of Illinois Arboretum

LABESCAPE

World-renowned quantum physicist Professor Alberta Pauline Schrödenberg 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 -- run the world's first distributed quantum algorithm! This NSF-funded outreach project is the world's first science-based 'escape-room', in which all the puzzles involve various physics phenomena (including now an entanglement source!). We've run over 10,000 Agents through, including >1000 scientists. *Note: This is a NEW mission from previous ones (e.g., at Lincoln Square Mall, or the APS or DAMOP meetings), with all new challenges.*

LabEscape will be available FREE for HQAN Retreat attendees each day in 1262 Digital Computer Laboratory. Create a team of 4-8 Agents (or join someone else's) and sign up online:
https://my.physics.illinois.edu/extranet/labescape/hqan2023

Questions? Please contact us at LabEscape@illinois.edu, or 1-815-683-8193 (leave a message or send a text)

July 19	July 20	July 21
9:00 – 10:30 PM	4:30 – 6:00 PM	12:00 – 1:30 PM
	9:00 – 10:30 PM	1:30 – 3:00 PM

ANNUAL RETREAT SCHEDULE

THURSDAY, JULY 20, 2023

East Lobby – Digital Computer Laboratory

8:15 am Registration & Breakfast

1320 Digital Computer Laboratory

9:00 am Executive Overview
Brian DeMarco, Director, IQUIST, UIUC

9:30 am Q&A

10:00 am Highlights from MA1: Distributed Processor and Network Testbeds
Mark Saffman, Professor of Physics, UW
Hannes Bernien, Assistant Professor of Molecular Engineering, The University of Chicago

10:15 am Q&A

10:20 am Highlights from MA2: Distributed Processing, Network Protocols, and Software Development
Eric Chitambar, Associate Professor of Electrical and Computer Engineering, UIUC

10:35 am Q&A

10:40 am Break

11:00 am Highlights from MA3: Protected Qubits
Robert McDermott, Professor of Physics, UW

11:15 am Q&A

11:20 am Highlights from Education, Outreach, Workforce Development & Industry Partnerships
Mallory Conlon, Quantum Science Outreach Program Coordinator, UW

11:35 am Q&A

11:45 am Conclusion & Summary of Changes and New Directions
Brian DeMarco, Director, IQUIST, UIUC

12:00 pm Q&A

East Lobby – Digital Computer Laboratory

12:15 pm Lunch

THURSDAY, JULY 20, 2023

1320 Digital Computer Laboratory

1:15 pm Lightning Research Talks
Faculty, Students & Postdocs

2:15 pm Outreach Activity
Jennifer Choy, Assistant Professor, Electrical and Computer Engineering, UW

3:15 pm Conclusion of talks

Basement Atrium - Digital Computer Laboratory

3:30 pm Poster Session

5:00 pm Poster Session Concludes

Riggs Beer Company, 1901 S. High Cross Rd., Urbana, IL 61802

6:00 pm Social & Pizza Dinner

FRIDAY, JULY 21, 2023

East Lobby – Digital Computer Laboratory

8:30 am Registration & Breakfast

1320 Digital Computer Laboratory

9:00 am Research Highlight: Building dual-species quantum processors and quantum networks atom-by-atom
Hannes Bernien, Assistant Professor, Molecular Engineering, UC

9:30 am Conclusion of talk

East Lobby – Digital Computer Laboratory

9:45 am Student & Postdoc scavenger hunt activity followed by lunch at Japan House

1310, 1320 & East Lobby – Digital Computer Laboratory

9:45 am Faculty & Staff MA Strategy Breakout Session

East Lobby – Digital Computer Laboratory

12:00 pm Lunch

2:00 pm Student Return and Departure

POSTER SESSION PROGRAM

MA1: DISTRIBUTED PROCESSOR AND NETWORK TESTBEDS

1. Josh Akin, University of Illinois Urbana-Champaign
   "Quantum Teleportation Using a Nonlinear Bell State Measurement"
2. Yuzhou Chai & Dahlia Ghoshal, The University of Chicago
   "Hybrid Atom — Rare-Earth Ion Interface for Quantum Networks"
3. Tanvi Deshmukh & Ian Hammock, The University of Chicago
   "Semiconductor Defect States for Coherent Interactions and Hybrid Technologies
4. Preston Huft, University of Wisconsin-Madison
   "Progress Toward an Efficient Neutral Atom Quantum Network"
5. Abdullah Irfan, University of Illinois Urbana-Champaign
   "Remote Entanglement in a Chiral Quantum Network"
6. Michael Mollenhauer, University of Illinois Urbana-Champaign
   "Realizing Modular Architectures with Superconducting Circuits"
7. Carlos Salazar, University of Wisconsin-Madison
   "Fabrication of Tunable Fiber Fabry-Pérot Microcavities
8. Lauren Weiss, The University of Chicago
   "Toward Quantum Simulation and Networking Using the Quantum Matter Synthesizer"
9. Deniz Yavuz, University of Wisconsin-Madison
   "Subradiance and Subradiance to Radiation Trapping Transition in Dilute Ultracold Atomic Clouds"
10. Maryam Zahedian, University of Wisconsin-Madison
    "Modeling And Fabrication of Diamond Color-Center Arrays"

MA2: DISTRIBUTED PROCESSING, NETWORK PROTOCOLS, AND SOFTWARE DEVELOPMENT

11. Brian Doolittle, University of Illinois Urbana-Champaign
    "Variational Quantum Networking"
12. Lakshman Goel, University of Illinois Urbana-Champaign
    "An Interactive Quantum Entanglement Source Simulator"
13. Sarah Hagen, University of Illinois Urbana-Champaign
    "Non-Classical Zero Communication Reductions"
14. Marius Junge, University of Illinois Urbana-Champaign
    "Convex Complexity: From Circuits to High Energy-A Math Path"
15. Benjamin Nussbaum & Lakshman Goel, University of Illinois Urbana-Champaign
    "An Interactive Quantum Entanglement Source Simulator"
16. Ujaan Purakayastha, University of Illinois Urbana-Champaign
    "Quantum Technology for Quantum Routing"

POSTER SESSION PROGRAM

MA2: DISTRIBUTED PROCESSING, NETWORK PROTOCOLS, AND SOFTWARE DEVELOPMENT CONT.

17. Jeffery Yao & Andrew Lingenfelter, The University of Chicago
    "Dissipative Stabilization of Remote Many-Qubit Entanglement"
18. Allen Zhang, The University of Chicago
    "Topics On Entanglement Purification for Practical Near-Term Quantum Repeater Networks"

MA 3: PROTECTED QUBITS

19. Ben Harpt & Avani Vivrekar, University of Wisconsin-Madison
    "Designing And Characterizing Germanium Superconducting Devices for Qubit Applications"
20. Jessica Montone, University of Illinois Urbana-Champaign
    "Signatures Of Majorana States in the Current-Phase Relation of Lateral S-TI-S Josephson Junctions"
21. Abigail Shearrow, University of Wisconsin-Madison
    "Toward Implementation of Protected Charge Parity Qubits"
22. Drew Wild, University of Illinois Urbana-Champaign
    "Progress Toward Braiding, Fusion, and Parity Readout of Majorana States In S-TI-S Josephson Junction Devices"
23. Benjamin Woods, University of Wisconsin-Madison
    "Realizing Majorana Zero Modes In Magnetic Field-Free InAs-Al Nanowires With Fewer Growth Constraints"

OUTREACH:

24. Masha Kozlova, University of Illinois Urbana-Champaign
    "LabEscape As Public Outreach"

SCAVENGER HUNT DETAILS

Join us for the NSF HQAN Retreat Scavenger Hunt, where participants will form teams and embark on a quest to capture photos at numerous on-campus spots. The winners will be chosen based on the count of locations photographed and the inventive flair displayed in their pictures. Following the scavenger hunt, we will gather for a picnic lunch at the enchanting University of Illinois Arboretum.

TIMELINE:

9:45 am	Start at Digital Computer Laboratory Atrium
11:30 am	Lunch Begins at the Japan House
1:30 pm	Bus Departs to return to campus
	Must board 21 Raven MTD bus at the Vet Med Building and exit at the Illini Union
1:50 pm	Arrive back at Digital Computer Laboratory

INSTRUCTIONS:

- Stop by as many of the locations as possible!
- Take a photo with your team at the location with at least one of the props provided to you before the event!
- There will be TWO winning teams:
    1. The team which stopped at the most locations
    2. The team with the most creative photos *(note: this is subjective)*
- Finish at The Japan House for lunch

EMERGENCY CONTACTS:

On-ground contact: Michael Mollenhauer | 512-413-3732 (call or text)
In need of emergency pickup/any other issues requiring a car: Mari Cieszynski: 217-530-5949 (call or text)

WHAT TO BRING:

- Sunscreen
- Water bottles (it will be a 2.4 mile walk)
- Blankets/towels to eat lunch on at the park
- Outdoor games (frisbees, soccer balls, etc.)

If you need special accommodations, please contact:
Mari Cieszynski: marim2@illinois.edu | 217-530-5949 (call or text)

— Scan the QR code to join HQAN Slack workspace —
Share your scavenger hunt pictures in Slack channel

SCAVENGER HUNT DETAILS

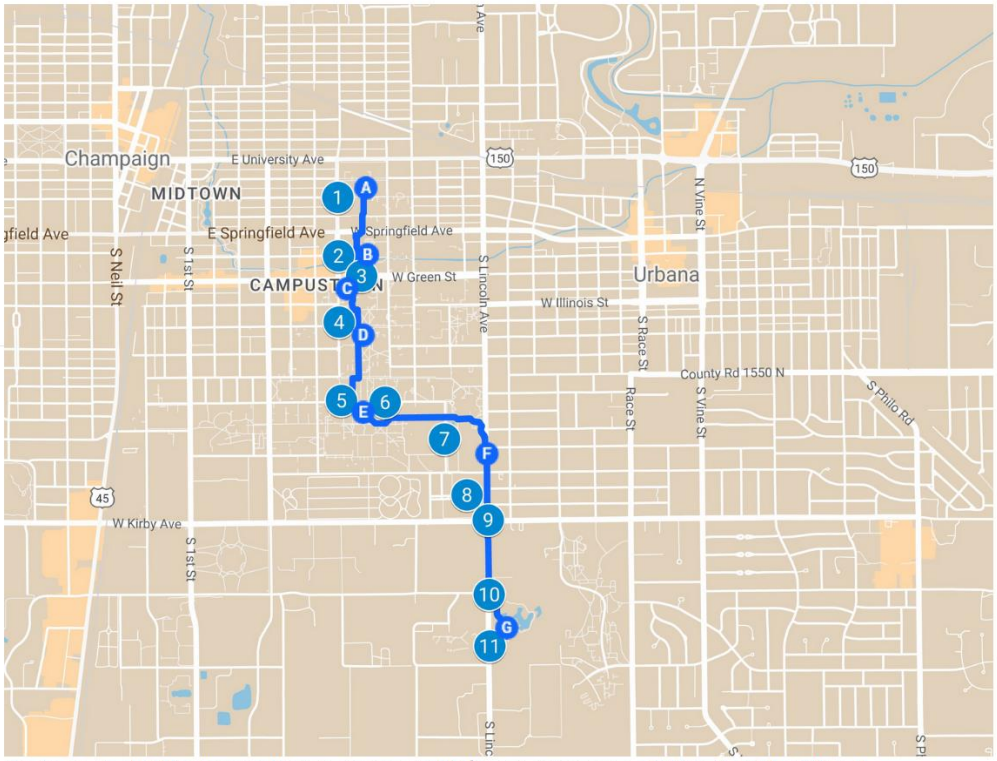
HQAN Scavenger Hunt

Scavenger Hunt Locations

- A North Quad
- B Bardeen Quadrangle
- C Alma Mater
- D Main Quad
- E South Quad
- F Stanley Illini Grove
- G Japan House, University of Illinois at Urbana-Champaign

Bus Stops

- 1 White & Wright (SE Corner)
- 2 Wright & Healey (East Side)
- 3 Illini Union (North Side Shelter)
- 4 Transit Plaza (SE Platform)
- 5 Gregory at Library (North Side)
- 6 Gregory at Mumford Hall
- 7 Plant Sciences Lab (West Side)
- 8 PAR (North Side Shelter)
- 9 Florida & Lincoln (NE Corner)
- 10 Lincoln & St. Marys (SE)
- 11 Lincoln at Japan House (East Side)



Go to each destination with you group and take an awesome picture together there!

Planning to start at the North Quad and finish at the Japan House within one hour.

Bus locations are marked and within 5 minutes walking distance of each destination. Check the bus line information below for which lines are free.

LINK TO MAP:

https://www.google.com/maps/d/viewer?mid=1xaZ4qJSIHGz40fcEtgoky6cVRzFkXwI&usp=sharing

SCAVENGER HUNT DETAILS

BUS LINE INFORMATION:

iStops are located on and near campus where it is unnecessary to show an iCard or other pass or pay a fare for the routes below. iStops are identified with the symbol at left.

10 Gold/ Gold Hopper:	From Lot E-14 to Goodwin & Springfield
22/220 Illini:	Any stop south of University Avenue and at Campus Circle, ONE Illinois South, ONE Illinois North, and Capstone Quarters
21 Raven:	Anywhere on this route
13/130 Silver:	From FAR-PAR to Goodwin & Springfield
12/120 Teal:	Westbound from FAR-PAR to Stoughton & Wright and eastbound from White & Wright to FAR-PAR
1/100 Yellow/ Yellow Hopper:	Northbound from Lot E-14 to Stoughton & Wright and southbound from White & Wright to Lot E-14

Please remember that it will be necessary to show your iCard if you board these routes outside the boundaries described above or take a different route. Be sure to always have your iCard (or cash fare or pass/Token Transit for non-UI Visitors) for your return trip.