

# iQuHACK Guests

## Academia

### **Professor Paola Cappellaro (Judge, Plenary Speaker)**



Paola Cappellaro is Associate Professor of Nuclear Science and Engineering at the Massachusetts Institute of Technology and a member of the Research Lab for Electronics, where she leads the Quantum Engineering Group. She received her Ph.D in 2006 from MIT and she then joined Harvard University as a postdoctoral associate in the Institute for Theoretical Atomic, Molecular and Optical Physics (ITAMP), before going back to MIT as a faculty in 2009. Prof. Cappellaro is an expert in NMR, ESR, coherent control and quantum information science. She is a specialist in spin-based quantum information processing and precision measurements in the solid state. With collaborators, she developed the concept and first

demonstrations of NV-diamond magnetometers. Cappellaro's major contributions have been in developing control techniques for nuclear and electronic spin qubits, including NV-diamond, inspired by NMR techniques and quantum information ideas. The goal is the realization of practical quantum nano-devices, such as sensors and simulators, more powerful than their classical counterparts, as well as the acquisition of a deeper knowledge of quantum systems and their environment. Her work has been recently recognized by the Young Investigator Award from the Air Force Office of Scientific Research and a Merckator Fellowship.

### **Professor Dirk Englund (Judge)**

Dirk Englund received his BS in Physics from Caltech in 2002. Following a Fulbright year at TU Eindhoven, he earned an MS in electrical engineering and a PhD in Applied Physics in 2008, both from Stanford University. He was a postdoctoral fellow at Harvard University until 2010, when he started his group as Assistant Professor of Electrical Engineering and of Applied Physics at Columbia University. In 2013, he joined the faculty of MIT's Department of Electrical Engineering and Computer Science. Dirk's research focuses on quantum technologies based on semiconductor and optical systems. Recent recognitions include the 2011 Presidential Early Career Award for Scientists and Engineers, the 2011 Sloan Research Fellowship in Physics, the 2012 DARPA Young Faculty Award, the 2012 IBM Faculty Award, an 2016 R&D100 Award, the OSA's 2017 Adolph Lomb Medal, and the 2017 ACS Photonics Young Investigator Award.



## **Professor Aram Harrow (Judge, Quantum Intro Lecturer)**



Aram Harrow grew up in Michigan before attending MIT for his undergraduate (math and physics, 2001) and graduate (physics, 2005) degrees. He then served as a lecturer in the math and computer science departments of the University of Bristol for five years, and as a research assistant professor at the University of Washington for two years. In 2013, he joined the MIT Physics department as an assistant professor. Aram Harrow's research focuses on quantum information and computing. He works to understand the capabilities of the quantum computers and quantum communication devices we will build in the future, and in the process, he creates connections to other areas of theoretical physics, mathematics and computer science. As a graduate student, Harrow developed the idea of "coherent classical communication", which along with his work on the resource inequality method, has greatly simplified our understanding of quantum information theory. Harrow has also

done foundational work on the role of representation theory in quantum algorithms and quantum information theory. In 2008, Harrow, Hassidim and Lloyd developed a quantum algorithm for solving linear systems of equations that provides a rare example of an exponential quantum speedup for a practical problem. Recently Harrow has been investigating properties of entanglement, such as approximate "superselection" and "monogamy" principles. The goal of this work is to better understand not only entanglement and its uses, but also the related areas of quantum communication, many-body physics and even convex optimization.

## **Prineha Narang (Judge)**

Prineha Narang is an Assistant Professor at the John A. Paulson School of Engineering and Applied Sciences at Harvard University. Prior to joining the faculty, Prineha came to Harvard as a Ziff Environmental Fellow at the Harvard University Center for the Environment to explore the new field of excited state quantum materials and devices. She was also a Research Scholar in Condensed Matter Theory at the MIT Dept. of Physics, working on new theoretical methods to describe quantum interactions. Prineha's work has been recognized by many awards and special designations, including being named a Moore Inventor Fellow by the Gordon and Betty Moore Foundation for innovations in quantum science and technology, CIFAR Azrieli Global Scholar by the Canadian Institute for Advanced Research, a Top Innovator by MIT Tech Review



(MIT TR35), and a Young Scientist by the World Economic Forum in 2018. In 2017, she was named by Forbes Magazine on their “30under30” list for her work in atom-by-atom quantum engineering. Prineha designs materials at the smallest scale, using single atoms, to enable the leap to quantum technologies. Prineha received her Sc.B. in Materials Science from Drexel University and an M.S. and Ph.D. in Applied Physics from the California Institute of Technology (Caltech), as a National Science Foundation Graduate Fellow and Resnick Sustainability Institute Fellow, where her work focused on understanding light-matter interactions in areas ranging from quantum plasmonics to nitride optoelectronics. Outside of science, she is an avid triathlete and runner.

### **Professor Kevin O’Brien (Judge)**



Kevin O’Brien joined the Department of Electrical Engineering and Computer Science as an assistant professor in July of 2018. He earned a BS in Physics from Purdue University and a PhD in Physics from the University of California at Berkeley, where he was an NSF Graduate Fellow. Afterward, he joined the Quantum Nanoelectronics Lab (Siddiqi Group) at UC Berkeley as a postdoc to lead development of multiqubit quantum processors. His work has appeared in top journals including Science, Nature Materials, and Nature Communications, among others. His research bridges nonlinear optics, metamaterials, and quantum engineering.

# Industry

## *HRL*

### **Dr. Jim Harrington (Judge)**

Jim Harrington was introduced to quantum information science as an undergrad at Duke University, and it has hooked him ever since with its combination of math, physics, computer science, and engineering. He studied at Caltech under John Preskill and has since worked at Los Alamos National Laboratory and HRL Laboratories. A variety of focus areas in his research have included: constructing rateless and rate-compatible error-correcting codes, developing protocols for distributed randomness beacons and secure authentication, utilizing permutations for addressable logic, analyzing the security and efficiency of quantum key distribution protocols, comparing logical performance of various quantum error-correcting codes, studying the impact of closed timelike curves on information theory, and simulating cellular automata decoders.



## *IBM*

### **Ismael Faro (Judge)**



Ismael Faro is a Senior Manager within IBM Research. He works in an agile, collaborative environment across software architecture, understanding both front-end and back-end concerns, while specializing in the front-end.

### **Bryce Fuller (Judge)**

Bryce Fuller recently graduated from the University of Texas at Austin with a BS in Electrical and Computer Engineering. He currently works as a client-facing applications researcher for IBM Q where his interests lie primarily in quantum machine learning.





### **Dr. Paco Martin (Judge)**

Paco Martin is a PhD in Computer Science from the University of La Laguna in Spain. Since 2016 he has been linked to IBM Research, working for the IBM Q and AI Research Team. Currently, he is the Lead Software Developer of IBM Q Experience, the web platform that allows to run experiments on real quantum backends.



### **Professor Robert Loredó (Qiskit Tutorial Leader)**



Robert Loredó is a Quantum Ambassador, Qiskit Advocate, Watson Architect, Distinguished IT Specialist, and Master Inventor at IBM where he holds over 130 patents, and many publications worldwide. He has over 19 years of experience in enterprise product development leveraging various technologies such as; Artificial Intelligence, Cloud, Blockchain, Social Computing, and Quantum Computing. Robert has presented various workshops, lectures, and has written numerous articles covering; artificial intelligence, bioinformatics, quantum computing, and has taught cloud and software engineering at the Florida International University School of Computer Science. Robert also serves on the

Society of Hispanic Professional Engineers professional chapter as Vice President. He holds a Bachelors and a Masters degree in Computer and Electrical Engineering from the University of Miami.

## ***Zapata Computing***

### **Dr. Yudong Cao (Judge)**

Yudong Cao is the CTO of Zapata Computing - a Harvard spinout quantum computing software and algorithm company funded by The Engine, the venture firm founded by MIT to invest in tough tech. Dr. Cao has a background in Mechanical Engineering and Computer Science. From 2016-2018 he held the position as a postdoctoral researcher at Harvard University working closely with Professor Alán Aspuru-Guzik, a world leader in quantum simulation for chemistry and materials and co-founder of Zapata Computing. The main focus of Dr. Cao's work at Harvard was on developing and deploying algorithms for noisy intermediate scale quantum devices. This work has served as the foundation for the applications and solutions Zapata can offer their enterprise clients today.

