Achieving Error Resilience in Quantum Processors

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Abstract: While quantum computing promises computational advantages for specific applications, its realization has been met by a number of challenges. A prominent hurdle for scalable quantum computing is noise due to imperfect control or interactions between the quantum system and its environment. Overcoming noise is a key step is enabling reliable computation with sufficiently low error rates. This talk will cover current challenges and opportunities for combating noise across the quantum computing stack. Throughout this discussion, I will highlight some of my group's recent research in methods to characterize and combat noise in quantum processors. I will discuss our work in constructing effective noise models and noise characterization protocols. I will show how these models and protocols can be used to create targeted error protection. Through demonstrations on existing hardware platforms, we showcase our protocols and convey their efficacy towards attaining error resilience.

Bio: Gregory Quiroz is a principal scientist at the Johns Hopkins University Applied Physics Laboratory. In addition, he is an associate research professor in the Department of Physics and Astronomy at Johns Hopkins University. Dr. Quiroz received his PhD from the University of Southern California in 2013, where he studied quantum control and adiabatic quantum computation. Thereafter, he transitioned to a role as a staff scientist at the Aerospace Corporation in Los Angeles, CA. His research focused on quantum communication and quantum algorithm development for National Security Space applications. Since 2016, he has been a senior scientist at the Johns Hopkins University Applied Physics Laboratory, where he now also holds the role of supervisor for the Applied Quantum Sciences section within the R&D sector of the lab. His current research interests include quantum characterization and control, applications of quantum control to quantum algorithm design, and quantum sensing.