Quantum AI

March Meeting 2021

March 15 - 19, 2021

Organizing Committee

Session Chair: Guillaume Verdon, Jimmy Chen, Kevin Satzinger, Ted White
Invited Speakers: Brooks Foxen, Masoud Mohseni, Nicholas Rubin, Patrick Francis Riley, Ross Koningstein, Xiao Mi

Invited Talks

Monday, March 15

Error mitigating NISQ chemistry computations
Presenter: Nicholas Rubin
Authors: *Frank Arute, Kunal Arya, Ryan Babbush, Dave Bacon, Joseph C. Bardin, Rami Barends, Sergio Boixo, Michael Broughton, Bob B. Buckley, David A. Buell, Brian Burkett, Nicholas Bushnell, Yu Chen, Zijun Chen, Benjamin Chiaro, Roberto Collins, William Courtney, Sean Demura, Andrew Dunsworth, Daniel Eppens, Edward Farhi, Austin Fowler, Brooks Foxen, Craig Gidney, Marissa Giustina, Rob Graff, Steve Habegger, Matthew P. Harrigan, Alan Ho, Sabrina Hong, Trent Huang, William J. Huggins, Lev Ioffe, Sergei V. Isakov, Evan Jeffrey, Zhang Jiang, Cody Jones, Dvir Kafri, Kostyantyn Kechedzhi, Julian Kelly, Seon Kim, Paul V. Klimov, Alexander Korotkov, Fedor Kostritsa, David Landhuis, Pavel Laptev, Mike Lindmark, Erik Lucero, Orion Martin, John M. Martinis, Jarrod R. McClean, Matt McEwen, Anthony Megrant, Xiao Mi, Masoud Mohseni, Wojciech Mruczkiewicz, Josh Mutus, Ofer Naaman, Matthew Neeley, Charles Neill, Hartmut Neven, Murphy Yuezhen Niu, Thomas E. O'Brien, Eric Ostby, Andre Petukhov, Harald Putterman, Chris Quintana, Pedram Roushan, Nicholas C. Rubin, Daniel Sank, Kevin J. Satzinger, Vadim Smelyanskiy, Doug Strain, Kevin J. Sung, Marco Szalay, Tyler Y. Takeshita, Amit Vainsencher, Theodore White, Nathan Wiebe, Z. Jamie Yao, Ping Yeh, Adam Zalcman*
9:24 AM–10:00 AM PST
Link to Paper; Link to Session

Authors with Google affiliation in blue
*Work done while at Google

Vignettes of machine learning in the natural sciences
Presenter: Patrick Francis Riley
Authors: Patrick Francis Riley
6:00 PM–6:36 PM PST
Links to papers: #1, #2; Link to Session

Wednesday, March 17

Let's Be An Awesome Future's Past
Presenter: Ross Koningstein
Author: Ross Koningstein, Shaughnessy (Siri) Brennan Brown
9:48 AM–10:24 AM
Link to Presentation Slides; Link to Session

Thursday, March 18

Advances in gates with tunable qubits and tunable couplers
Presenter: Brooks Foxen
Authors: B. Foxen, C. Neill, A. Dunsworth, P. Roushan, B. Chiaro, A. Megrant, J. Kelly, Zijun Chen, K. Satzinger, R. Barends, F. Arute, K. Arya, R. Babbush, D. Bacon, J.C. Bardin, S. Boixo, D. Buell, B. Burkett, Yu Chen, R. Collins, E. Farhi, A. Fowler, C. Gidney, M. Giustina, R. Graff, M. Harrigan, T. Huang, S.V. Isakov, E. Jeffrey, Z. Jiang, D. Kafri, K. Kechedzhi, P. Klimov, A. Korotkov, F. Kostritsa, D. Landhuis, E. Lucero, J. McClean, M. McEwen, X. Mi, M. Mohseni, J.Y. Mutus, O. Naaman, M. Neeley, M. Niu, A. Petukhov, C. Quintana, N. Rubin, D. Sank, V. Smelyanskiy, A. Vainsencher, T.C. White, Z. Yao, P. Yeh, A. Zalcman, H. Neven, John M. Martinis
12:06 PM–12:42 PM PST
Link to Paper; Link to Session

Tensor-Flow Quantum: An open source software framework for hybrid quantum-classical machine learning
Presenter: Masoud Mohseni
Authors: Michael Broughton, Guillaume Verdon, Trevor McCourt, Antonio J. Martinez, Jae Hyeon Yoo, Sergei V. Isakov, Philip Massey, Murphy Yuezhen Niu, Ramin Halavati, Evan Peters, Martin Leib, Andrea Skolik, Michael Streif, David Von Dollen, Jarrod R. McClean, Sergio Boixo, Dave Bacon, Alan K. Ho, Hartmut Neven, Masoud Mohseni
12:42 PM–1:18 PM PST
Link to Paper; Link to Session

Authors with Google affiliation in blue
*Work done while at Google

Richard L. Greene Dissertation Award in Experimental Condensed Matter or Materials Physics (2020): Beyond-Classical Quantum Computation at Google-AI Quantum

Presenter: Xiao Mi

Authors: Xiao Mi, Pedram Roushan, Chris Quintana, Salvatore Mandra, Jeffrey Marshall, Charles Neill, Frank Arute, Kunal Arya, Juan Atalaya, Ryan Babbush, Joseph C. Bardin, Rami Barends, Andreas Bengtsson, Sergio Boixo, Alexandre Bourassa, Michael Broughton, Bob B. Buckley, David A. Buell, Brian Burkett, Nicholas Bushnell, Zijun Chen, Benjamin Chiaro, Roberto Collins, William Courtney, Sean Demura, Alan R. Derk, Andrew Dunsworth, Daniel Eppens, Catherine Erickson, Edward Farhi, Austin G. Fowler, Brooks Foxen, Craig Gidney, Marissa Giustina, Jonathan A. Gross, Matthew P. Harrigan, Sean D. Harrington, Jeremy Hilton, Alan Ho, Sabrina Hong, Trent Huang, William J. Huggins, L. B. Ioffe, Sergei V. Isakov, Evan Jeffrey, Zhang Jiang, Cody Jones, Dvir Kafri, Julian Kelly, Seon Kim, Alexei Kitaev, Paul V. Klimov, Alexander N. Korotkov, Fedor Kostritsa, David Landhuis, Pavel Laptev, Erik Lucero, Orion Martin, Jarrod R. McClean, Trevor McCourt, Matt McEwen, Anthony Megrant, Kevin C. Miao, Masoud Mohseni, Wojciech Mruczkiewicz, Josh Mutus, Ofer Naaman, Matthew Neeley, Michael Newman, Murphy Yuezhen Niu, Thomas E. O'Brien, Alex Opremcak, Eric Ostby, Balint Pato, Andre Petukhov, Nicholas Redd, Nicholas C. Rubin, Daniel Sank, Kevin J. Satzinger, Vladimir Shvarts, Doug Strain, Marco Szalay, Matthew D. Trevithick, Benjamin Villalonga, Theodore White, Z. Jamie Yao, Ping Yeh, Adam Zalcman, Hartmut Neven, Igor Aleiner, Kostyantyn Kechedzhi, Vadim Smelyanskiy, Yu Chen

3:00 PM–3:36 PM PST

Link to Paper; Link to Session

Abstracts

Monday, March 15

Error mitigation via verified phase estimation

Presenter: Thomas O'Brien

Authors: Thomas E. O'Brien, Stefano Polla, Nicholas C. Rubin, William J. Huggins, Sam McArdle, Sergio Boixo, Jarrod R. McClean, Ryan Babbush

8:48 AM–9:00 AM PST

Link to Paper; Link to Session

Authors with Google affiliation in blue

*Work done while at Google

Simulating the Fermi-Hubbard model on Google's superconducting quantum processor
Presenter: Zhang Jiang
Authors: Frank Arute, Kunal Arya, Ryan Babbush, Dave Bacon, Joseph C. Bardin, Rami Barends, Andreas Bengtsson, Sergio Boixo, Michael Broughton, Bob B. Buckley, David A. Buell, Brian Burkett, Nicholas Bushnell, Yu Chen, Zijun Chen, Yu-An Chen, Ben Chiaro, Roberto Collins, Stephen J. Cotton, William Courtney, Sean Demura, Alan Derk, Andrew Dunsworth, Daniel Eppens, Thomas Eckl, Catherine Erickson, Edward Farhi, Austin Fowler, Brooks Foxen, Craig Gidney, Marissa Giustina, Rob Graff, Jonathan A. Gross, Steve Habegger, Matthew P. Harrigan, Alan Ho, Sabrina Hong, Trent Huang, William Huggins, Lev B. Ioffe, Sergei V. Isakov, Evan Jeffrey, Zhang Jiang, Cody Jones, Dvir Kafri, Kostyantyn Kechedzhi, Julian Kelly, Seon Kim, Paul V. Klimov, Alexander N. Korotkov, Fedor Kostritsa, David Landhuis, Pavel Laptev, Mike Lindmark, Erik Lucero, Michael Marthaler, Orion Martin, John M. Martinis, Anika Marusczyk, Sam McArdle, Jarrod R. McClean, Trevor McCourt, Matt McEwen, Anthony Megrant, Carlos Mejuto-Zaera, Xiao Mi, Masoud Mohseni, Wojciech Mruczkiewicz, Josh Mutus, Ofer Naaman, Matthew Neeley, Charles Neill, Hartmut Neven, Michael Newman, Murphy Yuezhen Niu, Thomas E. O'Brien, Eric Ostby, Bálint Pató, Andre Petukhov, Harald Putterman, Chris Quintana, Jan-Michael Reiner, Pedram Roushan, Nicholas C. Rubin, Daniel Sank, Kevin J. Satzinger, Vadim Smelyanskiy, Doug Strain, Kevin J. Sung, Peter Schmitteckert, Marco Szalay, Norm M. Tubman, Amit Vainsencher, Theodore White, Nicolas Vogt, Z. Jamie Yao, Ping Yeh, Adam Zalcman, Sebastian Zanker
8:48 AM–9:00 AM PST
Link to Paper; Link to Session

Error Mitigation with Artificial Symmetries
Presenter: William Huggins
Authors: William Huggins, Sam McArdle, Thomas O'Brien, Joonho Lee, Nicholas Rubin, Sergio Boixo, Birgitta K Whaley, Ryan Babbush, Jarrod McClean
3:36 PM–3:48 PM PST
Link to Paper; Link to Session

Exponential suppression of bit or phase flip errors using repetition codes on superconducting qubits (Part I)
Presenter: Sabrina Hong
Authors: Zijun Chen, Kevin J. Satzinger, Juan Atalaya, Alexander N. Korotkov, Andrew Dunsworth, Daniel Sank, Chris Quintana, Matt McEwen, Rami Barends, Paul V. Klimov, Sabrina Hong, Cody Jones, Andre Petukhov, Dvir Kafri, Sean Demura, Brian Burkett, Craig Gidney, Austin G. Fowler, Harald Putterman, Igor Aleiner, Frank Arute, Kunal Arya, Ryan Babbush, Joseph C. Bardin, Andreas Bengtsson, Alexandre Bourassa, Michael Broughton, Bob B. Buckley, David A. Buell, Nicholas Bushnell, Benjamin Chiaro, Roberto Collins, William Courtney, Alan R. Derk, Daniel Eppens, Catherine Erickson, Edward Farhi, Brooks Foxen, Marissa Giustina, Jonathan A. Gross, Matthew P. Harrigan, Sean D. Harrington, Jeremy Hilton, Alan Ho, Trent Huang, William J. Huggins, L. B. Ioffe, Sergei V. Isakov, Evan Jeffrey, Zhang Jiang, Kostyantyn Kechedzhi, Seon Kim, Fedor Kostritsa, David Landhuis, Pavel Laptev, Erik Lucero, Orion Martin, Jarrod R. McClean, Trevor McCourt, Xiao Mi, Kevin C. Miao, Masoud Mohseni, Wojciech Mruczkiewicz, Josh Mutus, Ofer Naaman, Matthew Neeley, Charles Neill, Michael Newman, Murphy Yuezhen Niu, Thomas E. O'Brien, Alex Opremcak, Eric Ostby, Bálint Pató, Nicholas Redd, Pedram Roushan, Nicholas C. Rubin, Vladimir Shvarts, Doug Strain, Marco Szalay, Matthew D. Trevithick, Benjamin Villalonga, Theodore White, Z. Jamie Yao, Ping Yeh, Adam Zalcman, Hartmut Neven, Sergio Boixo, Vadim Smelyanskiy, Yu Chen, Anthony Megrant, Julian Kelly
3:36 PM–3:48 PM PST
Link to Paper; Link to Session

Authors with Google affiliation in blue
*Work done while at Google

Exponential suppression of bit or phase flip errors using repetition codes on superconducting qubits (Part II)

Presenter: *Zijun Chen*

Authors: *Zijun Chen, Kevin J. Satzinger, Juan Atalaya, Alexander N. Korotkov, Andrew Dunsworth, Daniel Sank, Chris Quintana, Matt McEwen, Rami Barends, Paul V. Klimov, Sabrina Hong, Cody Jones, Andre Petukhov, Dvir Kafri, Sean Demura, Brian Burkett, Craig Gidney, Austin G. Fowler, Harald Putterman, Igor Aleiner, Frank Arute, Kunal Arya, Ryan Babbush, Joseph C. Bardin, Andreas Bengtsson, Alexandre Bourassa, Michael Broughton, Bob B. Buckley, David A. Buell, Nicholas Bushnell, Benjamin Chiaro, Roberto Collins, William Courtney, Alan R. Derk, Daniel Eppens, Catherine Erickson, Edward Farhi, Brooks Foxen, Marissa Giustina, Jonathan A. Gross, Matthew P. Harrigan, Sean D. Harrington, Jeremy Hilton, Alan Ho, Trent Huang, William J. Huggins, L. B. Ioffe, Sergei V. Isakov, Evan Jeffrey, Zhang Jiang, Kostyantyn Kechedzhi, Seon Kim, Fedor Kostritsa, David Landhuis, Pavel Laptev, Erik Lucero, Orion Martin, Jarrod R. McClean, Trevor McCourt, Xiao Mi, Kevin C. Miao, Masoud Mohseni, Wojciech Mruczkiewicz, Josh Mutus, Ofer Naaman, Matthew Neeley, Charles Neill, Michael Newman, Murphy Yuezhen Niu, Thomas E. O'Brien, Alex Opremcak, Eric Ostby, Bálint Pató, Nicholas Redd, Pedram Roushan, Nicholas C. Rubin, Vladimir Shvarts, Doug Strain, Marco Szalay, Matthew D. Trevithick, Benjamin Villalonga, Theodore White, Z. Jamie Yao, Ping Yeh, Adam Zalcman, Hartmut Neven, Sergio Boixo, Vadim Smelyanskiy, Yu Chen, Anthony Megrant, Julian Kelly*

3:36 PM–3:48 PM PST

Link to Paper; Link to Session

Exponential suppression of bit or phase flip errors using repetition codes on superconducting qubits (Part III)

Presenter: *Kevin Satzinger*

Authors: *Zijun Chen, Kevin J. Satzinger, Juan Atalaya, Alexander N. Korotkov, Andrew Dunsworth, Daniel Sank, Chris Quintana, Matt McEwen, Rami Barends, Paul V. Klimov, Sabrina Hong, Cody Jones, Andre Petukhov, Dvir Kafri, Sean Demura, Brian Burkett, Craig Gidney, Austin G. Fowler, Harald Putterman, Igor Aleiner, Frank Arute, Kunal Arya, Ryan Babbush, Joseph C. Bardin, Andreas Bengtsson, Alexandre Bourassa, Michael Broughton, Bob B. Buckley, David A. Buell, Nicholas Bushnell, Benjamin Chiaro, Roberto Collins, William Courtney, Alan R. Derk, Daniel Eppens, Catherine Erickson, Edward Farhi, Brooks Foxen, Marissa Giustina, Jonathan A. Gross, Matthew P. Harrigan, Sean D. Harrington, Jeremy Hilton, Alan Ho, Trent Huang, William J. Huggins, L. B. Ioffe, Sergei V. Isakov, Evan Jeffrey, Zhang Jiang, Kostyantyn Kechedzhi, Seon Kim, Fedor Kostritsa, David Landhuis, Pavel Laptev, Erik Lucero, Orion Martin, Jarrod R. McClean, Trevor McCourt, Xiao Mi, Kevin C. Miao, Masoud Mohseni, Wojciech Mruczkiewicz, Josh Mutus, Ofer Naaman, Matthew Neeley, Charles Neill, Michael Newman, Murphy Yuezhen Niu, Thomas E. O'Brien, Alex Opremcak, Eric Ostby, Bálint Pató, Nicholas Redd, Pedram Roushan, Nicholas C. Rubin, Vladimir Shvarts, Doug Strain, Marco Szalay, Matthew D. Trevithick, Benjamin Villalonga, Theodore White, Z. Jamie Yao, Ping Yeh, Adam Zalcman, Hartmut Neven, Sergio Boixo, Vadim Smelyanskiy, Yu Chen, Anthony Megrant, Julian Kelly*

3:48 PM–4:00 PM PST

Link to Paper; Link to Session

Tuesday, March 16

Correlated Charge Noise and Bit Flip Errors in Superconducting Qubits
Presenter: Chris Wilen
Authors: C. D. Wilen, S. Abdullah,N. A. Kurinsky, C. Stanford, L. Cardani, G. D'Imperio, C. Tomei, L. Faoro, L. B. Ioffe, C. H. Liu, A. Opremcak, B. G. Christensen, J. L. DuBois, and R. McDermott
10:00 AM–10:12 AM PST
Link to Paper; Link to Session

Physical Review Session on "Communication: A Key to the Progress of Physics
Presenter: Karl Ziemelis
Authors: Karl Ziemelis, Natalie Walchover, Sean M Carroll, Marissa Giustina
12:00 PM–12:12 PM PST
Link to Session

Reinforcement learning for quantum circuit optimization
Presenter: Thomas Foesel
Authors: Thomas Foesel, Murphy Yuezhen Niu, Florian Marquardt, Li Li
1:42 PM–1:54 PM PST
Link to Session

Numerical Simulation of Large Scrambling Quantum Circuits
Presenter: Salvatore Mandra
Authors: Xiao Mi, Pedram Roushan, Chris Quintana, Salvatore Mandra, Jeffrey Marshall, Charles Neill, Frank Arute, Kunal Arya, Juan Atalaya, Ryan Babbush, Joseph C. Bardin, Rami Barends, Andreas Bengtsson, Sergio Boixo, Alexandre Bourassa, Michael Broughton, Bob B. Buckley, David A. Buell, Brian Burkett, Nicholas Bushnell, Zijun Chen, Benjamin Chiaro, Roberto Collins, William Courtney, Sean Demura, Alan R. Derk, Andrew Dunsworth, Daniel Eppens, Catherine Erickson, Edward Farhi, Austin G. Fowler, Brooks Foxen, Craig Gidney, Marissa Giustina, Jonathan A. Gross, Matthew P. Harrigan, Sean D. Harrington, Jeremy Hilton, Alan Ho, Sabrina Hong, Trent Huang, William J. Huggins, L. B. Ioffe, Sergei V. Isakov, Evan Jeffrey, Zhang Jiang, Cody Jones, Dvir Kafri, Julian Kelly, Seon Kim, Alexei Kitaev, Paul V. Klimov, Alexander N. Korotkov, Fedor Kostritsa, David Landhuis, Pavel Laptev, Erik Lucero, Orion Martin, Jarrod R. McClean, Trevor McCourt, Matt McEwen, Anthony Megrant, Kevin C. Miao, Masoud Mohseni, Wojciech Mruczkiewicz, Josh Mutus, Ofer Naaman, Matthew Neeley, Michael Newman, Murphy Yuezhen Niu, Thomas E. O'Brien, Alex Opremcak, Eric Ostby, Balint Pato, Andre Petukhov, Nicholas Redd, Nicholas C. Rubin, Daniel Sank, Kevin J. Satzinger, Vladimir Shvarts, Doug Strain, Marco Szalay, Matthew D. Trevithick, Benjamin Villalonga, Theodore White, Z. Jamie Yao, Ping Yeh, Adam Zalcman, Hartmut Neven, Igor Aleiner, Kostyantyn Kechedzhi, Vadim Smelyanskiy, Yu Chen
3:36 PM–3:48 PM PST
Link to Paper; Link to Session

Fermionic partial tomography via classical shadows
Presenter: Andrew Zhao
Authors: Andrew Zhao, Nicholas C. Rubin, Akimasa Miyake
3:48 PM–4:00 PM PST
Link to Paper; Link to Session

Authors with Google affiliation in blue
*Work done while at Google

Protected qubits based on superconducting circuit topology
Presenter: Andrey Klots
Authors: Andrey Klots, Robert F McDermott, Lev B Ioffe
4:12 PM–4:24 PM PST
Link to Session

Wednesday, March 17

Focus Beyond Quadratic Speedup for Error-Corrected Quantum Advantage
Presenter: Ryan Babbush
Authors: Ryan Babbush, Jarrod R. McClean, Craig Gidney, Sergio Boixo, Hartmut Neven
8:12 AM–8:24 AM PST
Link to Paper; Link to Session

Correlation matrix tool for error diagnostics in QEC experiments
Presenter: Juan Atalaya
Authors of paper #1: M. McEwen, D. Kafri, Z. Chen, J. Atalaya, K. J. Satzinger, C. Quintana, P. V. Klimov, D. Sank, C. Gidney, A. G. Fowler, F. Arute, K. Arya, B. Buckley, B. Burkett, N. Bushnell, B. Chiaro, R. Collins, S.Demura, A. Dunsworth, C. Erickson, B. Foxen, M. Giustina, T. Huang, S. Hong, E. Jeffrey, S. Kim, K.Kechedzhi, F. Kostritsa, P. Laptev, A. Megrant, X. Mi, J. Mutus, O. Naaman, M. Neeley, C. Neill, M.Niu, A. Paler, N. Redd, P. Roushan, T. C. White, J. Yao, P. Yeh, A. Zalcman, Yu Chen, V. N.Smelyanskiy, John M. Martinis, H. Neven, J. Kelly, A. N. Korotkov, A. G. Petukhov, R. Barends
Authors of paper #2: Zijun Chen, Kevin J. Satzinger, Juan Atalaya, Alexander N. Korotkov, Andrew Dunsworth, Daniel Sank, Chris Quintana, Matt McEwen, Rami Barends, Paul V. Klimov, Sabrina Hong, Cody Jones, Andre Petukhov, Dvir Kafri, Sean Demura, Brian Burkett, Craig Gidney, Austin G. Fowler, Harald Putterman, Igor Aleiner, Frank Arute, Kunal Arya, Ryan Babbush, Joseph C. Bardin, Andreas Bengtsson, Alexandre Bourassa, Michael Broughton, Bob B. Buckley, David A. Buell, Nicholas Bushnell, Benjamin Chiaro, Roberto Collins, William Courtney, Alan R. Derk, Daniel Eppens, Catherine Erickson, Edward Farhi, Brooks Foxen, Marissa Giustina, Jonathan A. Gross, Matthew P. Harrigan, Sean D. Harrington, Jeremy Hilton, Alan Ho, Trent Huang, William J. Huggins, L. B. Ioffe, Sergei V. Isakov, Evan Jeffrey, Zhang Jiang, Kostyantyn Kechedzhi, Seon Kim, Fedor Kostritsa, David Landhuis, Pavel Laptev, Erik Lucero, Orion Martin, Jarrod R. McClean, Trevor McCourt, Xiao Mi, Kevin C. Miao, Masoud Mohseni, Wojciech Mruczkiewicz, Josh Mutus, Ofer Naaman, Matthew Neeley, Charles Neill, Michael Newman, Murphy Yuezhen Niu, Thomas E. O'Brien, Alex Opremcak, Eric Ostby, Bálint Pató, Nicholas Redd, Pedram Roushan, Nicholas C. Rubin, Vladimir Shvarts, Doug Strain, Marco Szalay, Matthew D. Trevithick, Benjamin Villalonga, Theodore White, Z. Jamie Yao, Ping Yeh, Adam Zalcman, Hartmut Neven, Sergio Boixo, Vadim Smelyanskiy, Yu Chen, Anthony Megrant, Julian Kelly
8:48 AM–9:00 AM PST
Link to Papers: #1, #2; Link to Session

Authors with Google affiliation in blue
*Work done while at Google

Accurately computing electronic properties of materials using eigenenergies
Presenter: Charles Neill
Authors: Igor Aleiner, Frank Arute, Kunal Arya, Juan Atalaya, Ryan Babbush, Joseph C. Bardin, Rami Barends, Andreas Bengtsson, Sergio Boixo, Alexandre Bourassa, Michael Broughton, Bob B. Buckley, David A. Buell, Brian Burkett, Nicholas Bushnell, Yu Chen, Zijun Chen, Benjamin Chiaro, Roberto Collins, William Courtney, Sean Demura, Alan R. Derk, Andrew Dunsworth, Daniel Eppens, Catherine Erickson, Edward Farhi, Austin G. Fowler, Brooks Foxen, Craig Gidney, Marissa Giustina, Jonathan A. Gross, Matthew P. Harrigan, Sean D. Harrington, Jeremy Hilton, Alan Ho, Sabrina Hong, Trent Huang, William J. Huggins, L. B. Ioffe, Sergei V. Isakov, Evan Jeffrey, Zhang Jiang, Cody Jones, Dvir Kafri, Kostyantyn Kechedzhi, Julian Kelly, Seon Kim, Paul V. Klimov, Alexander N. Korotkov, Fedor Kostritsa, David Landhuis, Pavel Laptev, Erik Lucero, Orion Martin, Jarrod R. McClean, Trevor McCourt, Matt McEwen, Anthony Megrant, Xiao Mi, Kevin C. Miao, Masoud Mohseni, Wojciech Mruczkiewicz, Josh Mutus, Ofer Naaman, Matthew Neeley, Charles Neill, Hartmut Neven, Michael Newman, Murphy Yuezhen Niu, Thomas E. O'Brien, Alex Opremcak, Eric Ostby, Bálint Pató, Andre Petukhov, Chris Quintana, Nicholas Redd, Pedram Roushan, Nicholas C. Rubin, Daniel Sank, Kevin J. Satzinger, Vladimir Shvarts, Vadim Smelyanskiy, Doug Strain, Marco Szalay, Matthew D. Trevithick, Benjamin Villalonga, Theodore White, Z. Jamie Yao, Ping Yeh, Adam Zalcman
9:00 AM–9:12 AM PST
Link to Paper; Link to Session

Removing leakage-induced correlated errors in superconducting quantum error correction - Experiment
Presenter: Matthew McEwen
Authors: M. McEwen, D. Kafri,Z. Chen, J. Atalaya, K. J. Satzinger, C. Quintana, P. V. Klimov, D. Sank, C. Gidney, A. G. Fowler, F. Arute, K. Arya, B. Buckley, B. Burkett, N. Bushnell, B. Chiaro, R. Collins, S. Demura, A. Dunsworth, C. Erickson, B. Foxen, M. Giustina,T. Huang, S. Hong, E. Jeffrey, S. Kim, K. Kechedzhi, F. Kostritsa, P. Laptev, A. Megrant, X. Mi, J. Mutus, O. Naaman, M. Neeley, C. Neill, M. Niu, A. Paler, N. Redd, P. Roushan, T. C. White, J. Yao, P. Yeh, A. Zalcman, Yu Chen, V. N. Smelyanskiy, John M. Martinis, H. Neven, J. Kelly,A. N. Korotkov, A. G. Petukhov, and R. Barends
9:00 AM–9:12 AM PST
Link to Paper; Link to Session

Removing leakage-induced correlated errors in superconducting quantum error correction - Theory
Presenter: Dvir Kafri
Authors: M. McEwen, D. Kafri,Z. Chen, J. Atalaya, K. J. Satzinger, C. Quintana, P. V. Klimov, D. Sank, C. Gidney, A. G. Fowler, F. Arute, K. Arya, B. Buckley, B. Burkett, N. Bushnell, B. Chiaro, R. Collins, S. Demura, A. Dunsworth, C. Erickson, B. Foxen, M. Giustina,T. Huang, S. Hong, E. Jeffrey, S. Kim, K. Kechedzhi, F. Kostritsa, P. Laptev, A. Megrant, X. Mi, J. Mutus, O. Naaman, M. Neeley, C. Neill, M. Niu, A. Paler, N. Redd, P. Roushan, T. C. White, J. Yao, P. Yeh, A. Zalcman, Yu Chen, V. N. Smelyanskiy, John M. Martinis, H. Neven, J. Kelly,A. N. Korotkov, A. G. Petukhov, and R. Barends
10:24 AM–10:36 AM PST
Link to Paper; Link to Session

Low depth mechanisms for quantum optimization
Presenter: Jarrod McClean
Authors: Jarrod R. McClean, Matthew P. Harrigan, Masoud Mohseni, Nicholas C. Rubin, Zhang Jiang, Sergio Boixo, Vadim N. Smelyanskiy, Ryan Babbush, Hartmut Neven
10:36 AM–10:48 AM PST
Link to Paper; Link to Session

Authors with Google affiliation in blue
*Work done while at Google

Robust phase estimation for two-qubit gates
Presenter: Benjamin Marinoff
Authors: Benjamin Marinoff, Joshua Combes, Nicholas Rubin, Kyle Gulshen
10:36 AM–10:48 AM PST
Link to Session

Thursday, March 18

Compilation of Fault-Tolerant Quantum Heuristics for Combinatorial Optimization
Presenter: Yuval Sanders
Authors: Yuval R. Sanders, Dominic W. Berry, Pedro C. S. Costa, Louis W. Tessler, Nathan Wiebe, Craig Gidney, Hartmut Neven, and Ryan Babbush
10:48 AM–11:00 AM PST
Link to Paper; Link to Session

Learnability and Complexity of Quantum Sample
Presenter: Murphy Yuezhen Niu
Authors: Murphy Yuezhen Niu, Andrew M. Dai, Li Li (李力), Augustus Odena, Zhengli Zhao, Vadim Smelyanskyi, Hartmut Neven, Sergio Boixo
12:06 PM–12:18 PM PST
Link to Paper; Link to Session

Tuning Kinetic Properties of Self-Assembled Systems
Presenter: Ella King
Authors: Carl Goodrich, Ella King, Sam Schoenholz, Ekin D Cubuk, Michael Brenner
12:54 PM–1:06 PM PST
Link to Paper; Link to Session

Power of data in quantum machine learning
Presenter: Hsin-Yuan Huang
Authors: Hsin-Yuan Huang, Michael Broughton, Masoud Mohseni, Ryan Babbush, Sergio Boixo, Hartmut Neven, and Jarrod R. McClean
1:30 PM–1:42 PM PST
Link to Paper; Link to Session

Quantum generative adversarial networks with provable convergence
Presenter: Alexander Zlokapa
Authors: Murphy Yuezhen Niu, Michael Broughton, Alexander Zlokapa, Masoud Mohseni, Vadim Smelyanskiy, Hartmut Neven
4:24 PM–4:36 PM PST
Link to Session

Authors with Google affiliation in blue
*Work done while at Google

Creating and manipulating a Laughlin-type v=1/3 fractional quantum Hall state on a quantum computer with linear depth circuits
Presenter: Armin Rahmani
Authors: Armin Rahmani, Kevin J. Sung, Harald Putterman, Pedram Roushan, Pouyan Ghaemi, Zhang Jiang
5:00 PM–5:12 PM PST
Link to Paper; Link to Session

Friday, March 19

Learning local and nonlocal quantum data via generative model over tensor network architecture
Presenter: Khadijeh Najafi
Authors: Khadijeh Najafi, Ahmadreza Azizi, Miles Stoudenmire, Xun Gao, Mikhail Lukin, Susanne F Yelin, Masoud Mohseni
8:12 AM–8:24 AM PST
Link to Session

Protected C-Parity Qubits Part 1: Characterization and Protection
Presenter: Kenneth Dodge
Authors: Kenneth Dodge, Yebin Liu, Brad Cole, Jaseung Ku, Michael Senatore, Abigail Shearrow, Shaojiang Zhu, Sohair Abdullah, Andrey Klots, Lara Faoro, Lev B Ioffe, Robert McDermott, Britton Plourde
8:24 AM–8:36 AM PST
Link to Session

Protected C-Parity Qubits Part 2: Gate Operations
Presenter: Abigail Shearrow
Authors: Abigail Shearrow, Shaojiang Zhu, Sohair Abdullah, Kenneth Dodge, Yebin Liu, Bradley G. Cole, Jaseung Ku, Michael Senatore, Andrey Klots, Lara Faoro, Lev B Ioffe, Britton Plourde, Robert McDermott
8:36 AM–8:48 AM PST
Link to Session

Soft Matter Physics for Machine Learning: Dynamical loss functions
Presenter: Miguel Ruiz Garcia
Authors: Miguel Ruiz Garcia, Ge Zhang, Sam Schoenholz, Andrea Liu
9:36 AM–9:48 AM PST
Link to Paper; Link to Session

Investigation of databased calibration for 1-Port cryogenic measurements
Presenter: Suren Singh
Authors: Haozhi Wang, S. Singh, C.R.H. McRae, J.C. Bardin, S.-X. Lin, N. Messaoudi, A.R. Castelli, Y.J. Rosen, E.T. Holland, D.P. Pappas, J.Y. Mutus
9:36 AM–9:48 AM PST
Link to Paper; Link to Session

Authors with Google affiliation in blue
*Work done while at Google

Improved resonator measurement using 1-port cryogenic calibration
Presenter: Haozhi Wang
Authors: Haozhi Wang, S. Singh, C.R.H. McRae, J.C. Bardin, S.-X. Lin, N. Messaoudi, A.R. Castelli, Y.J. Rosen, E.T. Holland, D.P. Pappas, J.Y. Mutus
9:48 AM–10:00 AM PST
Link to Paper; Link to Session

Unsupervised Learning of Physical Systems with Two-dimensional Tensor Network Structures
Presenter: Ahmadreza Azizi
Authors: Ahmadreza Azizi, Khadijeh Najafi, Masoud Mohseni
10:12 AM–10:24 AM PST
Link to Session

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