Yvonne Y. Gao

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Institute of Materials Research and Engineering
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Education

Yale Unversity (Ph.D, M.Phil., M.S. Physics) 2012 - 2018
- Research focus: quantum computing, superconducting circuits, solid state physics

Oxford University (B.A Physics) 2008 - 2011
- First Class Honours

Research Experience

Research scientist at the Institute for Materials Research and Engineering, Singapore 2018 - present
- Leading a new initiatve on building robust platforms for hybrid quantum computing
- Investigating the viability of a new superconductor for quantum devices resistant to magnetic field

Graduate study at Yale University 2012 - 2018
- Led new initiative to implement robust logical operations between multiple bosonic qubits encoded in superconducting cavities and developed it into a major research focus in the lab
- Achieved the first experimental realisations of programmable logical operations between bosonic modes
- First demonstration of two highly entangled Schröndinger cat states in a new multi-cavity architecture.
- 13 publications and 2 provisional patents

Research internship at Data Storage Institute, Singapore 2011 - 2012
- Developed toolbox for numerical simulation of multimode bosonic interference
- 1 publication and Best Poster Award at A*STAR Poster Presentation Session

Selected Publications

Yvonne Y. Gao, et al.
Entanglement of Bosonic Modes via an Engineered Exchange Coupling, *Nature* 566, 509–512 (2019)

Yvonne Y. Gao, et al.
Programmable interference between two microwave quantum memories, *Phys. Rev. X* 8, 021073 (2018)

S. Rosenblum & **Yvonne Y. Gao**, et al.
A CNOT gate between multiphoton qubits encoded in two cavities, *Nat Commun* 9, 652 (2018)

C. Wang, **Yvonne Y. Gao**, et al.
A Schöndinger cat living in two boxes, *Science* Vol.352, Issue 6289 (2016)

Patents

C. Wang, **Yvonne Y. Gao**, et al.
Techniques for manipulation of two-qubit quantum states and related systems and methods,
U.S Patent No.16/068,405

Liang Jiang, S. M. Girvin, **Yvonne Y. Gao**, B. J. Lester, R. J. Schoelkopf
Robust quantum logic gates
U.S Provisional Patent No. 62/613, 866

Honours and Awards

National Research Foundation Fellowship 2019
MIT Tech Review TR35 (Asia Pacific) 2019
National Science Scholarship (Undergraduate & Ph.D) 2008

Invited talks

- Universal quantum computing with superconducting circuits, Centre for Quantum Technologies (2018)
- A buyer's guide for quantum computing hardware, SGInnovate (2019)
- The promise and perils of quantum computing, Centre for Strategic Futures (2019)
- Modular and programmable building blocks for a quantum computer, RISE Innovation Week (2019)

Full List of Publications

- **Yvonne Y. Gao**, B. J. Lester, K. S. Chou, L. Frunzio, M. H. Devoret, Liang Jiang, S. M. Girvin, R. J. Schoelkopf
  Entanglement of Bosonic Modes through an Engineered Exchange Coupling,
  Nature vol. 566, no. 7745, pp. 509–512 (2019)
- Christopher S. Wang, Jacob C. Curtis, B. J. Lester, Yaxing Zhang, **Yvonne Y. Gao**, Jessica Freeze, Victor S. Batista, Patrick H. Vaccaro, Isaac L. Chuang, Luigi Frunzio, Liang Jiang, S. M. Girvin, Robert J. Schoelkopf
  Quantum simulation of molecular vibronic spectra on a superconducting bosonic processor,
  Preprint (2019)
- Yaxing Zhang, B. J. Lester, **Yvonne Y. Gao**, Liang Jiang, R. J. Schoelkopf, S. M. Girvin
  Engineering controllable bilinear mode coupling in circuit QED: Floquet theory of two-tone driven nonlinear oscillators,
  Phys. Rev. A 99, 012314 (2019), Editor's choice
- **Yvonne Y. Gao**, B. J. Lester, Yaxing Zhang, Chen Wang, S. Rosenblum, Luigi Frunzio, Liang Jiang, S. M. Girvin, R. J. Schoelkopf
  Programmable interference between two microwave quantum memories,
  Phys. Rev. X 8, 021073 (2018)
- K.S. Chou, J.Z. Blumoff, C.S. Wang, P.C. Reinhold, C.J. Axline, **Yvonne Y. Gao**, L. Frunzio, M.H. Devoret, Liang Jiang, R.J. Schoelkopf
  Deterministic teleportation of a quantum gate between two logical qubits,
  Nature 561, 368–373 (2018)
- S. Rosenblum* and **Yvonne Y. Gao***, Philip Reinhold, Chen Wang, Christopher Axline, Luigi Frunzio, Steven M Girvin, Liang Jiang, Mazyar Mirrahimi, Michel H. Devoret, Robert J. Schoelkopf
  A CNOT gate between multiphoton qubits encoded in two cavities,
  Nat Commun 9, 652 (2018)
- C. Wang, **Yvonne Y. Gao**, P. Reinhold, R. W. Heeres, N. Ofek, K. Chou, C. Axline, M. Reagor, J. Blumoff, K. M. Sliwa, L. Frunzio, S. M. Girvin, L. Jiang, M. Mirrahimi, M. H. Devoret, R. J. Schoelkopf
  A Schöndinger cat living in two boxes,
  Science Vol.352, Issue 6289 (2016)
- Y Chu, C. Axline, C. Wang, T. Brecht, **Yvonne Y. Gao**, L. Frunzio, R. J. Schoelkopf
  Suspending superconducting qubits by silicon micromachining,
  Applied Physics Letters 109 (11), 112601 (2016)
- R. P. Riwar, A. Hosseinkhani, L. D. Burkhart, **Yvonne Y. Gao**, R. J. Schoelkopf, L. I. Glazman, G. Catelani
  Normal-metal quasiparticle traps for superconducting qubits
  Phys. Rev. B 94 (10), 104516 (2016)
- C. Wang, C. Axline, **Yvonne Y. Gao**, T. Brecht, Y. Chu, L. Frunzio, M. H. Devoret, R. J. Schoelkopf
  "Surface participation and dielectric loss in superconducting qubits
  Applied Physics Letters 107, 162601 (2015)
- C. Wang, **Yvonne Y. Gao**, I. M. Pop, U. Vool, C. Axline, T. Brecht, R. W. Heeres, L. Frunzio, M. H. Devoret, G. Catelani, L. I. Glazman, R. J. Schoelkopf
  Measurement and control of quasiparticle dynamics in a superconducting qubit,
  Nature Communications 5, 5853 (2014)
- U. Vool, I. M. Pop, K. Sliwa, B. Abdo, C. Wang, T. Brecht, **Yvonne Y. Gao**, S. Shankar, M. Hatridge, G. Catelani, M. Mirrahimi, L. Frunzio, R. J. Schoelkopf, L, I. Glazman, M. H. Devoret
  Non-Poissonian quantum jumps of a fluxonium qubit due to quasiparticle excitations,
  Physical review letters 113 (24), 247001 (2014)
- S. H. Tan, **Yvonne Y. Gao**, H. de Guise, B. C. Sanders
  SU (3) quantum interferometry with single-photon input pulses
  Physical review letters, 110(11), 113603 (2013)