

Education

- 2019.10 – Present **University of Chicago.**
Degree: Ph.D. in Theoretical Chemistry.
- 2019.10 – 2020.12 **University of Chicago.**
Degree: M.S. in the Physical Sciences.
- 2015.09 – 2019.07 **University of Chinese Academy of Sciences.**
Degree: B.S. in Physics and B.S. in Chemistry.

Research Experience

- 2022.08 – Present **University of Chicago, Committee on Computational and Applied Mathematics.**
Project: Development of tensor network and Monte Carlo methods for committor functions of rare events and ground state properties of quantum many-body systems.
Advisor: Dr. Yuehaw Khoo, *Assistant Professor*.
- 2020.06 – 2022.07 **University of Chicago, Department of Chemistry.**
Project: Development of quantum defect embedding theory for strongly correlated states in materials and quantum algorithms for simulating materials properties on quantum computers.
Advisor: Dr. Giulia Galli, *Professor*.
- 2021.06 – 2022.04 **Flatiron Institute, Center for Computational Quantum Physics.**
Project: Compact imaginary frequency grids for dynamical mean-field theory and many-body perturbation theory using the discrete Lehmann representation.
Advisor: Dr. Jason Kaye, *Associate Research Scientist*, Dr. Kun Chen, *Flatiron Research Fellow* and Dr. Olivier Parcollet, *Senior Research Scientist*.
- 2018.12 – 2019.06 **University of Chinese Academy of Sciences, School of Physical Sciences.**
Project: Density matrix renormalization group applied to quantum chemical calculations.
Advisor: Dr. Tao Xiang, *Professor*.
- 2018.12 – 2019.06 **University of Chinese Academy of Sciences, School of Chemical Sciences.**
Project: GPU acceleration of matrix project state based hierarchical equations of motion.
Advisor: Dr. Qiang Shi, *Professor*.

Publications

* Co-first author

- 2022 Christian Vorwerk*, **Nan Sheng***, Marco Govoni, Benchen Huang, and Giulia Galli. Quantum embedding theories to simulate condensed systems on quantum computers. *Nature Comput. Sci.*, volume 2, pages 424–432. Nature Publishing Group, 2022.
- 2022 **Nan Sheng***, Christian Vorwerk*, Marco Govoni, and Giulia Galli. Green's function formulation of quantum defect embedding theory. *J. Chem. Theory. Comput.*, volume 18, pages 3512–3522. American Chemical Society, June 2022.

- 2022 **Nan Sheng**, Jason Kaye, Kun Chen, Alexander Hampel, Sophie Beck, Nils Wentzell, and Olivier Parcollet. Accelerating dynamical mean-field calculations using the discrete Lehmann representation. *In preparation*, March 2022.
- 2022 Benchen Huang, **Nan Sheng**, Marco Govoni, and Giulia Galli. Quantum simulations of fermionic hamiltonians with efficient encoding and ansatz schemes. *Submitted to npj Quantum Information*, October 2022.
- 2021 He Ma, **Nan Sheng**, Marco Govoni, and Giulia Galli. Quantum embedding theory for strongly correlated states in materials. *J. Chem. Theory. Comput.*, volume 17, pages 2116–2125. American Chemical Society, April 2021.
- 2020 He Ma, **Nan Sheng**, Marco Govoni, and Giulia Galli. First-principles studies of strongly correlated states in defect spin qubits in diamond. *Phys. Chem. Chem. Phys.*, volume 22, pages 25522–25527. The Royal Society of Chemistry, November 2020.

Talks

- 2023 Benchen Huang, **Nan Sheng**, Marco Govoni, and Giulia Galli. Quantum simulations of fermionic hamiltonians with efficient encoding and ansatz schemes. In *Bulletin of the American Physical Society*. American Physical Society, 2023.
- 2023 Marco Govoni, **Nan Sheng**, Christian Vorwerk, Benchen Huang, Victor Yu, and Giulia Galli. Green's function formulation of quantum defect embedding theory. In *Bulletin of the American Physical Society*. American Physical Society, 2023.
- 2022 Christian Vorwerk, **Nan Sheng**, Marco Govoni, and Giulia Galli. Extrinsic and intrinsic defects in MgO and CaO as potential spin-qubit candidates. In *Bulletin of the American Physical Society*. American Physical Society, 2022.
- 2022 **Nan Sheng**, Christian Vorwerk, Marco Govoni, and Giulia Galli. An exact double counting scheme for quantum defect embedding theory. In *Bulletin of the American Physical Society*. American Physical Society, 2022.
- 2021 **Nan Sheng**, He Ma, Marco Govoni, and Giulia Galli. First-principles studies of strongly correlated states in defect spin qubits in diamond. In *Bulletin of the American Physical Society*. American Physical Society, 2021.
- 2021 **Nan Sheng**, Jason Kaye, Kun Chen, and Olivier Parcollet. Accelerating dynamical mean-field calculations using the discrete Lehmann representation. Center for Computational Quantum Physics, Flatiron Institute, 2021.
- 2021 Marco Govoni, He Ma, **Nan Sheng**, Sijia Dong, and Giulia Galli. Coupling interoperable software for quantum simulations of materials. In *Bulletin of the American Physical Society*. American Physical Society, 2021.

Refereeing Activities

Physical Chemistry Chemical Physics, Royal Society of Chemistry, *reviewer*.

Teaching Activities

Comprehensive General Chemistry, University of Chicago, *teaching assistant*.

Organic Chemistry, University of Chicago, *teaching assistant*.

Fellowships & Awards

- 2019 **McCormick Fellowship**, University of Chicago.
- 2019 **Excellent Graduate of Beijing**, Chinese Ministry of Education (2 out of 39).
- 2019 **Excellent Graduate**, University of Chinese Academy of Sciences (3 out of 39).
- 2018 **Study Abroad Scholarship**, University of Chinese Academy of Sciences (2 out of 39).

2018 **Tang Lixin Scholarship**, University of Chinese Academy of Sciences (1 out of 39).

2016, 2017, 2018 **National Encouragement Scholarship**, Chinese Ministry of Education (2 out of 39).

2016, 2017, 2018 **Academic Excellence Scholarship**, University of Chinese Academy of Sciences.

Technical Skills

Programming: C/C++, Fortran, Python, MATLAB, Mathematica, Julia, Bash, \LaTeX , MPI, CUDA.

Software: Quantum Espresso, PySCF, Qiskit, Gaussian, ORCA, TRIQS, Wannier90, WEST, Qbox.