Alexander Kolar

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EDUCATION

University of Chicago Chicago, Illinois
Ph.D. student in the Pritzker School of Molecular Engineering Entered 2021

Northwestern University Evanston, Illinois
B.S. in Computer Engineering and Applied Math, GPA: 3.97/4.00 2017–2021

RESEARCH INTERESTS

- Quantum network simulation
- Quantum network control protocols and applications

EXPERIENCE

Argonne National Laboratory Lemont, Illinois
Research Assistant Summer 2019–2021

- Development of SeQUeNCe: Simulator of Quantum Network Communication
- Design and implement comprehensive discrete event simulation platform
- Realistically simulate existing quantum hardware and protocols
- Create novel protocol stack construction

Northwestern University Space Technology and Rocketry Society Evanston, Illinois
Member/Sub-team Lead 2017–Present

- NASA Student Launch
- Design and construct electronics to control payload within a rocket
- Lead electronics sub-team to coordinate building efforts
- Assisted new members in learning electronics fundamentals and design paradigms

Northwestern Design Thinking and Communication Evanston, Illinois
Design Team Member Winter–Spring 2018

- Multi-sensory instrument for Park School in Evanston, Illinois
- Wheelchair for Shirley Ryan AbilityLab in Chicago, Illinois
- Designed and built a working prototype of a multi-sensory instrument to allow creative expression for special needs students
- Developed a wheelchair addition for a patient with post-polio syndrome to allow greater traction and mobility during winter months
- Regularly served as team leader to facilitate product design, user testing, and creation of a final documentation
- Produced documentation to record the development and outcome of the project, presented findings to the client
- Presented the design to experts and users through participation in a design fair

Publications

1. X. Wu, J. Chung, A. Kolar, E. Wang, T. Zhong, R. Kettimuthu and M. Suchara, "Simulations of Photonic Quantum Networks for Performance Analysis and Experiment Design." In proceedings of the PHOTONICS workshop, collocated with SC19, November 2019.

2. X.Wu, J.Chung, A.Kolar, E.Wang, T.Zhong, R.Kettimuthu and M. Suchara, "Photon-Level Simulation of Quantum Key Distribution with Picosecond Accuracy." Inthe 2019 Single Photon Workshop, October 2019.

Talks and Presentations

1. "Quantum Network Simulation", at Argonne National Laboratory Learning Off the Lawn, July 2020

2. "Quantum Information Science at Argonne National Laboratory", at IEEE QCE20

Skills

- **Programming Languages:** Python, C++, C, Linux Shell, x86 assembly
- **Mathematics Languages:** MATLAB, Mathematica
- **Electronics Development:** VHDL, KiCad EDA

Projects

- SeQUeNCe: A Customizable Discrete-Event Simulator of Quantum Networks (Presentation Paper, 2020)
  Submission paper for the ACM CoNEXT conference. Available at https://arxiv.org/abs/2009.12000
- SeQUeNCe Open Source Release (Python Simulation Module, 2019)
  Open source tool for configuration and simulation of optical quantum communication networks. Includes example experiment scripts and HTML documentation. Available at https://github.com/sequence-toolbox/SeQUeNCe

Scholarships and Awards

- Eta Kappa Nu—IEEE Honor Society   2018
- National Merit Scholarship   2017–2021
- Eagle Scout Award   2015

Relevant Classes

- COMP SCI 213   Fall 2018
  Introduction to Computer Systems: Learning about the hierarchy of abstractions and implementations that comprise a modern computer system; clarifying modern computers and programming tools
- COMP ENG 347   Winter–Spring 2021
  Microprocessor Systems Project: Design, prototype and test individual projects involving microprocessors and related devices such as PAL/FPGA and special purpose ICs
- ELEC ENG 395   Spring 2019
  Quantum Computing: Introduction to mathematical formalisms of quantum computing, classical quantum algorithms, and recent advances in quantum and physical computing
- ES APPM 495   Spring 2020
  Special Topics in Applied Mathematics–Modeling Social Systems: Study and discussion of various social-system based models in a variety of academic fields

Extracurricular Activities

- Member of Phi Mu Alpha Sinfonia   2018–2021
  Fraternal music organization serving the interests of musicians and regularly staging music-based philanthropy events. Also served as alumni relations officer.
- Member of Northwestern University Marching Band   2017–2021
  Perform at all Northwestern home football games, as well as select other sporting events. Also served as bass drum section leader.