Lui Sha

Professional Preparation

• McGill University	Montreal, PQ, Canada	EE	B.S., 1978
• Carnegie Mellon University	Pittsburgh, PA, USA	EE, ECE	M.S., 1979
• Carnegie Mellon University	Pittsburgh, PA, USA	ECE	Ph.D., 1985

Appointments

• Professor, Department of Computer Science, UIUC	1998 – present
• Member Technical Staff, Software Engineering Institute, CMU	1988 – 1998
• Research Associate, Department of Computer Science, CMU	1985 – 1987

Honors

- Donald B. Gillies Chair, CS Department, UIUC.
- The Tau Beta Pi Daniel C. Drucker Eminent Faculty, College of Engineering, UIUC.
- ACM SIGBED Distinguished Lecture: Verifiably Safe Deep Reinforcement Learning Enabled Control.

Teaching

- "Teachers Ranked as Excellent by Their Students," Research Memorandum #257, Daily Illini, 9/8, 1999, 3/31, 2000.
- GE Scholar, the Academy for Excellence in Engineering Education, UIUC, 1999.

Recent Research

1) Verifiable safety is one of the critical technological bottlenecks in the era of AI-enabled Cyber-Physical Systems (CPS), and I have created the foundation to solve this problem for the control of CPS (See my ACM SIGBED Distinguished Lecture)

- **Challenge**: Hallucination is in AI's DNA because it uses probability models to approximate causal and deterministic relations.
- **Safety**: The foundation of safe AI is to construct a verifiably safe and enforceable envelope of CPS states within which AI operates.
- **Effectiveness:** Teaching scientific models to AI reduces its hallucination probability.

2) Safe AI-enabled medical GPS systems to dramatically reduce preventable medical errors, which are the misapplication of complex modern medical knowledge. Preventable medical errors claim 250,000 lives per year and are the third leading cause of death in the USA alone.

Recognition and Awards

- Fellow of the IEEE, 1998
- Fellow of the ACM, 2005
- IEEE Simon Ramo Medal, 2016. This medal is IEEE's highest honor for *exceptional achievement in systems engineering and systems science*
- David Lubkowski Award for the Advancement of Digital Avionics, AIAA, 2021.
- Member of the National Academy of Science's Committee on Certifiably Dependable Software Systems, 2005 to 2007. See the National Academy's Report on Dependable Software Systems.

- Member of NASA Advisory Council's Aeronautics Committee, assisting NASA in formulating her research programs, 2015 to 2017, and served as a reviewer of NASA Langley's Safety-Critical Systems Branch, 2013 and 2017.
- IEEE Distinguished Visitor, 2005 – 2007.
- Outstanding Technical Contributions and Leadership Award, IEEE Technical Committee on Real-Time Systems, Dec. 2001.
- Test of Time Award and Influential Paper Award. IEEE Technical Committee on Real-Time Systems, 2020
- ACM SIGBED Distinguished Lecture: Verifiably Safe Deep Reinforcement Learning Enabled Control, April 2024.

Research Impact

- "*Transformation of real-time computing practice from an ad hoc process to an engineering process based on analytic methods*." IEEE Fellow citation.
- "*Technical leadership and contributions to fundamental theory, practice and standardization for engineering real-time systems.*" IEEE Simon Ramo Medal citation.
- **Rescuing Mars Pathfinder**: "*The Mars Pathfinder mission was widely proclaimed as "flawless" in the early days after its July 4th, 1997 landing on the Martian surface. … But a few days into the mission, not long after Pathfinder started gathering meteorological data, the spacecraft began experiencing total system resets… Once diagnosed, it was clear to the JPL engineers that using priority inheritance would prevent the resets they were seeing. …No more system resets occurred. … When was the last time you saw a room of people cheer a group of computer science theorists for their significant practical contribution to advancing human knowledge? :-) It was quite a moment*." http://catless.ncl. ac.uk/Risks/ 19.49.html
- **Global Positioning Satellite in Orbit Software Upgrade**: "*The navigation payload software for the next block of Global Positioning System upgrades recently completed testing. … This design would have been difficult or impossible before the development of rate monotonic theory*", L. Doyle, and J. Elzey "Successful Use of Rate Monotonic Theory on A Formidable Real-Time System, technical report, p.1, ITT, Aerospace Communication Division, 1993.
- **International Space Station**: "*Through the development of Rate Monotonic Scheduling, we now have a system that will allow [Space Station] Freedom's computers to budget their time, to choose between a variety of tasks, and decide not only which one to do first but how much time to spend in the process*," Aaron Cohen, Deputy Administrator of NASA, October 1992 (p. 3), Charting The Future: Challenges and Promises Ahead of Space Exploration.`