

**COMMITTEE ON FACULTY RESEARCH LECTURE**  
**Annual Report 2021-2022**

To: Academic Senate, Santa Cruz Division

The Committee on the Faculty Research Lecture (CFRL) enthusiastically nominates JJ Garcia-Luna-Aceves, Distinguished Professor of Computer Science and Engineering, as the 57th Faculty Research Lecturer.

Professor Garcia-Luna-Aceves' work addresses computer networks, and in particular, the protocols that are used to route packets in these networks. Computer networks are so fundamental to modern life that they are considered a utility, perhaps as necessary as water and electricity. One of the early insights at the core of the internet was to divide the information to be transmitted into "packets" of standardized size, which could be independently routed to their destinations. Dividing the information into packets made it possible to share the communication links among large numbers of tasks and users, rendering possible the internet as we know it today – with email, messaging, video, audio, web, all coexisting. What remained as a problem was how to route these packets: how to decide whether to send them this or that way in a complex web of connections to efficiently reach their destinations.

The original routing algorithms were developed on the basis of common sense, intuition, and simulation. This led to routing that mostly worked, but occasionally sent packets into loops, dropped them, or caused delays and congestion. Professor Garcia-Luna-Aceves' fundamental insight was that mathematical logic and formal methods could be used in proving the correctness of the routing protocols, ensuring that they satisfied their design goals under all conditions.

In a seminal 1988 SIGCOMM paper, Professor Garcia-Luna-Aceves showed how packets could be routed by having nodes propagate information on their shortest distance to destinations. Prior approaches suffered from several problems: in some, updates to the routing information could send packets into loops; in others, the computation would not necessarily converge; others yet required an impractical amount of information to be communicated. Professor Garcia-Luna-Aceves proposed the first provably correct protocol that was loop-free at all times. The protocol was adopted by CISCO for its routing protocol EIGRP, and was very widely used. In another seminal paper co-authored with Dr. Fullmer in 1995, Professor Garcia-Luna-Aceves presented a family of protocols for sharing wireless bandwidth to transmit information packets. The paper presented a provably correct implementation that corrected problems in an IEEE standard protocol, introducing ideas that underlie many common wireless protocols in use today.

Professor Garcia-Luna-Aceves' work has touched most areas of computer communications: from wired to wireless protocols; from fixed-topology to ad-hoc wireless networks in which nodes learn how to route information even as the nodes move and their connections are in constant change; from connection-based protocols, where information is sent in order to connectionless protocols that aim at the synchronization of knowledge across computing devices. Professor Garcia-Luna-Aceves has published over 500 peer-reviewed papers and book chapters. His work has been cited over 40,000 times in the scientific literature; and his h-index is over 100, meaning that he has

published over 100 papers each of which was cited over 100 times, a rare distinction. To add to these accomplishments, he holds over 60 patents on computer communications.

Professor Garcia-Luna-Aceves' distinguished research record has received wide recognition. He was elected a Corresponding Member of the Mexican Academy of Sciences (Academia Mexicana de Ciencias) in 2013. He was elected an IEEE Fellow in 2006, an ACM Fellow in 2008, and a AAAS Fellow in 2010. He is the recipient of several awards for his research contributions, including: The IEEE MILCOM Technical Achievement Award in 2016 for his sustained contributions to military communications; the IEEE Computer Society Technical Achievement Award in 2011 for pioneering contributions to the theory and design of communication protocols for ad-hoc wireless networks; the IEEE Communications Society Ad Hoc and Sensor Networks Technical Committee (AHSN TC) Technical Recognition Award in 2012 for fundamental contributions to the theory and design of communication protocols for routing and channel access in ad-hoc wireless networks; and the SRI International Exceptional-Achievement Award in 1985 and 1989 for his work on multimedia communications and adaptive routing algorithms.

Professor Garcia-Luna-Aceves received his BS in Electrical Engineering at the Universidad Iberoamericana, Mexico City, Mexico. He later studied at the University of Hawaii, receiving a MS and a Ph.D. in Electrical Engineering. From 1983 to 1993 he was at SRI International in Menlo Park, where he directed the Network Information Systems Center (NISC) from 1991 to 1993, the year in which he joined UCSC.

At UCSC, Garcia-Luna-Aceves is a Distinguished Professor, and holds the Jack Baskin Endowed Chair of Computer Engineering. He heads the Computer Communications Research Group, which to-date has graduated 42 Ph.D. students and 43 MS students, and where he has raised many millions in funding. In addition, Professor Garcia-Luna-Aceves is a stellar contributor to UCSC's administration. He currently serves as the UCSC director for CITRIS, the Center for Information Technology Research in the Interest of Society and the Banatao Institute, a multi-campus initiative focused on research and emerging technologies established in 2001. He also serves as the Chair of the Computer Science and Engineering Department, which holds the distinction of educating the largest number of our students. Professor Garcia-Luna-Aceves has also been a prolific entrepreneur, co-founding Adara Networks, Inc. San Jose, California in 2000, and SUNS-Tech Corp., in Milpitas, California in 2010.

We are proud to nominate JJ Garcia-Luna-Aceves as the 57th Faculty Lecturer.

Respectfully submitted,

#### COMMITTEE ON FACULTY RESEARCH LECTURE

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