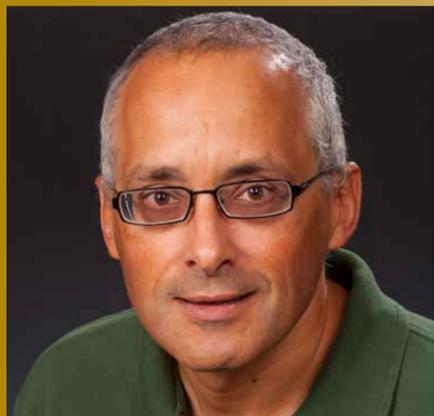


Distinguished Lectures Fall 2019



Colorado State University's Information Science and Technology Center (ISTeC) presents two lectures by

Dr. Roy Yates

Distinguished Professor
WINLAB, Electrical and Computer Engineering
Rutgers University

ISTeC Distinguished Lecture

In conjunction with the Department of Computer Science and Department of Electrical and Computer Engineering Seminar Series

"The Age of Information: Status Updates for Real-time Systems"

Monday, Sept. 16, 2019
Reception with refreshments: 10:30 a.m.
Lecture: 11:00 a.m.-12:00 noon
Morgan Library Event Hall

Department of Computer Science and Department of Electrical and Computer Engineering Seminar Series Sponsored by ISTeC

"The Age of Information in Networks: Moments, Distributions, and Sampling"

Friday, September 13, 2019
Lecture 4:00-5:00 p.m.
LSC Room 308-10

Abstracts

The Age of Information: Status Updates for Real-time Systems

Increasingly ubiquitous network connectivity has engendered applications in which sources such as environmental sensors, video cameras, and autonomous vehicles send updates of their status to interested recipients. These applications require timely status updates at the recipients; however, this is typically constrained by limited communication and network resources. In this work, we formulate an Age-of-Information (AoI) timeliness metric for the evaluation of status update systems and we characterize the AoI requirements of a range of real-time applications. We derive general methods for calculating the AoI metric that we apply to system abstractions of sources, monitors, networks, and edge cloud processors. We identify optimal updating policies based on the bandwidth and energy constraints of the senders and system. We observe that optimal updating policies can be counter-intuitive and differ from the throughput/delay tradeoffs that typically describe low latency networking.

The Age of Information in Networks: Moments, Distributions, and Sampling

We examine a source providing status updates to monitors through a network with state defined by a continuous-time finite Markov chain. Using an age of information (AoI) metric, we characterize timeliness by the vector of ages tracked by the monitors. Based on a stochastic hybrid systems (SHS) approach, we derive first order linear differential equations for the temporal evolution of both the age moments and a moment generating function (MGF) of the age vector components. We show that the existence of a non-negative fixed point for the first moment is sufficient to guarantee convergence of all higher order moments as well as a region of convergence for the stationary MGF vector of the age. The stationary MGF vector is then found for the age on a line network of preemptive memoryless servers. It is found that the age at a node is identical in distribution to the sum of independent exponential service times. This observation is then generalized to linear status sampling networks in which each node receives samples of the update process at each preceding node according to a renewal point process. For each node in the line, the age is shown to be identical in distribution to a sum of independent renewal process age random variables.

Speaker Biography

Roy D. Yates received the B.S.E. degree in 1983 from Princeton University, and the S.M. and Ph.D. degrees in 1986 and 1990 from M.I.T., all in Electrical Engineering. Since 1990, he has been with the Wireless Information Networks Laboratory (WINLAB) and the Electrical and Computer Engineering (ECE) department at Rutgers University where he is currently a Distinguished Professor. He is an author of three editions of the John Wiley textbook "Probability and Stochastic Processes: A Friendly Introduction for Electrical Engineers." An IEEE Fellow in 2011, Dr. Yates is a past associate editor of the IEEE Journal on Selected Areas of Communication Series in Wireless Communication and also a past Associate Editor for Communication Networks of the IEEE Transactions on Information Theory. His research interests include wireless communication and timely updating.

To arrange a meeting with the speaker, please contact Prof. Rockey Luo, Jie.Luo@ColoState.EDU.

Upcoming Distinguished Lectures

September 23

Quo Vadis Digital Microfluidic Biochips? From Laboratory Research to Commercialization and Beyond

11 a.m.-12 noon



Morgan Library Event Hall

Dr. Krishnendu Chakrabarty

October 14

Augmented Reality as the Future of Personal Computing

11 a.m.-12 noon



Morgan Library Event Hall

Dr. Doug Bowman

November 11

Usability in Health and Medical Contexts

11 a.m.-12 noon



Morgan Library Event Hall

Dr. Kirk St. Amant

December 2

Urban Data Science

11 a.m.-12 noon



Morgan Library Event Hall

Dr. Claudio Silva