

## Abstract:

In this talk we will describe the creation of a scalable effort at tracking, organizing and analyzing biometric data, especially metrics pertaining to the heart. Heart rate variability (HRV) is a measure of the beat-to-beat interval. It has become a noninvasive tool for accessing the activities of the autonomic nervous system. The fact that HRV can be easily derived makes it a promising marker for the study of human physiological response. Much study has previously been conducted using HRV to signify cardiovascular mortality and reduced cardiac activity. We are developing a novel approach to exploit HRV as an indicator of health and a state of well-being. Applying a signal processing technique known as wavelet coherence to find the degree of correlation as a function of time and frequency, we seek answers to the following questions: When in time do desirable patterns occur? In a group activity, how well, and when does the group synchronize? Using this data we can understand the relationship among HRV time-series from different sources, which in turn provides the measure of entrainment, or synchronicity, among them. Early experiments with practices such as yoga and meditation reveal remarkable correlation between quantified measures of well being and certain traditional practices such as Yoga and meditation.

## Bio:

Ramesh Rao is the director of the University of California, San Diego division of the California Institute for Telecommunications and Information Technology (Calit2). In 2004, he was appointed the first holder the Qualcomm Endowed Chair in Telecommunications and Information Technologies in the department of Electrical and Computer Engineering of the Jacobs School of Engineering at UC San Diego, where he has been a faculty member since 1984. Prior to becoming the Calit2 UCSD division director in 2001, Prof. Rao served as the director of UCSD's Center for Wireless Communications (CWC). Prof. Rao is involved on a day-to-day basis with a wide variety of interdisciplinary and collaborative research initiatives, leading several major projects at Calit2. He has been a lead investigator on dozens of major federal-, state-, foundation-, defense-, and industry-funded grants, including the NIH-funded Wireless Internet Information System for Medical Response in Disasters (WIISARD), Self-Scaling Systems for Mass Casualty Management (WIISARD SAGE), and the Multimedia Telemedical Diagnostic System (STRokE DOC), the NSF-funded Responding to Crises and Unexpected Events (RESCUE) and ResponSphere projects, and multiple projects involving cognitive networking. He has authored more than 225 peer-reviewed technical papers on a wide range of research topics in wireless communications including architectures, protocols, performance analysis of computer and communication networks, adaptive systems, energy-efficient communications, cognitive networking, disaster management systems, and health-related applications, among others. He is currently engaged in numerous projects to bridge emerging technologies with medicine and healthcare, including investigating the power of utilizing Web 2.0 technologies to enhance, even transform, healthcare resources, knowledge bases, and outcomes.

For his leadership in wireless communications, Dr. Rao was named an IEEE Fellow. He has twice been a member of the Board of Governors of the IEEE Information Theory Society. He is a Senior Fellow of the California Council on Science and Technology (CCST) and is the chair of the CCST's Personalized Health

Information Technology Task Force (pHIT). He is a member of the Rady Children's Hospital and Health Center Board of Trustees' Information Technology Task Force and a member of the Weqaya Advisory Task Force of the Health Authority of Abu Dhabi (HAAD), United Arab Emirates. He is on the advisory council to the California Telehealth Network. He also serves as a panelist on the Innovation Initiative Blue Ribbon Panel of the Alliance Healthcare Foundation Board and is a member of the UC San Diego Health System Advisory Board. In addition, he is a member of the Education Task Force of The San Diego Foundation Regional Vision Council. He received a 2010 Professional Gordon Engineering Leadership Award from the Bernard and Sophia Gordon Engineering Leadership Center, UCSD. He is on the Board of Directors of CommNexus San Diego: A Network of Communications Companies, and is the vice president of the San Diego Indian American Society (SDIAS). He participates in many technical, academic, health-related, and industry organizations, boards, councils, and committees. Rao chaired the National Research Council's Committee on Using Information Technology to Enhance Disaster Management, the findings were published by the NRC in 2007: "Improving Disaster Management: The Role of IT in Mitigation, Preparedness, Response and Recovery." He also served on a U.S. government panel to review the current status of research, development, and applications in wireless communications in the United States, Japan, and Western Europe with a view towards evaluating the competitive status of U.S. efforts. He has consulted extensively for government agencies and also provided consulting services to industry. He earned his Ph.D. and M.S. in electrical engineering from the University of Maryland, College Park, MD and his BE(Hons.) degree from the University of Madras.