Keynote Speech 1: Data Mining and Machine Learning for Analysis of Network Traffic

Ljiljana Trajkovic
Life Fellow, IEEE
2019-2020 IEEE Division X Delegate/Director
Past President, IEEE Systems, Man, and Cybernetics Society
Past President, IEEE Circuits and Systems Society
Simon Fraser University, Canada

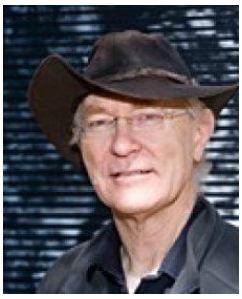
Abstract
Traffic traces collected from deployed communication networks have been used to characterize and determine traffic loads, analyze patterns of users' behavior, model network traffic, and predict future network traffic. Data have been also used to analyze network topologies and capture historical trends in their development. Of particular interest to cybersecurity is detection of network anomalies and intrusions including worms, denial of service attacks, ransomware, and blackouts. Machine learning techniques have proved to be valuable tools for predicting anomalous Internet traffic behavior and for classifying various traffic routing anomalies. In described case studies, traffic traces collected from various deployed networks and the Internet are used to characterize and model network traffic, analyze Internet topologies, and classify network anomalies.

Biography
Ljiljana Trajkovic received the Dipl. Ing. degree from University of Pristina, Yugoslavia, in 1974, the M.Sc. degrees in electrical engineering and computer engineering from Syracuse University, Syracuse, NY, in 1979 and 1981, respectively, and the Ph.D. degree in electrical engineering from University of California at Los Angeles, in 1986.

She is currently a Professor in the School of Engineering Science at Simon Fraser University, Burnaby, British Columbia, Canada. From 1995 to 1997, she was a National Science Foundation (NSF) Visiting Professor in the Electrical Engineering and Computer Sciences Department, University of California, Berkeley. She was a Research Scientist at Bell Communications Research, Morristown, NJ, from 1990 to 1997, and a Member of the Technical Staff at AT&T Bell Laboratories, Murray Hill, NJ, from 1988 to 1990. Her research interests include communication networks, computer-aided circuit analysis and design, and nonlinear circuits and dynamical systems.

Dr. Trajkovic served as IEEE Division X Delegate/Director (2019–2020) and IEEE Division X Delegate-Elect/Director-Elect (2018). She served as Senior Past President (2018–2019), Junior Past President (2016–2017), President (2014–2015), President-Elect (2013), Vice President Publications (2012–2013, 2010–2011), Vice President Long-Range Planning and Finance (2008–2009), and a Member at Large of the Board of Governors (2004–2006) of the IEEE Systems, Man, and Cybernetics Society. She served as 2007 President and 2006 President-Elect of the IEEE Circuits and Systems Society and a member of its Board of Governors (2004–2005, 2001–2003). She served as Chair of the IEEE Circuits and Systems Society joint Chapter of the Vancouver/Victoria Sections (2001–2021). She was Chair of the IEEE Technical Committee on Nonlinear Circuits and Systems (1998). She was General Co-Chair of SMC 2020 and General Co-Chair of SMC Workshops on BMI Systems (2018–2021), SMC 2016, and HPSR 2014, Special Sessions Co-Chair of SMC 2017, Technical Program Chair of SMC 2017 and SMC 2016 Workshops on BMI Systems, Technical Program Co-Chair of ISCAS 2005, and Technical Program Chair and Vice General Co-Chair of ISCAS 2004. She serves as Editor-in-Chief of the IEEE Transactions on Human-Machine Systems (2021–2023) and served as an Associate Editor of the IEEE Transactions on Circuits and Systems (Part I) (2004–2005, 1993–1995), the IEEE Transactions on Circuits and Systems (Part II) (2018, 2002–2003, 1999–2001), and the IEEE Circuits and Systems Magazine (2001–2003). She is a Distinguished Lecturer of the IEEE Systems, Man, and Cybernetics Society (2020–2021) and the IEEE Circuits and Systems Society (2020–2021, 2010–2011, 2002–2003). She is a Professional Member of IEEE-HKN and a Life Fellow of the IEEE.

Keynote Speech 2: Structure and Reflectance Reconstruction through integrating along a vector field



Richard Hartley
Fellow, IEEE
Fellow, Australian Academy of Science
Fellow, Australian Mathematical Society
Australian National University, Australia

Abstract
I will present a simple method which solves a problem of multi-view 3D-Reconstruction for objects with unknown and generic surface materials, imaged by a freely moving camera and a freely moving point light source. The object can have arbitrary (e.g. non-Lambertian), spatially-varying (or everywhere different) surface reflectances (svBRDF). Our solution consists of two small sized neural networks (dubbed the 'Shape-Net' and 'BRDFNet'), each having about 1,000 neurons, used to parametrize the unknown shape and unknown svBRDF, respectively. The shape of the object being reconstructed is encoded in the parameters of the network as a vector-field on R^3, which is integrated to transform a generic shape to a final shape.
Key to our method is a special network design (namely, a ResNet with a global feedback or 'ring' connection), which has a provable guarantee for finding a valid diffeomorphic shape parameterization. Despite the underlying problem is highly non-convex hence impractical to solve by traditional optimization techniques, our method converges reliably to high quality solutions, even without initialization.

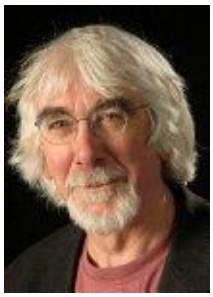
Biography
EDUCATION:

University of Toronto, Canada PhD Mathematics, 1976, MSc 1972
Stanford University, MSc Computer Science, 1985
Australian National University, BSc, 1971

EXPERIENCE:
Professor Richard Hartley is a member of the computer vision group in the Department of Information Engineering, at the Australian National University, where he has been since January, 2001.
Dr. Hartley worked at the General Electric Research and Development Center from 1985 to 2001. During the period 1985-1988, he was involved in the design and implementation of Computer-Aided Design tools for electronic design and created a very successful design system called the Parsifal Silicon Compiler. In 1991 he was awarded GE's Dushman Award for this work.
He became involved with Image Understanding and Scene Reconstruction working with GE's Simulation and Control Systems Division. He worked on several Imaging projects, including medical imaging, document imaging and visual inspection. In 1991, he began an extended research effort in the area of applying projective geometry techniques to reconstruction. This research direction was one of the dominant themes in computer vision research throughout the 1990s. In 2000, he co-authored (with Andrew Zisserman) a book for Cambridge University Press, summarizing the previous decade's research in this area.
More recently, he has been working in the area of applications of Riemannian geometry in computer vision, particularly issues of optimization and machine learning on Riemannian manifolds. Recent work has also included Markov Random Fields, image enhancement and stylization, Neural Net calibration and Few-shot learning.
He has recently transferred to an Emeritus position at the Australian National University, and also continues his research activity as a Visiting Researcher at Google.

Keynote Speech 3: Social Augmented Reality Interactions

Anton Nijholt
University of Twente, The Netherlands



Abstract
We introduce research on social augmented reality with an emphasis on social face-to-face interaction. In social interaction interactants employ knowledge about their conversational partner and have their verbal interaction supported by nonverbal interaction cues. We survey the issues that arise when we pursue social interaction in augmented reality. Since handhelds and bulky head-mounted devices hardly allow unobtrusive interaction we pay extensive attention to developments in the field of smart glasses and smart contact lenses. The focus is on the use of smart augmented reality glasses during social interactions. Acceptance issues and disruption of social interaction due to the use of these devices are also touched upon.

Biography
Anton Nijholt received his Ph.D. in computer science from the Vrije Universiteit in Amsterdam. He held positions at various universities, inside and outside the Netherlands. In 1989 he was appointed full professor at the University of Twente in the Netherlands, where he initiated its Human Media Interaction group. During some years he was a scientific advisor of Philips Research Europe, Eindhoven. A few years (2015-2017) he was a global research fellow at the Imagineering Institute in Iskandar, Johor, Malaysia. In 2018 he became a member of Microsoft's Technical Leadership Advisory Board on Brain-Computer Interfaces (BCI). His main research interests are multimodal interaction with a focus on entertainment computing, affect, humor, and brain-computer interfacing. Nijholt, together with many of the fifty Ph.D. students he supervised, wrote numerous journal and conference papers on these topics and acted as program chair and general chair of many large international conferences on entertainment computing, virtual agents, affective computing, faces & gestures, multimodal interaction, and computer animation. More recently he explores those topics in augmented reality environments. Nijholt is the chief editor of the specialty section Human-Media Interaction of the journals Frontiers in Psychology and Frontiers in Computer Science. He is also series editor of the Springer Book Series on Gaming Media and Social Effects. Recent edited books include the 2019/2020 books “Making Smart Cities More Playable: Exploring Playable Cities” and “Brain Art: Brain-Computer Interfaces for Artistic Expression.”