

Gerhard Kramer
Biography, January 2025

Gerhard Kramer is Professor of Communications Engineering at the Technical University of Munich (TUM). Since 2019, he has been TUM Senior Vice President for Research and Innovation and responsible for the Office for Research and Innovation (ForTe), which supports national and international research projects, commercial co-operations, patents, licensing, technology-based start-ups, and postdoc programs. His responsibilities include chairing numerous university boards and committees, such as the Appointment and Tenure Board. Past responsibilities included launching the TUM Innovation Networks, Sustainable Futures Strategy, and Venture Labs.

Kramer received the B.Sc. and M.Sc. degrees in electrical engineering from the University of Manitoba in 1991 and 1992, respectively, and the Dr. sc. techn. degree from ETH Zurich in 1998. From 1998 to 2000, he was with Endora Tech AG in Basel, Switzerland. From 2000 to 2008, he was with the Math Center at Bell Labs in Murray Hill, NJ. He joined the University of Southern California (USC), Los Angeles, CA, as a Professor of Electrical Engineering in 2009. He joined TUM as an Alexander von Humboldt Professor in 2010.

His research interests encompass information theory, communications, and coding. Kramer's doctoral thesis introduced the concept of causally conditioned directed information, which characterizes information flow and causal influence in communication networks. The thesis was awarded an ETH medal. During his postgraduate studies, he also worked on linear cryptanalysis of block ciphers and code time division multiple access (CTDMA).

Kramer's research at Bell Labs focused on information theory for multi-terminal communications, including relay, interference, broadcast, and multi-access channels. Among other results, in source coding, he introduced empirical coordination and theory for multiple description codes. In channel coding, he established the area property of extrinsic information transfer (EXIT) functions and showed how to design near-optimal codes for multi-input multi-output (MIMO) channels. His work applies to wireless networks, where he introduced multi-hop and quantization-based relaying schemes that achieve distributed MIMO capacity; to optical fiber networks, where he published an influential paper on capacity limits and methods to achieve them; and to digital subscriber lines (DSL), where he developed channel estimation algorithms for vectoring. His work was recognized with several awards, including the Stephen O. Rice Prize Paper Award of the IEEE Communications Society, the Vodafone Innovations Prize, and a Paper Award from the European Association for Signal Processing. He was a Thomson Reuters Highly Cited Researcher in 2014-2016.

At Bell Labs, Kramer played instrumental roles in initiating two applied projects: Lucent's transition to higher-order modulation for long-haul fiber-optic links and Alcatel-Lucent's transition to vectoring for DSL. He was a member of two teams recognized by Bell Labs teamwork awards: a long-haul optical fiber team and a high-capacity wireless team. He received a Thomas Alva Edison Patent Award from the Research & Development Council of New Jersey for an invention that improves DSL channel estimation. He has 20 issued patents.

At TUM, he has supervised and mentored over 60 doctoral researchers and postdocs on topics in communications engineering, including wireless (fading, feedback, low-latency codes, quantized precoding, sensing), optical (capacity, equalizers, shaping), and basic theory (compression, secrecy, stealth). He likes to work on information theory fundamentals and is proud of his research staff's impact on communications practice. His staff regularly receives lecturer awards for outstanding teaching.

Kramer is an IEEE Fellow. He has been active in the IEEE Information Theory Society (ITSoc), including as publications editor in 2004-2005 and associate editor for Shannon theory in 2006-2008. In 2008, he co-founded the Schools of Information Theory, which grew to annual events in Australia, East Asia, Europe, India, and North America. The IEEE Educational Activities Board recognized the ITSoc school program through its Society/Council Professional Development Award in 2014. Kramer was elected to the ITSoc board of governors in 2009 and became president in 2013. He has chaired several ITSoc flagship events, including ISITs in Toronto (2008 TPC Chair), Honolulu (2014 TPC Chair), Aachen (2017 General Chair), and Taipei (2023 General Chair), and ITW in Kaohsiung (2017 General Chair). Since 2011, he has organized over 30 workshops on coding, communications, and information theory at TUM. He received the ITSoc Aaron D. Wyner Distinguished Service Award in 2021 for outstanding leadership in, and providing long-standing, exceptional service to, the information theory community.

Kramer is a member of the Bavarian Academy of Sciences and Humanities (BAdW) and the BAdW Technology Forum. Since 2013, he has been a member of the board of curators of the Eduard Rhein Foundation, which presents monetary awards for achievements in radio, television, and information technology that promote public welfare. Since 2020, he has been a member of the board of curators of the Max Planck Institute of Quantum Optics. Since 2022, he has been a member of the supervisory boards of TUM CREATE Ltd., the Munich Quantum Valley e.V., and the TUM Venture Labs Management gGmbH. Since 2025, he has chaired the selection committee of the Bavarian Hightech Young Talent Award.