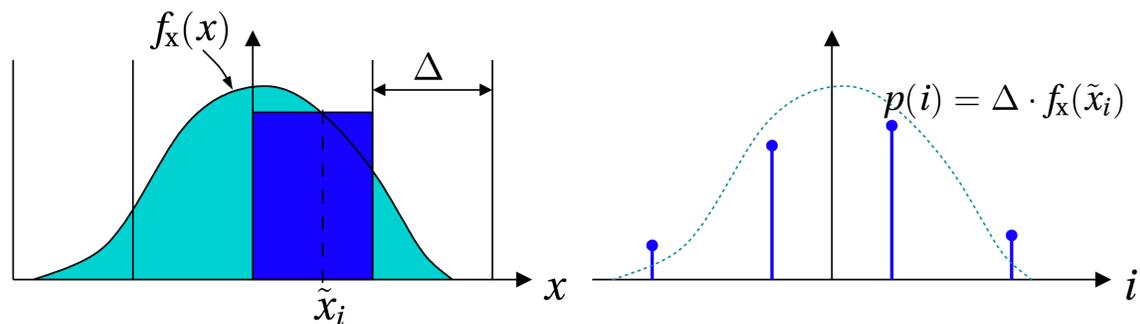


COLLOQUIUM

MATHEMATICS AND STATISTICS
QUEEN'S UNIVERSITY



THE DIFFERENTIAL ENTROPY GAIN CREATED BY LINEAR TIME-INVARIANT SYSTEMS

Abstract. The differential entropy of a continuous-valued random variable quantifies the uncertainty associated with the latter, and plays a crucial role in many fundamental results of Information Theory. This talk will discuss how the differential entropy rate of a random process exciting a discrete-time linear time invariant (LTI) system relates to that of the random process coming out of it. First, an apparent contradiction between existing results characterizing the difference between these two differential entropy rates, referred to as a “differential entropy gain”, will be exposed. It will then be shown how and when these results can be reconciled, presenting a geometric interpretation as well as novel results which quantify the differential entropy gain introduced by LTI systems. Finally, some of the implications of these results will be illustrated for three different problems, namely: the rate-distortion function for non stationary processes, an inequality in networked control systems, and the capacity of stationary Gaussian channels.

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Milan S. Derpich received the “Ingeniero Civil Electronico” degree from Federico Santa Maria Technical University, in Valparaíso, Chile in 1999. Dr. He then worked by the electronic circuit design and manufacturing company Protonic Chile S.A. between 2000 and 2004. In 2009 he received the PhD degree in electrical engineering from the University of Newcastle, Australia. He received the Guan Zhao-Zhi Award at the Chinese Control Conference 2006, and the Research Higher Degrees Award from the Faculty of Engineering and Built Environment, University of Newcastle, Australia, for his PhD thesis. Since 2009 he has been with the Department of Electronic Engineering at UTFSM, currently as associate professor. His main research interests include rate-distortion theory, networked control systems, and signal processing. He has just started a sabbatical one-year visit to the Department of Mathematics and Statistics in Queen's University, Canada, as a visiting professor.

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