



**THE CHINESE UNIVERSITY OF HONG KONG**  
 Department of Information Engineering  
*Faculty Seminar*

**Alternative Realities and other Insights from Graphical Models**  
 by  
**Professor Pascal O. VONTOBEL**

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**Date : 26<sup>th</sup> November, 2019 (Tuesday)**  
**Time : 11:00am – 12:00pm**  
**Venue : Room 801, Ho Sin Hang Engineering Building**  
**The Chinese University of Hong Kong**

Abstract

Graphical models have proven very useful for classical information processing. For example, some of the best performing channel coding schemes are based on factor graphs, along with suitable message-passing iterative decoding algorithms operating on them, and appear now in the 5G telecommunications standard.

In this presentation, I will discuss a class of graphical models that are suitable for tasks in quantum information processing. On the one hand, these graphical models are compatible with graphical models used in classical information processing. On the other hand, and more importantly, they allow one to appreciate some crucial differences between quantum and classical information processing. In particular, I will highlight how local graphical models, i.e., marginals of more detailed graphical models, can behave very differently in the quantum case than in the classical case; these insights allow one to understand several quantum paradoxes. Moreover, these graphical models yield a unified approach to estimating the information rate of quantum channels with memory and the design of stabilizer quantum codes.

At the end, I will review my teaching, research, and service activities during the past years, along with discussing future research plans.

Biography

Pascal O. Vontobel received the Diploma degree in electrical engineering in 1997, the Post-Diploma degree in information techniques in 2002, and the Ph.D. degree in electrical engineering in 2003, all from ETH Zurich, Switzerland.

From 1997 to 2002 he was a research and teaching assistant at the Signal and Information Processing Laboratory at ETH Zurich, from 2006 to 2013 he was a research scientist with the Information Theory Research Group at Hewlett-Packard Laboratories in Palo Alto, CA, USA, and since 2014 he has been an Associate Professor at the Department of Information Engineering at the Chinese University of Hong Kong. Besides this, he was a postdoctoral research associate at the University of Illinois at Urbana-Champaign (2002-2004), a visiting assistant professor at the University of Wisconsin-Madison (2004-2005), a postdoctoral research associate at the Massachusetts Institute of Technology (2006), and a visiting scholar at Stanford University (2014). His research interests lie in information and coding theory, quantum information processing, data science, communications, and signal processing.

Dr. Vontobel has been an Associate Editor for the IEEE Transactions on Information Theory (2009-2012), an Awards Committee Member of the IEEE Information Theory Society (2013-2014), a Distinguished Lecturer of the IEEE Information Theory Society (2014-2015), and an Associate Editor for the IEEE Transactions on Communications (2014-2017). Moreover, he has been a TPC co-chair of the 2016 IEEE International Symposium on Information Theory, the 2018 IEICE International Symposium on Information Theory and its Applications, and the 2018 IEEE Information Theory Workshop, along with co-organizing several topical workshops and being on the technical program committees of many international conferences. Moreover, he has been three times a plenary speaker at international information and coding theory conferences, he has received an exemplary reviewer award from the IEEE Communications Society, and has been awarded the ETH medal for his Ph.D. dissertation.

**\*\* ALL ARE WELCOME \*\***