Department of Computer Science, The University of Hong Kong

CS Seminar

AIFV-m Coding and Finding the Cheapest Markov Chain

Prof. Mordecai Golin
Hong Kong UST

Date:
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10:30 am

Venue:
Room 313
Chow Yei Ching Building
The University of Hong Kong

Abstract:
Binary AIFV-m codes are a relatively new method for lossless compression. They encode using an m-tuple of coding trees rather than the single tree used by Huffman coding. Their advantage is better proven redundancy than Huffman codes; their disadvantage is a slight decoding delay.

The compression rate of a binary AIFV-m code is the steady state average "gain" of an associated m-state Markov chain with rewards.
Finding a best compression rate AIFV-m code is the problem of finding a minimum-gain Markov chain within an implicitly defined (exponentially large) collection of Markov chains.

Previous algorithms for solving this problem ran in exponential time.
We show how to transform the problem to a Linear Programming one (with an exponential number of constraints). This LP problem can then be solved in polynomial time using binary search (for m=2) or the Ellipsoid method (for m >2). The technique maps all possible Markov chain states to hyperplanes that are then used to define the polytope for the LP problem. Since this polytope is only a function of the Markov chain structure, with almost no reliance on the original coding problem, the techniques developed might be of interest in other contexts.

About the Speaker:
Mordecai Golin is a professor of Computer Science at HKUST. After receiving his doctorate from Princeton University in 1990, Prof Golin worked as a researcher in the Projet Algorithmes of the Institut National de Recherche en Informatique et en Automatique (INRIA) in Rocquencourt, France before arriving at HKUST in 1993. Since then, he has also been a visiting researcher at the University of Waterloo, the MADALGO Center for Massive Data Algorithms, the Max-Planck-Institut fur Informatik, INRIA-Sophia, AT&T Labs-Research, and DIMACS. He served as the HKUST Associate Vice-President for Postgraduate Studies from 2011-2014. In addition, he was the 2008 recipient of the HKUST Michael G. Gale Award for Distinguished Teaching.

All are welcome!
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