UW CENTRE FOR PATTERN ANALYSIS AND MACHINE INTELLIGENCE

CPAMI LECTURE

From Data to Knowledge:

A Pattern Discovery Approach

With massive data, how do we make sense of them, extract most value from them and not missing something important in them?
How could we obtain knowledge fast?

Topics:
Genomic & Proteomic | Relational Datasets | Multiple Signals | Web and Documents

Speaker: **Professor Andrew K. C. Wong**
Distinguished Professor Emeritus
Systems Design Engineering, University of Waterloo

Date: **Tuesday October 2, 2012**

Time: **1:30 pm – 2:30 pm**

Place: **University of Waterloo**
William G. Davis Computer Research Centre
DC-1302

Refreshments will be served

Co-sponsored by:

- *KW IEEE Computational Intelligence Society*
- *KW IEEE Control Systems Society*
- *KW IEEE Systems, Man and Cybernetics Society.*
- *KW IEEE Signal Processing Society*

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CPAMI

Professor Andrew K. C. Wong
Centre for Pattern Analysis and Machine Intelligence
University of Waterloo

Abstract

This talk addresses the notion *from data to knowledge* based on the theoretical development and technical results of Professor Wong, the Founding Director of CPAMI (Centre of Pattern Analysis and Machine Intelligence) in the area of machine intelligence and data mining. It covers some of his recent research in pattern discovery on: a) large mixed-mode relational datasets, b) text data from the internet, c) multiple sequences of genomic and proteomic data; and d) multiple sequences. It presents the general framework, the theoretical bases, the methodologies and the experimental results at a high level without going into technical details. The applications to be presented cover pattern/knowledge discovery on: a) gene expression patterns from microarrays; b) sequence patterns from multiple sequences (such as binding sites in DNA and structural/functional patterns in proteins); c) mixed-mode patterns from chemical plant; d) temporal patterns from multiple time series for continuous process control and monitoring and e) contextual patterns from uploaded documents or text content on websites.

In this talk, using technical examples, he stresses that data do not turn into knowledge directly. Not until meaningful patterns are discovered, transformed, organized and related back to the real world, new hypotheses, new models and new theories would not arrive. When patterns are organized into interpretable forms and related back to the real world, they could help us build models or generate knowledge after they are understood, explained, proved useful, or bring new reality which can be verified. Patterns do help to narrow the search scope and provide a guide for constructing meaningful models and knowledge. The knowledge acquired could further generate knowledge at various levels. The specificity and quality of the outcome knowledge depend greatly on the data source, acquisition methods, data preprocessing (if necessary) and post pattern discovery organization with automated “intelligent” selection, summarization and visualization. Pattern discovery and pattern post processing developed by Professor Wong do render some of these capabilities without relying on prior knowledge. Nevertheless, domain experts can provide and incorporate subjective knowledge to guide the discovery processes which in turn could refine and enhance the existing knowledge.

Today, we are overwhelmed with data with diverse types. To be able to transform the immense amount of data acquired from laboratories, health institutes, industrial plants, business world via the Internet, intranets and cloud computing is an imminent challenge to Pattern and Knowledge Discovery in this Petabyte Era.

A Brief Biography of Professor Andrew K.C. Wong

Dr. Wong holds a Ph.D. from Carnegie Mellon University; B.Sc (Hons) and M.Sc. from the Hong Kong University. He is an IEEE Fellow for his contribution in machine intelligence, computer vision, and the intelligent robotics areas. Currently, Dr. Wong is a Distinguished Professor Emeritus (Systems Design Engineering). He was the Founding Director of Pattern Analysis and Machine Intelligence Laboratory (PAMI Lab) at UW, now the CPAMI, a Visiting Distinguished Chair Professor at the Hong Kong Polytechnic University (00-03).His research areas cover machine intelligence, computer vision, intelligence robotics, pattern recognition, data mining and bioinformatics. Dr. Wong has published over 300 papers and chapters and holds six US Patents. He served as the General Chair of International Conferences IASTED (1996) and IROS (1998) and has been an invited speaker in the Distinguished Speaker Program, IEEE Computer Society. Dr. Wong has served as consultant to many high-tech companies in USA, Canada and Hong Kong. Over the year, based on the core technologies he and his team founded several high tech companies. Dr. Wong is a founder, and retired director of Virtek Vision International Corporation, a leader in laser and vision technology. In 1997, he co-founded Pattern Discovery Software Systems Ltd. and has served as Chairman ever since. In 2006 he co-founded DossierView Inc. a software technology company at Waterloo focusing on desktop management and intelligent searching. In 2008 he co-founded Knowledge Funds Limited for algorithmic trading. All these companies are using Dr. Wong’s technologies as the base of their core engines.