

# Data Driven Modeling: Fundamental Challenges & Some Proposed Solutions

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## Abstract

This talk will focus on novel solutions for a subclass of the combinatorial optimization problem, which arises as a selection problem in different fields of data-driven modeling (*e.g.*, *pattern recognition* and *system identification*). The objective of the data driven modeling is to encode a pattern (in *pattern recognition*)/system dynamics (in *system identification*) through inductive learning from a finite amount of observed input-output data. One of the fundamental problems associated with such modeling approaches is the *bias-variance* dilemma. The possible solution to this dilemma is to optimize the model *structure* by removing redundant/irrelevant ‘*attributes*’, *e.g.*, feature selection (*removal of redundant features in pattern recognition*), structure selection (*removal of insignificant terms in system identification*), and topology selection in neural networks (*pruning or optimization of topologies*). Based on this notion, the researchers in *pattern recognition* and *system identification* communities have independently developed several algorithms without any consequential interaction with each other. This talk will demonstrate that seemingly different selection problems arising in these different fields can be formulated as a common subclass of the combinatorial optimization problem (referred to as *attribute selection*). This will further be demonstrated by a few interesting results, which show that feature selection algorithms can easily be tailored to detect the structure (*significant terms*) of nonlinear dynamic systems.

## Biography



**Faizal Hafiz** received a Ph.D. in electrical engineering from The University of Auckland, New Zealand in April, 2020. He is currently a Postdoctoral Research Fellow at the Artificial Intelligence Institute, SKEMA Business School, France. He was a New Zealand International Doctoral Scholar in Computational Intelligence and Control from 2016 to 2020.

Over his career, he held the positions of a research Assistant Professor (King Saud University, Saudi Arabia, 2010-2016) and a utility Assistant Manager (Reliance Energy Ltd., India, 2008-2010). He has authored over 35 articles in International journals and conferences. His research interests include computational intelligence and its applications to systems and control.