Title: Model-Based Knowledge and Its Representation

Abstract:
Suppes, van Fraassen and other proponents of the semantic aka “non-statement” view argue that a scientific theory is to be identified with an appropriate class of its models rather than with any of its possible syntactic axiomatic presentations. However these thinkers left aside the following question: Where the appropriate models come from? According to the standard view dating back to Hilbert and more recently defended by Hintikka, this question lies out of the scope of logic and rather belongs to the psychology and the sociology of scientific discovery. I argue, on the contrary, that ready-made scientific theories such as Newtonian Mechanics, usually comprise a model-building kit which allows for building specific models from simple elements. Just like logical inferences from some given axioms such model-building procedures are, generally, not algorithmic and leave a room for lucky guesses, insights, etc. But just like logical inferences they are also a subject of certain constructive rules, which allow for a precise formal treatment.

The need for an adequate formal treatment and an appropriate epistemological understanding of model-based scientific knowledge is particularly pressing in the field of computer Knowledge Representation. While technologies of digital modeling has been increasingly successful since the very beginning of the computer era and presently are highly developed, the existing technologies of representing the model-based knowledge and supporting the model-based reasoning in AI systems are still by far less impressive. In my talk I shall review some recent approaches to representing the model-based knowledge and finally make my own proposal using the Homotopy Type theory as a paradigm example.