

Motivation

In the now famous paper "The Unreasonable Effectiveness of Mathematics in the Natural Sciences", Nobel Prize winning physicist Eugene Wigner wrote in the 1960s on why mathematics is of such fundamental importance for sciences like physics and chemistry. **Logic** – as one of the oldest and most theoretical disciplines – and **computer science** – as one of the newest and most practical disciplines – seem at first sight as far away from each other as possible. But as it turned out, logic is to computer science what mathematics is to the natural sciences. This became apparent throughout the development of computer science, but was famously stated in the 2001 paper "On the Unusual Effectiveness of Logic in Computer Science", the title of course being a reference to Wigner's work. This was not only a paper, but the result of a workshop that included some of the most important computer scientists of their fields, among them ones working on databases, programming languages, system verification, security and computational complexity.

Computer Science

Logic

Problem Statement

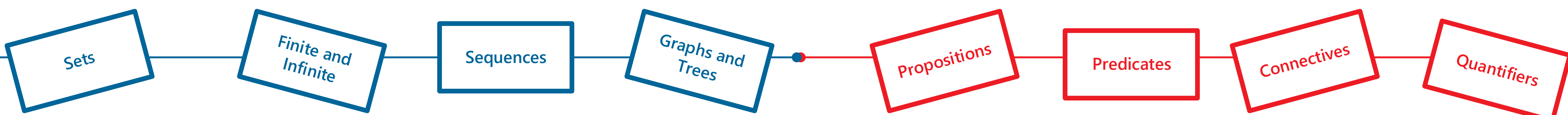
"the IEEE-CS/ACM Computing Science Curricula Report voiced a concern about the increasing specialization in CS education, and about the students' diminishing ability to focus on **major ideas and themes** that cut across traditional course lines. Since then, the CS field continued to grow in scope and complexity, and CS courses have become more detailed and specialized. As a result of this trend, students continue to **lose the forest for the trees**, failing to appreciate the underlying abstractions, interfaces, and contracts that hold the applied CS discipline together."

- Shimon Schocken, Noam Nisan and Michal Armoni, 2009

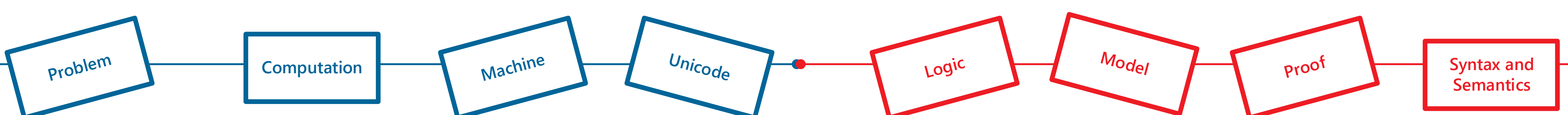
Goal

In this work, we show the "Unusual Effectiveness of Logic in Computer Science" by presenting the diverse applications of logic in computer science based on **unified concepts**. To reach this goal, we focus on simplicity and modular presentation, but without sacrificing **formality** (as a cornerstone of **logic**) and concrete **applications** (as a cornerstone of **computer science**).

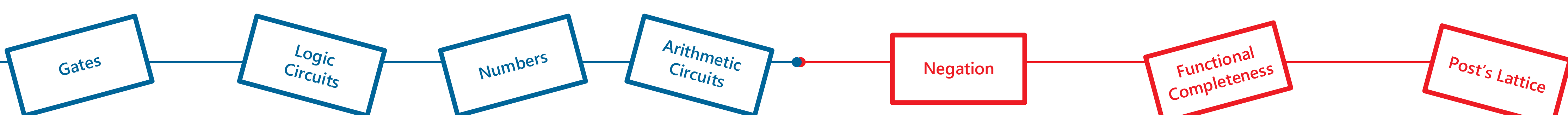
Modeling and an Informal Introduction to Logic



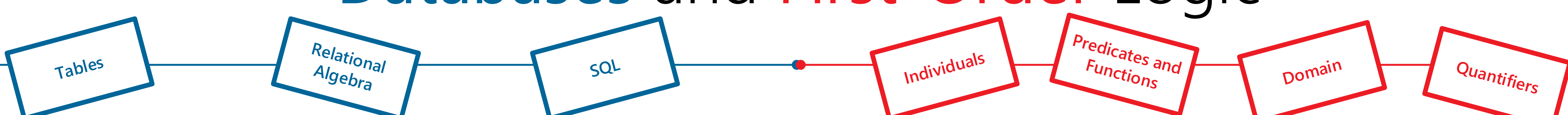
Computation and a Formal Introduction to Logic



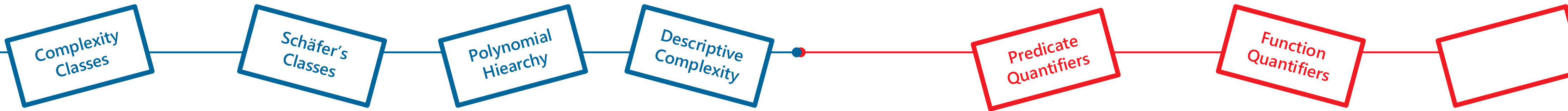
Circuits and Propositional Logic



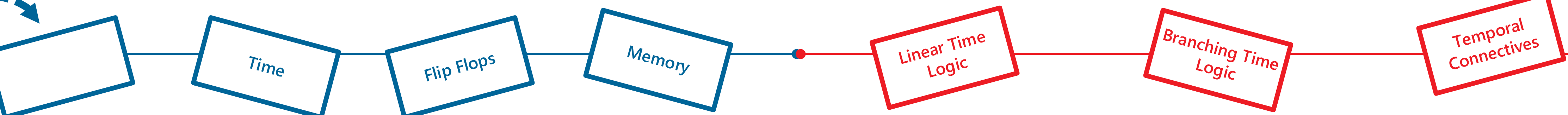
Databases and First-Order Logic



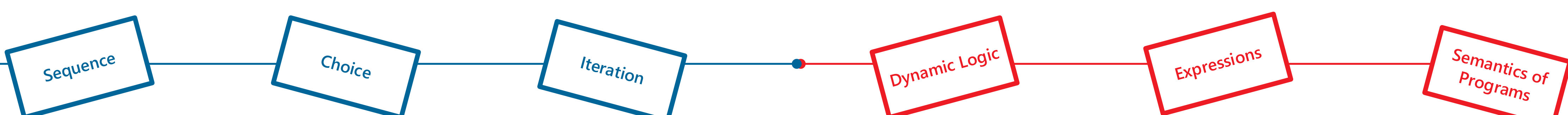
Complexity and Second-Order Logic



Hardware and Temporal Logic



Software and Dynamic Logic



Add your own!

Add your own!

Why not add a whole new area?