Parallel discrete event simulation (PDES) is the execution of a discrete event simulation on a tightly or loosely coupled computer system with several processors. The discrete-event simulation model is decomposed into several logical processors (LPs) or simulation objects that can be executed concurrently using partitioning types (e.g., spatial and temporal). PDES is very important in particular for reduction of the simulation time, increase of the model size, mitigate intellectual property issues in multi-enterprise simulations, and share resources.

One of the problems with PDES is the time management to provide flow control over event processing, the process flow, and the coordination of the different LPs to take advantage of parallelism. There are several time management schemes developed such as Time Warp (TW), Breathing Time Buckets (BTB), and Breathing Time Warp (BTW). Unfortunately, there is not a clear methodology to decide a priori a time management scheme to a particular PDES problem in order to achieve higher performance.

This dissertation shows a new approach for selecting the time synchronization technique class that corresponds to a particular parallel discrete simulation with different levels of simulation logic complexity. Simulation complexities such as branching, function calls, concurrency, iterations, mathematical computations, messaging frequency and number of simulation objects were given a weighted parameter value based on the cognitive weight approach. Deep belief neural networks were then used to perform deep learning from the simulation complexity parameters and their corresponding time synchronization scheme value as measured by speedup performance.

Educational Career:
Bachelor's of Mechanical Engineering, BS, 1996, UCF
Master's of Mathematics, MS, 2003, UCF
Master's of Modeling and Simulation, MS, 2014, UCF

Committee in Charge:
Luis Rabelo, Chair, Industrial Engineering
Peter Kincaid, Modeling and Simulation
Gene Lee, Industrial Engineering
Ahmad Elshennawy, Industrial Engineering

Approved for distribution by Luis Rabelo, Committee Chair, on June 1, 2015.

The public is welcome to attend.