

# Using Deep Learning Artificial Intelligence to Improve Foresight Method in the Optimization of Planning and Scheduling of Construction Processes

Mohsen Hatami, M.Sc., S.M.ASCE,<sup>1</sup> Bryan Franz, Ph.D., A.M.ASCE,<sup>2</sup>  
Suman Paneru, M.Sc., S.M.ASCE,<sup>3</sup> Ian Flood, Ph.D., A.M.ASCE,<sup>4</sup>

<sup>1</sup>M. E. Rinker, Sr. School of Construction Management, University of Florida, P.O. Box 115703, Gainesville, FL 32611; e-mail: [mohsen.hatami@ufl.edu](mailto:mohsen.hatami@ufl.edu)

<sup>2</sup>Assistant Professor, M. E. Rinker, Sr. School of Construction Management, University of Florida, P.O. Box 115703, Gainesville, FL 32611; e-mail: [bfranz@ufl.edu](mailto:bfranz@ufl.edu)

<sup>3</sup>M. E. Rinker, Sr. School of Construction Management, University of Florida, P.O. Box 115703, Gainesville, FL 32611; e-mail: [spaneru@ufl.edu](mailto:spaneru@ufl.edu)

<sup>4</sup>UF Term Professor, M. E. Rinker, Sr. School of Construction Management, University of Florida, P.O. Box 115703, Gainesville, FL 32611; e-mail: [flood@ufl.edu](mailto:flood@ufl.edu)

## ABSTRACT

Construction planning is a fundamental task in the management of construction projects. The most common modeling methods for construction planning are linear scheduling (LS), the critical path method (CPM), and discrete-event simulation (DES). While LS and CPM have advantages of visual feedback and simplicity, respectively, DES as a technique for simulating the behavior and output of a real-world process, facility, or system, is the most versatile of these methods. However, when the constraints and dimensionality of a planning problem increase, DES methods are cumbersome and struggle to accurately reflect decision options. As an alternative to DES, deep learning artificial intelligence (AI) methods can, through the use of reinforcement learning, more rapidly review and recommend more planning options for scheduling complex construction projects. The goal of this paper is to examine the feasibility of deep learning AI as an alternative to the DES in an existing project planning method, named Foresight. Foresight is a graphical constraint-based method of planning manufacturing and construction processes that uses DES to simulate possible outcomes. This paper presents the process changes necessary in Foresight to accommodate deep learning algorithms, composed of multiple network layers. In addition, challenges of implementing deep learning AI in construction planning are discussed. Early project planning leads to improved performance in terms of cost, schedule, and operations, balancing the competing needs of a project. A new modeling paradigm is proposed that is better suited to the needs of contemporary construction project planning.