



DEEP LEARNING ARCHITECTURES FOR PREDICTIVE MODELING IN COMPLEX DYNAMIC SYSTEMS

Optimizing Temporal Data Processing with Novel Attention
Mechanisms and Graph Neural Networks

AUTHORS: Dr. Eleanor Vance¹, Professor Alistair Finch², Dr. Sarah Jenkins³,
Maximilian Hartmann⁴ | ¹Department of Computer Science, University of Oxford

²MIT Computer Science & Artificial Intelligence Laboratory (CSAIL)

³Stanford AI Lab, Stanford University | ⁴Technical University of Munich

ABSTRACT

This study investigates novel deep learning architectures, specifically combining Graph Neural Networks (GNNs) and Transformer-based mechanisms, to enhance predictive modeling within complex, non-linear dynamic systems. We propose the Temporal-Graph Attention Network (T-GAN), demonstrating significant improvements in forecasting accuracy and robustness across various benchmark datasets. Findings offer substantial contributions to AI interpretability and real-time system analysis.

KEYWORDS: *Artificial Intelligence, Deep Learning, Graph Neural Networks, Predictive Modeling, Temporal Dynamics, Attention Mechanisms.*

PRESENTED AT: The 14th International Symposium on Neural Computation and Machine Intelligence | Kyoto, Japan | October 18-21, 2024

PUBLISHED BY: ACADEMIC PRESS | OXFORD & CAMBRIDGE | 2024