**The College of Graduate Studies and the College of Science Cordially Invite You to a**

**Master Thesis Defense**

Entitled

*CELLULAR AUTOMATA MODELING APPROACH OF ADDICTION*

by

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Abstract

This thesis develops a mathematical model and cellular automata simulations to study the spread of drug addiction in populations, incorporating key factors like peer influence, substance availability, support networks, and awareness campaigns. The model describes transitions between non-use, experimental use, recreational use, and addiction states. Mathematical analysis establishes model properties, while an irregular graph cellular automata framework analyzes emerging spatial patterns and behaviors. Extensive scenario simulations explore peer influence, isolation, substance availability, support networks, and awareness campaign impacts, enabling visualization of model evolution over time and determining thresholds, tipping points, and intervention effectiveness. The findings provide an actionable understanding of addiction trends to inform prevention and intervention strategies by policymakers and healthcare providers. The research contributes insights into addiction dynamics, control mechanisms, and societal impact while laying the foundation for future work incorporating richer individual dynamics, multi-addiction interplay, real-world data integration, and advanced treatment strategies.

**Keywords:** Mathematical model, Cellular automata simulation, Addiction spread, Relation-based graph cellular automaton