**Proposed Independent Study Course**

**ENMA897**: Independent Study

**Term**: Fall 2024

**Student**: Joseph Martinez Salcedo

**Professor**: Dr. Andrew J. Collins,

Engineering Management and Systems Engineering

**Background**

Agent-based modeling (ABM) is a powerful computational approach for simulating interactions between autonomous “agents” to understand the behavior of broader systems and their governing principles. ABMs help in modeling and understanding complex systems by representing the behaviors and interactions between agents. An agent can be anything like trees, animals, employees, vehicles, households, companies, or even governments, and studying their interactions can help us better understand and prepare for various micro and macroeconomic phenomena. The function of a model is to help us study and understand real-world phenomena in more tractable and efficient ways than by simply observing reality. ABMs have the potential to provide valuable insights into the study of endangered languages, enabling researchers to simulate how language use within communities might change over time under different social and environmental conditions.

**Independent Study Objective**

The first objective of this independent study is to get familiarized with the model “Language Change.” This model explores how the properties of language users and the structure of their social networks can affect the course of language change. The second objective is to study the effects of scale within the specific agent-based model. The third objective is to propose enhancements to the “Language Change” model to incorporate factors like community size and interaction frequency with external groups, allowing for a more nuanced understanding of language endangerment dynamics.

This independent study will assist in augmenting the student’s knowledge and application of agent-based modeling and programming for future research opportunities.

**Student’s Academic Deliverables**

1. The student will meet bi-weekly with the instructor to provide updates on research progress.
2. The student will conduct a simulation experiment using the “Language Change” model to understand the effects of social network structures and interaction scales on language retention. This includes creating a valid design of experiments and analyzing the output data.
3. The student will write a paper of a standard suitable for a professional conference, e.g., IISE Conference. Due to timing issues, this paper will be submitted to the conference after the independent study is completed and thus its submission is not part of this study.
4. The student will convene with the instructor at the conclusion of the semester to discuss the learning outcomes and receive recommendations for improving the paper quality.

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| **Week** | **Meeting** | **Plan** | **Progress** |
| ~~0-3~~ | ~~Sep 20~~ | * ~~Start looking into NetLogo model~~ * ~~Plan for incoming weeks~~ * ~~Start writing paper~~ | * Checked Language Change model * Comments from Jose * Initial Plan * Started writing using WinterSim template with some papers about ABM |
| 3-5 | Fri Oct 4 | * ~~Get few similar papers~~ * ~~Initial proposal for nlogo model adaptation~~ * Write about methodology |  |
| 5-7 | Thu Oct 17 | * Updates on model adaptation * Edits about methodology * Initial lit. review Language |  |
| 7-9 | Fri Nov 1 | * Updates on the model * First runs of model * Initial lit. review ABM |  |
| 9-11 | Fri Nov 15 | * Paper draft: * First analysis of results * Write about first analysis * More concrete lit. reviews * Write human-readable draft |  |
| 11-13 | Fri Dec 6 | * Analysis of results |  |