Project seminar (2)

An adaptive fuzzy inference in predator-prey pursuit game

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Agenda

I Introduction

II Main objectives and significance of research

III Methodology, data collection

IV Literature Review

V Results

VI Work completed so far and next steps

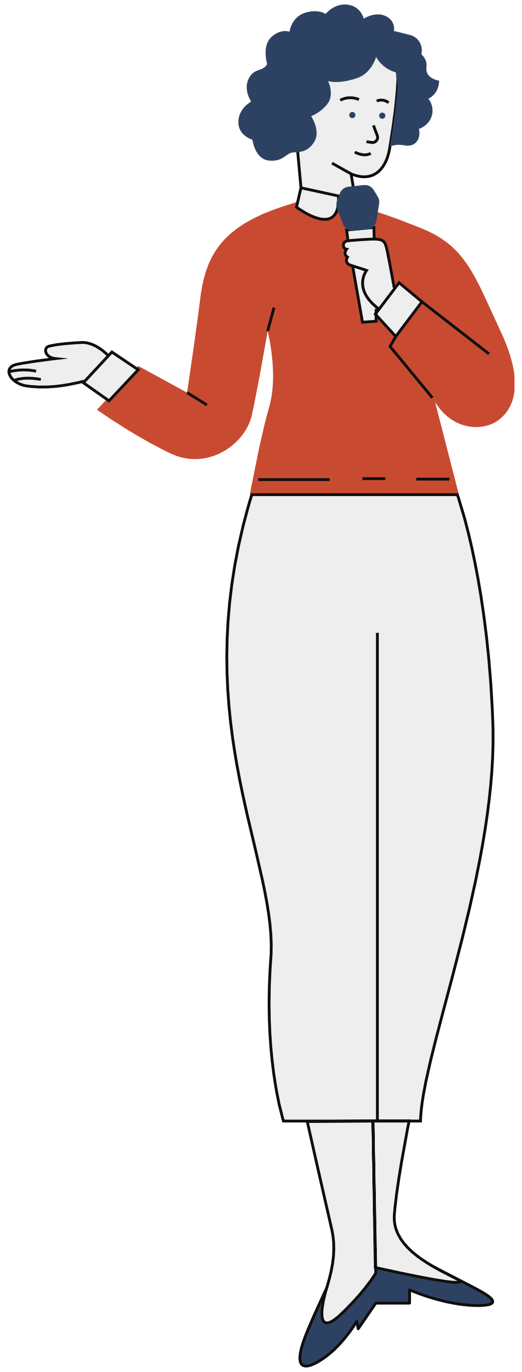
The main aim is a design and development of a fuzzy expert system for multiagent simulation of predator-prey pursuit game enabling implementation of suitable AI learning techniques.

Main Objectives

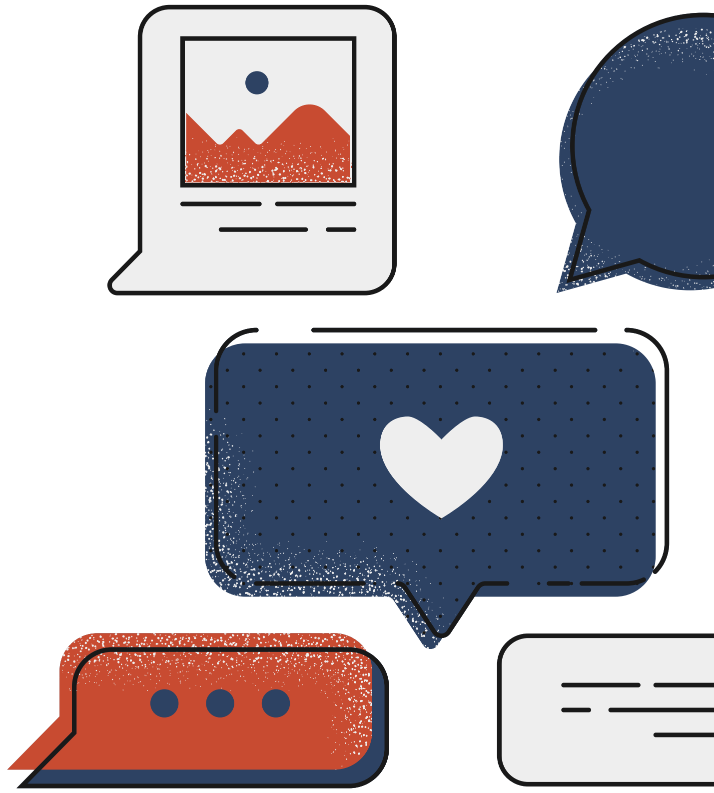
- Fuzzy Expert Systems (FES) stand as powerful tools in AI, mirroring common and expert thinking processes.
- The ability of FES to handle "soft" knowledge—uncertain, vague, and imprecise information—makes them invaluable in various applications.

Significance of Research:

- As we delve into the simulation of a predator-prey pursuit game, we address the challenge of handling "soft" knowledge efficiently.
- This work contributes to the broader field of artificial intelligence, exploring the intersection of fuzzy logic, expert systems, and multi-agent simulations.



- Obtain knowledge about different modifications from papers on the related topic
- Use the fuzzy logic designer to test assumptions and different predator and prey behaviors under changing circumstances.
- Iterative Development: Emphasize the importance of iterative development in handling evolving challenges. Develop system by adding additional conditions.



Data Collection

Data Collection Process:

- Heuristic Rules Compilation: Gather rules from the papers to form the initial knowledge base for each agent.
- Simulation Scenarios: Identify diverse pursuit scenarios to simulate real-world dynamics and interactions among agents.
- Learning Mechanism Data: Collect data on the integration of AI learning mechanisms, tracking the system's adaptation over time.

Next Steps:

- Simulation: Design chosen pursuit scenarios using Simulink extension.
- Fine-tuning Parameters: Adjust parameters based on initial insights to enhance the overall performance of the fuzzy inference system.

Neuro-fuzzy methods for modeling and identification. R. Babuska

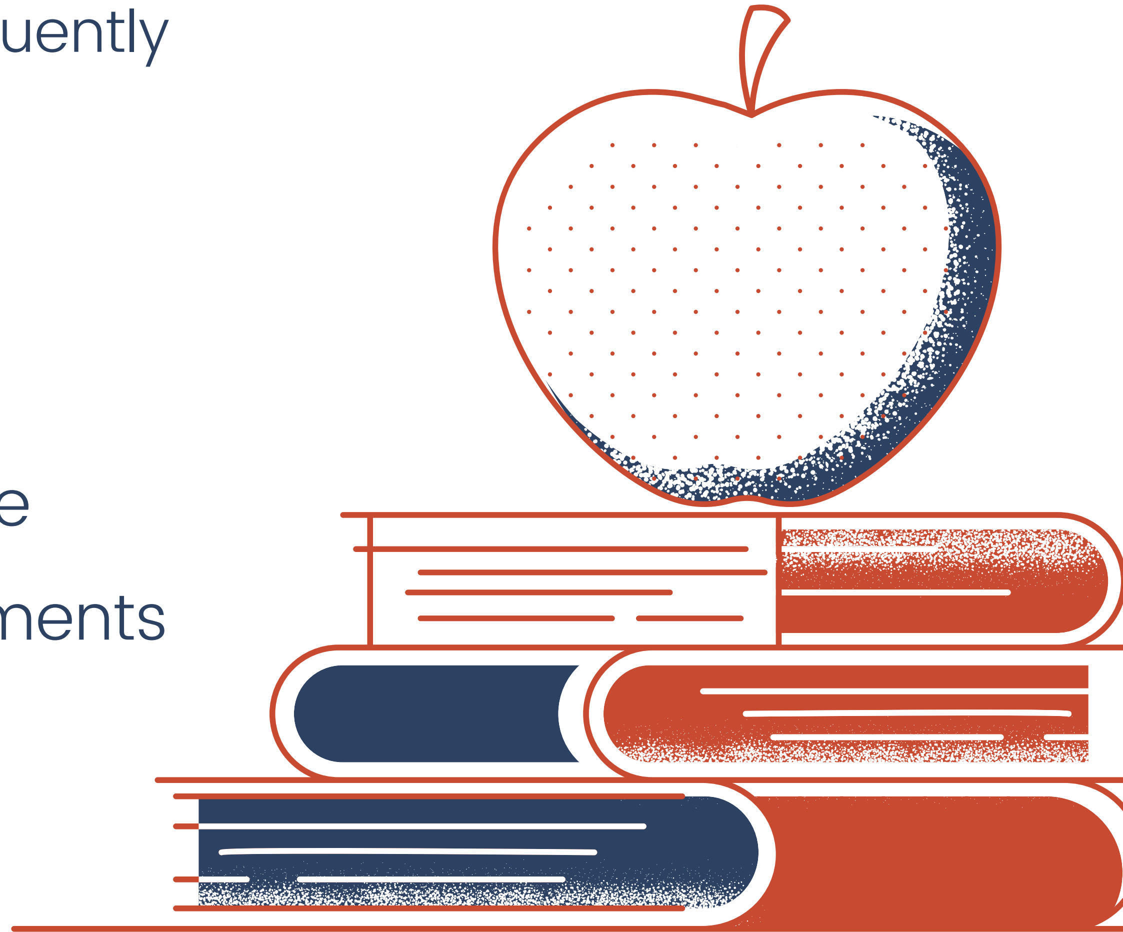
Neuro-fuzzy models, positioned as a gray-box technique at the intersection of neural networks and qualitative fuzzy models, are gaining prominence in both academic research and industrial applications.

Hierarchical fuzzy logic for multi-input. S. Kamthan, H. Singh

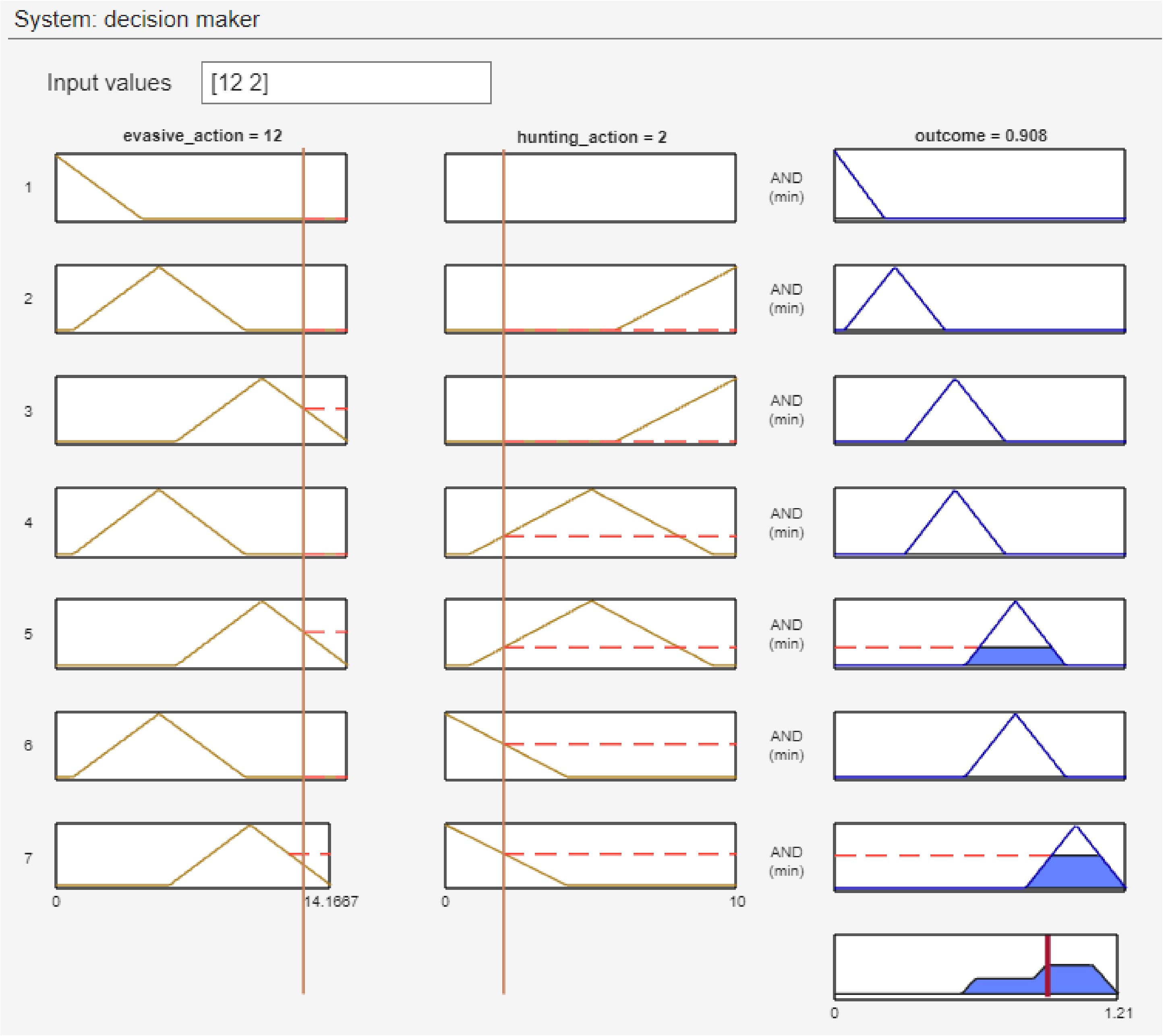
The paper aims to establish a methodology for developing multi-input multi-output hierarchical fuzzy systems, presenting an innovative strategy to avoid redundancy in common terms across subsystems, a novel approach not previously addressed by other authors. The discussion begins with the implementation of a multi-input single-output hierarchical system and subsequently extends this approach to encompass multi-input multi-output hierarchical systems.

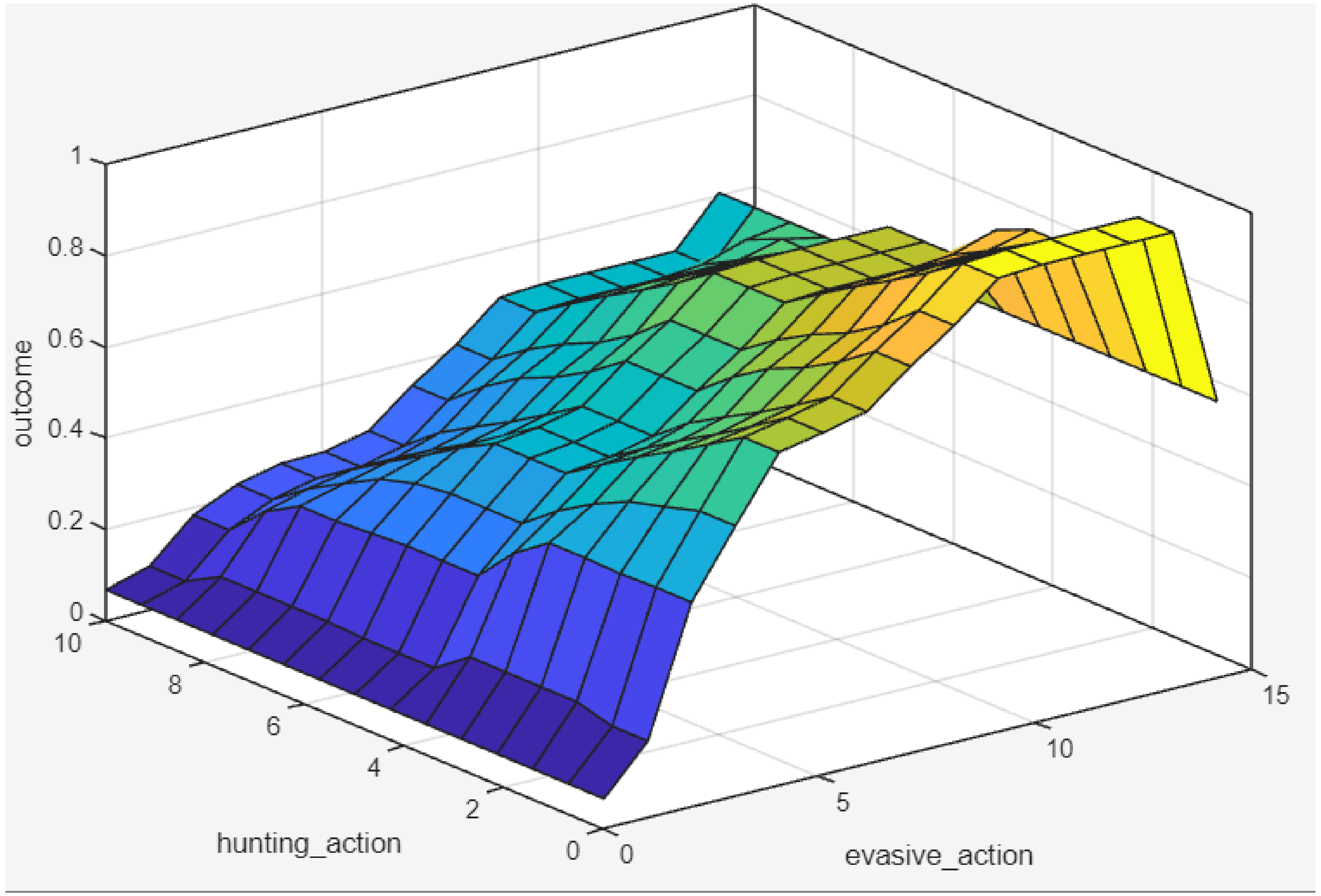
An Adaptive Predator/Prey Game. Hsieh, Wang

This study, introduced a fuzzy approach to enhance gaming experiences by dynamically adapting computer-controlled opponents' tactics in response to the player's behavior, allowing players to preset their desired challenge level; experiments on a predator/prey game reveal the method's effectiveness and robustness in meeting human players' preferences.



Results





Evasion action: run, hide, stay. Hunting action: Attack, approach, patrol. Evenly distributed on the 0–10.

The output shows whether the prey will be caught. In the following example, probability has a high risk of getting caught.

Work Completed So Far

1. Theoretical Foundation:
   - Developed and prepared the theoretical framework for the theses.
   - Conducted an in-depth study of various modifications of the predator-prey game.
2. Predator-Prey Game Modifications:
   - Explored and analyzed different modifications of the predator-prey game.
3. Fuzzy Trees Design:
   - Designed fuzzy trees tailored for both predator and prey agents.
4. Implementation of Decision Maker:
   - Successfully implemented a decision-making module based on designed fuzzy trees.
   - The decision maker assesses whether the prey gets caught, incorporating fuzzy logic for adaptive behavior.

Next steps

- End of December-January:
  - Complete the forest environment implementation, and agent interactions, and add additional input parameters.
- February:
  - Finalize and test the simulation with timeframes and dynamic predator behavior.
  - Adjust parameters for optimal experience.
  - Integrate multiple predator and prey agents into the simulation.
  - Start with learning mechanisms implementation.
- March–April:
  - Implement learning mechanisms for adaptive agent behavior.
  - Conduct comprehensive output evaluations.
  - Refine and optimize the simulation based on supervisors' feedback.
  - Dedicate time to finalize the design, implementation, and result description sections in the theses.

The End

Thank you for listening