

Assessment of Collaborative Problem-Solving Competencies in Engineering Through Cooperative Game Theory

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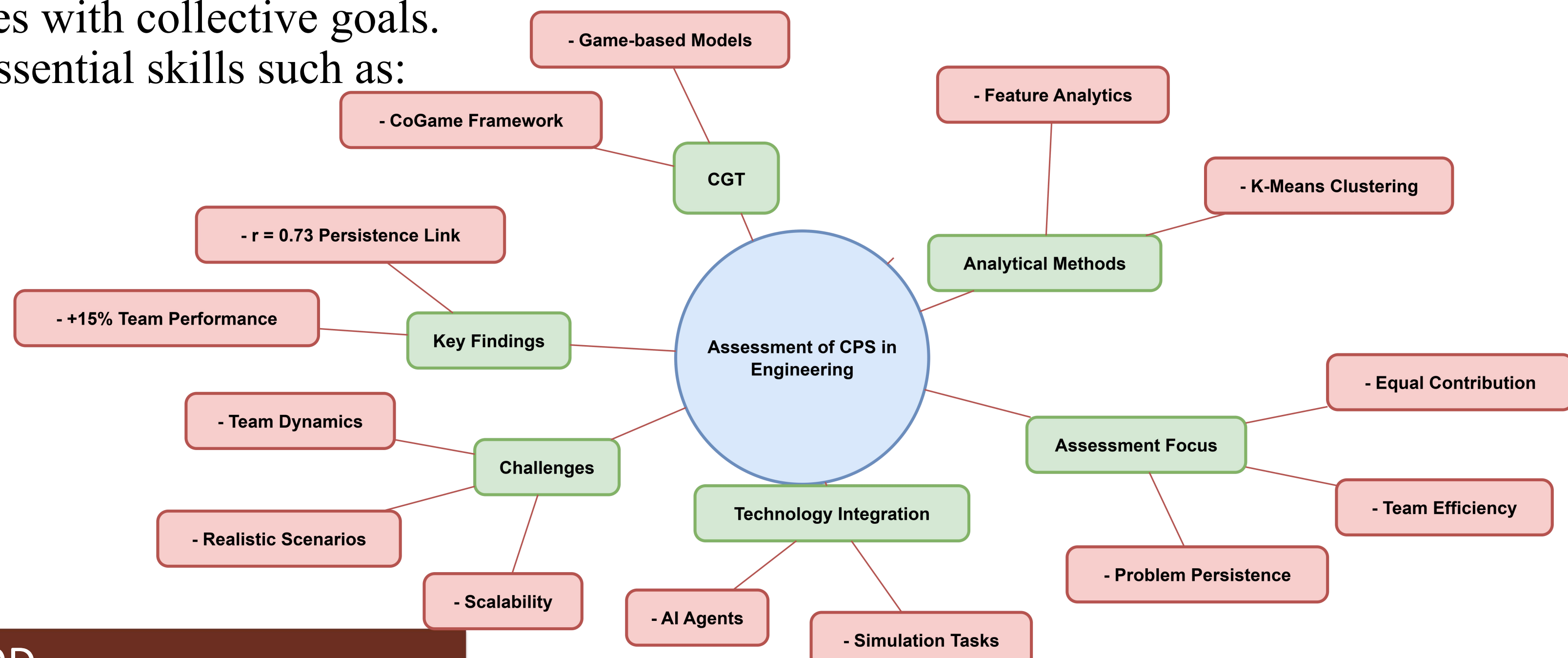
INTRODUCTION & AIM

Cooperative Game Theory (CGT) is increasingly being integrated into engineering education as an innovative tool to assess collaborative problem-solving (CPS) skills.

Unlike traditional assessments that focus on individual performance, CGT emphasizes group collaboration and shared success.

CGT creates a cooperative learning environment by aligning individual incentives with collective goals. This approach encourages essential skills such as:

- Communication
- Critical thinking
- Teamwork



METHOD

The study investigates the use of Cooperative Game Theory (CGT)-based evaluation models, such as:

- CoGame
 - Cobb-Douglas framework within undergraduate engineering courses.
- A variety of gamified tools were implemented to assess Collaborative Problem-Solving (CPS) behaviors, including:
- Intergroup competitions
 - Commercial board games (e.g., Pandemic)
 - Simulation-based activities

Quantitative models were utilized to monitor:

- Student engagement
- Individual contributions
- Team dynamics

Reflective tools were employed to validate learning outcomes, such as:

- Peer assessments
- Learning journals

RESULTS & DISCUSSION

Xu et al. (2024) found that teams working on online jigsaw puzzle tasks demonstrated 15% higher collaborative problem-solving (CPS) performance metrics compared to individuals.

San Pedro et al. (2019) reported a strong correlation ($r = 0.73$) between game-based persistence metrics and problem-solving success rates

Figure 1: Assessment of CPS in Engineering

CONCLUSION

Cooperative Game Theory provides a robust and flexible framework for evaluating collaborative problem-solving in engineering education. Its practical application not only enhances technical and soft skills but also supports fairer, more interactive assessment methods. While challenges remain in implementation and design complexity, CGT offers a promising pathway for cultivating essential 21st-century engineering competencies.

FUTURE WORK / REFERENCES

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