Gin Rummy Contest Results
and
Our Next Research Challenge

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Objective and 20/21 Engagement

- Mentored Undergraduate Research Challenge Objective: To …
  - offer attractive, attainable, introductory research challenges to …
  - support faculty mentorship of undergraduate research where …
  - students engage in the full research cycle including: research of prior related work, experimental design, empirical analysis of results, technical article writing, peer review, and (if accepted) conference presentation (where one is often inspired to one's next work)
- 14 teams of 50 total mentors and undergraduate students submitted 14 AI players for competition evaluation.
- 14 papers submitted for peer review; 13 accepted and presented at EAAI 2021.

Evaluation Process

- 14 players shuffled and split into two pools of 7 players
- Top 4 of each pool advanced to Top 8
- Top 8 evaluated in 10,000 total rounds of play

Group 1 (7 players)

- GinRummyAndTonic_Player
- MARJJ_Player
- AdvancedPlayer
- DePauwPlayer
- GettysburgPlayer
- Tonic
- PrincetonPlayer

Group 1 Top 4

- MARJJ_Player   Elo 1080
- DePauwPlayer   Elo 1052
- GettysburgPlayer   Elo 1041
- GinRummyAndTonic_Player   Elo 1037

Group 2 (7 players)

- DynamicGinRummyPlayer
- DualInception
- Heisenbot
- MyPlayer
- siftagent
- PercentTwenty_Player
- P12

Group 2 Top 4

- Percent20_Player   Elo 1044
- MyPlayer   Elo 1039
- DynamicGinRummyPlayer   Elo 1015
- siftagent   Elo 997

# Top 8

- MARJJ_Player
- DePauwPlayer
- GettysburgPlayer
- GinRummyAndTonic_Player
- Percent20_Player
- MyPlayer
- DynamicGinRummyPlayer
- siftagent

Top 8 with Elo

- MARJJ_Player   Elo 1037
- DePauwPlayer   Elo 999
- GettysburgPlayer   Elo 1020
- GinRummyAndTonic_Player   Elo 1012
- Percent20_Player   Elo 1007
- MyPlayer   Elo 1000
- DynamicGinRummyPlayer   Elo 986
- siftagent   Elo 943

A 5000 Game Batch
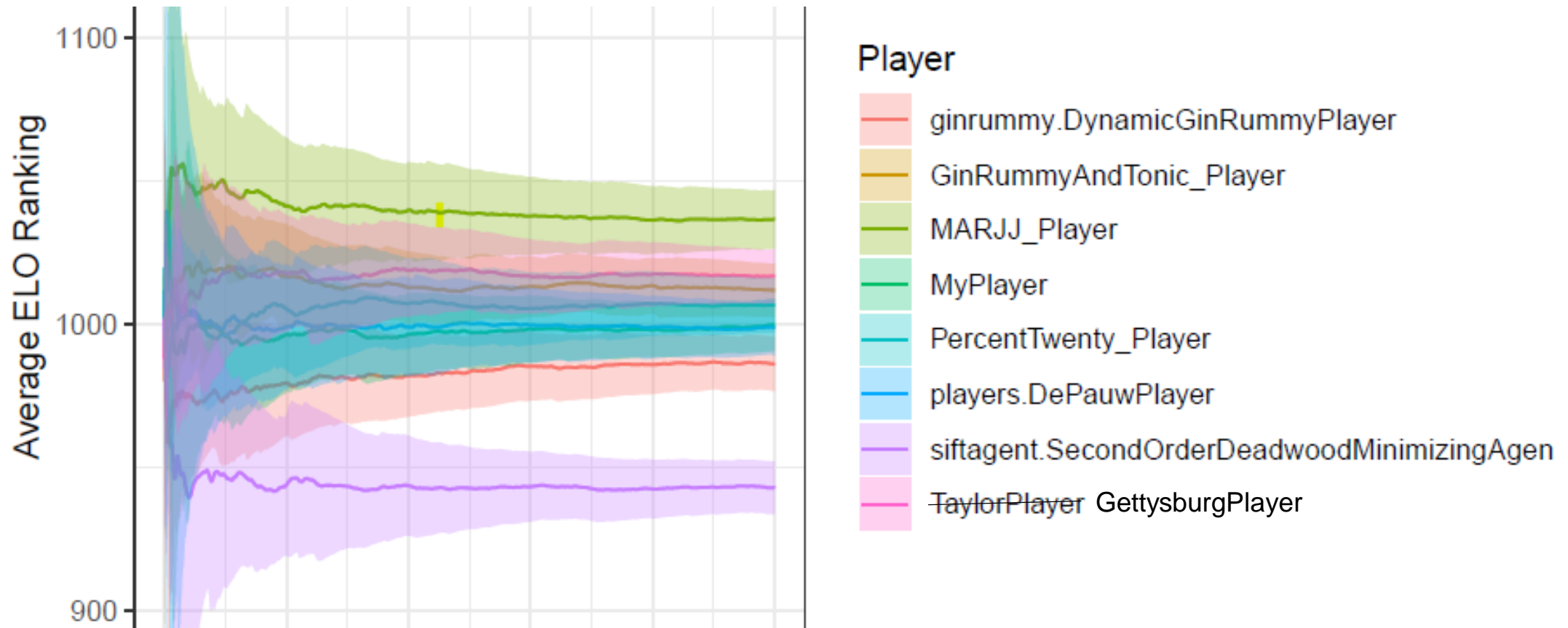
Top 3 – Congratulations!

- First place: MARJJ_Player
  - [A Heuristic Evaluation Function for Hand Strength Estimation in Gin Rummy](#)
    Aqib Ahmed, Joshua Leppo, Michal Lesniewski, Riken Patel, Jonathan Perez, Jeremy Blum

- Second place (tie): GettysburgPlayer
  - [Knocking in the Game of Gin Rummy](#)
    Ryzeson Maravich, Taylor Neller, Todd Neller

- Second place (tie): GinRummyAndTonic_Player
  - [Extracting Learned Discard and Knocking Strategies from a Gin Rummy Bot](#)
    Benjamin Goldstein, Jean Astudillo Guerra, Emily Haigh, Bryan Cruz Ulloa, Jeremy Blum

What's Next? AI-Assisted Game Design!

AI Education Matters: 2022 EAAI Mentored Undergraduate Research Challenge: AI-Assisted Game Design

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https://sigai.acm.org/static/aimatters/6-3/AIMatters-6-3-04-Neller.pdf

Or search "AI Matters"

What Is AI-Assisted Game Design

- What distinguishes AI-Assisted Game Design (AIAGD) from AI game play is that the results of an AI technique are applied to the design of the game itself.

- AIAGD *includes* but is not the same as Procedural Generation

- AIAGD also includes:
  - Game Analysis for Game Improvement
  - AI-Assisted Game Invention
  - Other application of AI techniques to Game Design

Game Analysis for Game Improvement

- Discern over-/under-powered (over-/under-used) game elements to nerf/buff
  - Magic the Gathering – recent card bannings (20 in the last 2 years)
  - Fortnite – nerfing/buffing over-/under-powered weapons

AI-Assisted Game Invention

- Cameron Browne's work
  - Digital Ludeme Project - seeks to express a wide variety of historical games according to game units called "ludemes".
  - Evolutionary algorithmic approach to computationally design the game Yavalath (Browne, 2011, pp. 75-85).
  - See also Browne's *Game and Puzzle Design Journal*.
- T. Neller, M. Malec, C. Presser, F. Jacobs. **Optimal, Approximately Optimal, and Fair Play of the Fowl Play Card Game**, in the Proceedings of the 8th International Conference on Computers and Games CG2013
  - Resulted in approximately fair Poker chip variation "Red Light"

Mentored Undergraduate Research Challenge

- A limited number of papers will be accepted for publication and presentation at EAAI-22 that
  - exemplify high-quality scholarly writing, and
  - demonstrate creative application of AI to AI-Assisted Game Design.
- As mentioned, this can take many forms, including but not limited to:
  - Existing game improvement through AI game analysis,
  - New game design through AI search in a design space,
  - Adaptive technologies shown empirically to improve player experience, and
  - AI procedural generation of game play elements.
- Teams must include at least one faculty mentor and at least one undergraduate. Faculty mentors will be expected to review. (Contact Todd Neller <tneller@gettysburg.edu>.)