Hearthstone AI Competition

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Task Description

- Program an agent, which is capable of playing the game Hearthstone

- We used the Sabberstone Framework (C#) modified for partial observation

- Evaluation in two separate tracks:

    - "Premade Deck Playing"-track
        - Play <u>mirror matches</u> using 6 decks of which 3 are known at time of submission

    - "User Created Deck Playing"-track
        - Play your own deck against other agents with unknown decks

"Premade Deck Playing" - track

- 16 submissions
  - Every agent needs to play 6 decks of which three are known at time of submission and 3 are hidden

  - ~~Round Robin Tournament~~
  - Single Elimination Tournament
    - 300 games per matchup of two agents,
    - Only mirror matchups were played
    - 50 games per deck combination (25 starts per player)

3 Decks – 3 Playstyles
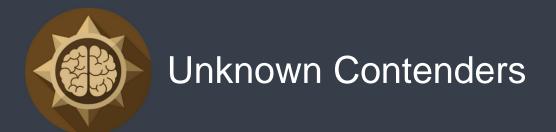
Reno Kazakus Mage

Midrange Jade Shaman

Aggro Pirate Warrior

Unknown Contenders

Midrange Buff Paladin

Miracle Pirate Rogue

Zoo Discard Warlock

"Premade Deck Playing" - Finalists

BotHeimbrodt - Pruned BFS + Heuristics
Tom Heimbrodt

Tyche Agent B - MCTS
Victor Le

AlvaroAgent - MCTS
Álvaro de Marcos Alés, Antonio José Fernández Leiva, Pablo García Sánchez

BestChildAgent – Pruned BFS
Marcel Öfele,
Martin Mendez Ruiz,

"Premade Deck Playing" - Finalists

BotHeimbrodt - Pruned BFS + Heuristics **Tom Heimbrodt**

Rank 4 – 37.11 %
Tyche Agent B - MCTS **Victor Le**

AlvaroAgent - MCTS **Álvaro de Marcos Alés, Antonio José** **Fernández Leiva, Pablo García Sánchez**

BestChildAgent – Pruned BFS **Marcel Öfele,** **Martin Mendez Ruiz,**

"Premade Deck Playing" - Finalists

BotHeimbrodt - Pruned BFS + Heuristics **Tom Heimbrodt**	**Rank 4 – 37.11 %** **Tyche Agent B - MCTS** **Victor Le**
AlvaroAgent - MCTS **Álvaro de Marcos Alés, Antonio José Fernández Leiva, Pablo García Sánchez**	**Rank 3 – 50.00%** **BestChildAgent – Pruned BFS** **Marcel Öfele,** **Martin Mendez Ruiz,**

"Premade Deck Playing" - Finalists

BotHeimbrodt - Pruned BFS + Heuristics **Tom Heimbrodt**

Rank 4 – 37.11 %
Tyche Agent B - MCTS **Victor Le**

Rank 2 – 55.22 %
AlvaroAgent - MCTS **Álvaro de Marcos Alés, Antonio José** **Fernández Leiva, Pablo García Sánchez**

Rank 3 – 50.00%
BestChildAgent – Pruned BFS **Marcel Öfele,** **Martin Mendez Ruiz,**

"Premade Deck Playing" - Finalists

Rank 1 – 57.66 %
BotHeimbrodt - Pruned BFS + Heuristics **Tom Heimbrodt**

Rank 4 – 37.11 %
Tyche Agent B - MCTS **Victor Le**

Rank 2 – 55.22 %
AlvaroAgent - MCTS **Álvaro de Marcos Alés, Antonio José Fernández Leiva, Pablo García Sánchez**

Rank 3 – 50.00%
BestChildAgent – Pruned BFS **Marcel Öfele,** **Martin Mendez Ruiz**

"Premade Deck Playing" – Conclusion

- Submitted agents:
  - Improved in overall quality
  - Multiple agents were based on previous entries
  - Bots now make use of the generous time limits

- Most frequent agent types:
  - simulation-based search algorithms, such as MCTS
  - or trained state evaluation functions using Eas

"User Created Deck Playing"-track

- 15 submissions
  - Everybody chose his own deck to play against the others

  - Round Robin Tournament
    - 100 games per matchup (50 starts per player)

"User Created Deck Playing" - Finalists

TycheAgent – JadeDruid, MCTS
Victor Le

JadeDruidBot – JadeDruid, EA
Lars Wagner

MCGSAgent – OddPaladin, MCGS
Jean Seong Bjorn Choe

GreedyEA – MidrangeJadeShaman, EA
Hoang Tony Nguyen

"User Created Deck Playing" - Finalists

TycheAgent – JadeDruid, MCTS
Victor Le

JadeDruidBot – JadeDruid, EA
Lars Wagner

MCGSAgent – OddPaladin, MCGS
Jean Seong Bjorn Choe

Rank 4 – 64.14 %
GreedyEA – MidrangeJadeShaman, EA
Hoang Tony Nguyen

"User Created Deck Playing" - Finalists

Rank 3 – 76.35 %
TycheAgent – JadeDruid, MCTS **Victor Le**

JadeDruidBot – JadeDruid, EA
Lars Wagner

MCGSAgent – OddPaladin, MCGS
Jean Seong Bjorn Choe

Rank 4 – 64.14 %
GreedyEA – MidrangeJadeShaman, EA **Hoang Tony Nguyen**

"User Created Deck Playing" - Finalists

Rank 3 – 76.35 %

TycheAgent – JadeDruid, MCTS
Victor Le

Rank 2 – 77.92 %

JadeDruidBot – JadeDruid, EA
Lars Wagner

Rank 4 – 64.14 %

MCGSAgent – OddPaladin, MCGS
Jean Seong Bjorn Choe

GreedyEA – MidrangeJadeShaman, EA
Hoang Tony Nguyen

"User Created Deck Playing" - Finalists

Rank 3 – 76.35 %
TycheAgent – JadeDruid, MCTS
Victor Le

Rank 2 – 77.92 %
JadeDruidBot – JadeDruid, EA
Lars Wagner

Rank 1 – 79.57 %
MCGSAgent – OddPaladin, MCGS
Jean Seong Bjorn Choe

Rank 4 – 64.14 %
GreedyEA – MidrangeJadeShaman, EA
Hoang Tony Nguyen

"User Created Deck Playing" - Conclusion

- Winning agents use top-performing meta-decks
  - JadeDruid, JadeShaman, Odd Paladin, MechaHunter
  - Winning strategies include: MCTS, EA optimized fitness

Future Work

- Deck Drafting Mode
  - Playing performance improved, but the evaluation setting is different from the real game
  - We look into possibilities in having a fair deck drafting mode
    - Any ideas are welcome

- Tracks will be updated for next year!

Thank you for all your submissions!
We are looking forward to continue this competition!

Bots of 2018 (and soon 2019) are available online

https://www.ci.ovgu.de/Research/HearthstoneAI.html