



Understanding Reinforcement Learning with *6nimmt!*

Games provide a good environment to learn new skills and discover innovative techniques. The card game “6 Nimmt!” is a partial information game that imposes some concrete challenges to any artificial intelligence bot. This project will therefore focus on the implementation and analysis of reinforcement learning bots for the game “6 Nimmt!”.

The Github repository by Brehmer and Gutschke [Joh20] provides us with a solid base to the project as it already implements a model of the game, and many reinforcement learning bots. Nevertheless, we would like to use this base to learn how the modeling is done, how the rl agents work and then focus on one or multiple of three points:

1. **Variants.** Investigating the implementation of other game variants and looking at how this affects the bots in their performance.
2. **Communication.** When playing a game, humans usually disclose information about their cards in an implicit manner (e.g. facial expression, time to play a card, comments...). We look at how we could implement a form of communication between the bots and try to understand how communication affects the bot. Possible approaches could be: implement betting system, passing meta information between players or predicting the other players hands.
3. **Explainability.** This is one of the biggest challenges of machine learning. Trying to extract human comprehensible strategies from the bots has proven to be very challenging. But the simple setting of a game, could help us to develop ways to understand the behavior of the bots. Possible approaches include: probing, comparing against strategy-based bots, hybrid/biased agents (apply some restrictive strategies), investigate which inputs are important, decision trees to approximate the neural networks, predicting other players hand.

Requirements: Strong motivation, proficiency in Python, ability to read papers and work independently. Prior knowledge in deep learning is preferred. We will have weekly meetings to address questions, discuss progress and think about future ideas.

Contact

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References

- [Joh20] Johann Brehmer. *Beating 6 nimmt! with reinforcement learning*. <https://github.com/johannbrehmer/rl-6-nimmt>. Accessed: October 2021. 2020.