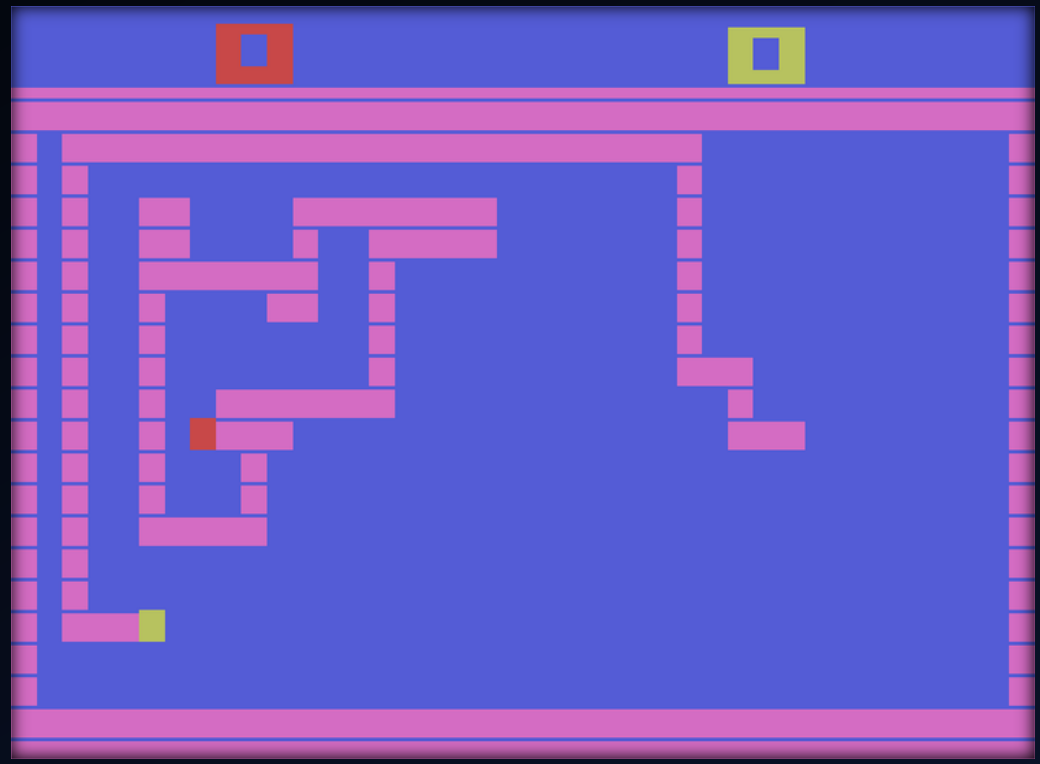
Reinforcement Learning Surround

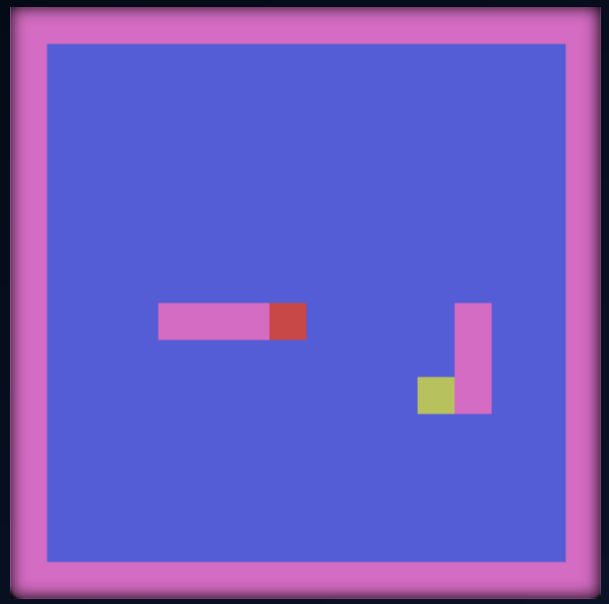
IAGO RIVEIRO SANTOS DUTRA
LUÍS HENRIQUE DOMINGUES BUENO
VINÍCIUS ANTUNES DE SOUZA

The Problem

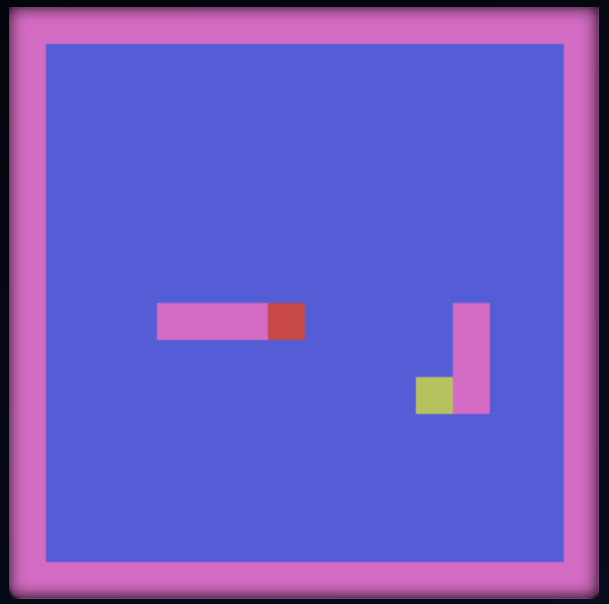


The Environment

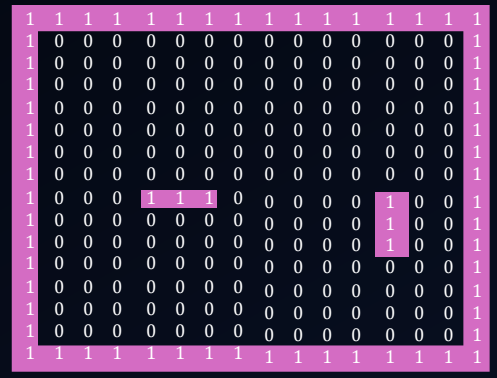
- 16x16 Board
- Up to 2 Controllable Players



Observation Space

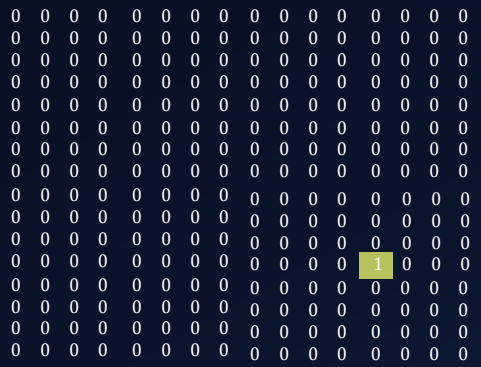


- Walls



- Player 1

- Player 2

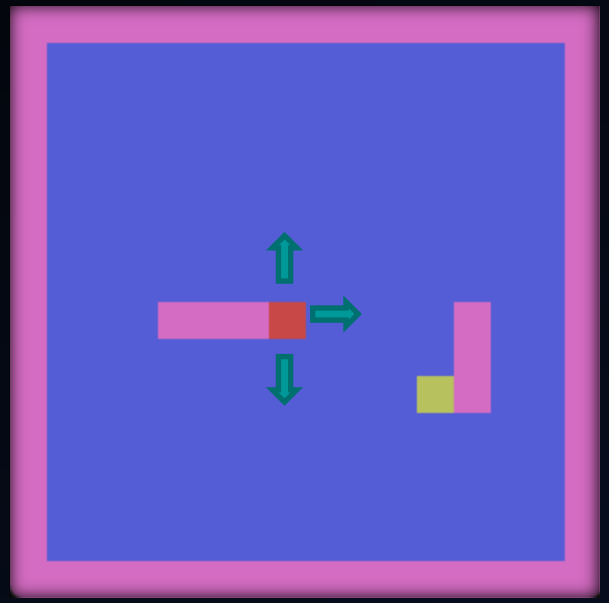


Action Space

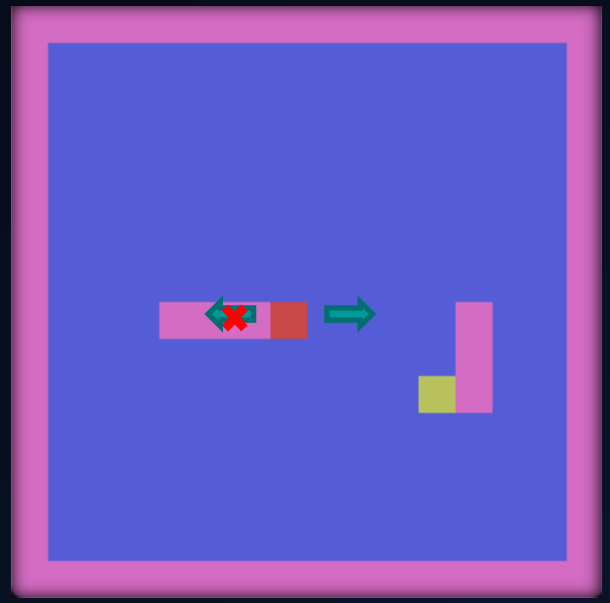
Value	Movement
0	Continue
1	Right
2	Up
3	Left
4	Down

Game Rules

- Board Perspective

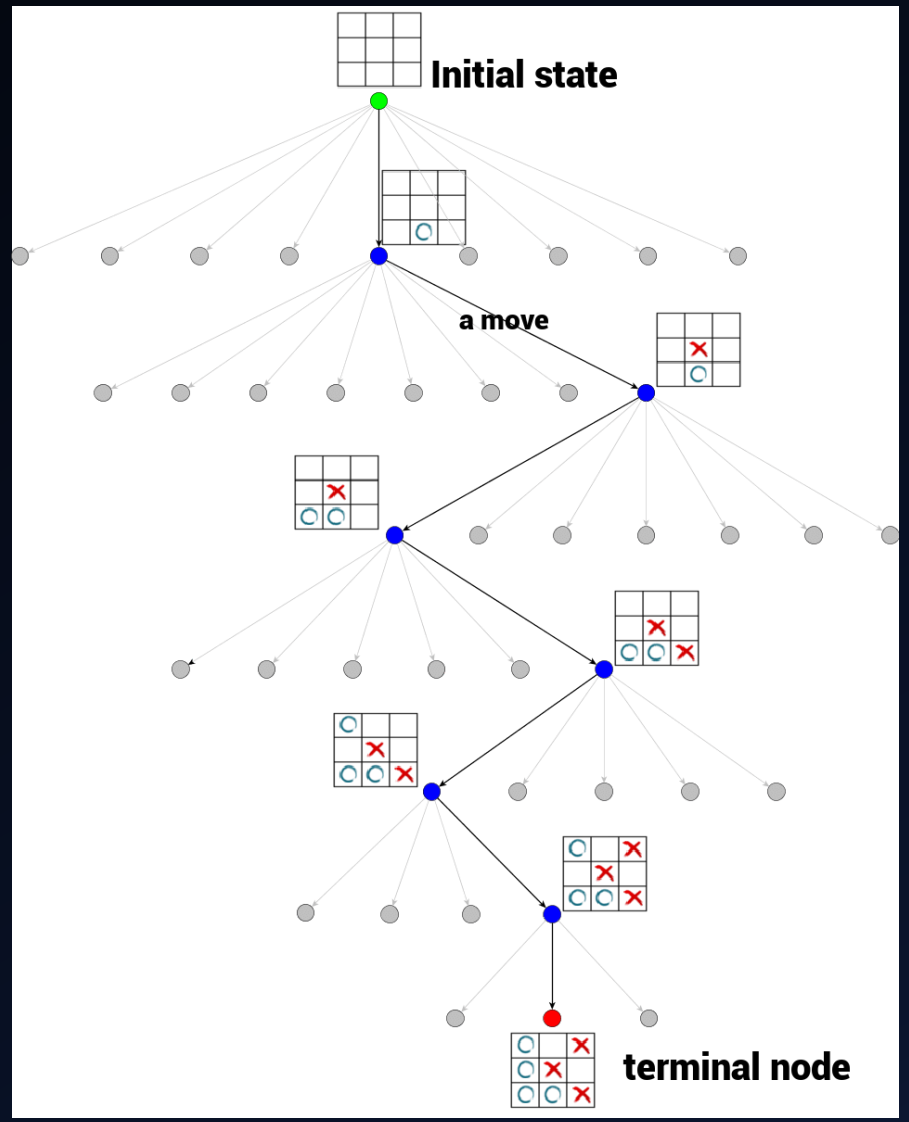


- Can´t Go Back



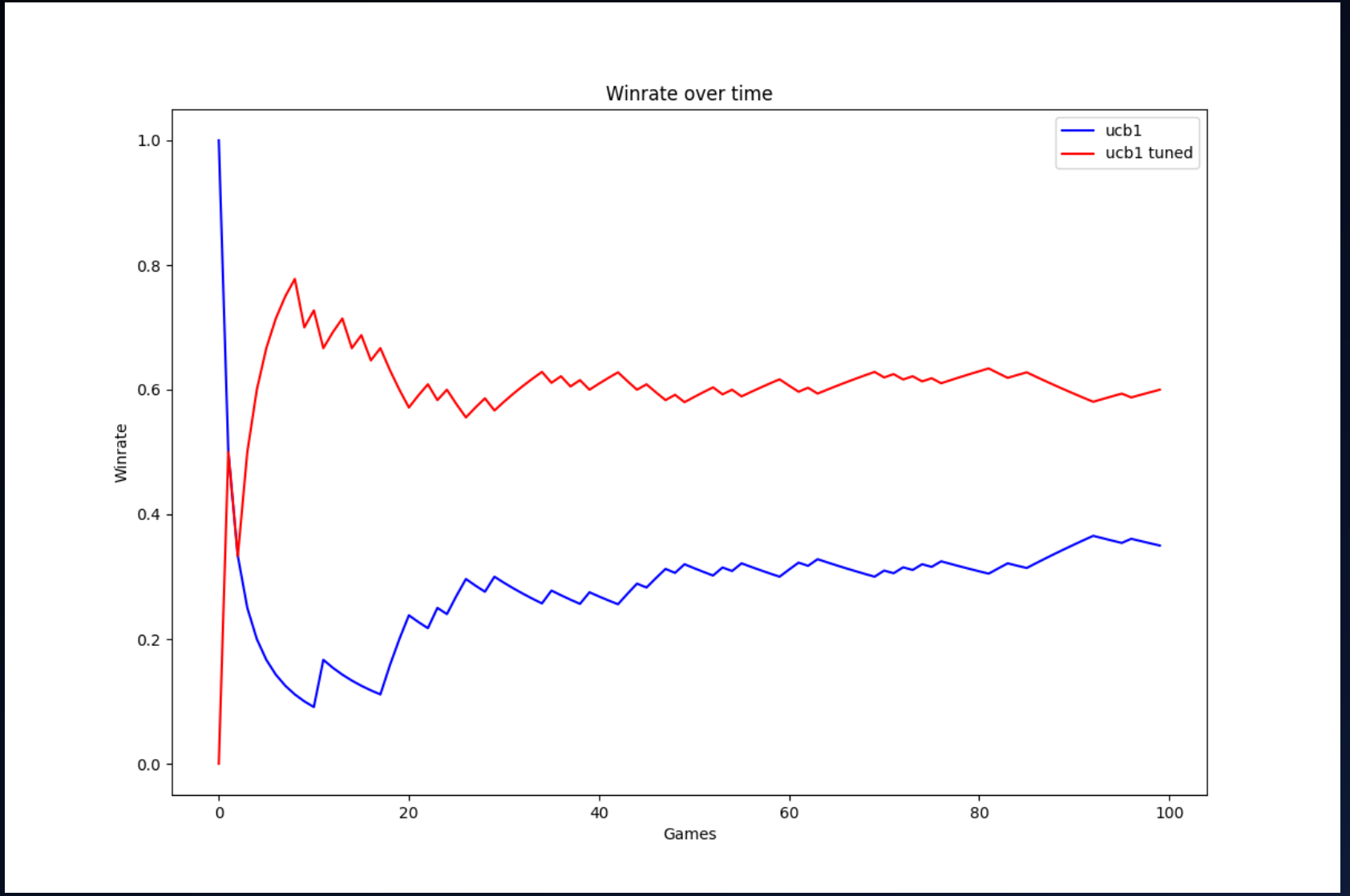
Algorithm 1

- Monte Carlo Tree Search
- “AlphaGo-like”



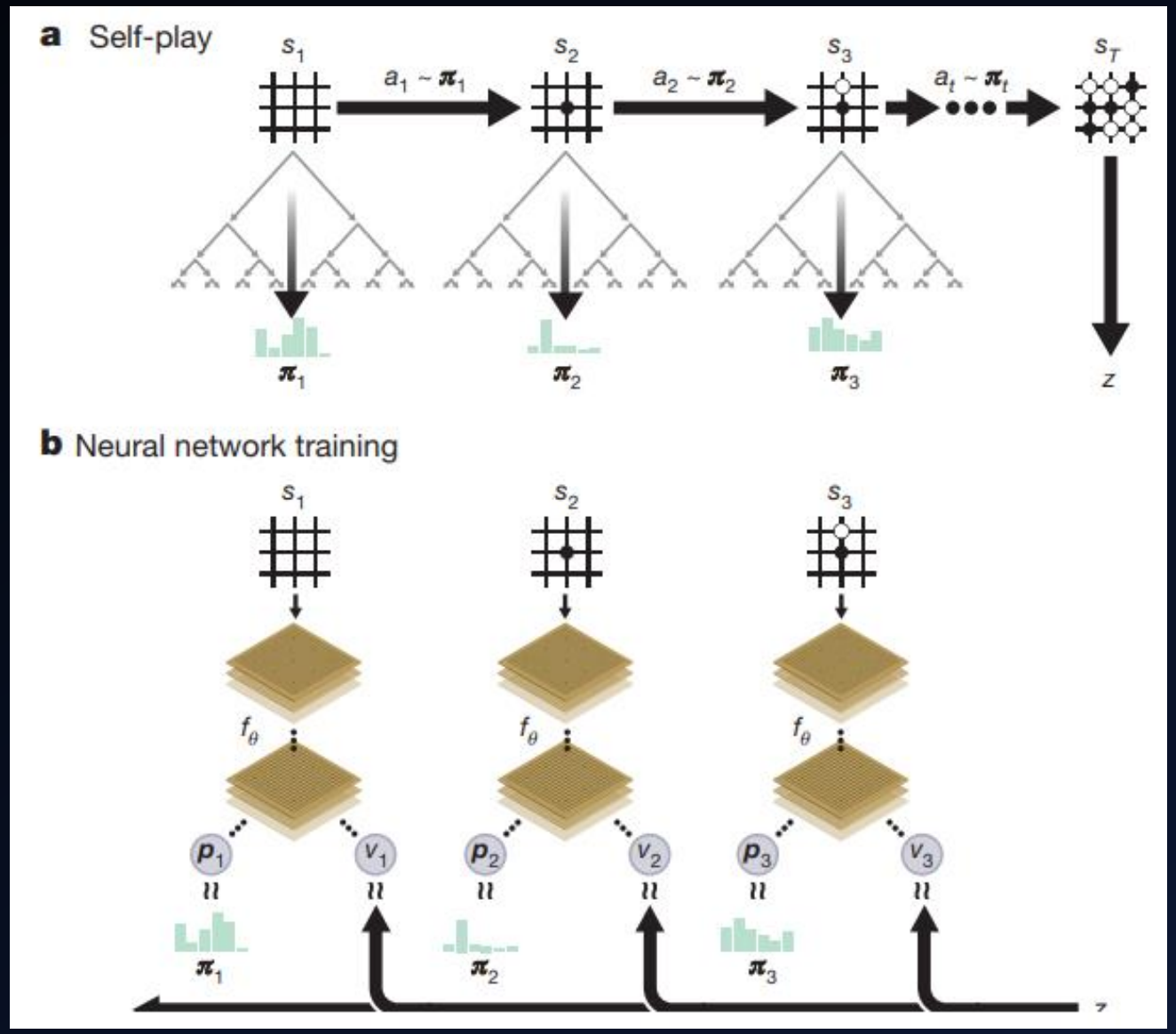
Algorithm 1

- Performance



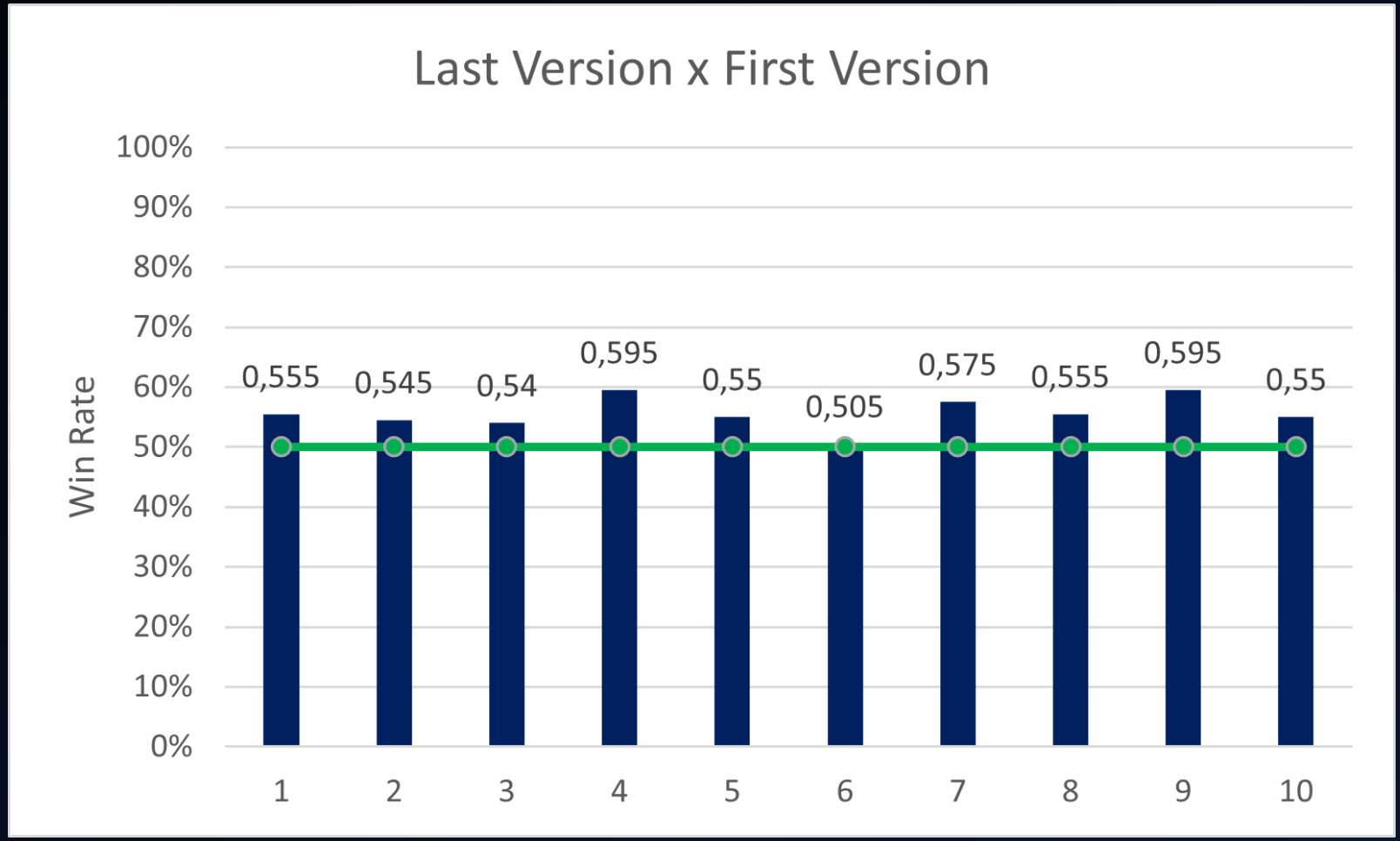
Algorithm 2

- CNN-guided MCTS
- “AlphaGo Zero-like”



Algorithm 2

- Performance



Conclusion

- Algorithm 1 is better than Algorithm 2
- Algorithm 1 beats a Clever Random Player
- Algorithm 2 is as good as a Clever Random Player
- Algorithm 2’s final version is better than the initial version

References

- LANCTOT, Marc; WITTLINGER, Christopher; WINANDS, Mark H. M.; TEULING, Niek G. P. Den. Monte Carlo Tree Search for Simultaneous Move Games: A Case Study in the Game of Tron. **Proceedings of Computer Games Workshop**. 2012. Available at: https://dke.maastrichtuniversity.nl/m.winands/documents/sm-tron-bnaic2013.pdf. Access on: 2023/10/15.
- LAPAN, Maxim. **Deep Reinforcement Learning Hands-On**. 2nd Edition. Packt Publishing, 2020.
- PREICK, Pierre; ST-PIERRE, David L.; MAES, Francis; ERNST, Damien. Comparison of Different Selection Strategies in Monte-Carlo Tree Search for the Game of Tron. **IEEE Conference on Computational Intelligence and Games (CIG)**, Granada, Spain, 2012, pp. 242-249, DOI: 10.1109/CIG.2012.6374162.
- SILVER, D., HUANG, A., MADDISON, C. *et al*. Mastering the game of Go with deep neural networks and tree search. **Nature**, n. 529, p. 484–489 (2016). DOI: 10.1038/nature16961
- SILVER, D.; SCHRITTWIESER, J.; SIMONYAN, K. *et al*. Mastering the game of Go without human knowledge. **Nature**, n. 550, p. 354–359 (2017). DOI: 10.1038/nature24270
- SLOANE, Andy. **Google AI Challenge post-mortem**. 2011. Available at: https://web.archive.org/web/20111230055046/http://a1k0n.net/2010/03/04/google-ai-postmortem.html. Access on: 2023/10/15.
- SUTTON, Richard S.; BARTO, Andrew G. **Reinforcement Learning: An Introduction**. 2nd Edition. MIT Press, 2018.
- WANG, Qi. **Connect 4 with Monte Carlo Tree Search**. 2022. Available at: https://www.harrycodes.com/blog/monte-carlo-tree-search. Access on: 2023/10/15.