This week you have spent some time exploring advanced concepts in reinforcement learning. In this discussion, you will be asked to explore the programs AlphaGo and AlphaGo Zero. You will need to use resources to support your points, and may use readings from the module resources as well as your own research. Below are a few potential resources from the Shapiro Library to get you started, but you are encouraged to find additional sources.

**NOTE**: You are not required to read *all* of these articles. Review the abstracts to select the articles that apply best to the prompts you want to discuss.

* [AlphaGo Zero: Starting From Scratch](https://deepmind.com/blog/article/alphago-zero-starting-scratch)
* [Mastering the Game of Go Without Human Knowledge](https://search.ebscohost.com/login.aspx?direct=true&custid=shapiro&authtype=athens,ip&db=edswsc&AN=000413247900053&site=eds-live&scope=site)
* [Demystifying AlphaGo Zero as AlphaGo GAN](https://search.ebscohost.com/login.aspx?direct=true&custid=shapiro&authtype=athens,ip&db=edsarx&AN=edsarx.1711.09091&site=eds-live&scope=site)
* [Deep New: The Shifting Narratives of Artificial Intelligence From Deep Blue and AlphaGo](https://search.ebscohost.com/login.aspx?direct=true&custid=shapiro&authtype=athens,ip&db=edswss&AN=000480579100004&site=eds-live&scope=site)
* [Where Does AlphaGo Go](https://search.ebscohost.com/login.aspx?direct=true&custid=shapiro&authtype=athens,ip&db=edseee&AN=edseee.7471613&site=eds-live&scope=site)
* [Mastering Chess and Shogi by Self-Play With a General Reinforcement Learning Algorithm](https://search.ebscohost.com/login.aspx?direct=true&custid=shapiro&authtype=athens,ip&db=edsarx&AN=edsarx.1712.01815&site=eds-live&scope=site)
* [AlphaGo, Deep Learning, and the Future of the Human Microscopist](https://search.ebscohost.com/login.aspx?direct=true&custid=shapiro&authtype=athens,ip&db=ccm&AN=122740824&site=eds-live&scope=site)

For your initial post, choose *two* of the following prompts and write a response of 2–3 paragraphs total. Your answer *must* include references to resources used, properly cited in APA format.

* What are the differences between AlphaGo Zero and its predecessors? How did these differences improve AlphaGo Zero's performance?
* How do the neural networks and reinforcement learning algorithms interact in AlphaGo Zero? How does this affect performance?
* How does the thinking of programs such as AlphaGo and AlphaGo Zero compare with how humans think? How does this affect gameplay? How does this affect our perception of AI?
* What implications does AlphaGo or AlphaGo Zero's performance have for future AI developments?

For your response posts, select peers who responded to *at least one* different prompt than you did and evaluate their responses. Remember to respond to *at least two* of your peers. Be sure to include cited sources to support your points.

AlphaGo Zero was designed to evolve from its predecessor DeepBlue due to its unique approach to learning. The earlier versions of this relied upon large datasets of human games to assist it’s learning & simulate the training. The system begins with no prior experience of the game outside of the basic rules, then improves itself by playing against itself. This removes the need for additional human data, while allowing the program to discover strategies & patterns on its own. This self-sufficiency not only reduces reliance on external information but also enables the system to develop innovative strategies that might not be present in human gameplay. This is known as reinforcement learning.

One difference between Zero & base form was the structure of the neural networks. The earlier version used separate networks for selection of moves & comprehending its position. Instead, its placed in a single, unified network that streamlines its design, improves the efficiency, & reduces the complexity. AlphaGoZero has more additional reinforcement built into its learning by integrating the Monte Carlo Tree Search (MCTS) inside its neural networks. These advancements allow Zero to achieve greater performance with less computational power then earlier iterations.

As every game play optimizes its playstyle and reinforces the previously learned strategies, its prediction methods grow for predicting the best moves & probability of winning from each play. The continued collaboration between the neural network & it’s reinforcement learning is critical to Zero’s improvement. MCTS then explores potential moves in greater depth, refining the neural network's predictions. This feedback loop enables AlphaGo Zero to continuously enhance its understanding of the game, leading to increasingly advanced strategies. The result is a system capable of outperforming even the best human players, showcasing the effectiveness of combining deep learning with reinforcement learning in complex decision-making tasks.

These achievements of Zero highlight the potential of reinforcement learning & the reinforcement learning in self-play mastery can be moved towards other advancements. The complex task without human learning could provide huge boost to robotics, healthcare, finance, environmental mapping. Applying A.I. systems to improve upon optimal strategies in learn without physical risk through trial & error. Examples would be stimulations ran in self-driving cars before they are put into live traffic with human drivers. Mapping out potentially scenarios could teach the A.I. systems to react to sometimes unpredictable driving we face on the freeways. Another could be A.I. in healthcare or fitness as discussed in week one discussion, where it could lay out a training regiment, or exercise plan along with potential outcomes to see before commencement.

With Zero’s ability to uncover new strategies, it is showcasing the potential creativity of A.I. In comparison to human expertise, Zero can generate innovative solutions that humans might not consider, or come up with in shorter time windows. Although the challenge of perception to A.I. usage in more involved ways past simply automating task may sway many from this route. The ethical questions about how much A.I. would be allowed in decision-making with potential consequences. As AI systems become more autonomous, ensuring they align with human values and priorities will be essential.

Silver, D., & Hassabis, D. (2017, October 18). AlphaGo Zero: Starting from scratch. Google DeepMind. <https://deepmind.google/discover/blog/alphago-zero-starting-from-scratch/>

Bory, P. (2019). *Http://journals.sagepub.com/doi/abs/10.1177/0887302x07303626 | request PDF*. Deep new: The shifting narratives of artificial intelligence from Deep Blue to AlphaGo. https://www.researchgate.net/publication/328039672\_httpjournalssagepubcomdoiabs1011770887302X07303626

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AlphaGo Zero evolved from its predecessor by adopting a unique self-learning approach. Unlike earlier versions that relied on human gameplay data, Zero starts with only the game’s basic rules and improves by playing itself. This eliminates dependence on external data and allows it to discover strategies independently, a process known as reinforcement learning.

A key improvement in Zero is its neural network structure. While earlier versions had separate networks for move selection and board evaluation, Zero integrates both into a unified network, improving efficiency and reducing complexity. It also embeds Monte Carlo Tree Search (MCTS) within its network, enhancing performance with less computational power.

With each game, Zero optimizes its strategy and refines its prediction methods. The interplay between its neural network and reinforcement learning enables continuous improvement, allowing it to surpass even top human players. This demonstrates the power of deep learning and reinforcement learning in complex decision-making.

Zero’s success highlights reinforcement learning’s potential in fields like robotics, healthcare, finance, and environmental mapping. AI can optimize strategies through simulations, such as training self-driving cars in virtual environments before real-world deployment. In healthcare, AI could design personalized exercise plans and predict outcomes before implementation.

Zero’s ability to generate innovative strategies showcases AI’s creative potential beyond automation. However, its growing autonomy raises ethical concerns about AI’s role in decision-making. Ensuring AI aligns with human values will be critical as its applications expand.

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Afternoon Cooper, how goes the week for ya? Closing towards the end of the semester fast!

I enjoyed your breakdown on the parallels between A.I. storytelling tools & how AlphaGoZero has advanced in recent years. I agree with your memory of how A.I. really used to be all over the place. Technically google searches might be considered an A.I. trait, and those used to be less streamlined & direct. I think a combination between how many links were clicked and what people were searching for benefits that. Then again, how direct the question or request was. Observations that Zero’s success is a signal that A.I. is being integrated into various aspects of life. This raises important questions back to ethical issues and privacy concerns where it’s applied.

If we look at A.I. overall in more depth, it must adhere to ethical concerns. While the technological advancements are very impressive, the challenges brought forth are also very impressive. How can we incorporate A.I. without job displacement, bias in the system, & potential abuse? Additionally, the “disheartening” aspect you mentioned, where humans are outperformed by A.I. This could have potentially devastating effects upon a person’s psyche, psychologically & culturally, especially in areas of a human expertise. A bit of exploration of these aspects could buff up your observation. Still a great read & write up.

Good afternoon to ya Ryan, stay warm wherever you’re at. Texas is cold, but least no snow right now.

Some of the advancements in A.I. should truly be considered spectacular. The improvements to Go from Fan were trained upon those thousands of human-played games. Zero, on the other hand, started from scratch and learned entirely through self-play. This approach, combined with its streamlined single neural network design, allowed it to surpass human expertise and its predecessors in an astonishingly short time. In fact, it defeated AlphaGo with a perfect 100-0 record.

Now if you’re comparing the thinking processes of Zero to human cognition, the differences are numerous. Zero relies on neural networks and reinforcement learning, enabling it to evaluate an immense number of move possibilities and outcomes far beyond human capacity. This allows it to make highly optimal moves without relying on human intuition or experience. In gameplay, this translates to a level of precision and foresight that humans simply cannot match.

A.I., like Zero, is advancing quickly. While humans might spend a lifetime mastering chess, Zero can learn it in hours from scratch. However, A.I. still lacks human creativity, like storytelling or imagining new ideas. It’s great at processing and optimizing within rules but can’t think outside the box. The speed of AI development is impressive. It’s exciting to see how A.I. will shape our understanding of intelligence.