**Capstone Project Topic Presentation**

* My topic: Game-playing AI

Which game?

* Ninety-Nine: Doesn’t seem to have been covered yet.

Background:

* Games as a proxy for studying Artificial Intelligence
* Different forms of AI (neural net, algorithmic, Monte Carlo)
* Previous: Kasparov, AlphaZero, AlphaGo, Nook
* Specific problem that has not been addressed is applying it to Ninety-Nine, a three-player trick-taking game of imperfect information.
* History and rules of the game explained: Bid selection, trick-taking.

Game theory concepts:

* Nash equilibrium. A situation where both players (or all N players) will not want to change their strategies, because any one change in strategy will entail a worse outcome for the strategy-changer.
  + Even though in the Prisoner’s Dilemma the globally best outcome is for both to deny, the only stable nash equilibrium outcome is for both to confess and get the medium punishment. In this case, there would be no possibility of improving the scenario by changing strategy. But double confession *does* have this possibility, which makes it an unstable state.
  + “A stable state of a system in which no participant can gain by a change of strategy as long as all the other participants remain unchanged.”

Papers:

* [This paper](https://ieeexplore-ieee-org.ezproxy.csuci.edu/document/8012473) on Mobile Cloud Computing shows that game theory analysis can be a useful *proxy* for real-world applications.
* [This article](https://go-gale-com.ezproxy.csuci.edu/ps/i.do?p=AONE&u=csuci&id=GALE%7CA650901652&v=2.1&it=r&aty=ip) discussed how Minecraft is a platform for reinforcement learning.
* [This article](https://www.deepmind.com/blog/alphastar-mastering-the-real-time-strategy-game-starcraft-ii) describes an OpenAI system playing StarCraft
* [This article](https://link-springer-com.ezproxy.csuci.edu/article/10.1007/s10994-006-8919-x) from 2006 covers some general topics in AI game goals.
* [This article](https://link-springer-com.ezproxy.csuci.edu/article/10.1007/s10994-006-6205-6) describes a technique called dynamic scripting which is used to make an AI more complex. (2006)
* [This article](https://ai.dmi.unibas.ch/papers/kupferschmid-helmert-cg2006.pdf) applies Monte Carlo to Skat
* [This paper](http://webdocs.cs.ualberta.ca/~nathanst/papers/comparison_algorithms.pdf) explains the Paranoid and AN algorithms
* [This website](https://xebia.com/blog/writing-board-game-ai-bots-the-good-the-bad-and-the-ugly/) describes an R&D project similar to mine

Phrases:

* Before OpenAI made headlines with ChatGPT, they were known for their game-playing systems.
* “For decades, progress in AI has been measured by how well they’ve succeeded at playing the games humans play.” -OpenAI
* [From an article on AI Bridge](https://link-springer-com.ezproxy.csuci.edu/article/10.1007/s10994-006-6225-2): “Game-playing has long been used by artificial intelligence researchers as a domain for studying decision-making in competitive multi-agent environments.”