

Chess Anti-cheat

Osama Dabbousi & Vishesh Jain



Team Members

Osama Dabbousi:

- Senior DS
- DS 598 Deep Learning



Vishesh Jain:

- Junior CS, Math & Econ
- MA 751 Statistical ML
- Slightly worse than Osama at Chess



Problem Statement

- Cheating in chess is too easy
- Cheat-detection only for “super-human” play
- Field is very secretive
- Solution? Deep Learning



Problem Statement

Questions:

- Can a DNN be effective anti-cheat?
- **Emergent Question:** can a chessAI be trained to avoid detection?

ChessGAN:

- Generator learns to play chess & avoid discriminator
- Discriminator distinguishes between human and AI

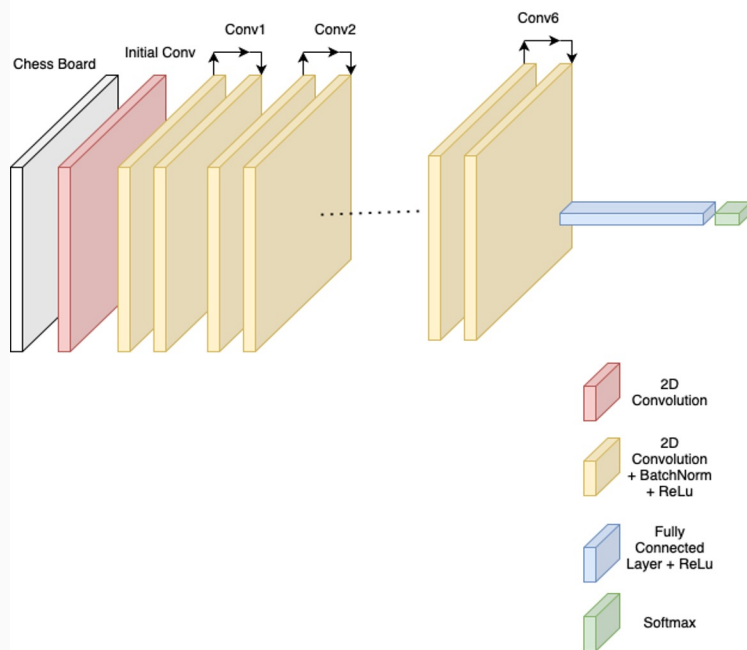
Data

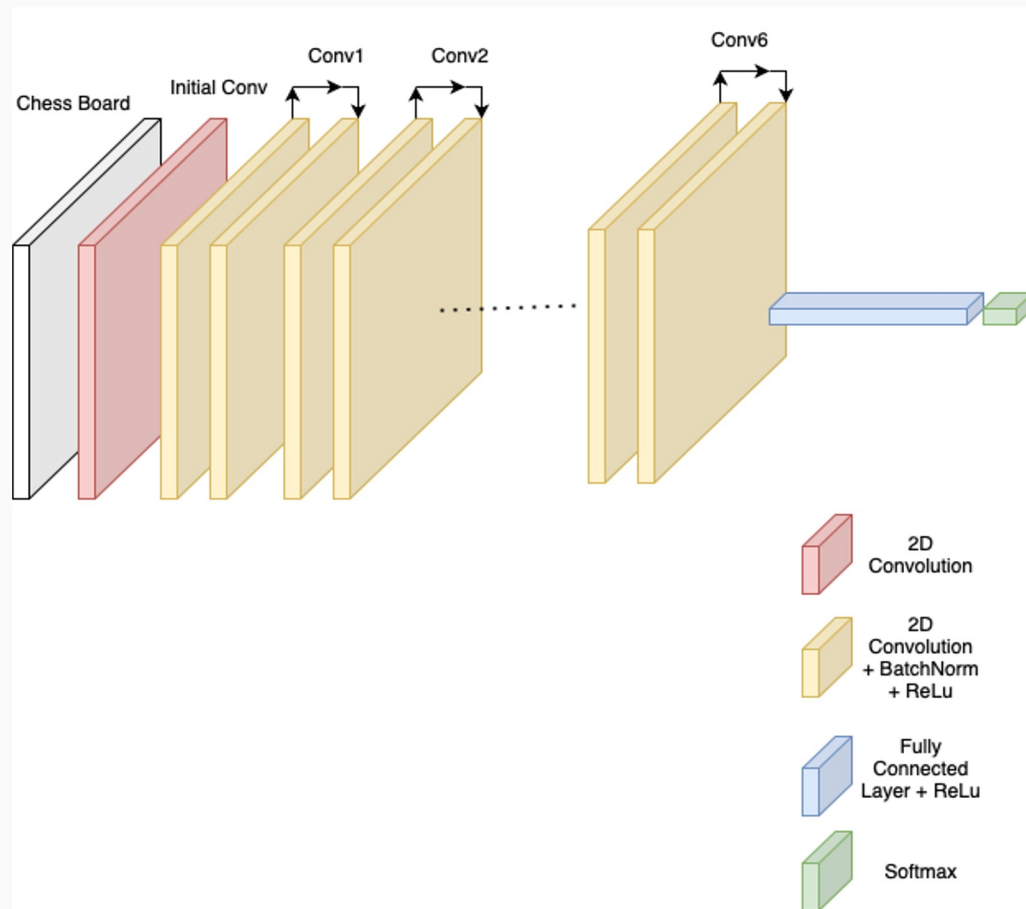
- 50,000 human games from Lichess.com
- When relevant, “optimal” moves generated using Stockfish



Architecture

- Convolutional ResNet
- **Generator:** board \rightarrow move
- **Discriminator:** board + move \rightarrow binary label





Methods

- Two generator loss functions
 - Standard GAN BCE
 - GAN BCE + categorical loss on optimal moves
- Baseline model trained using human moves directly
- Also models that used baseline weights

	Binary Cross Entropy loss	BCE + Categorical loss
No context	BasicGAN	StockGAN
Context	pre-trained BasicGAN	pre-trained StockGAN

Results (Generators)

- GAN alone was not enough
- GAN meaningfully improving pre-trained networks
- StockLoss improved training, not as effective as pre-trained

Model	Wins/Losses vs Baseline	KL divergence from Human Distribution
BasicGAN	0	10.34
Pre-trained BasicGAN	89	0.029
StockGAN	3	0.385
Pre-trained StockGAN	87.5	0.0439

Results (discriminator)

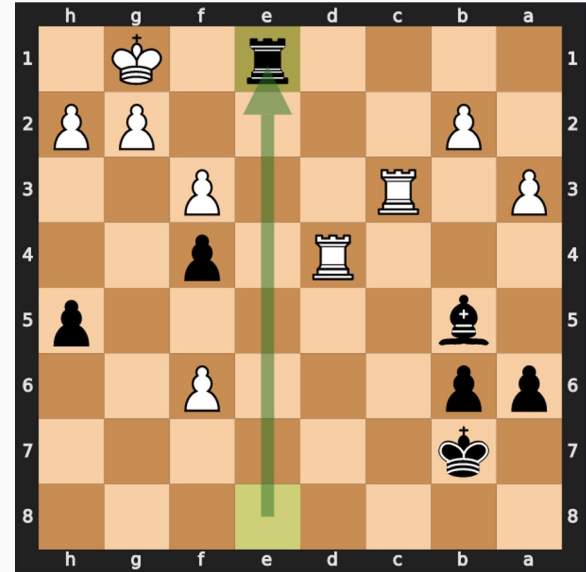
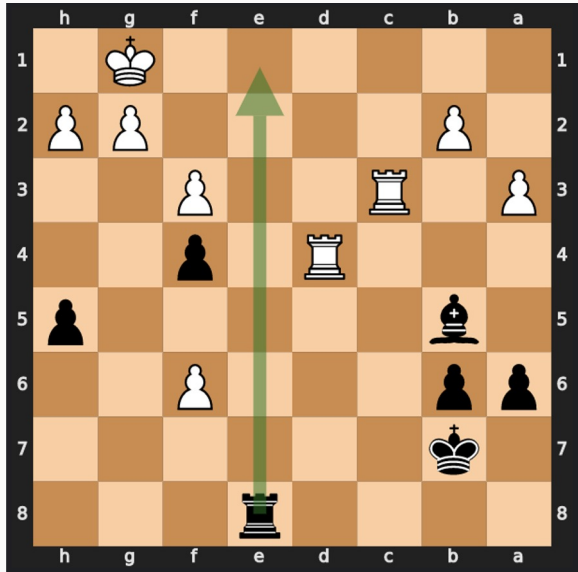
The Good

- Given a large enough sample (1-2 games worth), achieved high accuracy
- Able to detect AI play even when AI plays 40%+ human moves

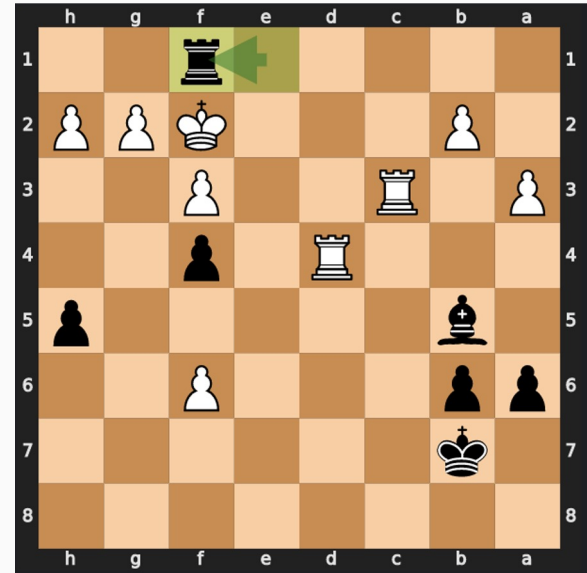
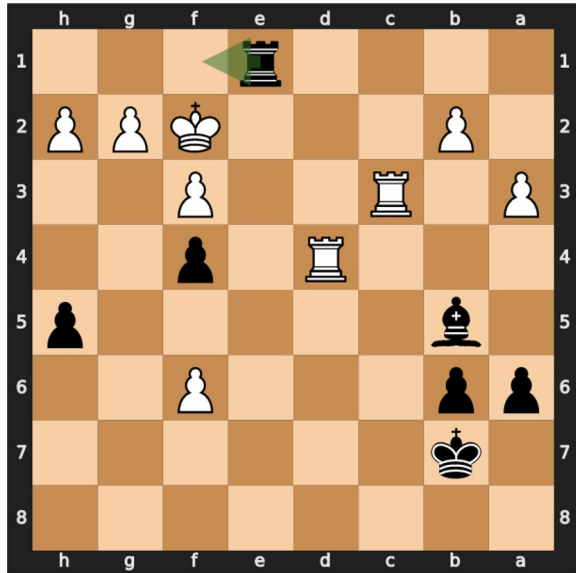
The Bad

- Discriminator did not generalize to all AI
- Discriminator failed to detect previous generators

Generator Demonstration



Generator Demonstration



Thank You

Citations

- https://www.espn.com/espn/story/_/id/34736588/inside-chess-cheating-scandal-fight-soul-game
- <https://maiachess.com/>
- lichess.org

- Repo & paper: https://github.com/OsamaDabb/Chess_anti_cheat