

# Bot Contests!!!

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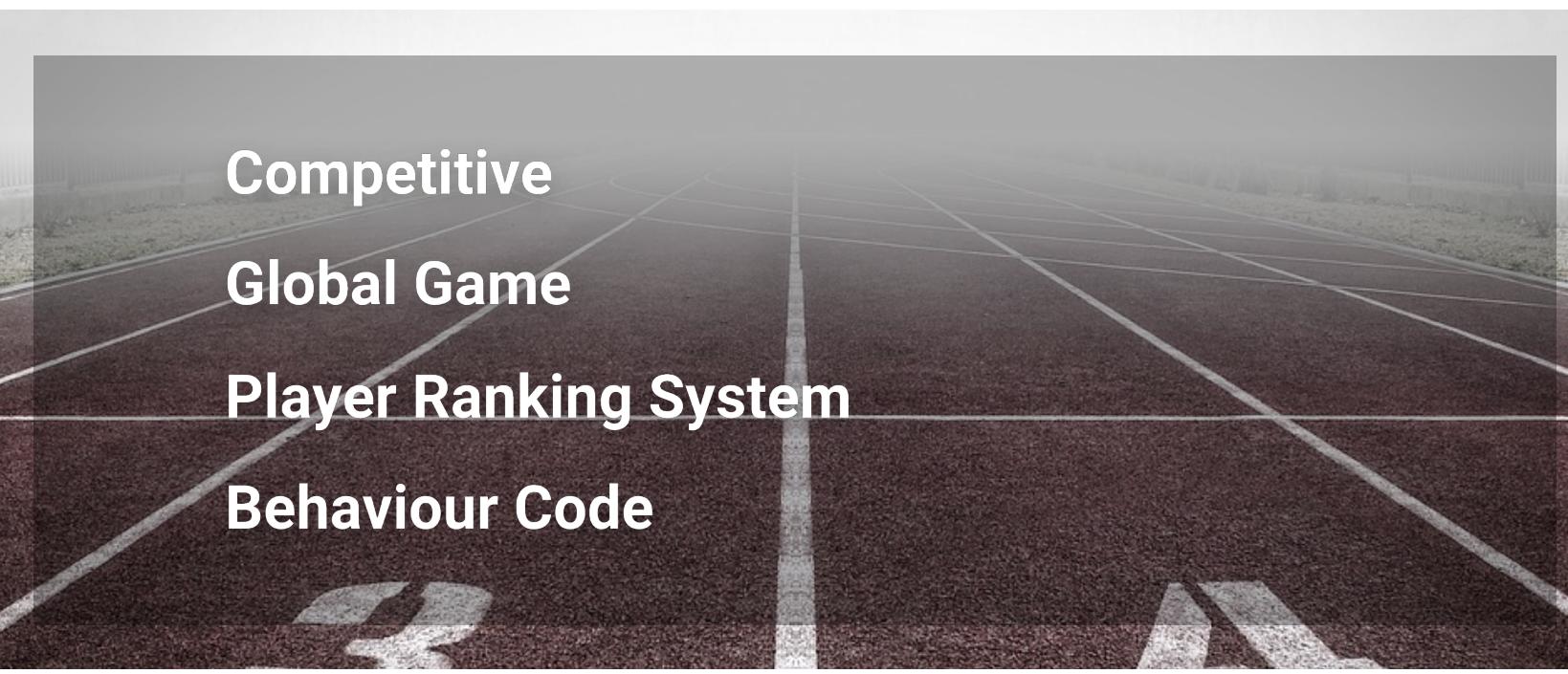
Oxford AI Talks and Discussions Meetup, 11th of February 2019



**Are bot contests  
a sport?**



**Peak mental condition requires  
being in good physical condition.**



**Competitive  
Global Game  
Player Ranking System  
Behaviour Code**



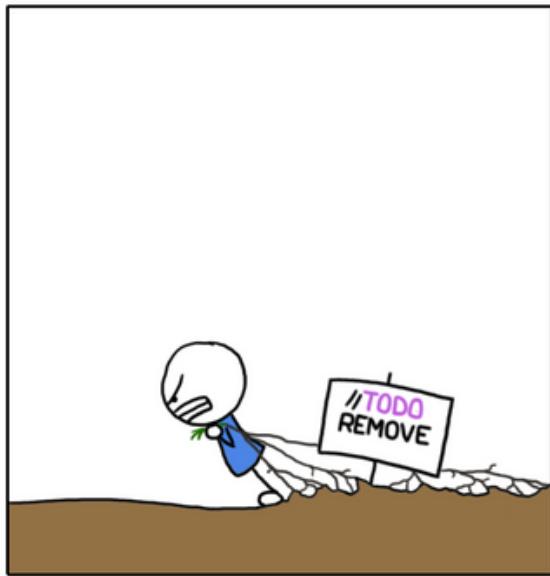
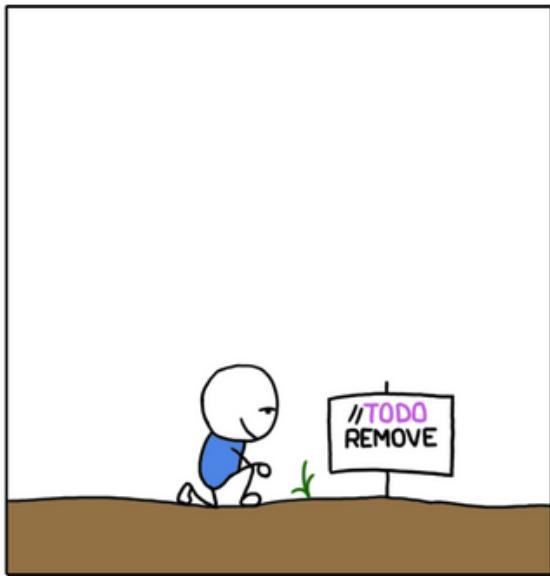
**No Olympic  
Recognition**

# Domain Specific Knowledge



- **Learn through small changes**
- **There's no need to understand and implement everything right away.**
- **Incomplete bot example for “Mean Max”:**  
problem statement:  
<https://www.codingame.com/ide/puzzle/mean-max>  
replay: <https://www.codingame.com/replay/369168994>
- **Pick arbitrary numbers**
- **Create a TODO list**

// TODO



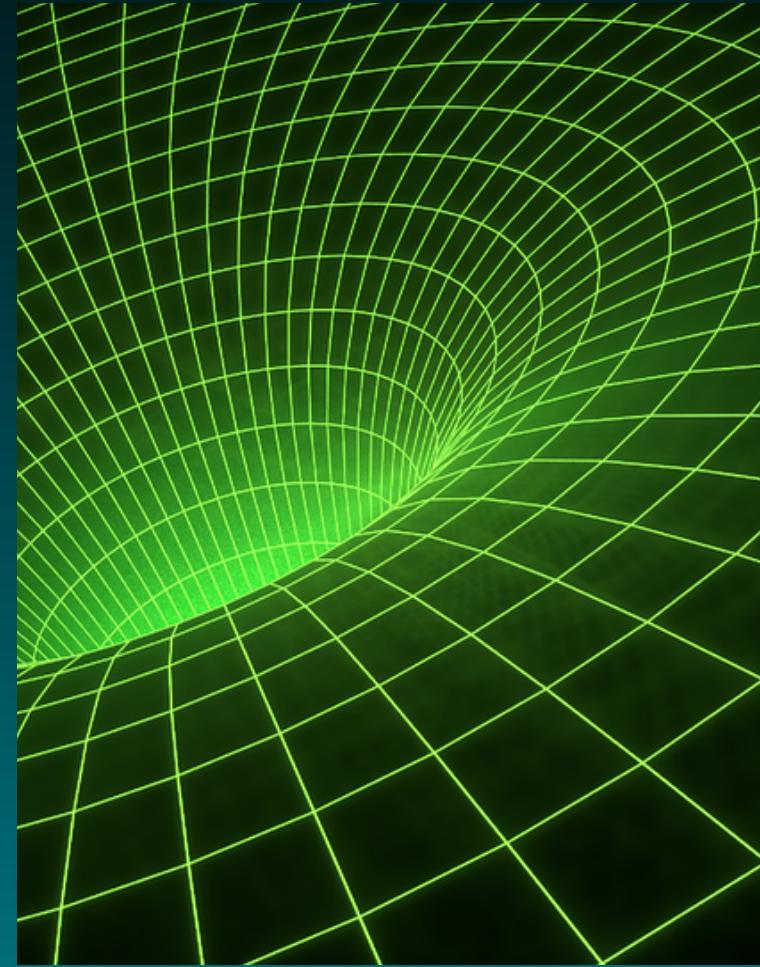
# Avoid Pitfalls

- Player ranks are misleading early on
- Test regularly
  - also test online against other bots
- It's a feature not a bug
  - an accidental discovery - have a closer look
- Track your versions



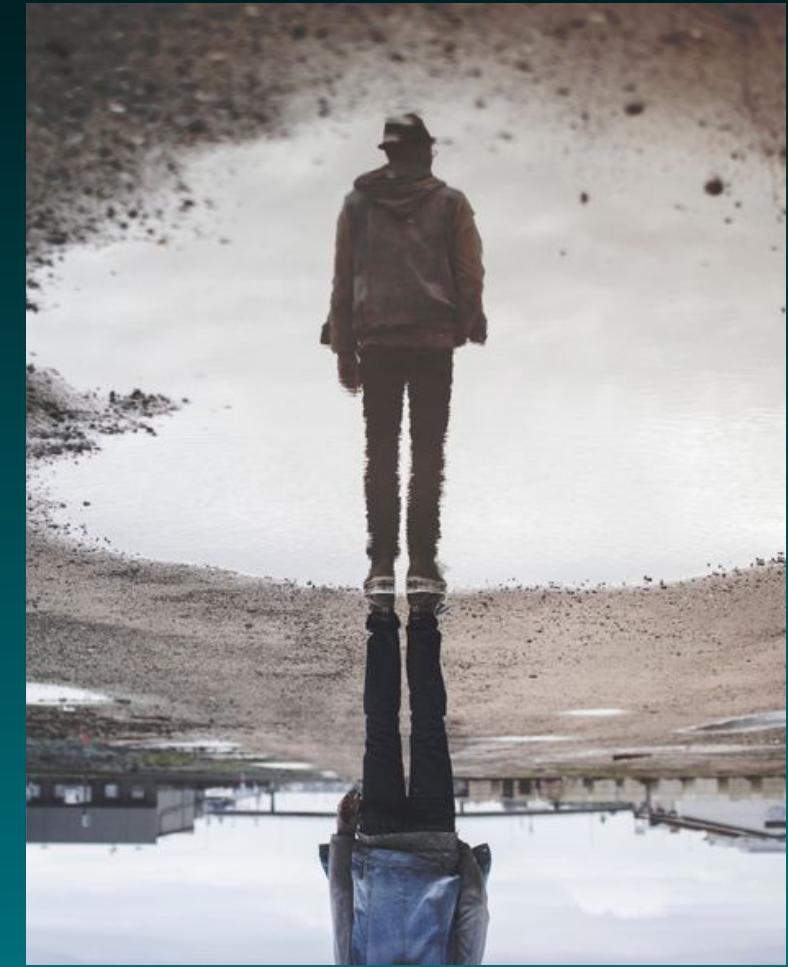
## Move Generator

- explore possibilities



## Simulation

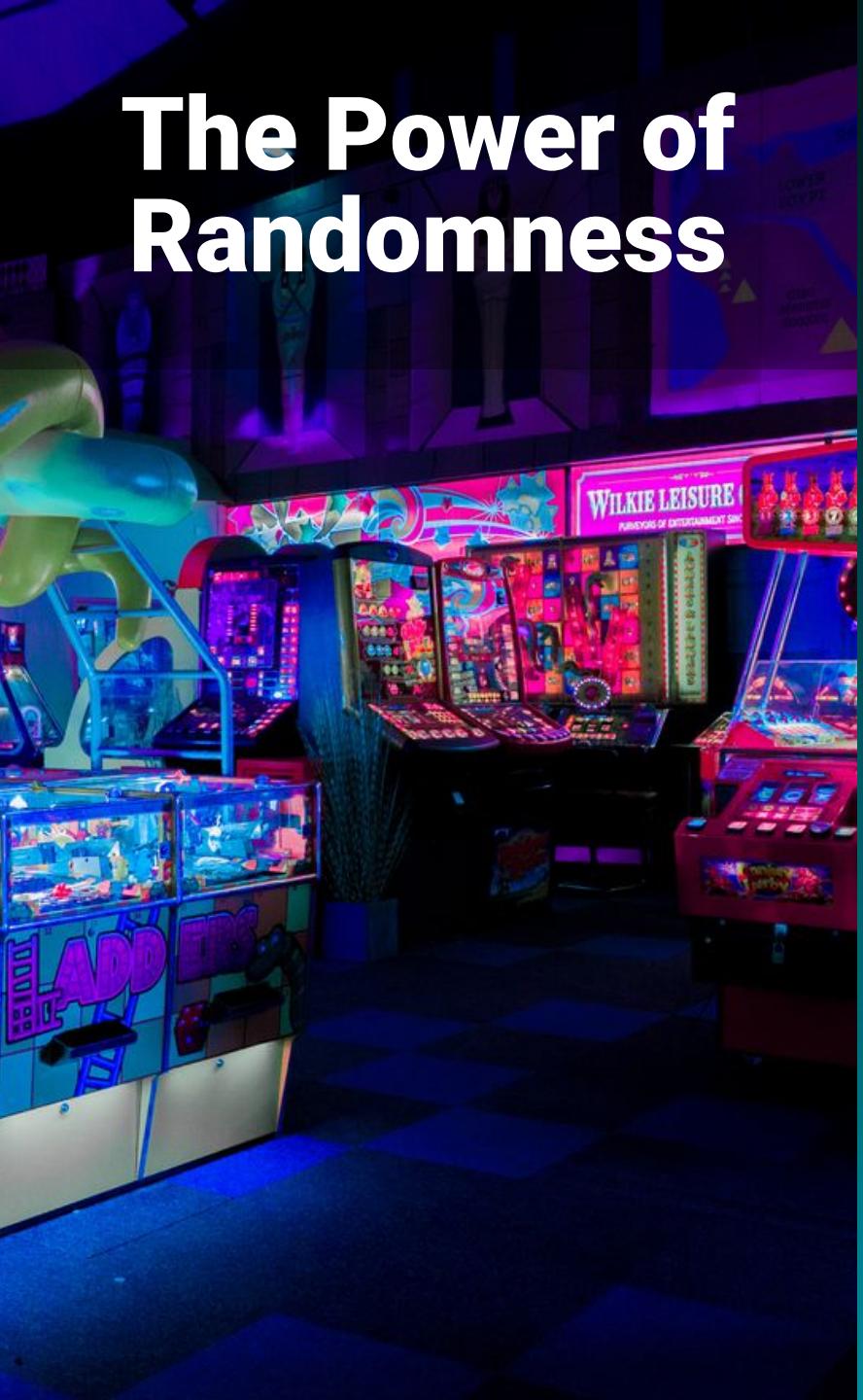
- apply move
- evaluate
- undo move / reset to initial state



## Evaluation

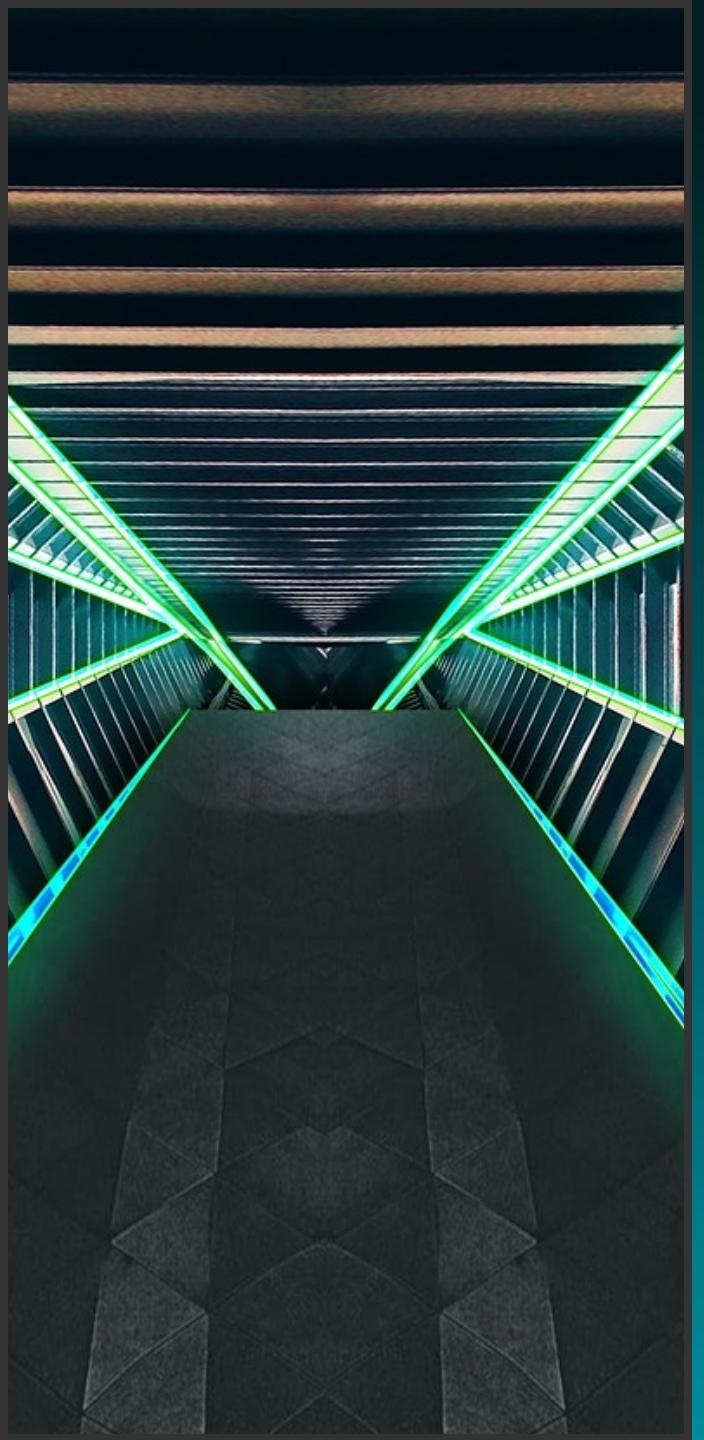
- domain specific knowledge
- win / loss condition check

# The Power of Randomness



- When in doubt, pick a random move
- Arbitrary magic numbers
- Bugged move selection
- Being unpredictable is good

Texas Hold'em

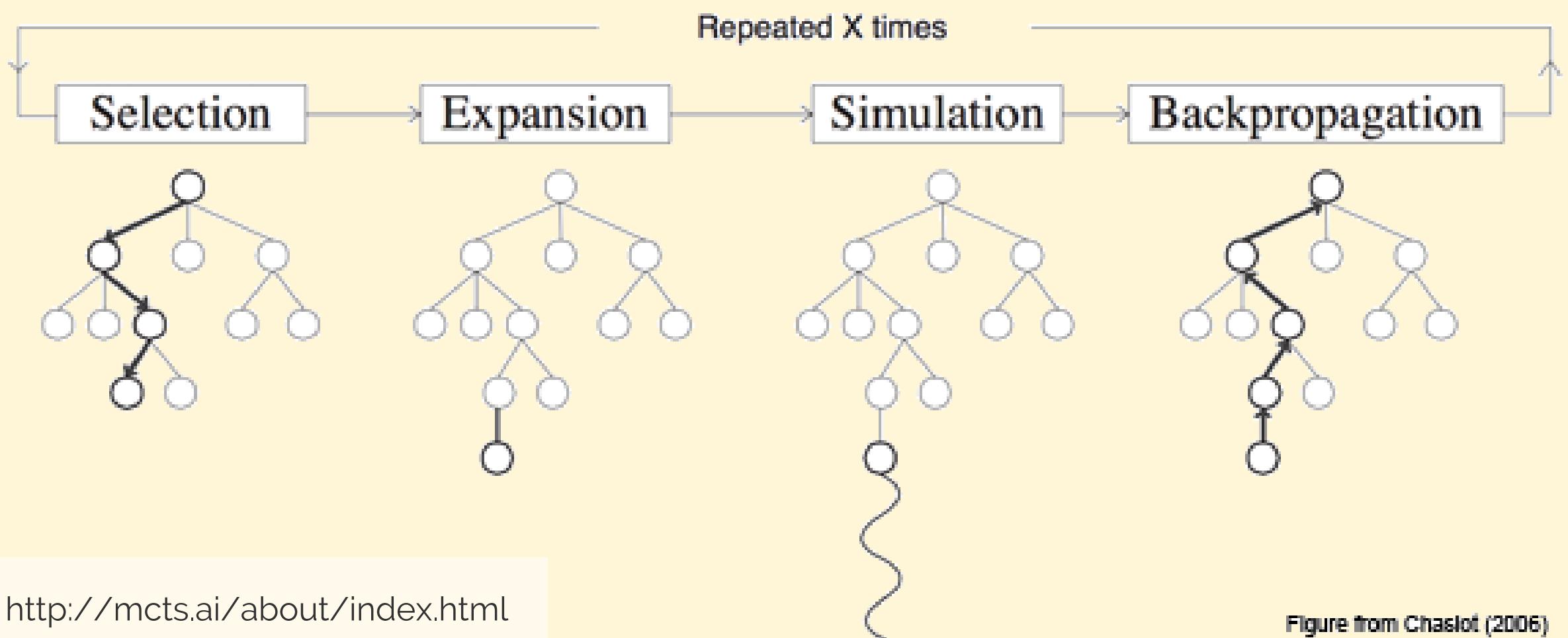


# Predicting Future Turns

- Try to predict the opponent's next move
- Add an aditional turn to predict for all players
- High depth simulation
  - replay: Smash the Code
- Low depth with strong evaluation
  - replay: Code of Kutulu

# MCTS

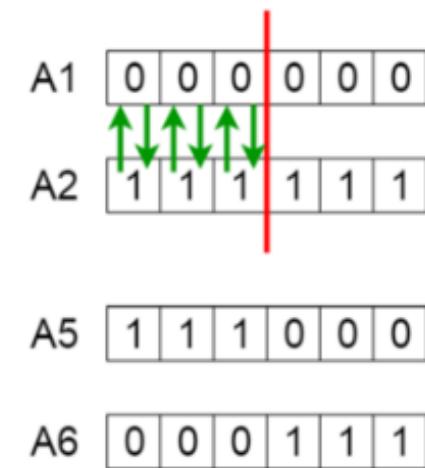
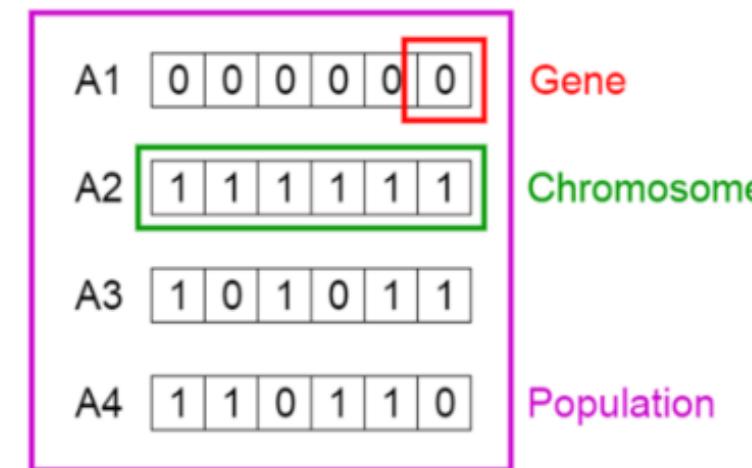
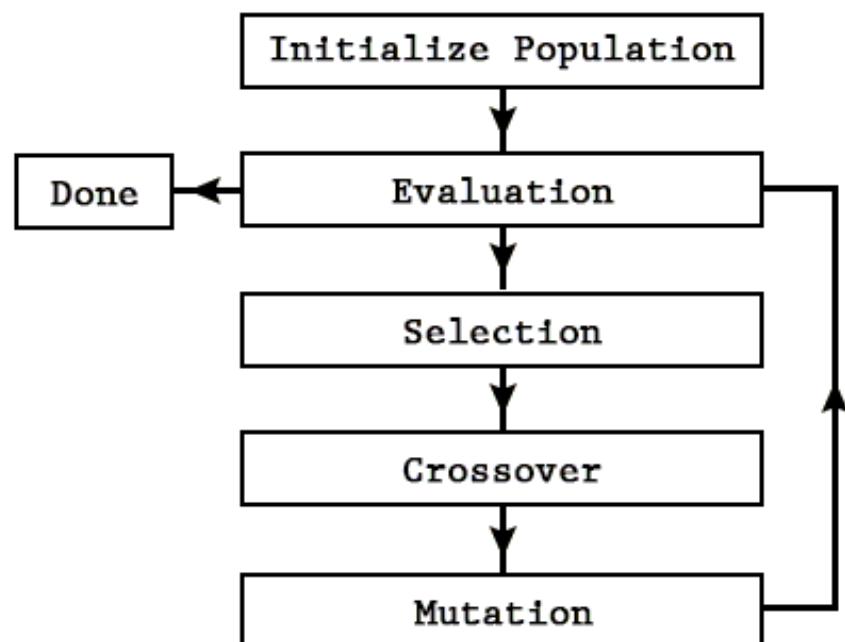
Rank 1 - Xmas Rush contest - Decoupled MCTS



# Genetic Algorithm

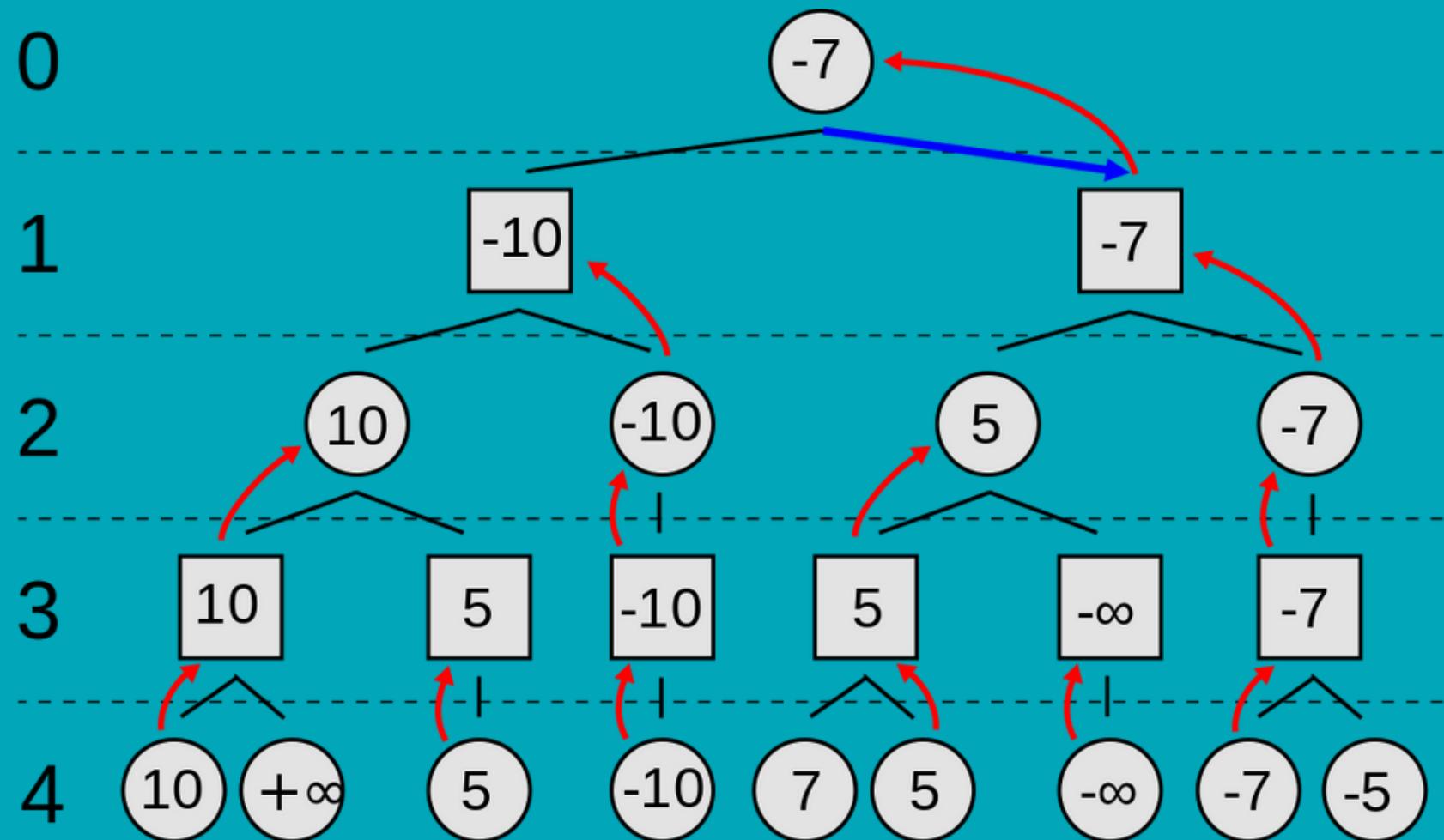
Rank 1 - Fantastic Bits contest

Rank 1 - Mean Max multiplayer



# Minimax

Rank 1 and Rank 2 - contest: Legends of Code and Magic





# Optimization Time

game turns are usually restricted between 50ms and 2 seconds

## A\*Craft Example

### Python 3 : 6930 points

- add arrows randomly
- add a chance to remove arrows
- reset state to best move state periodically
- preselecting best squares
- searching on all selected squares after
- searching preselected ones

### C++ : 9757 points

- increase from 2500 simulations to 600.000 simulations
- changing the approach yielded higher score, but the simulation count dropped to about 250.000
- fast random
- after 8000 iterations of no improvements stop undoing moves



# Statistics and Statistical Models

**It's better to adjust randomly picked  
values at this point.**

**The right moment to train a machine  
learning model**

Neural Network in 9 lines of Python

# >\_Terminal

NOW LIVE!

## SEASON 2

\$50,000+ IN CASH PRIZES | ENDS 4/30

# Upcoming Contests

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CODE A LA MODE

Fighting Game AI

- <https://russianaicup.ru/>
- [halite.io](https://halite.io)
- [battlecode.org/](https://battlecode.org/)



## Useful Links

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### Halite III Postmortems & Bot Source Code

<https://forums.halite.io/t/collection-of-post-mortems-bot-source-code/1335>

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### Chessprogramming Wiki

[https://www.chessprogramming.org/Main\\_Page](https://www.chessprogramming.org/Main_Page)

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### General Video Game AI Competition

<http://www.gvgai.net/>

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## Thanks for your attention! \*mic drop\*