BUILDING A GAME AI FOR CLASH ROYALE

Helsinki Data Science Meetup
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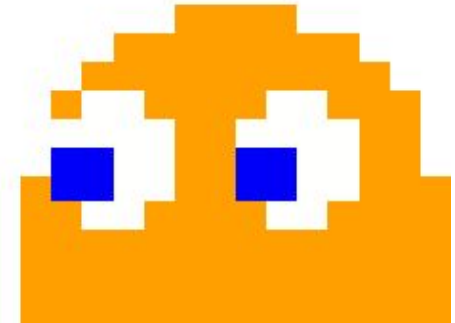
2021-11-24

2534
2416
Bot 0
0
0
2786

Game AI

what?

Computer controlled characters



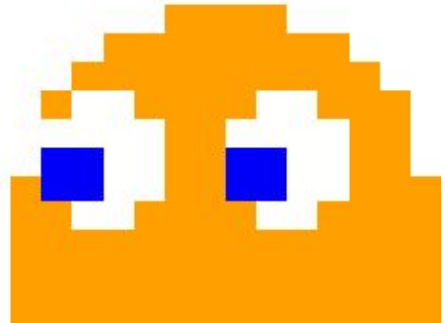
Game AI

what?

Computer controlled characters

why?

Game content, player tutoring, game testing, …

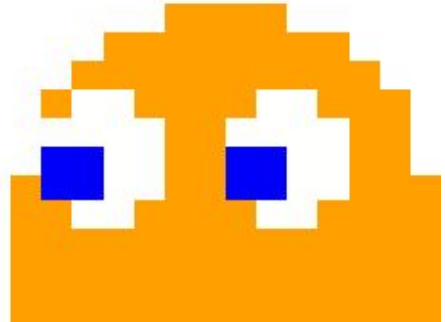


Game AI

Computer controlled characters

Game content, player tutoring, game testing, …

Rule-based systems

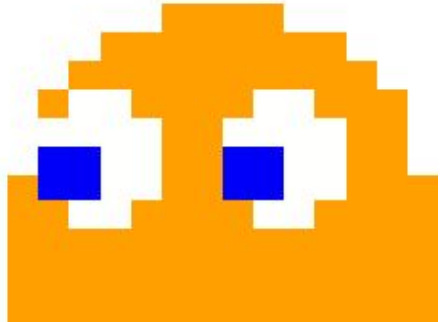


Game AI

Computer controlled characters

Game content, player tutoring, game testing, …

~~Rule-based systems~~ **Imitation learning from game replays**



Casual & fun game experience

Casual & fun
game experience

Player vs player

Casual & fun
game experience

Player vs player

Activity Log
DEFEAT
VICTORY
DEFEAT
VICTORY
DEFEAT
DEFEAT
VICTORY
DEFEAT
VICTORY
DEFEAT

Activity Log
VICTORY
VICTORY
DEFEAT
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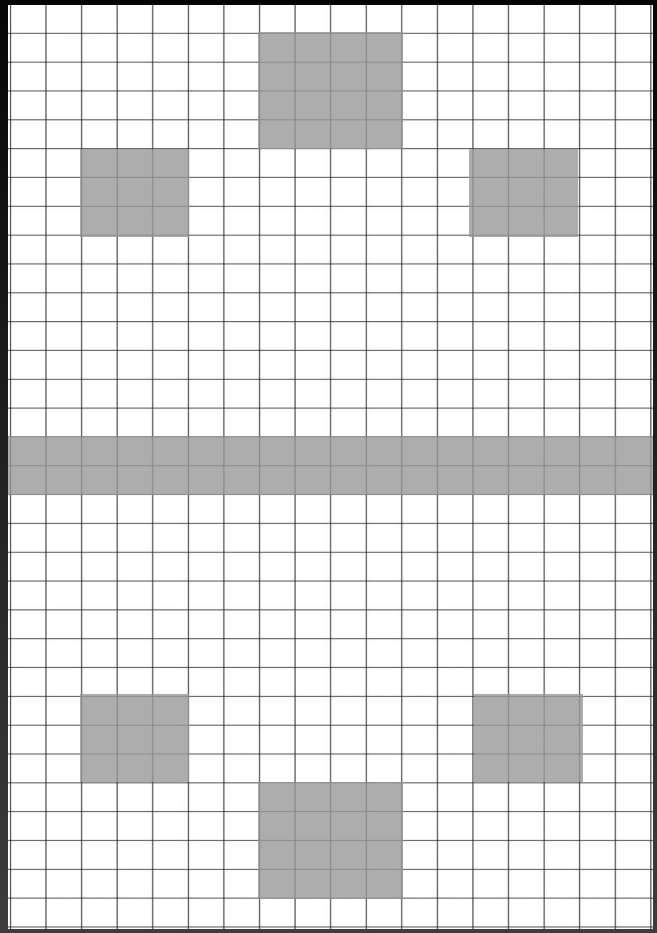
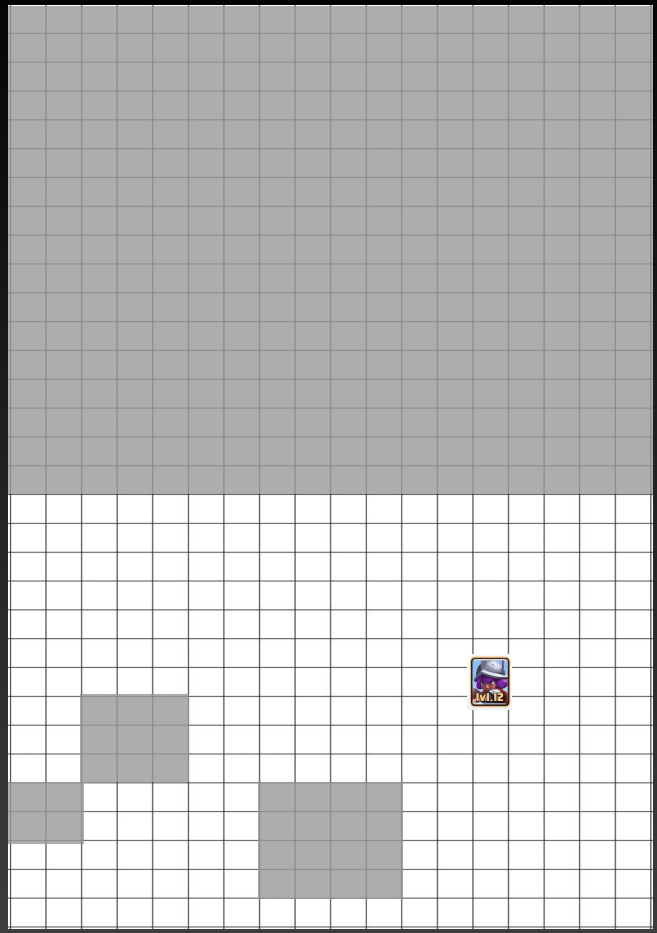
DEFEAT
VICTORY
VICTORY
VICTORY
DEFEAT



wait

1613
1792
5
2
4

lvl.12
lvl.12
lvl.11
lvl.12

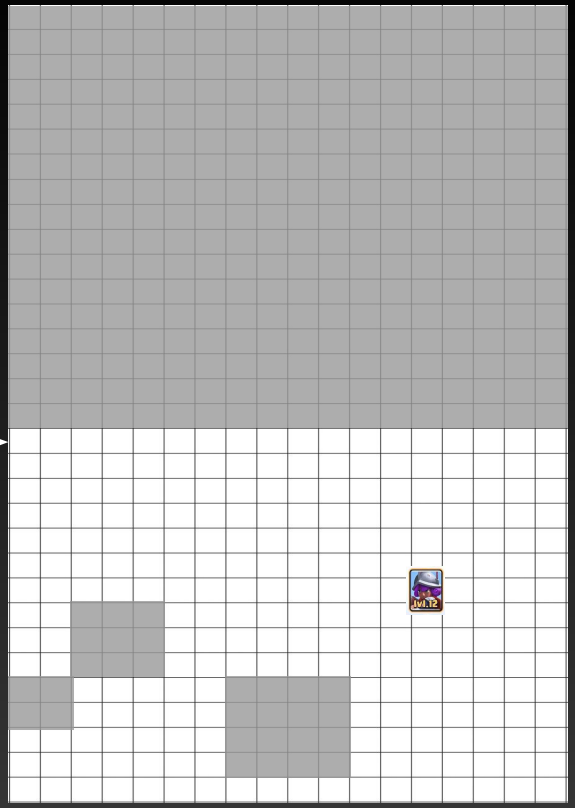

lvl.12

wait

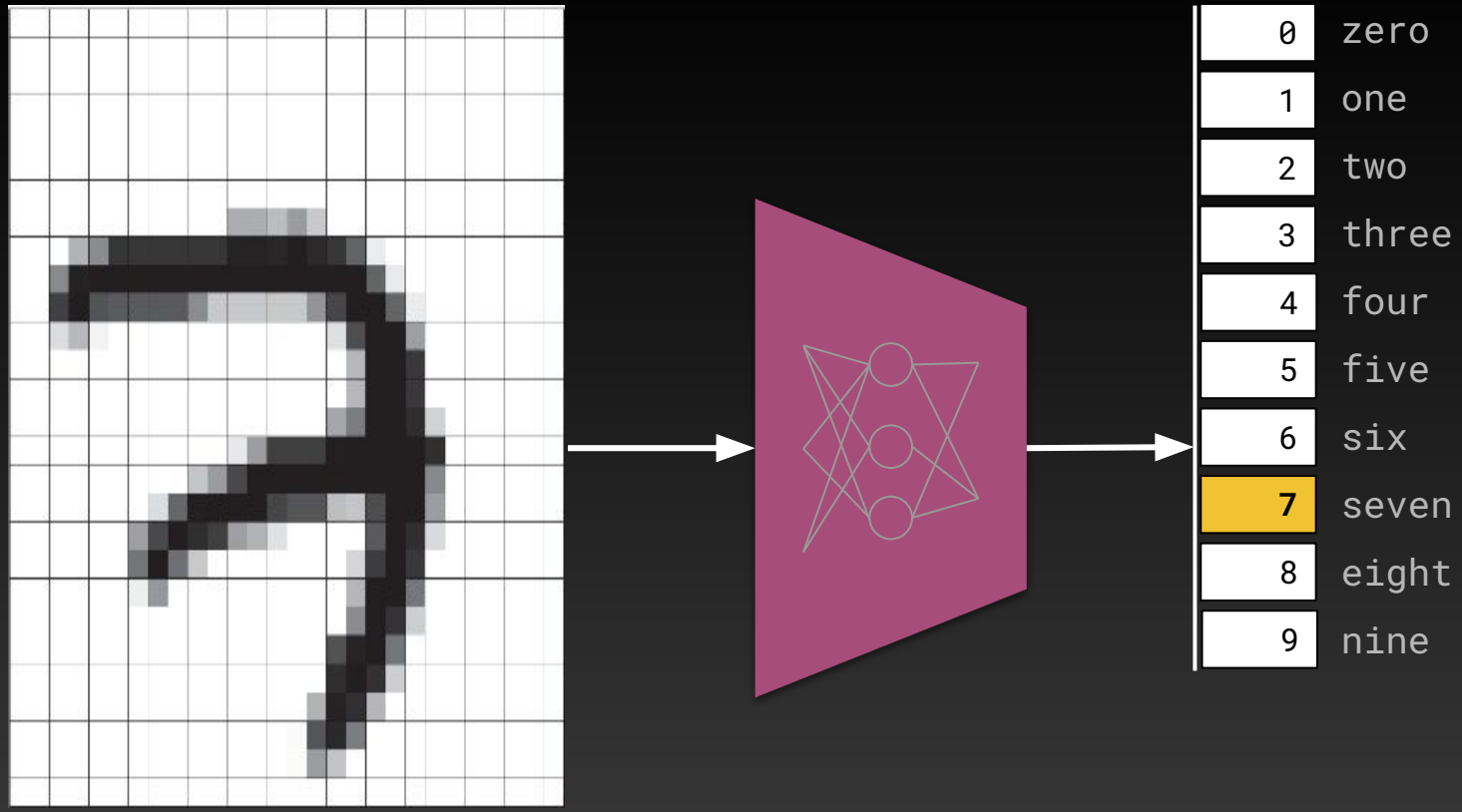
lvl.12
lvl.12
lvl.11
lvl.12

1613
1792

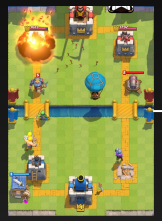
lvl.12
lvl.12
lvl.11
lvl.12


lvl.12

lvl.12


0 zero
1 one
2 two
3 three
4 four
5 five
6 six
7 seven
8 eight
9 nine

0	wait
1	musketeer, 0, 0
2	musketeer, 0, 1
3	musketeer, 0, 2
	...
157	musketeer, 13, 8
	...
2302	giant skeleton, 17, 29
2303	giant skeleton, 17, 30
2304	giant skeleton, 17, 31



board *(32×18)*

Embed → 1×1 → Resblk ··· Resblk (×5) → + → Resblk ··· Resblk (×5) → MLP → action *(2305)*

context *(21)*

Embed → Concat → MLP → +

Results

Quantitative evaluation ¯_(ツ)_/¯

Empirical playtesting 👍

A/B testing 🎉

Net win rate: 72%

Live system

Trained on 70M frames of game replays

In production since 2018

Live for low/mid trophies

Memoryless = stateless ❤️

Served more than 10^{12} frames

THANKS!