GREEN
Parse Trees

Pac-Man	Ghosts
RAND |3.88 |G	- |+ ||/ |||+ ||||G ||||2.3 |||- ||||W ||||P ||RAND |||* ||||F ||||F |||/ ||||W ||||W |- ||- |||* ||||M ||||M |||- ||||F ||||G ||+ |||RAND ||||1.98 ||||G |||RAND ||||4.15 ||||P
RAND |1.14 |RAND ||G ||G	+ |RAND ||* |||RAND ||||2.43 ||||M |||+ ||||M

	||||M ||RAND |||- ||||F ||||3.31 |||/ ||||M ||||W |RAND ||* |||* ||||M ||||F |||- ||||W ||||G ||/ |||RAND ||||W ||||3.52 |||+ ||||W ||||P
RAND |-4.28 |G	RAND |+ ||/ |||G |||F ||* |||-1.86 |||-4.77 |RAND ||* |||G |||0.94 ||- |||P |||F
RAND |/ ||+ |||G |||G ||+	* |-1.03 |-1.03

`|||1.42`
`|||P`
`|+`
`||*`
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`|||-0.4`
`||/`
`|||G`
`|||G`	

`+`
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`||1.84`
`||P`
`|RAND`
`||G`
`||W`
	`*`
	`|RAND`
	`||+`
	`|||/`
	`||||M`
	`||||G`
	`|||+`
	`||||F`
	`||||-2.61`
	`||-`
	`|||*`
	`||||-0.55`
	`||||G`
	`|||-`
	`||||M`
	`||||P`
	`|*`
	`||-`
	`|||+`
	`||||M`
	`||||W`
	`|||+`
	`||||1.56`
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	`||RAND`
	`|||RAND`
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	`||||G`
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	`||||P`
	`||||W`

`G`	`+`
	`|-`
	`||/`
	`|||W`
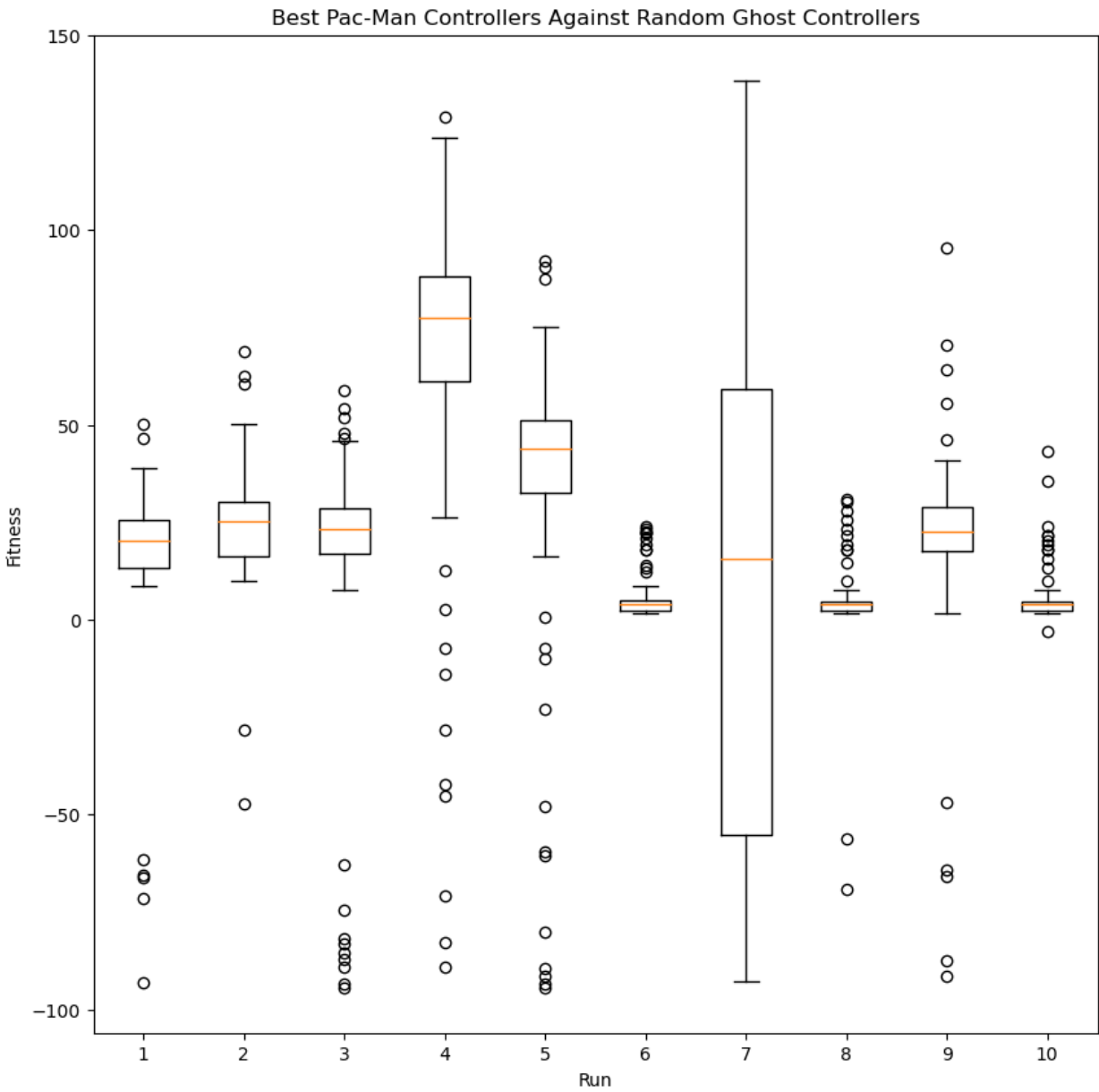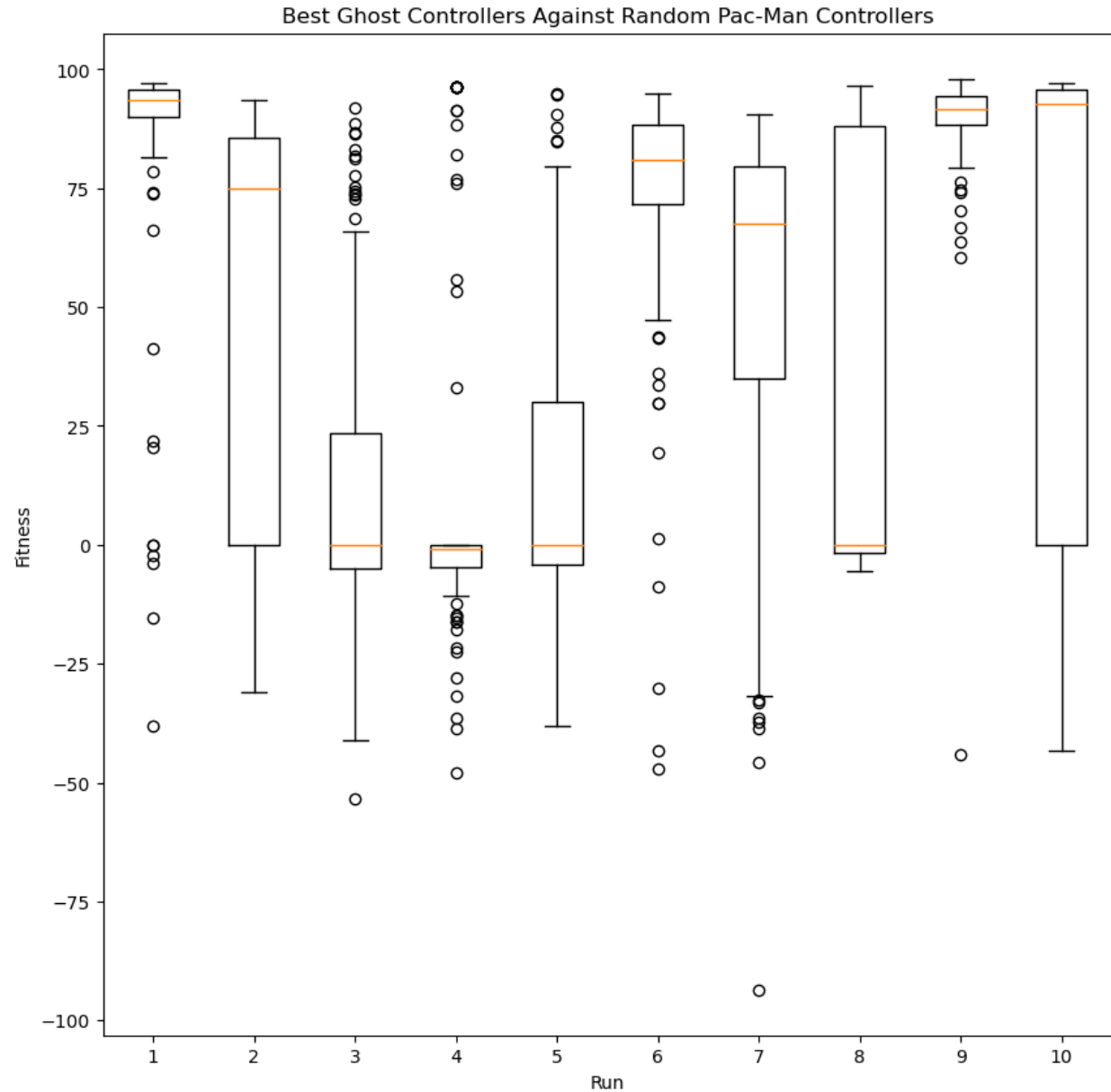
| | ```
|||F
||RAND
|||F
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|RAND
||*
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| ```
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|RAND
||-
|||-1.04
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``` |
| G | ```
*
|-1.85
``` |

	|M
RAND |RAND ||G ||G |1.77	- |+ ||* |||RAND ||||F ||||P |||- ||||G ||||M ||/ |||+ ||||G ||||0.19 |||- ||||F ||||1.1 |* ||RAND |||RAND ||||M ||||W |||+ ||||G ||||W ||+ |||RAND ||||M ||||-2.52 |||+ ||||M ||||M
G	- |- ||/ |||-1.66 |||M ||+ |||M |||-4.14 |/ ||RAND |||1.67 |||-1.32

	||+ |||W |||F

Statistical Analysis

Best Pac-Man Controllers Against Random Ghost Controllers
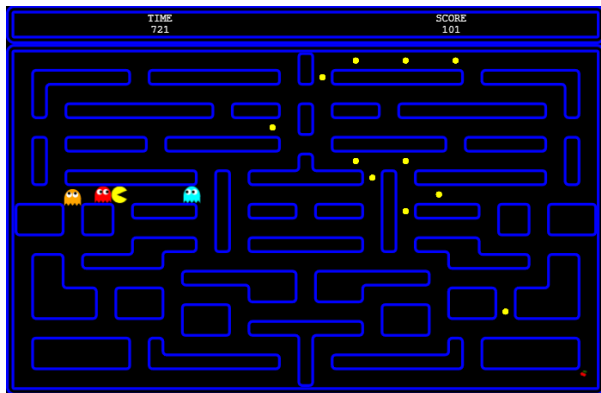
The best Ghost controllers perform remarkably well against the Random Pac-Man controllers, with a few outliers. The best Pac-Man controllers perform well, but not to the same extent. This is likely because the Pac-Man controllers need to be very precise and often over emphasis the need to stay clear of the Ghosts and, thus miss out on pills and fruits in certain areas of the arena.

Top Run Ghost vs Top Run Pac

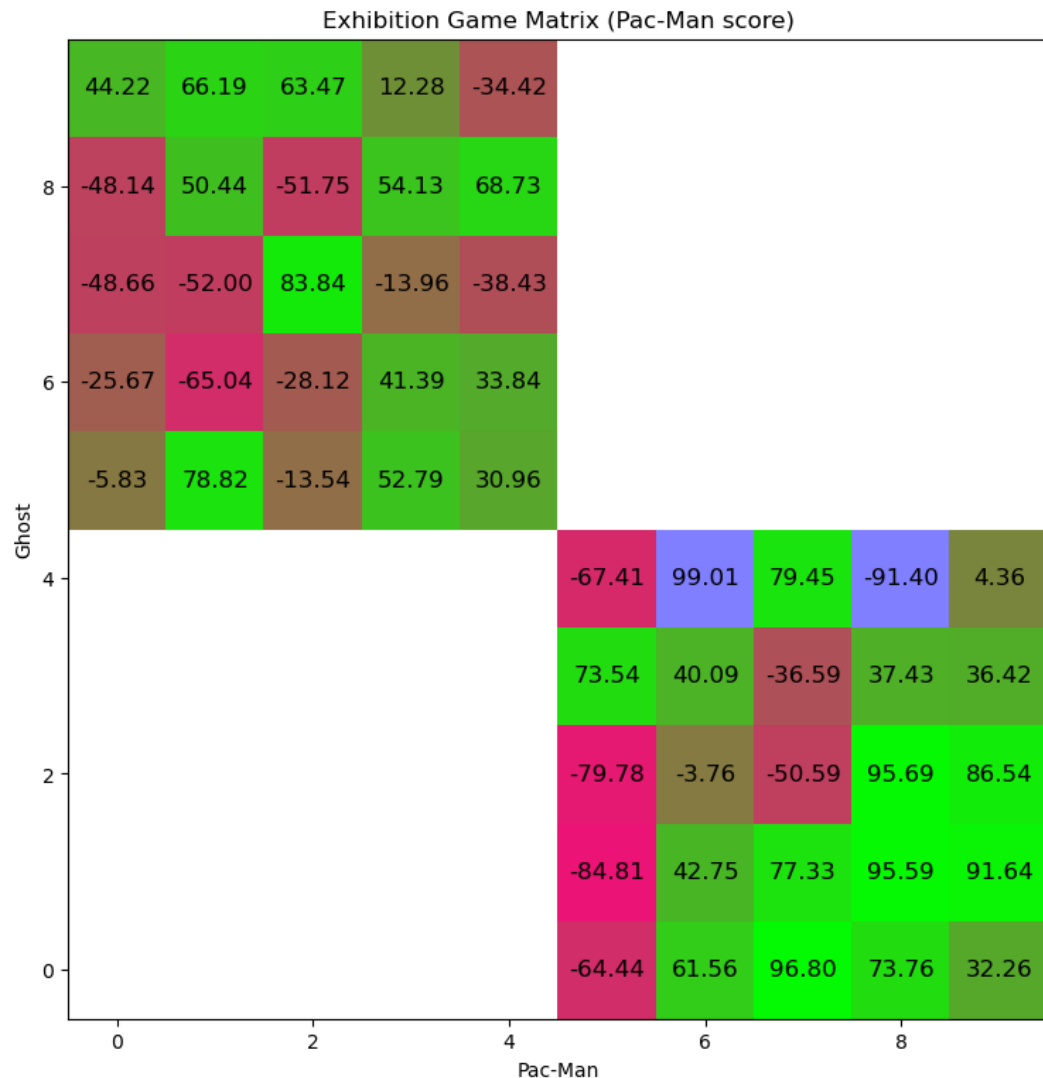| Pac-Man	Ghost
RAND |RAND ||G ||G |1.77	- |- ||/ |||-1.66 |||M ||+ |||M |||-4.14 |/ ||RAND |||1.67 |||-1.32 ||+ |||W |||F

Score: 60.44

Informal Analysis
The Pac-Man individual seemed to make pretty decent decisions in terms of avoiding the ghosts. It had reached a score of 101 before getting surrounded on all sides by the ghosts. The Pac-Man parse tree, obviously, favors increasing the distance from the nearest ghost. The inclusion of the RAND nonterminal can be ignored since both parameters are just G. There is a small amount of randomness which can lead to inconsistent results across many runs, however. The Ghost parse tree favors decreasing the distance between the Ghost and the nearest Pac, while also slightly favoring staying close to fruit, presumably because other Pacs may have favored fruits and the Ghost staying near fruits would decrease the potential score for the Pac-Man.

YELLOW

The results definitely showcase some level of intransitivity, where some Pac-Man parse trees perform better against some Ghosts but then perform poorly against others. Whether this is the result of random chance is hard to say exactly, but it seems unlikely given each value is from the average of ten games. A perfect example of this intransitivity is between *Pac-Men* 1 and 2, and Ghosts 7 and 8, where we see a sort of checkerboard pattern emerge. Another noteworthy observation is Pac-Man 8's remarkably high performance against the Ghosts 0 - 3, and then totally collapse against Ghost 4.