

Does Weapon Type Affect a BattleBot's Performance?

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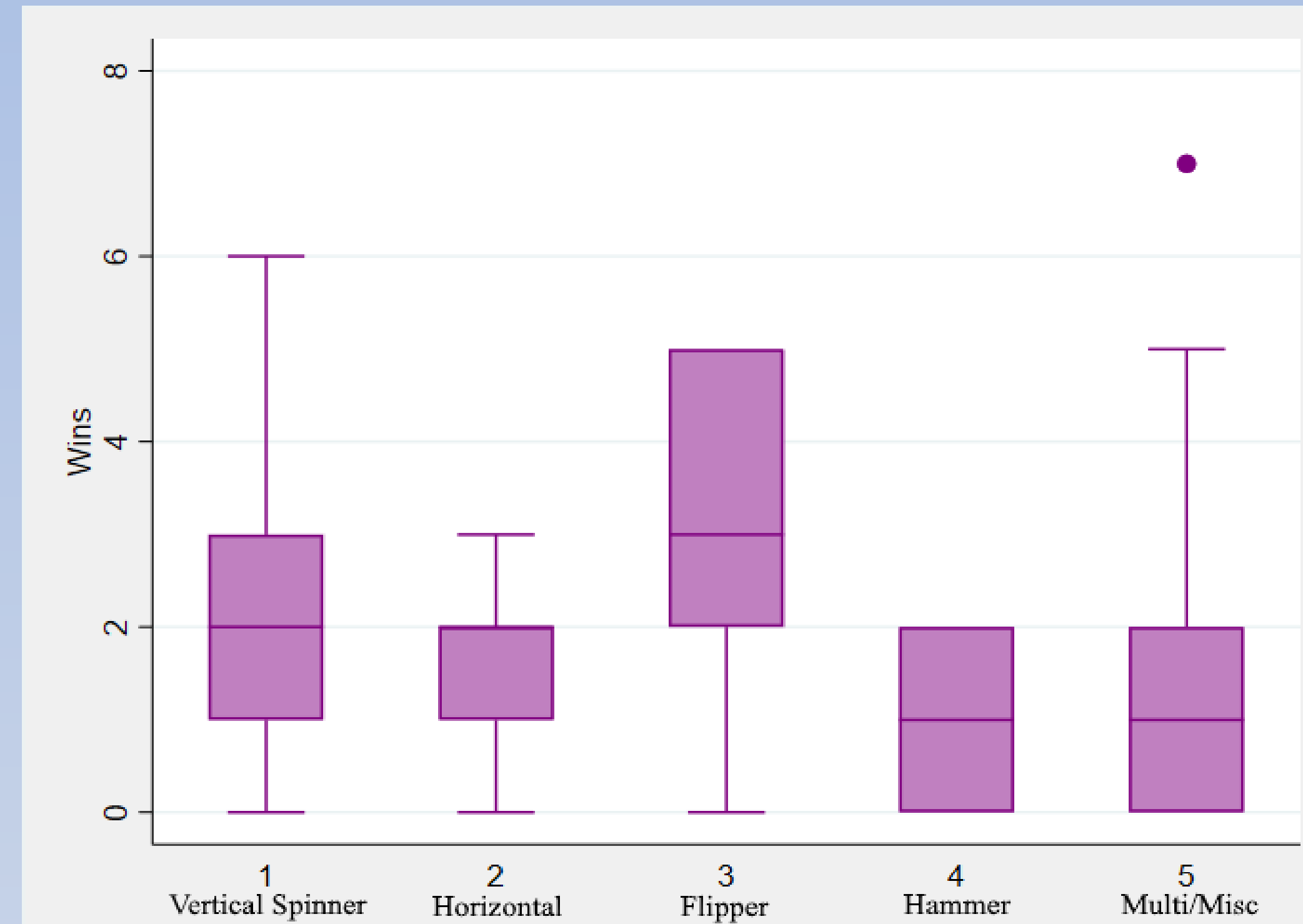
Abstract

The objective is to investigate data from the 2021 BattleBots matches to see if any variables have a statistically significant contribution to how many wins a bot achieves. This could gauge how much investment is needed to win. The authorities of BattleBots have worried about the possibility of bots having only the same weapons fight each other. After investigating the relationships of many factors, the weapon type used does not seem to be statistically significant if the weapon can still achieve knockouts.

Introduction

BattleBots is a competition where many engineering teams create, drive, and enter remote-controlled robots to fight each other. There are rules for the matches and regulations for how the bots are built.

The objective is to see if factors such as weapon type, number of a team's years of experience (XP), number of sponsors (Sponsors), and number of knockouts in all the matches before the championship tournament (Knockouts), can explain what makes a BattleBot effective at getting overall wins (Wins).



Regression Results				
Variables	Wins (1)	Wins (2)	Wins (3)	Wins (4)
<i>Knockouts</i>	1.076*** (0.192)	1.095*** (0.197)	1.081*** (0.195)	1.003*** (0.220)
<i>XP</i>		0.0105 (0.0217)	0.0181 (0.022)	0.0178 (0.0231)
<i>Sponsors</i>			0.0785 (0.0509)	0.0897 (0.0569)
<i>Weapon</i>	No	No	No	Yes
<i>Constant</i>	0.879*** (0.251)	0.739* (0.383)	0.262 (0.489)	0.352 (0.572)
<i>Observations</i>	60	60	60	60
<i>R²</i>	0.351	0.354	0.380	0.398
<i>Adjusted R²</i>	0.340	0.331	0.347	0.317
<i>Standard Errors in Parentheses</i> *** p<0.01, ** p<0.05, * p<0.1				

Summary Statistics								
Variable	n	Mean	SD	Min	0.25	Median	0.75	Max
<i>Wins</i>	60	2	1.7	0	1	2	3	7
<i>Knockouts</i>	60	1	0.9	0	0	1	1	3
<i>XP</i>	60	12	8.4	1	4	10	20	26
<i>Sponsors</i>	60	5	3.6	0	3	5	7	21

Weapon Summary				
Weapon Type	ID #	Mean Wins	SD	#
<i>Vertical Spinner</i>	1	2	1.65	21
<i>Horizontal Spinner</i>	2	2	0.78	12
<i>Flipper</i>	3	3	2.12	5
<i>Hammer</i>	4	1	1.14	2
<i>Multiple/Misc</i>	5	1	1.88	20

Methodology

Most of the data collected on the bots and their teams was from the official BattleBots website on the 2021 season page.

Additional sources were needed for more information on how long teams have been competing. That data came from the BattleBots wikia

Many bots have weapons that are difficult to categorize and/or have multiple main weapons or can swap out main weapons. This is why so many bots are in the multiple/miscellaneous category. Flamethrowers were not considered.

Results

The overall model does not seem to be very strong since the R^2 is only 0.398. The only variable that is always statistically significant is Knockouts, which is significant at every conventional level. No weapon categories are statistically different from one another. XP and Sponsors are never statistically significant, which implies they do not have much relation to wins.

When other factors are accounted for, even when they are insignificant, an increase in Knockouts increases wins by 1. Which is not surprising.

Conclusion

Weapon type, a team's years of experience, and a team's number of sponsors are not significant to winning BattleBots matches. Knockouts are very effective at increasing wins, however. If a bot's weapon can get a knockout, it should be able to increase its wins. Knockouts are not the only way to win a match but are the most decisive. No single weapon type dominates over the others. The weapon type does not appear to affect a BattleBot's performance.

Select References

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