

Research Article

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An analysis of the NCAA college football playoff team selections using an Elo ratings model

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Abstract: In December 2023 the Florida State Seminoles became the first Power 5 school to have an undefeated season and miss selection for the College Football Playoff. In order to assess this decision, we employed an Elo ratings model to rank the teams and found that the selection committee's decision was justified and that Florida State were not one of the four best teams in college football in that season (ranking only 11th!). We extended this analysis to all other years of the CFP and found that the top four teams by Elo ratings differ greatly from the four teams selected in almost every year of the CFP's existence. Furthermore, we found that there have been more egregious non-selections including when Alabama was ranked first by Elo ratings in 2022 and were not selected. The analysis suggests that the current criteria are too subjective and a ratings model should be implemented to provide transparency for the sport, its teams, and its fans.

Keywords: ELO ratings, rankings, college football, American football

1 Introduction

On December 2nd 2023, the Florida State Seminoles football team won the Atlantic Coast Conference championship game against the University of Louisville Cardinals, finishing off an undefeated season of 13 wins and 0 losses. Despite this, the following day they were not selected by the College Football Playoff (CFP) selection committee as one of four teams to compete for the college football national championship in January. This decision rendered them the first team from a Power 5 conference¹ to record an undefeated season and miss selection for the CFP. The committee's decision is an openly subjectively exercise and this year (like many years) was met with great criticism from national sports media [5, 9, 14] (whose opinions are often similarly subjective), but one cannot help but wonder whether the decision could be adequately justified.

The CFP committee chair Boo Corrigan explained to a national media organization that Florida State was left out based on the "unavailability of key players" [5], which is one of many criteria that the committee uses for selection. This comment was made in reference to the injury to star quarterback Jordan Travis, who suffered a season-ending leg injury in the game against North Alabama on November 18, 2023. It could be argued however, that Florida State were a great team regardless the Travis injury, as evidenced by them winning their final two games of the regular season, including the ACC championship game against the highly-ranked University of Louisville.

¹ The Power 5 are: Atlantic Coast Conference (ACC), Big Ten Conference, Big 12 Conference, Pac-12 Conference, and Southeastern Conference (SEC).

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In this paper, we seek to quantitatively answer the question of whether the selection committee was correct in excluding Florida State from the CFP using Elo rankings—a method for calculating the relative skill of competitors in head-to-head zero-sum games (such as American football).

2 Background

Since 2014, at the conclusion of the conference championship games, four college football teams from Division 1 of the National Collegiate Athletic Association (NCAA) have been invited to compete in the CFP, a knockout tournament used to award a national champion. The tournament consists of three games: two semi-finals—where the selected teams ranked 1 and 4 play against each other, and so do the teams ranked 2 and 3—followed by a championship game between the winners of the two semi-finals².

2.1 CFP selection committee and criteria

The CFP selection committee consists of 13 members serving three-year terms. The committee members include a current athletic director from each of Power 5 conferences; former athletic directors, coaches, players and administrators; and a former media member. The committee is also selected with the intention of geographical balance [12].

The teams invited by the selection committee to participate in the CFP are selected using the following criteria [11]:

1. Conference championships won;
2. Strength of Schedule;
3. Head-to-head games between teams vying for selection;
4. Comparative outcomes of common opponents; and,
5. Other relevant factors such as unavailability of key players and coaches that may have affected a team's performance during the season or likely will affect its postseason performance.

The final point here was the criterion used to exclude Florida State, as quarterback Jordan Travis was unavailable for the 2023 CFP due to an injury suffered in Week 13.

2.2 CFP selection statistics

Table 1 shows the teams selected for the CFP since 2014. The teams who have appeared multiple times would not be a surprise to any college football fan as these are historically dominant programs, with Alabama appearing 8 times, which is every year bar one. Alabama, Clemson, and Georgia account for seven of the nine championships awarded.

Table 2 shows the number of times teams from each conference have been selected, with the Power 5 conferences being clearly dominant.

² We note here that the CFP occurs in the year following the season it is concluding. To avoid confusing we refer the CFP by the year that the regular season occurred—for example the 2021 CFP, concluded the 2021 season, but actually occurred in January 2022.

Tab. 1: The number of CFP selections and national championships by team.

Team	Selections	Championships Won
Alabama	8	3
Clemson	6	2
Ohio State	5	1
Oklahoma	4	0
Georgia	3	2
Michigan	3	0
Notre Dame	2	0
Washington	2	0
LSU	1	1
Oregon	1	0
TCU	1	0
Florida State	1	0
Michigan State	1	0
Cincinnati	1	0
Texas	1	0

Tab. 2: The number of CFP selections by conference.

Conference	Selections	No. of teams
SEC	12	3
Big Ten	9	3
ACC	8	3
Big 12	6	2
Pac-12	3	2
Independent	1	1
American	1	1

3 Elo ratings

Elo Ratings were created by physicist—and chess master—Arpad Elo in the late 1950s, and were originally developed to rank chess players (and are still used for this purpose). Elo Ratings are used to define a relative skill level of a player in head-to-head zero-sum games. While their origin is in chess, Elo ratings are now applied across many sports and games including soccer [2, 6, 7], snooker [3], hockey [15], Australian football [13], and in professional American football [4, 8, 18].

Over many decades Elo ratings have proven to be a fair and comprehensive ranking method [6, 16]. Additionally, it has been shown to have great predictive power, consistently predicting the winners and close margins for a variety of sports [1, 15, 17].

Elo ratings have proven so reliable that they have even been adapted for applications outside of sports and games. For instance, Pelánek [10] use the system in the education setting where the head-to-head competition is between the student’s answer and the item.

3.1 How are they calculated?

Elo ratings work by comparing the opposing teams’ current ratings and setting up an expected outcome of the match. Once the match is completed, the rating for each side is updated by comparing the actual outcome to the expected outcome based on Elo. As the ratings are zero-sum, the magnitude of the increase in one team’s rating is equal to the magnitude of the decrease in the other team’s rating.

To create Elo ratings, each team is given a starting rating of 1500. Then we must calculate the expected probability of team A winning the game p_A :

$$p_A = \frac{1}{1 + 10^{(e_A - R_B)/400}}$$

where R_A and R_B are the pre-match Elo ratings of team A and team B, respectively. We note here that p_B is equal to $1 - p_A$ as there are no ties in college football.

Once the match has occurred, the rating for team A is updated (R_A^*) by the following:

$$R_A^* = R_A + 25(O_A - p_A)$$

where O_A is the outcome of the match from the perspective of team A, i.e. 1 if they won the match or 0 if they lost. The same calculation is used to adjust the rating of team B:

$$R_B^* = R_B + 25(O_B - p_B)$$

This means that the rating of a team with a high expected probability of winning a match, will not improve by a significant amount, however if a team causes an upset then their rating will increase noticeably. The chosen constant of 25 can be changed in order to make the ratings more or less sensitive to the outcome of single matches.

4 Results and Discussion

4.1 The 2023 College Football Season

Table 3 shows the Elo ratings of the highest ranked College Football teams on selection day, prior to the CFP committee's selection. According to Elo ratings, the selection committee was justified in excluding Florida State from the 2023 CFP, as they were only the 11th best team in the country at that time. The ratings did not agree with the selection committee any further however as the four teams selected ranked first (Michigan), fifth (Texas), sixth (Alabama), and thirteenth (Washington), making it the season with the largest disagreement between the CFP selection committee and the Elo ratings. The ratings suggest that joining Michigan in the CFP should have been Georgia (the defending national champion), Ohio State and Penn State, both from the Big Ten conference. The ratings for 2023 represent a scenario that the selection committee are highly unlikely to permit based on their criteria—a team with two losses for the season being included alongside the two teams that they have lost to. However, as of selection day, Penn State, while being only the third best team in the Big Ten, were also the fourth best team in the country. (Interestingly, this marks the second time that Penn State were ranked in the top 4 according to Elo ratings, but missed selection for the CFP—See Table 9).

Similarly unlucky in 2023 were Georgia, who despite losing the SEC conference championship to Alabama, were the second best team on selection day according to Elo ratings and were not selected to defend their 2022 national championship.

4.2 The 2014–2022 College Football Seasons

Tables 4–12 show the Elo ratings and the teams selected for the CFP by the committee for each season since the playoff began.

An inspection of these Tables shows that the CFP committee has never selected the four highest ranked teams according to Elo. However, twice they have selected four of the top five—in 2021 and 2016. The only time the number one ranked team was not selected was Alabama in 2022. There have been three occasions where a selected team was not ranked in the Elo top ten—Notre Dame in 2020 (Elo ranking of 11th), TCU in 2022 (12th), and Washington in 2023 (13th).

Tab. 3: The Elo Ratings for the top 13 teams in 2023 College Football prior to the CFP selection.

Elo ranking	Team	Conference	Elo rating	CFP ranking
1	Michigan	Big Ten	2174	1
2	Georgia	SEC	2111	
3	Ohio State	Big Ten	2108	
4	Penn State	Big Ten	2061	
5	Texas	Big 12	2050	3
6	Alabama	SEC	2039	4
7	Oregon	Pac-12	2031	
8	Notre Dame	Independent	2009	
9	LSU	SEC	1995	
10	Oklahoma	Big 12	1974	
11	Florida State	ACC	1951	
12	Kansas State	Big 12	1942	
13	Washington	Pac-12	1883	2

Tab. 4: The Elo Ratings for the top 12 teams in 2022 College Football prior to the CFP selection.

Elo ranking	Team	Conference	Elo rating	CFP ranking
1	Alabama	SEC	2151	
2	Michigan	Big Ten	2150	2
3	Georgia	SEC	2146	1
4	Ohio State	Big Ten	2108	4
5	Penn State	Big Ten	1979	
6	Tennessee	SEC	1977	
7	Utah	Pac-12	1936	
8	Texas	Big 12	1931	
9	Kansas State	Big 12	1891	
10	Clemson	ACC	1866	
11	Notre Dame	Independent	1858	
12	TCU	Big 12	1856	3

Tab. 5: The Elo Ratings for the top 10 teams in 2021 College Football prior to the CFP selection.

Elo ranking	Team	Conference	Elo rating	CFP ranking
1	Alabama	SEC	2220	1
2	Ohio State	Big Ten	2153	
3	Georgia	SEC	2143	3
4	Michigan	Big Ten	2065	2
5	Cincinnati	AAC	2059	4
6	Notre Dame	Independent	1992	
7	Iowa State	Big 12	1929	
8	Oklahoma State	Big 12	1911	
9	Clemson	ACC	1889	
10	Wisconsin	Big Ten	1870	

Tab. 6: The Elo Ratings for the top 11 teams in 2020 College Football prior to the CFP selection.

Elo ranking	Team	Conference	Elo rating	CFP ranking
1	Clemson	ACC	2396	2
2	Ohio State	Big Ten	2373	3
3	LSU	SEC	2207	
4	Alabama	SEC	2160	1
5	Wisconsin	Big Ten	2020	
6	Oregon	Pac-12	2011	
7	Georgia	SEC	1992	
8	Michigan	Big Ten	1984	
9	Oklahoma	Big 12	1984	
10	Penn State	Big Ten	1968	
11	Notre Dame	Independent	1965	4

Tab. 7: The Elo Ratings for the top 10 teams in 2019 College Football prior to the CFP selection.

Elo ranking	Team	Conference	Elo rating	CFP ranking
1	Clemson	ACC	2396	3
2	Ohio State	Big Ten	2373	2
3	LSU	SEC	2207	1
4	Alabama	SEC	2160	
5	Wisconsin	Big Ten	2020	
6	Oregon	Pac-12	2011	
7	Georgia	SEC	1992	
8	Michigan	Big Ten	1984	
9	Oklahoma	Big 12	1984	4
10	Penn State	Big Ten	1968	

Tab. 8: The Elo Ratings for the top 10 teams in 2018 College Football prior to the CFP selection.

Elo ranking	Team	Conference	Elo rating	CFP ranking
1	Alabama	SEC	2324	1
2	Clemson	ACC	2277	2
3	Georgia	SEC	2035	
4	Oklahoma	Big 12	2026	4
5	Ohio State	Big Ten	2018	
6	Michigan	Big Ten	1966	
7	Notre Dame	Independent	1953	3
8	Mississippi State	SEC	1949	
9	Penn State	Big Ten	1929	
10	Iowa	Big Ten	1926	

Tab. 9: The Elo Ratings for the top 10 teams in 2017 College Football prior to the CFP selection.

Elo ranking	Team	Conference	Elo rating	CFP ranking
1	Alabama	SEC	2206	1
2	Clemson	ACC	2141	2
3	Penn State	Big Ten	2126	
4	Ohio State	Big Ten	2104	3
5	Oklahoma	Big 12	2070	
6	Georgia	SEC	2040	
7	Wisconsin	Big Ten	2026	
8	Washington	Pac-12	2017	4
9	Auburn	SEC	2015	
10	Oklahoma State	Big 12	1899	

Tab. 10: The Elo Ratings for the top 10 teams in 2016 College Football prior to the CFP selection.

Elo ranking	Team	Conference	Elo rating	CFP ranking
1	Ohio State	Big Ten	2328	3
2	Alabama	SEC	2311	1
3	Washington	Pac-12	2149	4
4	Michigan	Big Ten	2142	
5	Clemson	ACC	2077	2
6	Oklahoma	Big 12	2013	
7	USC	Pac-12	1951	
8	Western Kentucky	Conference USA	1941	
9	Auburn	SEC	1938	
10	LSU	SEC	1932	

Tab. 11: The Elo Ratings for the top 10 teams in 2015 College Football prior to the CFP selection.

Elo ranking	Team	Conference	Elo rating	CFP ranking
1	Oklahoma	Big 12	2155	4
2	Ohio State	Big Ten	2107	
3	Alabama	SEC	2106	2
4	Baylor	Big 12	1975	
5	Stanford	Pac-12	1967	
6	Clemson	ACC	1965	1
7	Michigan State	Big Ten	1944	3
8	TCU	Big 12	1943	
9	Florida State	ACC	1938	
10	Houston	AAC	1891	

Tab. 12: The Elo Ratings for the top 10 teams in 2014 College Football prior to the CFP selection.

Elo ranking	Team	Conference	Elo rating	CFP ranking
1	Ohio State	Big Ten	2232	4
2	Alabama	SEC	2139	1
3	Oregon	Pac-12	2119	2
4	TCU	Big 12	2105	
5	Baylor	Big 12	2061	
6	Michigan State	Big Ten	2025	
7	Florida State	ACC	2012	3
8	Georgia	SEC	2004	
9	Mississippi State	SEC	1933	
10	Kansas State	Big 12	1891	

4.3 Should Elo replace the CFP selection committee?

Whether the CFP selection committee should be replaced by an Elo ratings method is difficult to answer for anyone outside of the CFP organization. If the goal of the CFP is to have transparency befitting of the elite-level on-field product, then an Elo model is a far better choice. Elo takes into account strength of schedule and compares outcomes to expected outcomes, which are all known quantities and can be calculated by teams hoping to qualify. Elo also has a heavier weighting on recent matches, ensuring that the teams qualifying for the CFP are currently the best four choices. Overall, an Elo model removes subjectivity, but this might not be the purpose of the CFP selection. If the intention of the CFP is to draw the most viewers and media attention then the subjectivity offered by employing the CFP selection committee is the best way to achieve this.

4.4 Future CFPs

Starting in the 2024 season, the CFP will be expanded to include 12 teams competing for the national championship. However, the CFP expansion will retain the current selection-based criteria, meaning that rather than discussing the ‘unlucky’ fifth team who missed out, the sports media will discuss the ‘unlucky’ thirteenth team. As above, if the CFP process wants to be transparent, a ratings model would be the only way to achieve this.

5 Conclusion

In this paper we compared the teams chosen by the CFP committee to compete for the NCAA college football national championship with an Elo ratings method. We found that the top four teams by Elo ratings differ greatly from the four teams selected in almost every year of the CFP’s existence. We use this to suggest that the subjective criteria used by the selection committee should be replaced by a ratings model in the name of transparency.

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