Predicting and End-of-Season Top-25 Ranking of College Football Teams

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Abstract

Every December, four college football teams are picked to play in the college football playoff. There are many ways team can be picked, but these criteria seem to change every season. Because of this, many people disagree with the playoff participants, and there is always controversy. The purpose of this project is to use machine learning to look at past data and predict an end-of-season top-25, where the top-4 teams should be playoff participants.

1. Introduction

From 1998 through 2014, college football issued a final regular season ranking that was comprised of the Associated Press (AP) rankings, college football coaches ranking, and a computer-based ranking. This was called the Bowl Championship Series (BCS) ranking and made the top two teams play for the national championship. Due to this representation in the national championship, where only 2 teams got to play based on what people thought of how they played in the season, there was much controversy over this. Mark L. Shurtleff, Attorney General of Utah in 2011, stated the following about the BCS: “The BCS unreasonably limits access to participation in the national championship and other lucrative bowl games to protect revenues and market shares of the six preferred conferences, the bowl hosts and television networks.” Shurtleff also stated that the system is unfair and illegal due to the money that specific conferences or teams get, and therefore those teams are the one that participate. More importantly, some games seem picked with bias in mind, like the matchup of two SEC teams, LSU, who won the SEC, and Alabama, a 1-loss SEC team who lost to LSU during the season. Alabama went on to win that national championship. “In 2008, undefeated Utah of the non-AQ Mountain West Conference was denied a shot at the championship because the cabal required AQ one-loss teams to play each other” (BCS Has Devolved College Football into Unfairness, Greed).

In the 2014-2015 season, division 1 college football moved to a 4-team playoff, where the #4 ranked team plays the #1 team and the #2 team plays #3. This allowed more teams to compete for a spot in the national championship, like in 2014, where #4 Ohio State played #2 Oregon in the national

championship. Had the BCS still been in place, an unbeaten Florida State (#3 in the playoff rankings) team would likely have played Alabama or Oregon (#1 and #2 in the college football playoff rankings). These rankings are set the Sunday after conference championship games and determine the playoff participants. The rankings are formed by a committee of athletic directors for colleges around the country (CFP Selection Committee).

This system is not without its own controversy. In 2014, before conference championship games TCU was #3, Ohio State was #5, and Baylor was #6. The final college football playoff (CFP) rankings had Ohio State #4, Baylor #5, and TCU #6. Urban Meyer, former Ohio State head coach stated about running up the score against Wisconsin in the Big Ten Championship, "if [Ohio State deserves] a chance to go play in this playoff, we need to make it a resounding win. I'm not saying we kept everybody in too long, but that was one of the first times in my career I was ever aware of the score" (ESPN). More recently, 1-loss conference champions have been left out, like Penn St. in 2016 and Ohio State in 2018, while non power-five conference teams (like UCF, who was unbeaten in 2017 and heading into postseason in 2018) were passed for more prestigious teams like Georgia and Oklahoma, who were 1-loss conference champions. Due to these controversies, no one knows exactly how teams get into the playoff, even if the data and statistics say a team should be competing for the playoff.

2. Setting the Problem

This project will attempt to provide a ranking of the top-25 best teams based only on data and historical trends. The following statistics were chosen:

- S&P+: The S&P+ ratings are derived from play-by-play data for all college football teams and are based on how a team does on offense, defense, special teams, and who they have played. This was picked as it gives a good picture of how a team is doing during the season and is used to gauge how good a team is. In eve year of the CFP, except 2018, not all CFP participants were listed in the top-4, indicating that the CFP may have room for improvement. However, it can also be said that some national champions were not #1, and based on CFP rankings, it could be said they didn't deserve to be in the playoff, again, leaving room for CFP improvement.
- ESPN FPI: The ESPN Football Power Index (FPI) is used as a predictor of a team's performance against future opponents and is based on how they have done and who they played during the season. This statistic can be used to show possible top-4 CFP rankings to get the best matchups as it predicts a better performance if the team is ranked higher. This statistic also has its problems as many teams from a highly ranked conference could be ranked highly. For example, as of 12/7/19, the SEC has 5 teams ranked in the top-7 of the FPI.
- Strength of Schedule: This is a "power rating" based on strength of schedule and how a team has done based on that schedule. This source was picked mostly for its inclusion of 2019 SOS, which is not present with the other two sources. This statistic is useful for seeing a team's performance based on their schedule; going on the road to beat a highly ranked team gives a higher rating and is indicative of good performance, while losing close on the road to a highly ranked team will also be rated higher than if the team lost to an unranked opponent in a blowout.

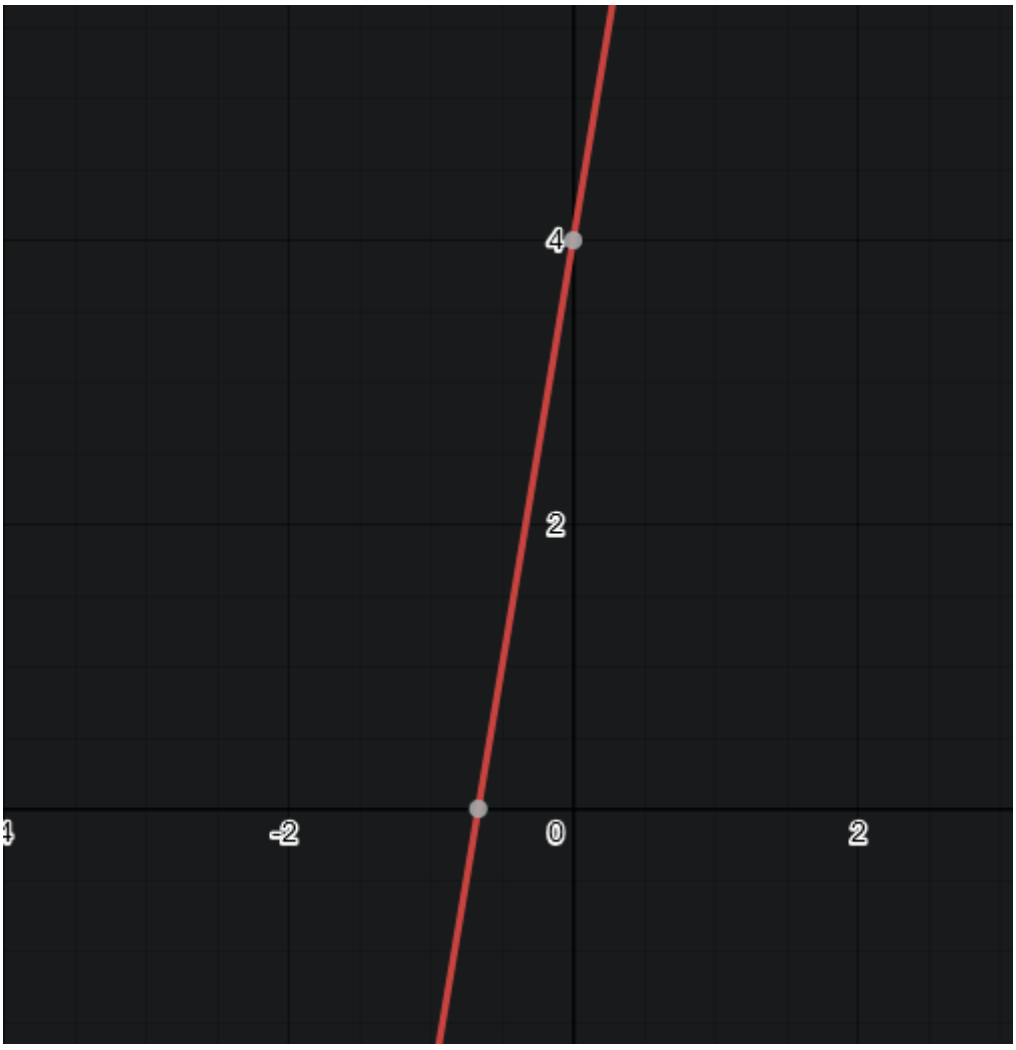
The project used these features for linear regression using the scikit-learn library in Python. Linear regression takes features and maps a linear function to the features to produce an output.

$$y = mx + b$$

The equation above is the equation of a line. This is used to predicts the rankings. The variables are:

- y: The target value, or rankings in this case.
- m: The slope. This is based on a feature given.
- x: The value of the feature. Together with the slope, this can be used for the rest of the feature data to extrapolate the target value.
- b: The y-intercept. This places the line of best fit, and is also based on the feature(s) to get the line of best fit.

For multiple features, multiple "mx" features are used, and m becomes more of another weight than a slope. For a linear function with one feature, an example is shown below:



The graph of $y = 6x + 4$ (desmos.com)

Here, the slope is 6 and the y-intercept is 4. From the equation, if we have an x value of 3, we get that y is 22, and so the target (or prediction in this case) of x being 3 is 22. Likewise, if we had y=16, we get that

x is 2, and if we have a point x=2 on the line, we see that we can train the equation and have an error of 0.

$$y = 6x + 4, x = 3$$

$$y = 6 * 3 + 4$$

$$y = 22$$

Equation showing the predicted value from a sample in our feature set

$$y = 6x + 4, y = 16$$

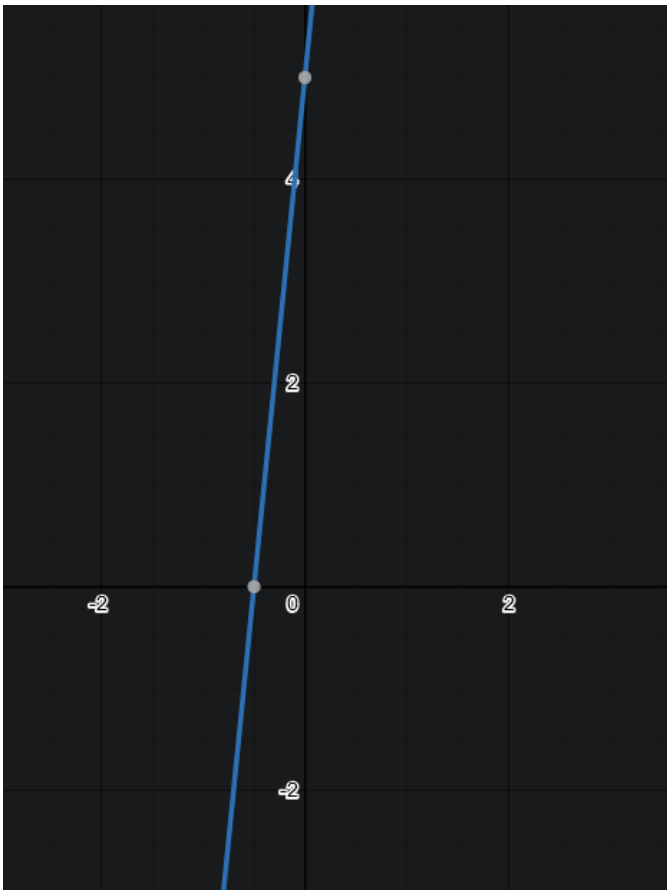
$$16 = 6x + 4$$

$$16 - 4 = 6x$$

$$\frac{12}{6} = x, x = 2$$

Equation showing the training of our function

A graph of multiple features is shown below. Notice how the slope is different than either of our "mx" values.



The graph of $y = 7x + 3x + 5$

Here, the slope is 10, but the weights become apparent as one feature set moves the line more than another. In this way, we can assign importance to one feature set over another. For example, in the following equation, feature set x_1 is more important than feature set x_2. Now we can remove any bias from one feature set by using another feature set to enhance the prediction. For example, if we want a_2 to be the prediction, using only 1 feature set might give us a_1 but having another feature set of greater importance could give us the a_2 result.

$$y = 7x_1 + 3x_2 + 5, x_1, x_2 = 5$$

$$y = 7(5) + 3(5) + 5$$

$$y = 35 + 15 + 5$$

$$y = 55$$

Equation showing how differing weights impact the prediction

$$y = 3x + 5, x = 5$$

$$y = 3(5) + 5$$

$$y = 15 + 5$$

$$y = 20$$

Equation showing how different weights give us a different prediction

The same could be said about assigning the same weight to different features. The equation $y = 7x + 7x + 5, x = 5$ gives $y = 75$ and $y = 3x + 3x + 5, x + 5$ gives $y = 25$ when the prediction should be $y = 55$. This is why it is important to use multiple features when doing linear regression, with the caveat that if all the features will give the same result, it won't matter which one is used, nor how many features are used.

With linear regression, we get real values. For example, if our result should be in the form $[1,4,6,9,14]$, and we had only 5 feature values, we should get 5 results. With a neural network, we could use it for predictions, but that is better used for sequences and predictions based on a previous value. It can be used to give a ranking of teams, and may be better when choosing to order teams, but won't give us a real value like linear regression. Linear regression is better for the result we want.

We could also use other classification methods like K-Means or K-Nearest Neighbor (K-NN), but this project is not about splitting teams between ranked and unranked (though the result is in that form). We want real values for each team, and K classification would end up having only 1 team in each classification for the result to be in the form we want. This defeats the purpose of having a K classifier as we overfit the data on purpose. In this case, linear regression is better. Finally, linear regression allows for multiple features giving us 1 answer, which, while it can be done with other machine learning algorithms, is better done with linear regression.

As for the types of regression used, linear is better than logistic because we done want a true or false answer here. While we could use it to tell us whether a team is in the playoff or not (for which we could also use a K classifier), the result of the project is to rank teams, not directly tell us whether a team should be in the playoff or not.

3. Expectations

3.1. Expected Results

The expectation is that the result of using linear regression will give us a top-25 ranking that is close to that of the USA Today Coaches Poll at the end of the season. There are 4 predictions:

1. S&P+ Rankings: This will be based on only the S&P+ ratings as a feature set. The expectation is that this should be the best prediction when using only 1 feature set
2. ESPN FPI (FPI): This will only use the FPI as a feature set. It is expected to be the next best predictor of using 1 feature set, after the S&P+.
3. Strength of Schedule (SOS): This only uses the SOS feature set and is expected to be the worst of the three feature sets due to questions of legitimacy.
4. Combination of all features: This uses all three feature sets and should be the most accurate.

The result should be a ranking in the form $[41, 2, 6, 14, 100, 23, \dots]$ where the order is the order of the teams listed in the *teams.csv* data file. We can order the teams by the predicted ranking to show what the final, end-of-season, top-25 rankings will be.

3.2. Interpreting the Results

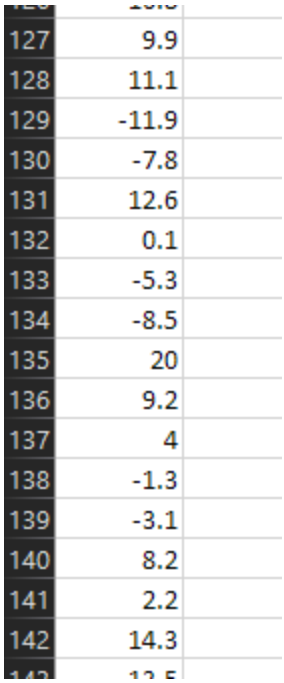
The results will be ordered from ranking 1 to ranking 25. #1 is the predicted national champion, and #2 is the predicted runner-up. All rankings past these cannot be extrapolated to a "correct" playoff poll as the CFP does not do an end-of-season poll. The point of the project, however, is not to concur with the CFP rankings; rather, it predicts the teams that should be in the playoff based on the rank they finished at in previous years. This is so that we can have teams that finished strong be our playoff participants and may yield a better playoff. Therefore, this predicted top-25 cannot be compared with the CFP poll of that year for accuracy. Instead, it should be compared to the coaches' poll, and looked at as a possible better playoff poll than an existing playoff poll.

4. Data

All data was obtained from the following websites:

- S&P+: https://www.footballoutsiders.com/stats/ncaa/2014
- FPI: http://www.espn.com/college-football/statistics/teamratings
- SOS: https://www.teamrankings.com/college-football/ranking/schedule-strength-by-other
- Rankings: https://www.masseyratings.com/cf/compare.htm

The data was combined for each year into one .csv file and read into python. In the case of multiple features, each column represented one feature. The teams were listed in alphabetical order first, then by year. So, reading the csv file as an array, rows 0-131 were the teams in alphabetical order for 2018, 132-x is 2017, where x is the number of teams plus the first index, and so on.



127	9.9
128	11.1
129	-11.9
130	-7.8
131	12.6
132	0.1
133	-5.3
134	-8.5
135	20
136	9.2
137	4
138	-1.3
139	-3.1
140	8.2
141	2.2
142	14.3

An example of the S&P+ data showing the transition of 2018 data to 2017 data where the indexes are i+1 (since this is an Excel spreadsheet). Index 132 is Wyoming 2018, while index 133 is Air Force 2017.

5. Results

5.1. S&P+ Results

When using the S&P+ feature, we see that all the teams are ranked very closely. However, when looking at the coaches poll from this week (week 13), we see many similarities, but also very odd ranks. For one thing, the rankings range from 61.4 to 73.6, a difference of almost 12, not 25. Another thing is that the result was supposed to be from 1-25, not from 61-73. The minimum rank of all teams is 61.4 (Ohio State) and maximum rank for all teams is 131.6 (Idaho, who doesn't play football in 2019).

Other things we notice are the discrepancies in the rankings of certain teams. In the coaches poll and CFP poll, we see LSU ranked #1, but our prediction ranks Ohio State #1. In fact, all the top-5 rankings differ from the actual poll to the prediction, with teams' spots being switched, but the top-5 is consistent in which teams are in the top-5 of all three polls. There are some similarities in that Utah is #8 in the coaches poll and our prediction, and Iowa St. is #22 in the CFP poll and our prediction. However, we see teams that are unranked in actual polls show up in our prediction. #12 is Washington in our prediction, Oregon is #15 in our prediction (#6 in the other polls), #18 is UCF, #19 is Indiana; none of these teams are ranked in the CFP poll or the coaches poll.

1	LSU (55)	
2	Ohio State (6)	
3	Clemson (4)	
4	Georgia	
5	Alabama	
6	Oregon	
7	Oklahoma	
8	Utah	
9	Penn State	
10	Florida	
11	Minnesota	
12	Michigan	
13	Baylor	
14	Wisconsin	
15	Notre Dame	
16	Auburn	
17	Cincinnati	
18	Memphis	
19	Boise State	
20	Iowa	
21	SMU	
22	Appalachian State	
23	Oklahoma State	
24	Texas A&M	
25	San Diego State	

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13	Michigan	
14	Baylor	
15	Auburn	
16	Notre Dame	
17	Iowa	
18	Memphis	
19	Cincinnati	
20	Boise State	
21	Oklahoma State	
22	Iowa State	
23	USC	
24	Appalachian State	
25	SMU	

1	[61.46524673]	Ohio State
2	[63.6129797]	Alabama
3	[65.14707469]	LSU
4	[65.65843968]	Clemson
5	[65.91412218]	Georgia
6	[67.14139817]	Oklahoma
7	[67.70389966]	Penn State
8	[68.31753765]	Utah
9	[68.62435665]	Florida
10	[69.03344865]	Michigan
11	[69.13572165]	Auburn
12	[69.69822314]	Washington
13	[69.85163264]	Wisconsin
14	[70.46527063]	Memphis
15	[70.51640713]	Oregon
16	[70.66981663]	Minnesota
17	[71.02777213]	Texas A&M
18	[71.23231812]	Central Florida
19	[71.53913712]	Indiana
20	[71.53913712]	Notre Dame
21	[71.64141012]	Baylor
22	[72.15277511]	Iowa State
23	[72.25504811]	Iowa
24	[73.1243686]	USC
25	[73.6357336]	Miami-FL

Comparison of Coaches Poll, CFP Poll, and Predicted Rankings for Week 10.

Our root-mean-squared-error is 31.284389774352924, indicating that our prediction is not very accurate. This root-mean-squared-error is not based on 2019 predictions; rather, on the test set in comparison with the targets. While it could be more inaccurate, it is also not very close to 0. It is possible that this is because we changed the S&P+ ratings for teams that are not playing anymore or joined division 1 after 2005 and had a -100 S&P+ rating. Let's try changing that to -50.

1	LSU (55)	
2	Ohio State (6)	
3	Clemson (4)	
4	Georgia	
5	Alabama	
6	Oregon	
7	Oklahoma	
8	Utah	
9	Penn State	
10	Florida	
11	Minnesota	
12	Michigan	
13	Baylor	
14	Wisconsin	
15	Notre Dame	
16	Auburn	
17	Cincinnati	
18	Memphis	
19	Boise State	
20	Iowa	
21	SMU	
22	Appalachian State	
23	Oklahoma State	
24	Texas A&M	
25	San Diego State	

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15	Auburn	
16	Notre Dame	
17	Iowa	
18	Memphis	
19	Cincinnati	
20	Boise State	
21	Oklahoma State	
22	Iowa State	
23	USC	
24	Appalachian State	
25	SMU	

1	[43.13303857]	Ohio State
2	[47.41758283]	Alabama
3	[50.47797158]	LSU
4	[51.49810117]	Clemson
5	[52.00816596]	Georgia
6	[54.45647696]	Oklahoma
7	[55.57861951]	Penn State
8	[56.80277501]	Utah
9	[57.41485276]	Florida
10	[58.23095643]	Michigan
11	[58.43498234]	Auburn
12	[59.55712489]	Washington
13	[59.86316376]	Wisconsin
14	[61.08731926]	Memphis
15	[61.18933222]	Oregon
16	[61.4953711]	Minnesota
17	[62.20946181]	Texas A&M
18	[62.61751364]	Central Florida
19	[63.22959139]	Indiana
20	[63.22959139]	Notre Dame
21	[63.43361731]	Baylor
22	[64.45374689]	Iowa State
23	[64.65777281]	Iowa
24	[66.3919931]	USC
25	[67.41212269]	Miami-FL

Updated (lowest S&P+ is -50) comparison of Coaches Poll, CFP Poll, and Predicted Rankings for Week 10.

Here we see 1 difference: the rankings are lower across the poll. The lowest top-25 team is ranked 43.1 while the highest is 67.4. The difference is around 24, which is improved over the last S&P+ prediction. Let's try to change the -50 rating to 1 number less than the lowest S&P+ rating ever recorded, which is -38.9.

1	LSU (55)	
2	Ohio State (6)	
3	Clemson (4)	
4	Georgia	
5	Alabama	
6	Oregon	
7	Oklahoma	
8	Utah	
9	Penn State	
10	Florida	
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19	Cincinnati	
20	Boise State	
21	Oklahoma State	
22	Iowa State	
23	USC	
24	Appalachian State	
25	SMU	

1	[37.77535855]	Ohio State
2	[42.7123764]	Alabama
3	[46.23881772]	LSU
4	[47.41429816]	Clemson
5	[48.00203838]	Georgia
6	[50.82319144]	Oklahoma
7	[52.11621992]	Penn State
8	[53.52679645]	Utah
9	[54.23208472]	Florida
10	[55.17246907]	Michigan
11	[55.40756516]	Auburn
12	[56.70059364]	Washington
13	[57.05323777]	Wisconsin
14	[58.4638143]	Memphis
15	[58.58136235]	Oregon
16	[58.93400648]	Minnesota
17	[59.75684279]	Texas A&M
18	[60.22703496]	Central Florida
19	[60.93232323]	Indiana
20	[60.93232323]	Notre Dame
21	[61.16741931]	Baylor
22	[62.34289975]	Iowa State
23	[62.57799584]	Iowa
24	[64.57631259]	USC
25	[65.75179303]	Miami-FL

Updated (lowest S&P+ is -39.9) comparison of Coaches Poll, CFP Poll, and Predicted Rankings for Week 10.

This made a less drastic change in our rankings with the only change, once again, being the ranks. The difference is now around 28, and we see some separation in the teams' ranks. We'll keep this change for our combined predictor while noting that it doesn't matter what the S&P+ ratings are for teams that didn't play every year from 2005-2019, as long as they are consistent with the other ratings in that they should be lower than every other team. Our root-mean-squared-error was better at 28.693579781761677.

5.2 FPI Prediction

Like the S&P+ prediction, all the teams are very closely ranked. There are also other similarities, like the top-5 and unranked teams being ranked in our prediction.

We do see a prediction that correlates more closely with the coaches and playoff poll from that week, unlike the S&P+. However, there are still ranking discrepancies, like Ohio State at #1 and none of the top-5 are ranked in the order of the other polls, and UCF and Washington St. is ranked in the prediction, but not in the other polls.

1	LSU (55)	
2	Ohio State (6)	
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4	Georgia	
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16	Notre Dame
17	Iowa
18	Memphis
19	Cincinnati
20	Boise State
21	Oklahoma State
22	Iowa State
23	USC
24	Appalachian State
25	SMU

1	[63.36739857]	Ohio State
2	[65.04780321]	Clemson
3	[65.40425268]	Alabama
4	[67.28834273]	LSU
5	[68.05216302]	Georgia
6	[69.01966872]	Penn State
7	[69.17243278]	Oregon
8	[69.63072495]	Florida
9	[69.63072495]	Oklahoma
10	[69.93625307]	Auburn
11	[69.93625307]	Michigan
12	[70.34362389]	Utah
13	[70.39454524]	Wisconsin
14	[70.95468012]	Notre Dame
15	[73.09337693]	Texas A&M
16	[73.19521964]	Iowa
17	[73.50074775]	Minnesota
18	[73.50074775]	Washington
19	[73.60259046]	Iowa State
20	[74.36641075]	Central Florida
21	[74.5191748]	Baylor
22	[74.57009616]	USC
23	[75.33391645]	Texas
24	[75.63944456]	Washington State
25	[75.84312997]	Oklahoma State

Comparison of Coaches Poll, CFP Poll, and Predicted Rankings for Week 10.

The root-mean-squared-error is 31.438908742315935, which is worse than the S&P+ rankings by a few decimals (S&P+ was 31.284389774352924). To make our combined prediction more consistent, and reduce our error, let's change the -100 ratings to 1 less than the lowest FPI (lowest FPI is -27.5).

1	LSU (55)	
2	Ohio State (6)	
3	Clemson (4)	
4	Georgia	
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13	Michigan	
14	Baylor	
15	Auburn	
16	Notre Dame	
17	Iowa	
18	Memphis	
19	Cincinnati	
20	Boise State	
21	Oklahoma State	
22	Iowa State	
23	USC	
24	Appalachian State	
25	SMU	

1	[30.99361874]	Ohio State
2	[35.99449931]	Clemson
3	[37.05529216]	Alabama
4	[42.66234008]	LSU
5	[44.93546762]	Georgia
6	[47.8147625]	Penn State
7	[48.269388]	Oregon
8	[49.63326452]	Florida
9	[49.63326452]	Oklahoma
10	[50.54251554]	Auburn
11	[50.54251554]	Michigan
12	[51.75485022]	Utah
13	[51.90639206]	Wisconsin
14	[53.57335225]	Notre Dame
15	[59.93810935]	Texas A&M
16	[60.24119302]	Iowa
17	[61.15044403]	Minnesota
18	[61.15044403]	Washington
19	[61.45352771]	Iowa State
20	[63.72665524]	Central Florida
21	[64.18128075]	Baylor
22	[64.33282258]	USC
23	[66.60595012]	Texas
24	[67.51520113]	Washington State
25	[68.12136847]	Oklahoma State

Updated comparison of Coaches Poll, CFP Poll, and Predicted Rankings for Week 10.

Like the S&P+ correction, we see no changes in the position of teams, but we do see better ranks in that Ohio State is ranked #30 and Oklahoma St. is ranked #68, a difference of 38. Our root-mean-squared-error is 27.461547662927398, which is better than the previous FPI prediction, and better than the S&P+ prediction (28.693579781761677).

5.3. Strength of Schedule Results

We know from our previous results that our predicted ranking is not going to be 1-25, nor will the prediction be entirely correct. We also know that we must correct the data to make our -100 ratings better. Our first prediction will be corrected for this.

1	LSU (55)	
2	Ohio State (6)	
3	Clemson (4)	
4	Georgia	
5	Alabama	
6	Oregon	
7	Oklahoma	
8	Utah	
9	Penn State	
10	Florida	
11	Minnesota	
12	Michigan	
13	Baylor	
14	Wisconsin	
15	Notre Dame	
16	Auburn	
17	Cincinnati	
18	Memphis	
19	Boise State	
20	Iowa	
21	SMU	
22	Appalachian State	
23	Oklahoma State	
24	Texas A&M	
25	San Diego State	

1	LSU	
2	Ohio State	
3	Clemson	
4	Georgia	
5	Alabama	
6	Oregon	
7	Utah	
8	Penn State	
9	Oklahoma	
10	Minnesota	
11	Florida	
12	Wisconsin	
13	Michigan	
14	Baylor	
15	Auburn	
16	Notre Dame	
17	Iowa	
18	Memphis	
19	Cincinnati	
20	Boise State	
21	Oklahoma State	
22	Iowa State	
23	USC	
24	Appalachian State	
25	SMU	

1	[2.01041672]	Ohio State
2	[5.6919658]	Clemson
3	[7.32580451]	Alabama
4	[15.96180915]	LSU
5	[19.46289212]	Georgia
6	[23.8975972]	Penn State
7	[24.59781379]	Oregon
8	[26.69846357]	Florida
9	[26.69846357]	Oklahoma
10	[28.09889675]	Auburn
11	[28.09889675]	Michigan
12	[29.966141]	Utah
13	[30.19954653]	Wisconsin
14	[32.76700737]	Notre Dame
15	[42.57003966]	Texas A&M
16	[43.03685073]	Iowa
17	[44.43728391]	Minnesota
18	[44.43728391]	Washington
19	[44.90409497]	Iowa State
20	[48.40517793]	Central Florida
21	[49.10539453]	Baylor
22	[49.33880006]	USC
23	[52.83988302]	Texas
24	[54.2403162]	Washington State
25	[55.17393833]	Oklahoma State

Comparison of Coaches Poll, CFP Poll, and Predicted Rankings for Week 10.

Like S&P+ and FPI, the prediction isn't correct, but there are some better results. The top-5 is still correct in that all the polls list the same top-5. The CFP poll agrees with the prediction than Oklahoma is #9 but doesn't agree with anything else. The root-mean-squared error is 29.011268785213275, which is worse than the FPI at 27.461547662927398 and worse than the S&P+ prediction which was 28.693579781761677. It should also be noted that the results were closer to what we expect in that The rankings are from 2-55 which, while it is a big margin, is closer to the 1-25 rankings we expect.

5.4. Combined Prediction

Using S&P+, FPI, and SOS as features in the prediction, we should get a better error, but judging by the previous results, we will not get a 1-25 ranking; rather, the order is what we pay attention to. To correct our -100 data points, all -100 data was set to the lowest S&P+ score, minus 1, which is -39.9.

1	LSU (55)
2	Ohio State (6)
3	Clemson (4)
4	Georgia
5	Alabama
6	Oregon
7	Oklahoma
8	Utah
9	Penn State
10	Florida
11	Minnesota
12	Michigan
13	Baylor
14	Wisconsin
15	Notre Dame
16	Auburn
17	Cincinnati
18	Memphis
19	Boise State
20	Iowa
21	SMU
22	Appalachian State
23	Oklahoma State
24	Texas A&M
25	San Diego State

1	LSU
2	Ohio State
3	Clemson
4	Georgia
5	Alabama
6	Oregon
7	Utah
8	Penn State
9	Oklahoma
10	Minnesota
11	Florida
12	Wisconsin
13	Michigan
14	Baylor
15	Auburn
16	Notre Dame
17	Iowa
18	Memphis
19	Cincinnati
20	Boise State
21	Oklahoma State
22	Iowa State
23	USC
24	Appalachian State
25	SMU

1	[33.3152316]	Ohio State
2	[35.31603644]	Clemson
3	[38.44532314]	Alabama
4	[46.23189134]	LSU
5	[47.45056251]	Georgia
6	[47.71631015]	Oklahoma
7	[50.86663649]	Utah
8	[52.80713055]	Oregon
9	[53.71324499]	Penn State
10	[54.58250219]	Florida
11	[56.38000061]	Michigan
12	[57.09051407]	Auburn
13	[57.53624856]	Wisconsin
14	[58.85254117]	Washington
15	[58.87592255]	Notre Dame
16	[58.94924812]	Minnesota
17	[60.12901908]	Central Florida
18	[62.3560298]	Memphis
19	[62.44530193]	Iowa State
20	[62.92402171]	Baylor
21	[63.58427404]	Texas A&M
22	[64.71915006]	Iowa
23	[66.94727375]	Boise State
24	[67.10382255]	Washington State
25	[67.11813576]	USC

Comparison of Coaches Poll, CFP Poll, and Predicted Rankings for Week 10.

For the first run, a random state of 1 is used, which is not random compared to additional tests in that every time the code is run, the same training set and testing set is picked, but is the same random state the other predictions were trained on.

As we see, LSU still is not #1, but the top-5 is the same in all polls, consistent with the other results. The similarities we see with the other predictions are:

- Oklahoma is #6 in S&P+ and combined predictors.

- Michigan is #11 in FPI, SOS, and combined predictions.
- Wisconsin is #13 in all predictions.
- Minnesota is #16 in S&P+ and combined predictions.
- Iowa St. is #19 in all predictors except S&P+.
- Washington St. is #24 in all but the S&P+ prediction.

There are also many differences in ordering, but most of the same teams show up in all the predictors. In comparison to the coaches poll and CFP poll, Utah is at #7 in CFP and combined prediction, Penn St. is #9 in the coaches poll and our prediction, Florida agrees with the coaches poll, Notre Dame is #15 in the coaches poll and prediction, and Memphis is #18 in all polls. Putting all of these comparisons together, it looks like this is the best prediction from a qualitative view in that is agrees with the real polls better than any one feature prediction did. That being said, it also agreed with some of our individual feature predictions, making this combined feature prediction seem like a refinement, which is the intent. The root-mean-squared error here is 28.3410236678784, worse than the FPI prediction alone (27.461547662927398), but better than all the other single feature predictions.

Now, let's change the random state to see if we can train the data better. This should affect our individual runs, but it should add variance from run-to-run. The random state used for this run is 5.

1	LSU (55)
2	Ohio State (6)
3	Clemson (4)
4	Georgia
5	Alabama
6	Oregon
7	Oklahoma
8	Utah
9	Penn State
10	Florida
11	Minnesota
12	Michigan
13	Baylor
14	Wisconsin
15	Notre Dame
16	Auburn
17	Cincinnati
18	Memphis
19	Boise State
20	Iowa
21	SMU
22	Appalachian State
23	Oklahoma State
24	Texas A&M
25	San Diego State

1	LSU
2	Ohio State
3	Clemson
4	Georgia
5	Alabama
6	Oregon
7	Utah
8	Penn State
9	Oklahoma
10	Minnesota
11	Florida
12	Wisconsin
13	Michigan
14	Baylor
15	Auburn
16	Notre Dame
17	Iowa
18	Memphis
19	Cincinnati
20	Boise State
21	Oklahoma State
22	Iowa State
23	USC
24	Appalachian State
25	SMU

1	[33.92660456]	Ohio State
2	[37.19149012]	Clemson
3	[39.12697794]	Alabama
4	[46.14687922]	LSU
5	[47.54386858]	Georgia
6	[48.59651993]	Oklahoma
7	[51.57949789]	Utah
8	[53.17553946]	Penn State
9	[53.32910676]	Oregon
10	[54.29937053]	Florida
11	[55.89471139]	Michigan
12	[56.47024482]	Auburn
13	[57.16184156]	Wisconsin
14	[58.8500976]	Notre Dame
15	[59.11077087]	Washington
16	[59.4622331]	Minnesota
17	[60.80312018]	Central Florida
18	[62.60568734]	Iowa State
19	[62.99994024]	Texas A&M
20	[63.0201805]	Memphis
21	[63.11729356]	Baylor
22	[64.25479342]	Iowa
23	[66.78146332]	USC
24	[67.28301095]	Washington State
25	[67.33784691]	Indiana

Comparison of Coaches Poll, CFP Poll, and Predicted Rankings for Week 10 with random state 5.

Here we see the rank result for each team deviate, and there are some differences in ranking the teams. Compared to the last prediction, we have the same top-7, but Penn St. switches with Oregon, Washington and Notre Dame swap places, Iowa St, Memphis, and Texas A&M all switch places, and among other swaps, Boise St goes unranked and Indiana takes its place. Compared with the real polls, Penn St now matches the CFP poll. While it looks like this is a worse poll, our root-mean-squared error was lower at 28.02242493208747, compared to 28.3410236678784.

Now, for the final test, the train/test split will be modified. In all previous runs, an 85% train (15% test) split was used. This means we may be overfitting slightly as more of the train test is being used to train rather than test. This test will change the split to an 80-20 train/test split. The error should go up.

1	LSU (55)	
2	Ohio State (6)	
3	Clemson (4)	
4	Georgia	
5	Alabama	
6	Oregon	
7	Oklahoma	
8	Utah	
9	Penn State	
10	Florida	
11	Minnesota	
12	Michigan	
13	Baylor	
14	Wisconsin	
15	Notre Dame	
16	Auburn	
17	Cincinnati	
18	Memphis	
19	Boise State	
20	Iowa	
21	SMU	
22	Appalachian State	
23	Oklahoma State	
24	Texas A&M	
25	San Diego State	

1	LSU
2	Ohio State
3	Clemson
4	Georgia
5	Alabama
6	Oregon
7	Utah
8	Penn State
9	Oklahoma
10	Minnesota
11	Florida
12	Wisconsin
13	Michigan
14	Baylor
15	Auburn
16	Notre Dame
17	Iowa
18	Memphis
19	Cincinnati
20	Boise State
21	Oklahoma State
22	Iowa State
23	USC
24	Appalachian State
25	SMU

1	[35.05105504]	Ohio State
2	[37.91399089]	Clemson
3	[40.16437832]	Alabama
4	[47.28250009]	LSU
5	[48.61905008]	Georgia
6	[49.48040782]	Oklahoma
7	[52.45291936]	Utah
8	[54.14365293]	Oregon
9	[54.30671067]	Penn State
10	[55.34825533]	Florida
11	[56.96810769]	Michigan
12	[57.56558973]	Auburn
13	[58.18383957]	Wisconsin
14	[59.74051862]	Notre Dame
15	[60.03634974]	Washington
16	[60.29959018]	Minnesota
17	[61.59221882]	Central Florida
18	[63.45216689]	Iowa State
19	[63.85644262]	Memphis
20	[63.98374044]	Baylor
21	[64.03218979]	Texas A&M
22	[65.21520743]	Iowa
23	[67.69094897]	USC
24	[68.07498104]	Washington State
25	[68.32306866]	Indiana

Comparison of Coaches Poll, CFP Poll, and Predicted Rankings for Week 10 with random state 5 and 80/20 test split.

Here, as predicted, the error went up because we are not fitting as much data to our function. However, it is evident that we were not overfitting since the data is within 1 unit. The new root-mean-squared-error is 28.62781840123873, compared to changing the random state only at 28.02242493208747, and our original prediction at 28.3410236678784.

If we compare the three predictions, we find:

- Penn St. and Oregon have swapped positions again.
- Memphis is up 1 spot from the random state change prediction
- Baylor moves back up a spot
- Texas A&M moves back to #21

So, it looks like changing how much of the training set is used for testing matters, but not by much in this instance. This could be because we don't have much data to train our regression function. We only use seasons 2005-2018. For a more accurate ordering, we should have more data, which was unavailable for this project.

That being said, our predictions stacked up well against the real polls from week 10 of the 2019 regular season, and the errors, while not good, were fine. To make a more accurate prediction, the data collected may need to be more manual in that the user creates statistics based on how a team does, offense and defense capability, and who they play. The user could come up with an algorithm that ranks each team, but that was out of the scope of this project simply because of time and computing constraints. The user rating teams would likely need to watch every play, or parse through drive charts to rate all 131 teams, which was not something a college student can do.

6. Problems

There are some problems with the data that should be addressed. The two main problems are data size and legitimacy.

- Data Size: The data only goes back to 2005 (14 years, including the current, 2019, season). This is bad since there is little data to train on, resulting in a lower accuracy. If we could train on 30 years for example, the data should more closely correlate with our targets, and the accuracy should go up. There are also discrepancies in the size of the data, where some teams are rated in some feature sets, but not in others (Liberty is not in the FPI).
- Legitimacy of sources: There are many websites that had strength of schedule, but only one had 2019 statistics. Part of the project is to try to predict the current season's rankings, so this site had to be used for this. It is not clear how they ranked the teams, leading to legitimacy questions. There are also discrepancies among teams who have been in the division 1 not having ratings (like UCLA before 2012).

  The ESPN FPI and S&P+ also are questioned as they do not provide their algorithm for rating teams. As we see from the 12/7/19 FPI, Clemson is #2, Alabama, who lost the previous week, is #3, and LSU, who beat Alabama, is #4. While the FPI is shown at the end of the season after the championship, and has the correct #1 and #2 teams, using the in-season ratings may not be a good feature set. The S&P+ ratings also have a problem of not ranking the national champion and runner-up #1 and #2 respectively at times, possibly adding some inaccuracy to our calculation. However, in trying to predict the best possible playoffs, these are good ratings as they show who the best teams are currently, and who has the best chance of winning the rest of the season are.

There were also data collection issues as new teams joined the division 1 almost every year since 2008. For a team that was not division 1 in the past, but is now, they were assigned an arbitrary rating based on how bad teams are rated. For example, low negative numbers are used for bad teams in S&P+, like -12.1 is better than -14.5. So, teams that were not rated in a year were assigned -100. Conversely, only 25 teams are ranked at the end of the season. So, teams that were not ranked were assigned a ranking of 100. Both of these arbitrary ratings could cause the prediction to be inaccurate. It's also possible that teams' suspensions could impact the prediction. For example, Ohio State was suspended from

competing in a bowl in 2012 and was unranked to finish the season but finished 12-0 and had high feature ratings.

7. Conclusion

This project was intended for issuing a CFP poll that would rank teams with only the statistics. The error was high in that it was not close to 0, but following expectations, the combined feature prediction was the best, although not by much. Our final prediction for 2019 deviated from the real polls in that some teams were ranked in real polls but not our prediction, and our prediction ranked some teams that real polls did not.

In order to make the prediction more accurate, more data may be needed, and some features may need to be replaced. For example, if we rated teams' SOS by the teams they played without looking at who they played, some bad teams would be rated higher since they played better opponents. The other side to that is that higher ranked teams would have had similar ratings since they play similar teams. So, if Ohio State played 3 top-10 teams (and went 13-0) and Rutgers played 4 top-10 teams (and went 2-10), Rutgers should be slightly higher rated than Ohio State. However, this may be unrealistic when using it as a predictor since we want higher rated teams to be better ranked, consistent with the other metrics.

Additionally, since data gathered went back to 2005 and not earlier, we had only 13 years of data to use for our training and testing. Had we had more data, the training set would have been bigger, and our accuracy would have been more refined.

At the end however, this project is not to rank teams to match the CFP poll or coaches poll. While we need to test accuracy to make sure predictions are not completely off from a realistic poll, there should be some inaccuracy with these polls since the resulting prediction is supposed to predict a better top-25 poll that the playoff committee can use. Judging our final prediction from 5.4, Ohio State, LSU, and Clemson are sure to make it to the playoff in 2019, while Alabama and Georgia lost as of 12/8/19, so Oklahoma could be into the playoff. All these teams are ranked closely, and there may not be much controversy over who gets into the playoff in 2019. The main controversy will be seeding, and if this project predicts a good playoff, Ohio State should be the #1 seed, and eventual national champion.

In closing, the results, while ordered well enough, were unexpected. The result of regression should have outputted integer values from 1-25, but we saw real values, mostly between 30-70. This could be because the regression function cannot fit the features well enough to give us lower numbers when some metrics have feature values in the 30's. If we want a true 1-25 ranking, we might need to look at clustering or logistic regression to tell whether a team is ranked or not, then use linear regression among 25 teams. In the end, the project satisfied at least one expectation: order the teams correctly based on statistics to give the best playoff in college football.

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