

FBS Networks in the CFP Era

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Data 340- Social Networks

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Background

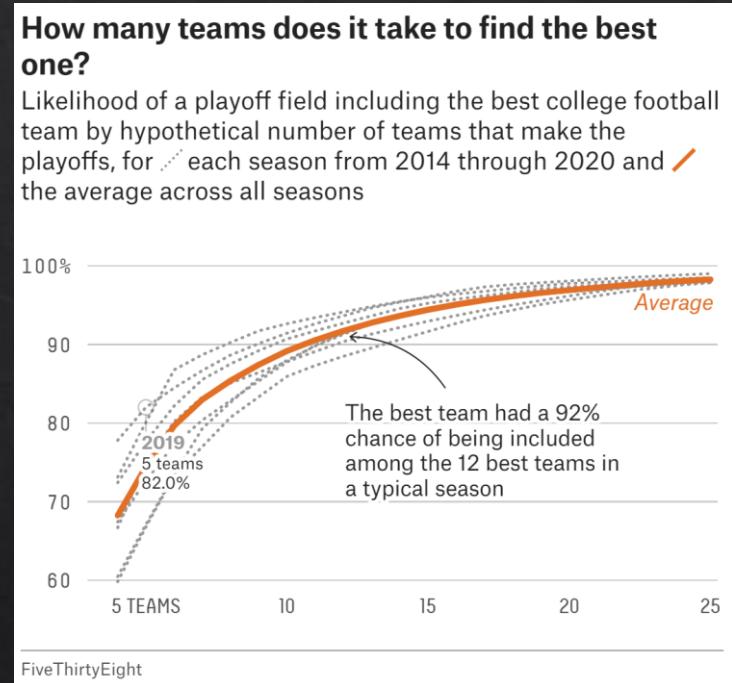
- ❖ NCAA Division 1 College Football
 - ❖ Football Bowl Subdivision (FBS)
 - ❖ Football Championship Subdivision (FCS)
- ❖ 2014: College Football Playoff (CFP)
- ❖ Research Questions:
 - ❖ Which FBS teams are most influential in the CFP era?
 - ❖ To what extent are playoff schools more central to the CFP era?



<http://collegefootballplayoff.com/images/logos/site/site.png>

Related Research

- ❖ Wissner-Gross at *FiveThirtyEight*
 - ❖ Does the CFP produce the “best” team every year?
 - ❖ Mathematical approach using Elo rankings for each team
 - ❖ “Best” differs from “influential” in concept, not practice
- ❖ Auerbach et al. at *The Athletic*
 - ❖ Journalistic exploration of failure of playoff expansion
 - ❖ Certain leagues against expansion even as they would benefit
- ❖ No notable network analysis of FBS in CFP era



Why Network Analysis

- ❖ Visualizing sports through networks
 - ❖ Non-standard, unbalanced scheduling in college sports
 - ❖ Both conference and team level analysis
- ❖ Different perspective on concepts of “importance” and “influence”



<https://www.actionnetwork.com/ncaaf/college-football-conference-championship-tiebreaker-scenarios-big-12-sec-more>

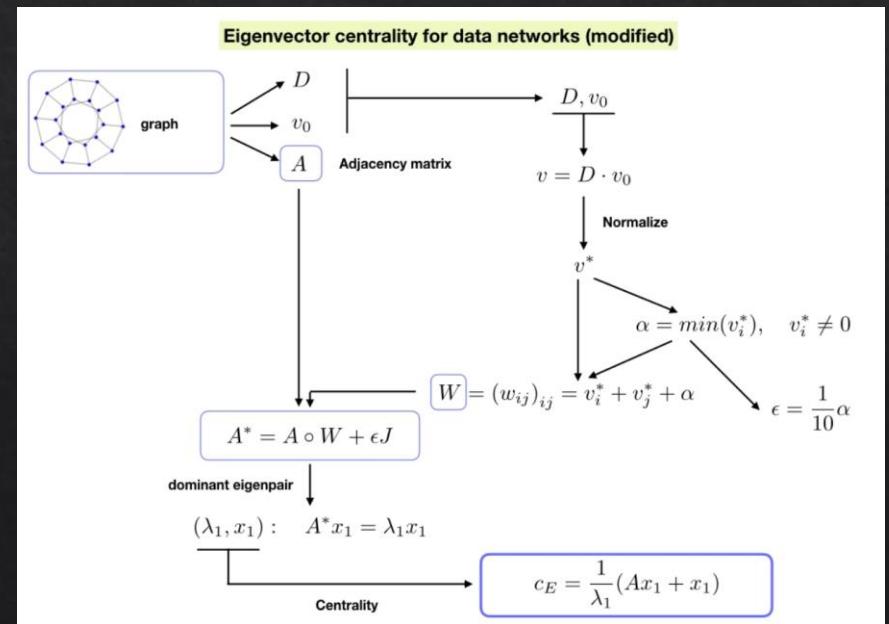
Datasets

- ❖ Data collected from College Football database at Sports-Reference
 - ❖ Eight seasons of data (2014-2021)
 - ❖ FBS schedule by year
 - ❖ FBS standings by conference
- ❖ Playoff teams from CFP official website

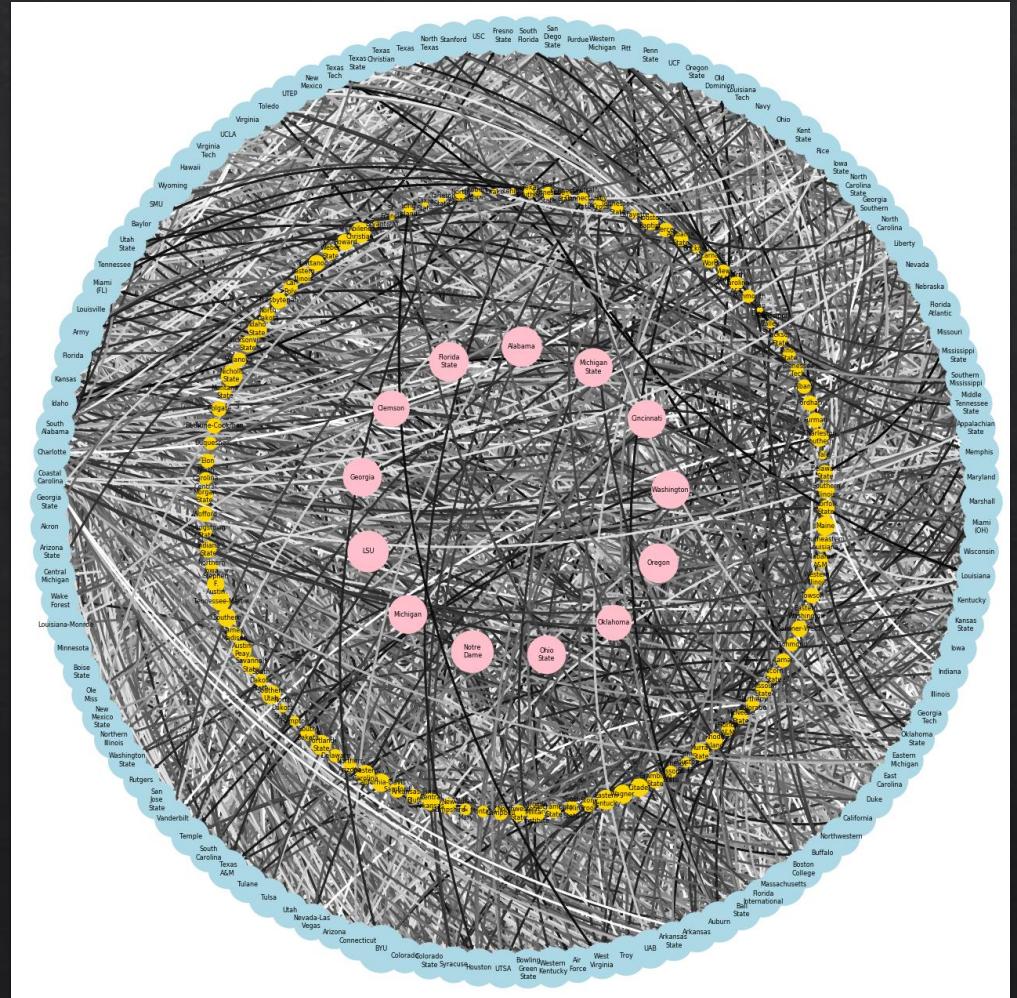
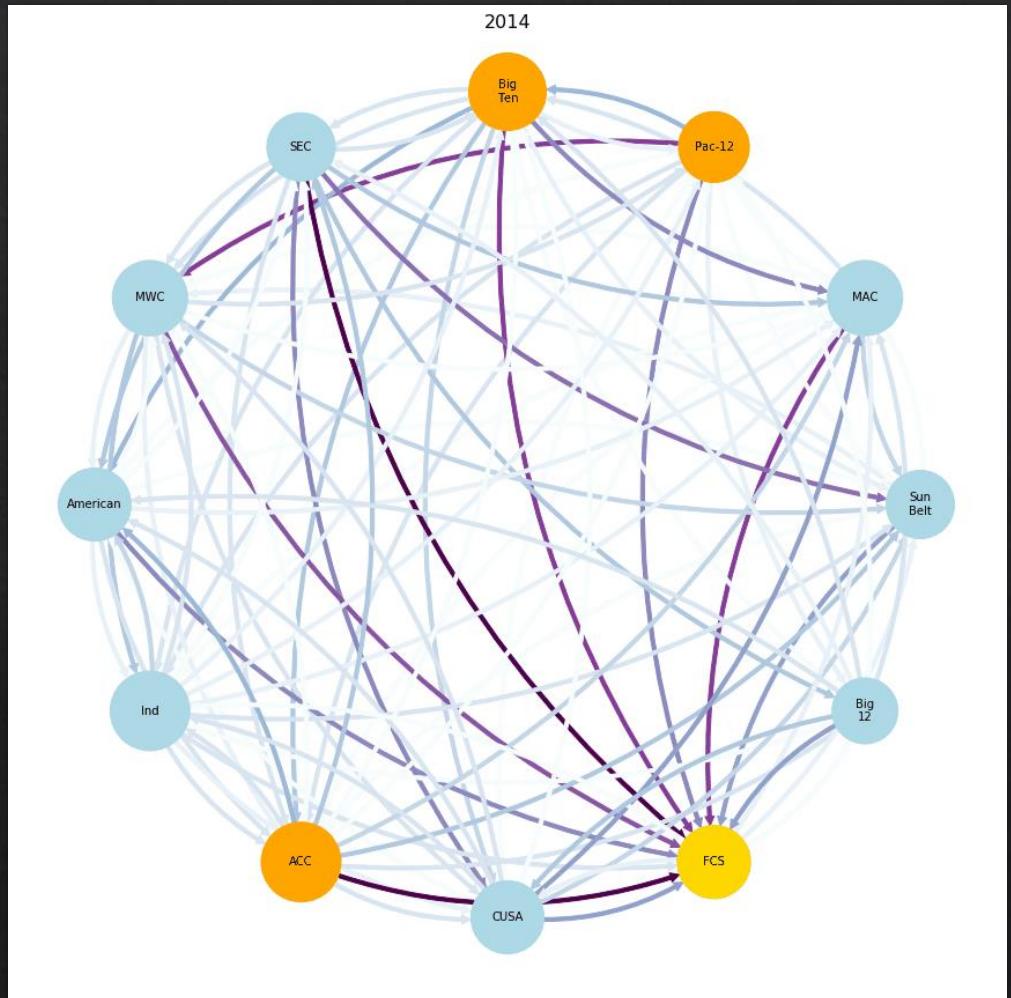
Season	# of Teams	# of Games
2014	128	868
2015	128	871
2016	128	873
2017	130	874
2018	130	884
2019	130	888
2020	130	570
2021	130	887
Total	1034	6715

Network Analysis Methodology

- ❖ Networks by year at team and conference level
 - ◊ Teams as nodes, games as edges
 - ◊ Directed from losing team to winning team (opposite at conference level)
- ❖ Centrality metrics on overall, eight season schedule
 - ◊ Degree
 - ◊ Betweenness
 - ◊ Closeness
 - ◊ Eigenvector
- ❖ Comparison of playoff and non-playoff schools

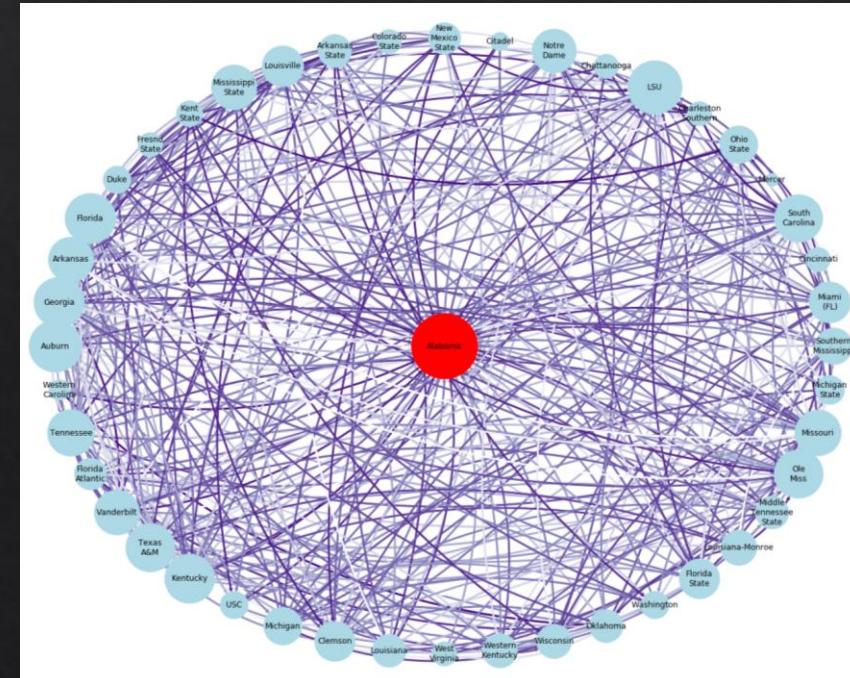
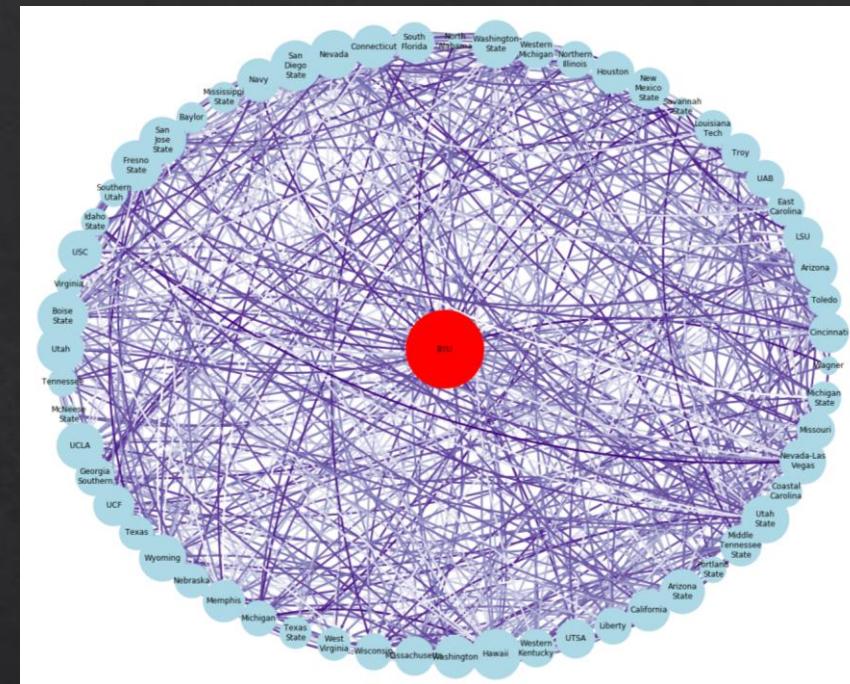
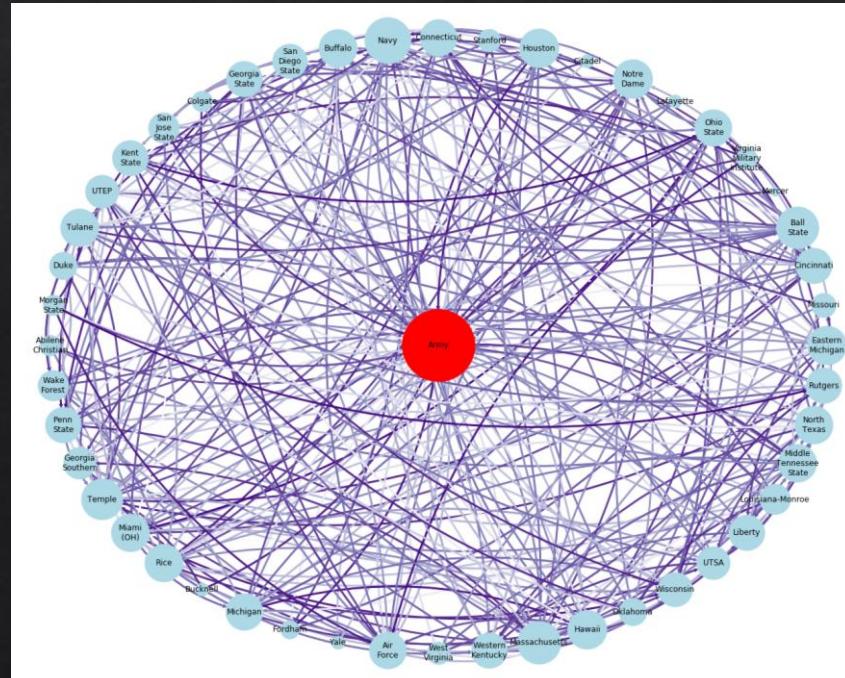


Network Analysis Visualizations



Network Analysis Visualizations

	Degree	Betweenness	Closeness	Eigenvector
Team #1	BYU	Army	BYU	Alabama
Team #2	Army	BYU	Alabama	Ohio State
Team #3	Massachusetts	Massachusetts	LSU	Notre Dame



Analysis, Results, and Findings

- ❖ “Most influential” school depends on metric
 - ❖ FBS independents (BYU, Army, Notre Dame, UMass)
 - ❖ “Elites” (Alabama, LSU, Ohio State, Clemson)
- ❖ Playoff teams average higher on all centrality metrics
 - ❖ Playoff teams are “more central” to FBS
- ❖ No notable insights at conference level

	Degree	Betweenness	Closeness	Eigenvector
Playoff	0.199359	0.005079	0.481904	0.139301
Non-Playoff	0.111440	0.004324	0.289716	0.038558

Conclusions

- ❖ New perspective on “central” and “influential” in FBS
 - ❖ Ego networks helpful for comparing different teams
- ❖ Major source of bias: Parallel edges
 - ❖ NetworkX cannot handle parallel edges (multi-directional graphs) in centrality metrics
- ❖ Future work
 - ❖ Role of past and future realignment
 - ❖ Include full schedule and standings for FCS as well
 - ❖ Centrality metrics with multi-directional graphs

References

- ❖ Auerbach, N., & Vannini, C. (2022, February 27). *Inside the college football playoff expansion breakdown: Pettiness, power struggles and indignation*. The Athletic. Retrieved April 16, 2022, from <https://theathletic.com/3142187/2022/02/25/inside-the-college-football-playoff-expansion-breakdown-pettiness-power-struggles-and-indignation/>
- ❖ Pedroche, F., Tortosa, L., & Vicent, J. F. (2019). An eigenvector centrality for multiplex networks with data. *Symmetry*, 11(6), 763. <http://dx.doi.org/10.3390/sym11060763>
- ❖ Sidearm Sports. (2019, May 22). *College football playoff history*. College Football Playoff. Retrieved April 16, 2022, from <https://collegefootballplayoff.com/sports/2019/5/22/history.aspx>
- ❖ Sports Reference LLC. (n.d.). *College Football Statistics and history: College football at sports*. Sports-Reference. Retrieved April 16, 2022, from <https://www.sports-reference.com/cfb/>
- ❖ Wissner-Gross, Z. (2021, November 2). *A 12-team college football playoff would be big enough ... 90 percent of the time*. FiveThirtyEight. Retrieved April 16, 2022, from <https://fivethirtyeight.com/features/a-12-team-college-football-playoff-would-be-big-enough-90-percent-of-the-time/>



FBS Networks in the College Football Playoff Era

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Background or Abstract

In 2014, the NCAA Division I Football Bowl Subdivision (FBS) began a new playoff format, the College Football Playoff (CFP). In the eight years since, five different teams have won, but only thirteen different teams have played in the Playoff, leading to discussions of expansion^{1,2,3}. This project examines the FBS during this era, at both the conference and team level, to uncover which team(s) have been most central to the FBS in this era.

Research Questions

- 1) Which team(s) are most important or influential to the FBS in the CFP era?
- 2) To what extent are playoff teams more central to the CFP era?

Related Research

FiveThirtyEight did an analysis of CFP field sizes by considering an optimized way of finding the “best” team in a season, which determined that 12 teams would be enough in most years². In February 2022, however, plans to expand the CFP to 12 teams fell apart with pushback from three conferences³.

Data

The data was collected from Sports-Reference’s College Football database and includes the FBS schedule and standings for eight seasons between 2014 and 2021⁴. Data was collected by copying the csv data from the standings and schedule page for each season into csv files. Overall, there are 1034 team seasons and 6715 games, for an average of 129 teams and 840 games per season.

Table 1: Metadata from the seasons in the dataset.

	Season	# of Teams	# of Games
2014	128	868	
2015	128	871	
2016	128	873	
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Total	1034	6715	

Preprocessing

Five steps were taken to preprocess the data before analysis or visualization:

1. Standardize team names across schedule/standings.
2. Remove AP rankings from team names in schedule.
3. Add conference affiliation to each team in schedule.
4. Add year for each game in schedule/team in standings.
5. Concatenate single dataframe for standings/schedule.

Later steps taken to create conference-based network visualizations:

1. Create empty adjacency matrix with conference rows and columns.
2. Iterate over schedule by game, increasing cell at index (winner, loser).
3. Reset diagonal to zero to ignore intra-conference games.

Table 2: The non-conference games adjacency matrix for the entire dataset, with winners by row and losers by column.

Winner	Sun Belt	MAC	Pac-12	Big Ten	SEC	MWC	American	Ind	ACC	CUSA	FCS	Big 12
Sun Belt	0	21	0	1	4	12	5	16	2	29	65	5
MAC	15	0	1	14	1	16	4	10	3	16	71	5
Pac-12	9	7	0	23	5	53	3	18	11	9	54	10
Big Ten	12	59	25	0	14	26	22	18	29	23	41	14
SEC	52	25	7	21	0	16	22	18	45	51	94	21
MWC	19	15	27	1	4	0	14	36	5	16	71	0
American	19	15	6	8	9	11	0	21	21	31	69	7
Ind	16	19	18	10	6	29	27	0	34	27	37	3
ACC	20	27	2	19	35	4	33	25	0	32	103	11
CUSA	27	28	0	3	5	8	18	21	5	0	83	1
FCS	8	8	4	2	3	7	6	7	3	8	0	5
Big 12	7	9	18	9	18	7	23	6	8	29	55	0

Methods or Analysis

To analyze and explore this dataset, I relied on network analysis using the NetworkX package in Python, with a focus on centrality measures for various data subsets.

$$C(u) = \frac{n-1}{\sum_{v=1}^{n-1} d(v, u)}$$

$$c_B(v) = \sum_{s, t \in V} \frac{\sigma(s, t|v)}{\sigma(s, t)}$$

Figure 3: Formulas for Closeness and Betweenness centrality in NetworkX

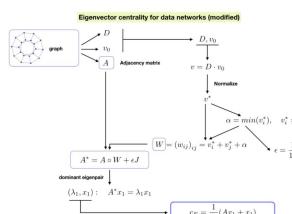


Figure 4: Eigenvector centrality⁵

Results

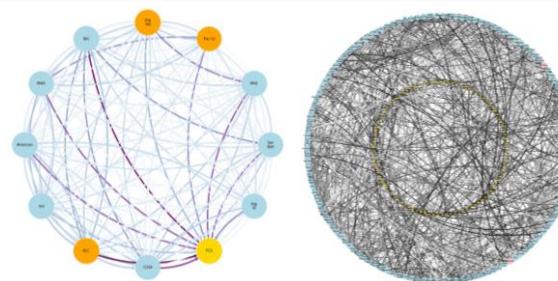


Figure 5: (a) The overall non-conference network. Orange indicates votes against playoff expansion, gold indicates FCS (no vote), (b) The schedule network for 2021. Playoff teams are shaded pink and FCS teams are shaded gold.

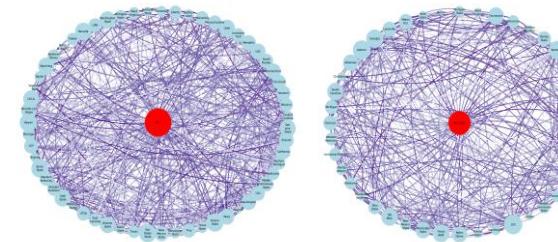


Figure 6: (a) BYU ego network (top degree/closeness centrality), (b) Alabama ego network (top eigenvector centrality)

	Degree	Betweenness	Closeness	Eigenvector
Playoff	0.199359	0.005079	0.481904	0.139301
Non-Playoff	0.111440	0.004324	0.289716	0.038558

Table 7: Average centrality scores for 13 schools that have made the playoff vs. all schools that have not.

	Degree	Betweenness	Closeness	Eigenvector
Team #1	BYU	Army	BYU	Alabama
Team #2	Army	BYU	Alabama	Ohio State
Team #3	Massachusetts	Massachusetts	LSU	Notre Dame

Table 8: The top 3 schools by each main centrality measure

Discussion

Understanding which team is “most influential” is metric dependent. The main FBS independents (BYU, Army, Massachusetts, Notre Dame) are central to the FBS in the era by playing more different teams over time. Conversely, Alabama has high rank by “influence” centrality metrics such as eigenvector centrality. Further, the average score across each centrality metric is higher for the 13 playoff teams than the non-playoff teams, suggesting that they are, in fact, more “central” to the CFP era. However, these metrics are predicated on ignoring the “parallel edges” from multiple games between two teams, a major source of bias.

Conclusion

Though there is much analysis of the FBS during the CFP era from various perspectives, little to none of it takes a network analysis perspective to the topic. This perspective allows for new analysis of centrality and communities in the FBS, for the purposes of understanding influence and importance for teams.

Future Work

- I. Consider future realignment beginning with 2022-2023 season.
- II. Community detection analysis at the team and conference level in expansion context.
- III. Expand analysis to include Football Championship Subdivision (FCS) teams.
- IV. Measure centrality metrics when including parallel edges.

References

1. Sidearm Sports 2019 College Football Playoff
2. Wissner-Gross 2021 FiveThirtyEight
3. Auerbach et al. 2022 The Athletic
4. Sports-Reference n.d. College Football Reference
5. Pedroche et al. 2019 Symmetry