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NCAA college football pseudo-playoff non-conference games scheduling via constraint and Integer Programming

Craig Stevens
University of Arkansas, Fayetteville

NCAA College Football Pseudo-Playoff Non-Conference Games Scheduling via Constraint and Integer Programming

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By

Craig J Stevens

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Advisor: Dr. Chase Rainwater

Reader: Dr. C. Richard Cassady

Abstract

NCAA Division I-A College Football post-season play is currently determined by a controversial BCS Bowl system. Due to the massive differences in compensation for playing in differing bowl games, heated debates arise every year as to who deserves places in the prestigious BCS bowl games. Without a round-robin approach, in which every team plays every other, there would be no absolute measure of which teams deserve BCS births. We developed a scenario involving a pseudo-playoff system to be implemented at the end of regular season conference play to create unique matchups to increase comparisons of teams across the nation. The system was modeled twice, once using Integer Programming techniques and again with Constraint Programming techniques. Instances of the two models were implemented on the 2010 NCAA football season and compared on their performance. Lastly, we discussed how certain matchups of the resulting solutions would have affected the outcomes of the season and perhaps the assignment of post-season bowl games.

1 Introduction

1.1 Project Background/Motivation

NCAA Division I-A College Football is America's most watched, most popular, most profitable, and largest group of inter-collegiate athletic programs, Ryan [7]. While it is on a smaller scale than professional sports such as the National Football League (NFL), National Basketball Association (NBA), or Major League Baseball (MLB), college football has more attendance, more advertisement, more involvement, and more revenue/expenses than any other NCAA sport. Being the largest isn't always a good thing. There is a lot of controversy, as many people have vested their interest and money into such programs.

Division I-A NCAA football is one of the few collegiate programs that doesn't have a post-season playoff system. Instead, they have adopted a system of post-season bowl games in which teams are invited to play based on certain criteria and match-up potential. Teams compete during the regular season to prove their worth and earn a bid into a bowl game. Requirements of all bowl games are at least 6 regular season wins with a winning record at the end of the season.

Currently, there are 35 Bowl games, 5 of which are considered to be in the Bowl Championship Series (BCS). Each bowl has matchups of varying opponent caliber, with the 5 BCS bowls having the matchups of the "best" teams in the country. The BCS includes The Fiesta Bowl, The Orange Bowl, The Rose Bowl, The Sugar Bowl, and the BCS National Championship Bowl. The BCS has its own system for ranking teams based on their regular season performance and selecting who will play for the prestigious BCS National Championship Bowl and earn the title of National Champions.

Earning a bid into a bowl game not only allows your season to continue and play for a bowl trophy but also ensures payouts of millions of dollars to your university. BCS bowl games

pay close to $18 million, while other bowl games pay anywhere from $3 million to only $400,000, BCS [5]. One regular season game can have significant financial impacts on an institution. This is a large source of the controversy over the bowl system. Almost every year that the BCS has been in effect, debates have existed regarding one team deserving a spot in a bowl more than another. Disagreements have intensified over the years. Prominent University officials have even suggested the elimination of the BCS to move to a playoff system similar to that of NCAA Basketball's "March Madness."

Both sides have their advantages over the other. The BCS system offers 35 bowl games and gives 70 of the 120 Football Bowl Subdivision (FBS, Division I-A) a chance to end their season with a win in a bowl game, something that most teams seem to take for granted. A playoff system would add up to 4 games onto an already lengthy season of one of the most, if not the most, dangerous sports out there today. A key thing to remember is that players on these college football teams are student-athletes, student coming first. A playoff system would be adding more games that would need to be fit into an already demanding academic calendar. Advocates of the playoff scenario have many convincing arguments as well. No one can argue that "March Madness" isn't the highlight of college basketball and it would be easy to see how such enthusiasm could be carried over to a similar set-up for football.

1.2 Literature Review

Constraint programming is a relatively new "reasoning and computing" technique that deals with constraining on the combination of variable domains, rather than variable values, Apt [1]. Problems that work well with constraint programming are those that deal with a set of rules or general properties in which constraints are modeled by means of relationships. Constraint

programming has already been successfully applied for many optimization problems, especially scheduling problems in particular, Apt [1]. Apt [1] and Hentenryck [3] present guides to the constraint programming methodology in terms of a basic background of the language, various examples of sample problems, and in-depth analysis of solving procedures. Benefits of using constraint programming lie in its ease of development, as constraints can be designed as general rules instead of specifying the constraint to all possible variables.

Applying constraint programming to a football playoff scenario will prove difficult without some way of ranking teams based on a predetermined set of past performances. The current college football ranking system is that of a poll, where certain people vote on who are the best teams. Cassady, Maillart, and Salman [2] and Coleman [3] both present models in which teams are mathematically compared in order to give a less subjective process of ranking teams. Coleman [3] uses the goal of retrodictive accuracy, or minimizing the number of occurrences where a winning team was ranked lower than the losing team in a matchup. Cassady, Maillart, and Salman [2] use an genetic algorithm (GA) approach to optimize rankings based on margin of victory, the location of games (home or away), and the dates of the games (early or late in the season). The GA was used, discussed in this study later, to give meaningful rankings based on a specific scenario that could not be covered using the poll system implemented today.

1.3 Problem Definition

Rather than trying to create a completely new playoff system, in this study, the existing BCS system will be modified to adopt some of the bettering qualities that a playoff system does offer. The regular season would be slightly modified for teams in the FBS. Teams would play all of their conference games first, which for most teams is 8 games. Since they are determined

solely on conference matchups, the Conference Championship games can also be played in the following week, although this is not required. This schedule would allow for two additional non-conference games to be played at the end of the season. As discussed in this work, there are a number of compelling objectives that might be considered when determining these matchups. In the proposed system, teams would play teams from other conferences to force matchups that would allow for comparisons that otherwise would not occur. Similar to a playoff, some teams would have to prove their worth by playing teams of higher caliber; while others would be rewarded for having a tough regular season by playing lesser opponents. However, teams would be guaranteed to play two games instead of being sent home after a first round loss. This pseudo-playoff system would assign matchups, based on certain criteria that we will discuss with the main goal being to increase comparisons between conferences and undefeated teams. After the regular season and this two game non-conference playoff, the BCS system of ranking and bowl assignment could be carried on as usual.

The problem description described previously was modeled mathematically using two separate techniques: (i)Mixed-Integer Programming (MIP) and (ii) Constraint Programming (CP). Performance of the models, as well as the solutions obtained, will be compared and contrasted to obtain a better understanding of the differences between the two approaches.

2 Model Formulation

The model has numerous data sets and parameters that must be taken into account. These include the:

- set of all teams to be considered for play in the playoffs, Teams;
- set of opponents that a team played in the regular season, Previous;

- set of teams belonging to the same conference, Conference;
- ranking of each team, Ranking;
- strength of schedule of each team's regular season, Regular;

all of which indexed by *i*. The pseudo-playoff system is intended for two weeks of non-conference matchups, therefore there are two weeks of games for the model to schedule. Each team must play in a game each week, thus partitioning the system into two decisions. The matchups will be assigned for both weeks *simultaneously* in order to take advantage of the larger solution space.

2.1 Mixed-Integer Program (MIP)

2.1.2 MIP Decision Variables

The MIP model was formulated based on two sets of binary decision variables; one representing whether a team plays another team in a certain week of the pseudo-playoffs at home and the other representing whether a team plays another team away. Specifically, let

$$home_{i,j,k} = \begin{Bmatrix} 1\ if\ team\ i\ plays\ team\ j\ in\ week\ k\ at\ home \\ 0\ Otherwise \end{Bmatrix}$$

$$away_{i,j,k} = \begin{Bmatrix} 1\ if\ team\ i\ plays\ team\ j\ in\ week\ k\ at\ away \\ 0\ Otherwise \end{Bmatrix}.$$

2.1.3 MIP Constraints

Basic constraints are formulated to enforce necessary game assignment restrictions. For example a team is not allowed to play itself. Also, if one team is assigned a matchup, the other team must be assigned the same matchup. Other constraints restrict whether or not the teams are allowed to play each other. Two teams *cannot* play in the pseudo-playoffs if they

- have already played in the regular season;
- arein the same conference, as that would defeat the purpose of the system.

The last constraints ensure that the structure of the system stays intact. Specifically, teams must play once and only once each week and play different opponents each week.

IP Model Constraints:

$$home_{i,j,k} = 0 \qquad \forall\, k \in weeks, i \in teams, j \in teams \mid i = j \qquad (1)$$

$$home_{i,j,k} = 0 \qquad \forall\, k \in weeks, i \in teams, j \in teams \mid i = j \qquad (2)$$

$$home_{i,j,k} = away_{j,i,k} \qquad \forall\, k \in weeks, i \in teams, j \in teams \qquad (3)$$

$$away_{i,j,k} = home_{j,i,k} \qquad \forall\, k \in weeks, i \in teams, j \in teams \qquad (4)$$

$$\sum_{j \in Previous_i} \sum_{k \in weeks} home_{i,j,k} + \sum_{j \in Previous_i} \sum_{k \in weeks} away_{i,j,k} = 0 \quad \forall\, i \in teams \qquad (5)$$

$$\sum_{j \in Conference_i} \sum_{k \in weeks} home_{i,j,k} + \sum_{j \in Conference_i} \sum_{k \in weeks} away_{i,j,k} = 0 \quad \forall\, i \in teams \qquad (6)$$

$$\sum_j \left(home_{i,j,k} + away_{i,j,k}\right) = 1 \qquad \forall\, i \in teams, k \in weeks \qquad (7)$$

$$\sum_k \left(home_{i,j,k} + away_{i,j,k}\right) \leq 1 \qquad \forall\, i \in teams, j \in teams, k \in weeks \qquad (8)$$

$$home_{i,j,k} + home_{j,i,k} \leq 1 \qquad \forall\, i \in teams, j \in teams, k \in weeks \qquad (9)$$

$$away_{i,j,k} + away_{j,i,k} \leq 1 \qquad \forall\, i \in teams, j \in teams, k \in weeks \qquad (10)$$

Constraint (1) and (2) ensure that a team doesn't play itself in any week. Constraint (3) and (4) require that if team *i* is going to play team j in either week then team j must also play team i in that same week. Constraint (5) sums across all teams in the set $Previous_i$ (the teams that team *i* played in the regular season) and negates any assignment between those teams and team *i* in any week. Constraint (6) is similar to (5) except instead sums across the set

Conference$_i$ (the teams that are in team *i*'s conference). Constraint (7) guarantees that team *i* will play 1 and only 1 game against all possible opponents in each week. Constraint (8) states that the maximum number of times that team *i* can play team *j* in both weeks is one. In other words, team i can only play team j once, independent of which week or home or away. Finally, Constraints (9) and (10) are required due to the nature of the decision variables and ensure that if two teams play each other, they both can't play at home at the same time nor can they both play away.

2.2 Constraint Program (CP)

2.2.1 CP Decision Variables

The CP formulation differs from the MIP model due to the inherent differences between Constraint and Integer modeling techniques. Instead of having binary variables for all possible combinations of teams in all possible weeks, the constraint program variables correspond to the actual games to be played. These game variables are created with a finite domain of all of the teams included in the system. The value of the variables upon solution represents which team is playing in a particular game. In this model, there are two sets of variables; one representing the home teams in each game, for each week, and one representing the away teams.

$$home_{k,j} = \{Team\ playing\ at\ home\ in\ game\ j\ in\ week\ i\}, \qquad home_{k,j} \in \{1, \cdots, n\}$$

$$away_{k,j} = \{Team\ playing\ at\ home\ in\ game\ j\ in\ week\ k\}, \qquad away_{k,j} \in \{1, \cdots, n\}$$

The same set of 2 weeks is present, indexed by *k* in this CP model however there is now a set of games each week, indexed by *j*, which represents the second dimension of the variable arrays (58 games each week).

2.2.3 CP Constraints

Constraints restrict the domain of the variables to represent the allowed matchups and allowed structure of the playoff system. Because the variables are domain variables and not binary variables, some types of constraints can be intuitively left out of the model; for example, the $home_{k,j}$ variable can only hold one value, thus there is no need to ensure that only one team is the home team for each game as was required in constraint (9) in the MIP formulation.

CP Formulation Constraints:

$$\{home_{k,j}, away_{k,j}\} \subseteq Combinations \qquad \forall\, k \in weeks, j \in gamesEachWeek \tag{11}$$

$$\{home_{k,1} \neq \cdots \neq home_{k,n} \neq away_{k,1} \neq \cdots \neq away_{k,n}\} \quad \forall\, k \in weeks \tag{12}$$

$$\begin{Bmatrix} \{home_{0,i} = home_{1,j}\} \Longrightarrow \{away_{0,i} \neq away_{1,j}\} \\ \{home_{0,i} = away_{1,j}\} \Longrightarrow \{away_{0,i} \neq home_{1,j}\} \\ \{away_{0,i} = away_{1,j}\} \Longrightarrow \{home_{0,i} \neq home_{1,j}\} \\ \{away_{0,i} = home_{1,j}\} \Longrightarrow \{home_{0,i} \neq away_{1,j}\} \end{Bmatrix} \tag{13}$$

$$\forall\, i \in gamesEachWeek, j \in gamesEachWeek$$

Constraint set (1) model restrict only the allowable combinations of teams; namely, the matchups that haven't occurred in regular season, aren't within the same conference, and aren't the same team. *Combinations* is the set of possible matchups that don't violate those three criteria. Rather than explicitly stating which teams cannot play each other, the constraint instead ensures that matchups will only be made if they are included in the *Combinations* subset. Only the home and away team matchups that are included in *Combinations* are allowed to be assigned to a specific game.

Constraint (2) requires that all the values of both the $home_{k,j}$ and $away_{k,j}$ variables be different for each week. By definition of the variables, this ensures that each team plays once each week and only once. There are exactly enough game variables each week for each team to play; thus, forcing all values to be different, forces one game variable to take on a value for each team.

Constraint set (3) represents a group of If-Then constraints, something that is relatively difficult to model in MIPs without the introduction of a constraints pairs and so-called big-M values. They are modeled such that IF the left side logical statement is true, THEN implement the constraint on the right side. These constraints ensure that the opponent of a team in the first week is different than the opponent of that team in the second week.

2.3 Objective Functions

Limiting which teams can play which is not enough to set up a playoff system. Certain objectives need to be established in order to pick meaningful matchups. In this study, three unique objectives were considered and each modeled in both formulations.

2.3.1 Objective 1

The first objective was based on a more traditional bracket system, in which higher seeded or ranked teams play lower seeded or ranked teams. For example, in a 16 team bracket, the #1 seed team would play #16, #2 would play #15, and so on. Mathematically, this ensures that the sum of the two teams rankings all equal the number of teams plus 1 (i.e. 1 + 16 = 17, 2 + 15 = 17, etc.). For this first objective, the decision variables were constrained in order to minimize the deviation from this scenario, without breaking any of the previous constraints.

That is, let $r[i]$ = ranking of team i. Then, our object if to

$$min \sum_{j \in gamesEachWeek} abs\left(K - (r[i_j] + r[i'_j]\right)$$

where

$$K = max_{i \in teams} r[i] + min_{i \in teams} r[i]$$

and$i_j$and i'_j are the two teams that play in game j.

2.3.2 Objective 2

The second objective was based on the fact that not every team has to play the same caliber of opponents during the regular season. There is evidence to say that some conferences are tougher to play in than others, as 11 of the final top 25 from last years' season were from either of these conferences, ESPN [6]. Objective 2's goal then would strive towards all teams playing a certain amount of games against opponents in some top echelon. In this study, the objective attempts to maximize the number of teams that have played at least 4 games against teams in the top 25.

$$max \sum_{i \in teams} play^{25}[i]$$

Where $play^{25}[i] = 1$ if team i plays at least 4 games against top 25 teams in the season (including games not scheduled by our model) and 0 otherwise.

2.3.3 Objective 3

The third objective furthers objective 2, by looking at the team's strength of schedule. The more difficult opponents that a team has played the greater their strength of schedule would be. Ideally, all teams would have identically difficult schedules. This would eliminate one of

the variables between teams and make comparing teams easier. Objective 3's goal is to minimize the difference between all team's strength of schedule at the end of the two playoff weeks. The two opponents that a team plays in these two weeks will add to their regular season strength of schedule (more for stronger opponents, less for weaker), thus allowing all teams' schedule strength to be normalized.

$$\min \sum_{i \in teams} \sum_{j \in teams} abs(strength[i] - strength[j])$$

Where *strength[i]* is the strength of team *i*'s schedule, including the games played in the regular season and the scheduled games of the two playoff weeks.

3 Experimentation

3.1 Data and Parameters

To demonstrate the model, as well as the proposed pseudo-playoff system, we use data from the 2010-11 NCAA Division I-A football season. This subset of all college football teams delimits the 120 teams that are apart of, and influenced by, the BCS bowl system. These teams played games against each other beginning on September 2, 2010 and ending with the conclusion of the BCS National Championship on January 10, 2011.

The purpose and intended use of this model is to determine a two-game pseudo-playoff system that would be implemented after teams have played all of their conference games in the first 8-10 weeks. In order to simulate this scenario, non-conference games were removed from the data set, as well as all of the post-season Bowl games and Conference Championship games. Army, Navy, and Notre Dame are independent of conference play and therefore were removed from consideration in our scenario. In order to rebalance the number of teams back to an even number to create an even number of matchups, Buffalo, being the team ranked last in the nation,

was also removed from the scenario. Remaining was a list of all conference matchups and their outcomes from the 2010 season. This data can be used to create the set of teams, the set of opponents each team has played, and the conference of each team. The only data set that is missing is the rankings of each team. After 8-10 weeks, teams would have finished their regular season, having played 8-9 games (with a bye week), and would be awaiting the announcement of the Week 11 and Week 12 matchups for the pseudo-playoff. Various sources and polls would have ranked the teams in order of the best team in the country to the worst. Unfortunately, such rankings don't exist as this scenario doesn't exist. To circumvent this problem, Cassady's [1] Customizable Quadratic Assignment Sports Team Ranking system was used. This model takes user inputs on various parameters as well as (more importantly to this study) a customizable list of played games and uses a genetic algorithm (GA)to assign a ranking value to each team involved. The different parameters assign values for certain model variables: weight of overtime scores, upper limit on margin of victory, weight of home vs. away victories, and weight of games later in the season. The list of conference games considered in our scenario was given to this model. The GA provides the would-be rankings of all 120 (116 in our scenario) Division I-A teams at the end of the proposed 'regular' season to be used by our model. The table below shows a subset of those rankings:

Ranking	Team	Ranking	Team	Ranking	Team
1	Oregon	11	OhioState	21	Arkansas
2	Auburn	12	NorthernIllinois	22	Missouri
3	VirginiaTech	13	Toledo	23	LouisianaState
4	TexasChristian	14	Utah	24	FloridaInternational
5	Stanford	15	Miami(Ohio)	25	Tulsa
6	MichiganState	16	TexasA&M	26	OklahomaState
7	Wisconsin	17	CentralFlorida	27	SouthernMethodist
8	Nevada	18	Oklahoma	28	FloridaState
9	Hawaii	19	Troy	29	Nebraska
10	BoiseState	20	Connecticut	30	Alabama

3.2 Computer Specifications and Software

The model was formulated as both an MIP and a CP using Microsoft Visual Studio. C++ was used as the programming language medium to call the CPLEX and CPOPTIMIZER environments, respectively. All scenarios of both formulations were ran on a personal computer with a 1.8GHz Intel Core 2 Duo processor and 2.0GB of RAM.

3.3 Results

Both the MIP and CP models were tested using the same set of input data, over all three objectives. Time limits of 1800 seconds were set on the model as optimal solutions were unable to be found due to the size of the problems.

3.3.1 Objective 1 Results

Again, Objective 1's goal was to minimize the deviation from a perfect bracket system. Below are the results for both the MIP and CP solution.

MIP

Objective Value of MIP: 4300			
Team	**Rank**	**Team**	**Rank**
Auburn	2	MichiganState	6
Nevada-LasVegas	91	Florida	67
Washington	56	Baylor	65
Alabama	30	Tennessee	82
Arkansas	21	AirForce	43
BowlingGreenState	99	TexasA&M	16

High ranked teams Auburn and Michigan State are rewarded for their regular season success with easier matchups during the playoff weeks. Florida and UNLV are granted a last

chance to prove their worth and upset a higher ranked opponent to move up the rankings late in the season and improve their bowl chances, when they otherwise would be out of the running. Middle of the road teams like Alabama and Baylor get matched up with teams similar to their ranking in order to create fair games.

CP

Objective Value: 3566			
Team	**Rank**	**Team**	**Rank**
Tulane	90	WesternKentucky	102
Arkansas	21	TexasA&M	16
Louisiana-Lafayette	77	Rutgers	101
TexasChristian	4	Stanford	5
Temple	50	Syracuse	51
NorthCarolina	52	SouthernCalifornia	46

Likewise to the MIP solution, higher ranked teams like Texas Christian (TCU) and Stanford were rewarded for their success during the regular season with easier matchups against lower ranked teams. Correspondingly, Louisiana-Lafayette and Rutgers were given chances to upset a top ranked team in order to move up in the standings late in the season. Middle of the road teams Southern California (USC) and Syracuse played each other in what could be a tough competitive matchup.

The CP solution represents a lower objective function value of 3566 over the MIP solution value of 4300. Given the same time limit, the CP found an overall better solution according to this objective, although both solutions presented many meaningful matchups.

(See Appendix 5.2 for a full list of results).

3.3.2 Objective 2 Results

This objective was to maximize the number of teams that have played four games against teams who are in the top 25. The four games could come from the regular season or from the two playoff weeks.

CP

Objective Value: Maximum Number of teams who have played 4 top 25 teams: 38					
Team	**Rank**	**Previous**	**Team**	**Rank**	**Previous**
FloridaInternational	24	1	FloridaState	28	0
Hawaii	9	2	Utah	14	1
PennState	55	2	NewMexicoState	108	3
EasternMichigan	96	3	NorthCarolina	52	1
OklahomaState	26	2	LouisianaTech	61	3
Iowa	47	3	MississippiState	49	3

Teams such as Mississippi State and Oklahoma State are both in conferences in which many of the top 25 teams are from. They had to play those top teams during the regular season, and thus should not have to play top teams during the playoff weeks. They instead play against other teams who have tough conference play, Iowa and Louisiana Tech. They all get the chance to prove that they are worthy teams and just happen to play in elite conferences. On the other hand, high ranked teams like Hawaii and Utah have only played against two and one top 25 teams, respectively. They then are forced to play matchups against other high ranked teams Florida State and Florida International, in order to better judge their skills. These matchups try and balance the scale between teams who have and have not played against tough opponents.

(See Appendix 5.3 for a full list of results).

3.3.3 Objective 3Results

The third and final objective tested was one that attempted to normalize the strength of schedule of every team.

MIP

The MIP formulation of this objective function had to reduce to half its original size. Due to hardware and processor capabilities, the full set of constraints of this objective was unable to run. The CPLEX environment required more memory than was available. To compensate for this and not totally invalidate results, only home team strength of schedules were increased based on playoff matchups.

Objective Value of MIP: 15085.3			
Team	**Rank**	**Team**	**Rank**
Rutgers	101	BrighamYoung	38
Texas	98	Alabama	30
CentralFlorida	17	ArizonaState	59
Oklahoma	18	MississippiState	49
Vanderbilt	114	Utah	14
TexasTech	68	Stanford	5

Texas and Alabama are from the Big12 and SEC, respectively, both top football conferences that are home to many of the top echelon teams in the nation. To counter their tough regular season schedule, they are matched up against teams of lesser caliber and given a legitimate chance of saving their season with a few wins before it's over. Texas Tech and Vanderbilt are of a similar situation.

Stanford and Utah, not having a relatively tough regular season, play each other to test the validity of their high ranking.

CP

Objective Value: Total Difference b/w SoS: 20898.1			
Team	**Rank**	**Team**	**Rank**
TexasChristian	4	VirginiaTech	3
OklahomaState	26	Hawaii	9
Stanford	5	Auburn	2
Alabama	30	Rutgers	101
Florida	67	MiddleTennesseeState	39
ColoradoState	92	Texas	98

Texas Christian (TCU) is criticized every year for having a weak schedule, playing teams that don't hold up on the national scale. In this scenario, they would be forced to play a very tough Oklahoma State team, likewise giving Oklahoma State the chance to jump the ranks by exposing a possibly weaker TCU team. Similarly, Hawaii and Stanford, notorious for having weak schedules would play Virginia Tech and defending National champs Alabama. On the other hand, Florida and Texas are from football powerhouse conferences: the SEC and Big12. They've played against some of the best in the nation, just during the regular season. They, who have had sub-par performances in conference play, would play easier matchups to try and secure one or two more wins before the season is over.

(See Appendix 5.4 for a full list of results).

4 Conclusion

4.1 Summary

The intention of this study was to develop a playoff like system to add to the NCAA college football regular season that complements the existing post-season BCS. More than that, it was to compare and contrast the different modeling techniques of Linear Integer programming and Constraint programming. We present a general model, both MIP and CP, which gives

potential matchups to a two week pre-post-season pseudo-playoff system in which different objectives were in mind. The MIP model excelled by returning solutions with better objective function values within the time limits while the CP model excelled by creating models with fewer variables to potentially put less strain on a computing system. Both models gave solutions that would increase the comparisons of the conferences of the NCAA. Teams were rewarded for performing well in the regular season and playing tough opponents, while other teams were given final opportunities before the end of the season.

4.2 Future Work

Future work to this study would primarily lie in the objective functions. Objective 3, normalizing the strength of schedule, proved to be the most relevant of the three and provided the most meaningful matchups to the playoff weeks. Further research and development into better ways of calculation the strength of schedule values may prove to give better solutions.

Another possibility is to extend the model to take into account variables such as travel distance between teams, the size of the home team's stadium, prospective media coverage of the matchups, etc. Many such variables were dealt with in this model that would need to be if such a system was to be implemented into the NCAA.

4.3 References

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5 Appendix

Following is the various data from the model. 5.1 gives a list of all of the inputs that the model used to create its solutions. 5.2, 5.3, and 5.4 present the full solutions of both models for objectives 1, 2, and 3 respectively.

5.1 Input Data

Team ID	Team Name	Conference	Ranking	SoS	# Games
1	AirForce	7	43	445	8
2	Akron	6	105	512	7
3	Alabama	9	30	547	8
4	Alabama-Birmingham	5	76	496	8
5	Arizona	8	81	533	9
6	ArizonaState	8	59	511	9
7	Arkansas	9	21	500	8
8	ArkansasState	10	54	475	8
9	Auburn	9	2	500	8
10	BallState	6	93	401	7
11	Baylor	3	65	425	8
12	BoiseState	11	10	423	8
13	BostonCollege	1	83	470	8
14	BowlingGreenState	6	99	515	7
15	BrighamYoung	7	38	440	8
16	California	8	85	537	9
17	CentralFlorida	5	17	394	8
18	CentralMichigan	6	89	513	8
19	Cincinnati	4	88	445	7
20	Clemson	1	48	488	8
21	Colorado	3	100	470	8
22	ColoradoState	7	92	494	8
23	Connecticut	4	20	377	7
24	Duke	1	112	459	8
25	EastCarolina	5	37	512	8
26	EasternMichigan	6	96	518	7
27	Florida	9	67	434	8
28	FloridaAtlantic	10	72	493	8
29	FloridaInternational	10	24	445	8
30	FloridaState	1	28	443	8
31	FresnoState	11	40	453	8
32	Georgia	9	73	470	8
33	GeorgiaTech	1	62	455	8
34	Hawaii	11	9	422	8

35	Houston	5	60	475	8
36	Idaho	11	74	487	8
37	Illinois	2	63	407	8
38	Indiana	2	113	495	8
39	Iowa	2	47	503	8
40	IowaState	3	79	416	8
41	Kansas	3	107	521	8
42	KansasState	3	78	410	8
43	Kent	6	58	482	8
44	Kentucky	9	95	404	8
45	Louisiana-Lafayette	10	77	498	8
46	Louisiana-Monroe	10	53	474	8
47	LouisianaState	9	23	462	8
48	LouisianaTech	11	61	474	8
49	Louisville	4	69	426	7
50	Marshall	5	57	453	8
51	Maryland	1	44	399	8
52	Memphis	5	115	543	8
53	Miami(Florida)	1	35	500	8
54	Miami(Ohio)	6	15	393	8
55	Michigan	2	71	531	8
56	MichiganState	2	6	420	8
57	MiddleTennesseeState	10	39	460	8
58	Minnesota	2	86	560	8
59	Mississippi	9	109	520	8
60	MississippiState	9	49	516	8
61	Missouri	3	22	441	8
62	Nebraska	3	29	410	8
63	Nevada	11	8	421	8
64	Nevada-LasVegas	7	91	493	8
65	NewMexico	7	104	506	8
66	NewMexicoState	11	108	521	8
67	NorthCarolina	1	52	528	8
68	NorthCarolinaState	1	33	505	8
69	NorthernIllinois	6	12	430	8
70	NorthTexas	10	75	496	8
71	Northwestern	2	84	456	8
72	Ohio	6	34	383	7
73	OhioState	2	11	391	8
74	Oklahoma	3	18	462	8
75	OklahomaState	3	26	457	8
76	Oregon	8	1	400	8
77	OregonState	8	64	400	8
78	PennState	2	55	455	8
79	Pittsburgh	4	31	388	7
80	Purdue	2	103	495	8
81	Rice	5	66	524	8
82	Rutgers	4	101	458	7

83	SanDiegoState	7	42	444	8
84	SanJoseState	11	116	529	8
85	SouthCarolina	9	36	452	8
86	SouthernCalifornia	8	46	475	8
87	SouthernMethodist	5	27	445	8
88	SouthernMississippi	5	41	459	8
89	SouthFlorida	4	70	427	7
90	Stanford	8	5	457	9
91	Syracuse	4	51	408	7
92	Temple	6	50	407	7
93	Tennessee	9	82	389	8
94	Texas	3	98	557	8
95	TexasA&M	3	16	503	8
96	TexasChristian	7	4	406	8
97	Texas-ElPaso	5	80	420	8
98	TexasTech	3	68	512	8
99	Toledo	6	13	410	8
100	Troy	10	19	440	8
101	Tulane	5	90	563	8
102	Tulsa	5	25	420	8
103	UCLA	8	94	475	8
104	Utah	7	14	416	8
105	UtahState	11	97	510	8
106	Vanderbilt	9	114	430	8
107	Virginia	1	87	517	8
108	VirginiaTech	1	3	361	8
109	WakeForest	1	111	523	8
110	Washington	8	56	501	8
111	WashingtonState	8	110	501	8
112	WesternKentucky	10	102	523	8
113	WesternMichigan	6	45	371	8
114	WestVirginia	4	32	389	7
115	Wisconsin	2	7	415	8
116	Wyoming	7	106	508	8

5.2 Objective 2 Results

MIP Objective 1			
Objective Value of MIP: 4300			
Week 1		Week 2	
Team	Rank	Team	Rank
AirForce	43	AirForce	43
TexasA&M	16	Georgia	73
Arizona	81	Akron	105
ArkansasState	54	EastCarolina	37
ArizonaState	59	Alabama	30
Iowa	47	VirginiaTech	3
Arkansas	21	Arizona	81
BowlingGreenState	99	Syracuse	51
Auburn	2	ArizonaState	59
Nevada-LasVegas	91	BoiseState	10
BallState	93	Arkansas	21
EastCarolina	37	Baylor	65
Baylor	65	ArkansasState	54
Tennessee	82	Missouri	22
BostonCollege	83	Auburn	2
MississippiState	49	California	85
California	85	BallState	93
NewMexico	104	Virginia	87
CentralFlorida	17	BrighamYoung	38
Miami(Ohio)	15	Illinois	63
CentralMichigan	89	CentralFlorida	17
Utah	14	EasternMichigan	96
Cincinnati	88	CentralMichigan	89
WakeForest	111	Wisconsin	7
Clemson	48	Cincinnati	88
Alabama-Birmingham	76	SanJoseState	116
Colorado	100	Colorado	100
Purdue	103	Clemson	48
ColoradoState	92	ColoradoState	92
SanJoseState	116	Kansas	107
Connecticut	20	Connecticut	20
Wyoming	106	Miami(Florida)	35
Duke	112	Duke	112
Kansas	107	SouthCarolina	36
FloridaInternational	24	Florida	67
Vanderbilt	114	Michigan	71
FresnoState	40	FloridaAtlantic	72
Tulane	90	Iowa	47
Georgia	73	GeorgiaTech	62
GeorgiaTech	62	Vanderbilt	114
Houston	60	Hawaii	9

WashingtonState	110	NewMexico	104
Idaho	74	Houston	60
Kentucky	95	Nevada-LasVegas	91
Illinois	63	Idaho	74
Maryland	44	Louisiana-Lafayette	77
Indiana	113	Indiana	113
NorthCarolina	52	Washington	56
Louisiana-Lafayette	77	IowaState	79
BoiseState	10	Rice	66
Louisiana-Monroe	53	KansasState	78
Pittsburgh	31	Purdue	103
LouisianaState	23	Kentucky	95
Michigan	71	Alabama-Birmingham	76
LouisianaTech	61	Louisiana-Monroe	53
Memphis	115	Oregon	1
Marshall	57	LouisianaState	23
Stanford	5	TexasTech	68
Miami(Florida)	35	LouisianaTech	61
PennState	55	SouthFlorida	70
MichiganState	6	Marshall	57
Florida	67	OklahomaState	26
MiddleTennesseeState	39	Maryland	44
Wisconsin	7	Kent	58
Minnesota	86	Memphis	115
EasternMichigan	96	NewMexicoState	108
Missouri	22	Miami(Ohio)	15
Toledo	13	BostonCollege	83
Nebraska	29	MichiganState	6
WesternMichigan	45	Mississippi	109
Nevada	8	MiddleTennesseeState	39
Akron	105	Nevada	8
NewMexicoState	108	Minnesota	86
Mississippi	109	WakeForest	111
NorthCarolinaState	33	MississippiState	49
KansasState	78	OhioState	11
NorthernIllinois	12	Nebraska	29
SouthernCalifornia	46	Troy	19
NorthTexas	75	NorthCarolina	52
SouthCarolina	36	Ohio	34
Northwestern	84	NorthernIllinois	12
OregonState	64	Tulsa	25
Ohio	34	NorthTexas	75
TexasChristian	4	SouthernMethodist	27
OhioState	11	Oklahoma	18
FloridaAtlantic	72	SouthernMississippi	41
OklahomaState	26	Pittsburgh	31
FloridaState	28	Temple	50

Oregon	1	SanDiegoState	42
Rice	66	SouthernCalifornia	46
Rutgers	101	Stanford	5
IowaState	79	TexasChristian	4
SanDiegoState	42	Tennessee	82
Louisville	69	Northwestern	84
SouthernMethodist	27	Texas	98
Hawaii	9	Texas-ElPaso	80
SouthernMississippi	41	TexasA&M	16
WestVirginia	32	FloridaState	28
SouthFlorida	70	Toledo	13
UtahState	97	OregonState	64
Syracuse	51	Tulane	90
VirginiaTech	3	NorthCarolinaState	33
Temple	50	UCLA	94
UCLA	94	Louisville	69
Texas	98	Utah	14
Troy	19	PennState	55
Texas-ElPaso	80	UtahState	97
BrighamYoung	38	Rutgers	101
TexasTech	68	WashingtonState	110
Kent	58	FresnoState	40
Tulsa	25	WesternKentucky	102
Virginia	87	WesternMichigan	45
Washington	56	WestVirginia	32
Alabama	30	BowlingGreenState	99
WesternKentucky	102	Wyoming	106
Oklahoma	18	FloridaInternational	24

CP Objective 1 Results			
Objective Value: 3566			
Week 1		Week 2	
Team	Rank	Team	Rank
Louisiana-Lafayette	77	MiddleTennesseeState	39
TexasChristian	4	OklahomaState	26
Houston	60	FloridaInternational	24
BoiseState	10	TexasTech	68
Colorado	100	Louisiana-Monroe	53
EasternMichigan	96	Texas-ElPaso	80
Nevada	8	SouthernMethodist	27
OregonState	64	Cincinnati	88
FresnoState	40	Washington	56
Missouri	22	Nevada-LasVegas	91
WesternMichigan	45	LouisianaTech	61
NorthTexas	75	WakeForest	111
Alabama	30	BallState	93

Alabama-Birmingham	76	OhioState	11
GeorgiaTech	62	Toledo	13
ColoradoState	92	SanJoseState	116
Illinois	63	Alabama-Birmingham	76
FloridaState	28	Kent	58
Akron	105	NewMexicoState	108
SouthCarolina	36	Wisconsin	7
Mississippi	109	Michigan	71
ArizonaState	59	FresnoState	40
Virginia	87	Maryland	44
CentralFlorida	17	Baylor	65
BowlingGreenState	99	Connecticut	20
Tennessee	82	Marshall	57
Hawaii	9	Temple	50
Purdue	103	NorthCarolinaState	33
TexasTech	68	IowaState	79
Idaho	74	Clemson	48
Iowa	47	Tulsa	25
Memphis	115	Florida	67
Syracuse	51	UtahState	97
SouthernCalifornia	46	VirginiaTech	3
Tulane	90	FloridaState	28
Arkansas	21	Colorado	100
Troy	19	Nevada	8
WashingtonState	110	Virginia	87
Washington	56	ArkansasState	54
Michigan	71	Tennessee	82
Wyoming	106	ColoradoState	92
Nebraska	29	Pittsburgh	31
California	85	Mississippi	109
MississippiState	49	SanDiegoState	42
WestVirginia	32	EasternMichigan	96
Texas	98	Purdue	103
OhioState	11	Arkansas	21
Miami(Florida)	35	Idaho	74
Louisiana-Monroe	53	Rutgers	101
UtahState	97	Houston	60
Baylor	65	Texas	98
LouisianaState	23	CentralFlorida	17
CentralMichigan	89	Akron	105
SanDiegoState	42	Syracuse	51
VirginiaTech	3	Auburn	2
BrighamYoung	38	Wyoming	106
Kansas	107	BowlingGreenState	99
Maryland	44	Northwestern	84
NewMexico	104	CentralMichigan	89
OklahomaState	26	KansasState	78

Miami(Ohio)	15	MississippiState	49
NorthCarolinaState	33	WesternKentucky	102
Rutgers	101	Ohio	34
Stanford	5	Memphis	115
Utah	14	Arizona	81
Rice	66	Louisville	69
Wisconsin	7	SouthernMississippi	41
Florida	67	BostonCollege	83
MichiganState	6	NewMexico	104
BostonCollege	83	Iowa	47
Clemson	48	WashingtonState	110
EastCarolina	37	NorthCarolina	52
UCLA	94	MichiganState	6
MiddleTennesseeState	39	Hawaii	9
Oklahoma	18	California	85
Georgia	73	NorthernIllinois	12
SouthernMethodist	27	Georgia	73
Auburn	2	SouthFlorida	70
NewMexicoState	108	Miami(Florida)	35
NorthernIllinois	12	ArizonaState	59
WesternKentucky	102	SouthernCalifornia	46
TexasA&M	16	Indiana	113
Kentucky	95	SouthCarolina	36
Arizona	81	WesternMichigan	45
KansasState	78	Utah	14
Marshall	57	Oregon	1
IowaState	79	TexasA&M	16
LouisianaTech	61	AirForce	43
AirForce	43	Troy	19
PennState	55	Tulane	90
FloridaInternational	24	Miami(Ohio)	15
Vanderbilt	114	Kansas	107
Kent	58	Minnesota	86
SouthernMississippi	41	BrighamYoung	38
Pittsburgh	31	Duke	112
Texas-ElPaso	80	BoiseState	10
WakeForest	111	PennState	55
Cincinnati	88	GeorgiaTech	62
Oregon	1	TexasChristian	4
Minnesota	86	Kentucky	95
BallState	93	Nebraska	29
SanJoseState	116	Alabama	30
Temple	50	OregonState	64
NorthCarolina	52	Missouri	22
Indiana	113	Illinois	63
Louisville	69	EastCarolina	37
FloridaAtlantic	72	Vanderbilt	114

Toledo	13	Stanford	5
Nevada-LasVegas	91	WestVirginia	32
Northwestern	84	LouisianaState	23
Duke	112	NorthTexas	75
Connecticut	20	Oklahoma	18
Ohio	34	Rice	66
SouthFlorida	70	Louisiana-Lafayette	77
Tulsa	25	FloridaAtlantic	72
ArkansasState	54	UCLA	94

5.3 Objective 2 Results

CP Objective 2			
Objective Value: Maximum # of teams who play 4 top 25 team: 38			
Week 1		Week 2	
Team	Rank	Team	Rank
Cincinnati	88	NorthCarolinaState	33
SouthCarolina	36	BallState	93
Iowa	47	Miami (Ohio)	15
BostonCollege	83	EastCarolina	37
Nebraska	29	FloridaInternational	24
BowlingGreenState	99	Hawaii	9
BoiseState	10	Minnesota	86
Kansas	107	WesternKentucky	102
SouthernCalifornia	46	Vanderbilt	114
Miami (Ohio)	15	Toledo	13
KansasState	78	Texas	98
ArkansasState	54	Kentucky	95
Oklahoma	18	Miami (Florida)	35
WesternMichigan	45	Arizona	81
Temple	50	Temple	50
TexasA&M	16	NewMexico	104
PennState	55	Houston	60
EasternMichigan	96	Nevada-LasVegas	91
OhioState	11	LouisianaTech	61
NorthTexas	75	MississippiState	49
LouisianaTech	61	Oklahoma	18
NorthernIllinois	12	Alabama	30
Syracuse	51	Arkansas	21
Vanderbilt	114	Indiana	113
EastCarolina	37	BoiseState	10
ColoradoState	92	Louisville	69
Miami (Florida)	35	Nebraska	29
Akron	105	OregonState	64
WesternKentucky	102	Pittsburgh	31
Auburn	2	NewMexicoState	108
SouthFlorida	70	Kansas	107
MississippiState	49	WakeForest	111
FloridaState	28	ArkansasState	54
Minnesota	86	UtahState	97
NewMexicoState	108	NorthernIllinois	12
NorthCarolina	52	Oregon	1
Northwestern	84	Wyoming	106
Florida	67	California	85
BallState	93	BowlingGreenState	99
Maryland	44	Tulane	90
Illinois	63	Georgia	73

VirginiaTech	3	Michigan	71
Tennessee	82	Tulsa	25
Ohio	34	Idaho	74
Louisville	69	UCLA	94
Rice	66	TexasA&M	16
Memphis	115	FloridaState	28
UtahState	97	Utah	14
Kentucky	95	ArizonaState	59
FresnoState	40	OhioState	11
SouthernMississippi	41	NorthCarolina	52
Alabama	30	Ohio	34
AirForce	43	Mississippi	109
UCLA	94	Alabama-Birmingham	76
CentralFlorida	17	ColoradoState	92
Louisiana-Lafayette	77	KansasState	78
Tulsa	25	Syracuse	51
Kent	58	Auburn	2
Houston	60	AirForce	43
Stanford	5	Cincinnati	88
Nevada	8	TexasTech	68
Wisconsin	7	GeorgiaTech	62
LouisianaState	23	TexasChristian	4
WashingtonState	110	CentralMichigan	89
Arizona	81	WestVirginia	32
FloridaInternational	24	VirginiaTech	3
Michigan	71	LouisianaState	23
Marshall	57	Louisiana-Monroe	53
Oregon	1	Texas-ElPaso	80
Nevada-LasVegas	91	Nevada	8
OklahomaState	26	EasternMichigan	96
NewMexico	104	Purdue	103
Washington	56	CentralFlorida	17
Mississippi	109	Akron	105
GeorgiaTech	62	MichiganState	6
WestVirginia	32	Marshall	57
Wyoming	106	Connecticut	20
Hawaii	9	Colorado	100
OregonState	64	SouthernCalifornia	46
Indiana	113	Troy	19
Pittsburgh	31	NorthTexas	75
Toledo	13	Missouri	22
BrighamYoung	38	Baylor	65
Missouri	22	BrighamYoung	38
CentralMichigan	89	Rice	66
Clemson	48	Maryland	44
Georgia	73	SouthernMethodist	27
TexasTech	68	PennState	55

SouthernMethodist	27	WesternMichigan	45
Idaho	74	Illinois	63
Texas	98	SouthFlorida	70
MichiganState	6	Clemson	48
Rutgers	101	SouthernMississippi	41
Virginia	87	MiddleTennesseeState	39
Baylor	65	FresnoState	40
Troy	19	BostonCollege	83
Connecticut	20	SanJoseState	116
Alabama-Birmingham	76	Duke	112
Louisiana-Monroe	53	Kent	58
NorthCarolinaState	33	SouthCarolina	36
SanDiegoState	42	IowaState	79
WakeForest	111	Stanford	5
ArizonaState	59	SanDiegoState	42
FloridaAtlantic	72	Tennessee	82
Colorado	100	Northwestern	84
California	85	Rutgers	101
Texas-ElPaso	80	Wisconsin	7
Duke	112	Florida	67
Arkansas	21	Memphis	115
Tulane	90	FloridaAtlantic	72
SanJoseState	116	Washington	56
Purdue	103	Louisiana-Lafayette	77
Utah	14	WashingtonState	110
MiddleTennesseeState	39	Virginia	87
TexasChristian	4	OklahomaState	26
IowaState	79	Iowa	47

5.4 Objective 3 Results

MIP Objective 3			
Objective Value of MIP: 15085.3			
Week 1		Week 2	
Team	Rank	Team	Rank
Arizona	81	AirForce	43
Georgia	73	Miami(Florida)	35
ArizonaState	59	ArkansasState	54
MississippiState	49	SanDiegoState	42
BallState	93	BallState	93
Alabama-Birmingham	76	Arizona	81
Baylor	65	Baylor	65
Washington	56	PennState	55
BrighamYoung	38	BoiseState	10
Alabama	30	NorthernIllinois	12
California	85	BostonCollege	83
BostonCollege	83	Houston	60
CentralFlorida	17	CentralFlorida	17
Miami(Ohio)	15	Oklahoma	18
CentralMichigan	89	Cincinnati	88
Tulane	90	Minnesota	86
Clemson	48	Colorado	100
MiddleTennesseeState	39	CentralMichigan	89
Colorado	100	ColoradoState	92
Virginia	87	EasternMichigan	96
ColoradoState	92	Connecticut	20
Minnesota	86	Troy	19
Duke	112	Duke	112
Louisiana-Lafayette	77	California	85
Florida	67	Florida	67
TexasTech	68	Rice	66
FloridaState	28	FloridaAtlantic	72
OklahomaState	26	Michigan	71
FresnoState	40	FloridaInternational	24
NorthCarolinaState	33	Arkansas	21
Houston	60	Georgia	73
Temple	50	SouthFlorida	70
Idaho	74	GeorgiaTech	62
NorthTexas	75	Syracuse	51
Illinois	63	Hawaii	9
NorthCarolina	52	OhioState	11
Indiana	113	Illinois	63
NewMexico	104	Washington	56
IowaState	79	Indiana	113
GeorgiaTech	62	BowlingGreenState	99
Kansas	107	Iowa	47

WakeForest	111	FresnoState	40
KansasState	78	IowaState	79
Kent	58	ArizonaState	59
Kentucky	95	KansasState	78
ArkansasState	54	Marshall	57
Louisville	69	Kent	58
FloridaAtlantic	72	MississippiState	49
Marshall	57	Kentucky	95
SouthernCalifornia	46	Louisiana-Monroe	53
Maryland	44	Louisiana-Lafayette	77
Ohio	34	Idaho	74
MichiganState	6	LouisianaState	23
Toledo	13	Missouri	22
Mississippi	109	LouisianaTech	61
SanJoseState	116	Pittsburgh	31
Missouri	22	Maryland	44
FloridaInternational	24	EastCarolina	37
NewMexicoState	108	Miami(Ohio)	15
Memphis	115	TexasA&M	16
NorthernIllinois	12	MiddleTennesseeState	39
Nevada	8	NorthCarolinaState	33
Northwestern	84	Mississippi	109
Cincinnati	88	Memphis	115
OhioState	11	Nebraska	29
TexasChristian	4	SouthernMethodist	27
Oklahoma	18	Nevada	8
Connecticut	20	Wisconsin	7
Oregon	1	Nevada-LasVegas	91
Auburn	2	Tulane	90
OregonState	64	NewMexico	104
Louisiana-Monroe	53	Rutgers	101
PennState	55	NorthTexas	75
AirForce	43	Louisville	69
Purdue	103	Northwestern	84
BowlingGreenState	99	Alabama-Birmingham	76
Rutgers	101	Ohio	34
Texas	98	Alabama	30
SanDiegoState	42	OklahomaState	26
Miami(Florida)	35	Tulsa	25
SouthCarolina	36	OregonState	64
Nebraska	29	NorthCarolina	52
SouthernMethodist	27	Purdue	103
Pittsburgh	31	Texas	98
SouthernMississippi	41	SouthernCalifornia	46
WestVirginia	32	SouthCarolina	36
SouthFlorida	70	Stanford	5
Michigan	71	MichiganState	6

Syracuse	51	Temple	50
TexasA&M	16	SouthernMississippi	41
Tennessee	82	Tennessee	82
Iowa	47	Clemson	48
Texas-ElPaso	80	TexasChristian	4
LouisianaTech	61	Auburn	2
Troy	19	Texas-ElPaso	80
Arkansas	21	UtahState	97
Tulsa	25	Toledo	13
LouisianaState	23	Utah	14
UCLA	94	UCLA	94
EasternMichigan	96	Virginia	87
Utah	14	Vanderbilt	114
Stanford	5	TexasTech	68
UtahState	97	VirginiaTech	3
Nevada-LasVegas	91	Oregon	1
Vanderbilt	114	WakeForest	111
Rice	66	Akron	105
VirginiaTech	3	WashingtonState	110
BoiseState	10	Kansas	107
WashingtonState	110	WesternKentucky	102
WesternKentucky	102	SanJoseState	116
WesternMichigan	45	WesternMichigan	45
EastCarolina	37	BrighamYoung	38
Wisconsin	7	WestVirginia	32
Hawaii	9	FloridaState	28
Wyoming	106	Wyoming	106
Akron	105	NewMexicoState	108

CP Objective 3			
Objective Value: Total Difference b/w SoS: 20898.1			
Week 1		Week 2	
Team	Rank	Team	Rank
Indiana	113	NorthCarolina	52
Cincinnati	88	SouthernMississippi	41
OklahomaState	26	ColoradoState	92
ArizonaState	59	Temple	50
Minnesota	86	LouisianaTech	61
Arizona	81	Cincinnati	88
MississippiState	49	Nevada-LasVegas	91
Louisiana-Monroe	53	Texas	98
Oklahoma	18	MichiganState	6
SouthernMethodist	27	Miami(Florida)	35
WakeForest	111	Minnesota	86
Purdue	103	OregonState	64
VirginiaTech	3	TexasChristian	4

Hawaii	9	OklahomaState	26
Florida	67	Tulane	90
ColoradoState	92	WakeForest	111
NorthCarolinaState	33	Kent	58
Nevada-LasVegas	91	Rice	66
TexasA&M	16	Tulsa	25
Toledo	13	Stanford	5
Mississippi	109	WesternKentucky	102
WesternKentucky	102	California	85
Georgia	73	Missouri	22
FloridaInternational	24	Alabama-Birmingham	76
Stanford	5	Connecticut	20
Alabama	30	Oregon	1
Kentucky	95	FloridaAtlantic	72
EastCarolina	37	Arizona	81
BostonCollege	83	PennState	55
Kansas	107	BowlingGreenState	99
Louisville	69	Tennessee	82
Ohio	34	Utah	14
NewMexico	104	NorthernIllinois	12
Colorado	100	Troy	19
FresnoState	40	Memphis	115
MichiganState	6	SouthernCalifornia	46
TexasChristian	4	FloridaInternational	24
SanJoseState	116	Toledo	13
FloridaState	28	Miami(Ohio)	15
Idaho	74	Washington	56
Duke	112	TexasTech	68
ArkansasState	54	SouthFlorida	70
Missouri	22	Vanderbilt	114
SouthFlorida	70	TexasA&M	16
BallState	93	Ohio	34
LouisianaTech	61	SanDiegoState	42
Oregon	1	Virginia	87
BoiseState	10	Wyoming	106
Rice	66	Iowa	47
UCLA	94	Maryland	44
TexasTech	68	Purdue	103
Temple	50	CentralFlorida	17
NewMexicoState	108	GeorgiaTech	62
Syracuse	51	Akron	105
NorthCarolina	52	NorthTexas	75
Texas-ElPaso	80	NewMexicoState	108
Nevada	8	Mississippi	109
Kent	58	EasternMichigan	96
KansasState	78	Florida	67
Arkansas	21	Louisville	69

BowlingGreenState	99	Louisiana-Monroe	53
Louisiana-Lafayette	77	SanJoseState	116
Illinois	63	Arkansas	21
Vanderbilt	114	NewMexico	104
Wisconsin	7	OhioState	11
Alabama-Birmingham	76	LouisianaState	23
SouthernCalifornia	46	Indiana	113
Wyoming	106	BostonCollege	83
Marshall	57	ArkansasState	54
Utah	14	MississippiState	49
WesternMichigan	45	BoiseState	10
OhioState	11	IowaState	79
LouisianaState	23	Clemson	48
SouthernMississippi	41	AirForce	43
GeorgiaTech	62	SouthCarolina	36
NorthernIllinois	12	Nevada	8
NorthTexas	75	VirginiaTech	3
Iowa	47	Nebraska	29
Auburn	2	Northwestern	84
CentralMichigan	89	Oklahoma	18
OregonState	64	WashingtonState	110
Michigan	71	UtahState	97
BrighamYoung	38	FresnoState	40
IowaState	79	BrighamYoung	38
Troy	19	Auburn	2
Virginia	87	Rutgers	101
FloridaAtlantic	72	NorthCarolinaState	33
Rutgers	101	Kentucky	95
AirForce	43	Baylor	65
California	85	WesternMichigan	45
SanDiegoState	42	Hawaii	9
Connecticut	20	Marshall	57
Tulsa	25	Colorado	100
Baylor	65	Louisiana-Lafayette	77
CentralFlorida	17	WestVirginia	32
Northwestern	84	Texas-ElPaso	80
Akron	105	CentralMichigan	89
Miami(Florida)	35	UCLA	94
Miami(Ohio)	15	EastCarolina	37
WestVirginia	32	MiddleTennesseeState	39
WashingtonState	110	Georgia	73
Maryland	44	Wisconsin	7
MiddleTennesseeState	39	Idaho	74
Texas	98	BallState	93
Nebraska	29	Duke	112
Tennessee	82	KansasState	78
PennState	55	Houston	60

Washington	56	Kansas	107
SouthCarolina	36	ArizonaState	59
Houston	60	Syracuse	51
EasternMichigan	96	Michigan	71
Memphis	115	Alabama	30
Tulane	90	Illinois	63
UtahState	97	FloridaState	28
Pittsburgh	31	SouthernMethodist	27
Clemson	48	Pittsburgh	31