

IEEE Computer Society New Orleans Chapter

Group Project Ideas, Sports Data Mining

07/26/2017



Recap IEEE New Orleans CS Chapter

Goals:

1. Regularly Scheduled Meetings (twice a month)
 - Tech Talk Meetups (Hangout and talk tech!)
 - Dinner Meetings with Distinguished Lectures/Guests

2. Community Outreach

- Student Outreach
 - 24 hour coding competition



- Volunteering at Conferences
 - Nov 18-21 International Conference on Data Mining



- Coding Workshops



Tech Talk Meetup

Regular Meeting Agenda

- 600 – 615 pm Networking & Order Food
- 615 – 630 pm Cybersecurity Update/Vulnerability Discussion
- 630 – 7 pm Group Project Introduction/Update
- 7 – 8 pm Meeting Topic/Presentation



Cybersecurity Update Vulnerability Discussion



Cybersecurity Update Vulnerability Discussion

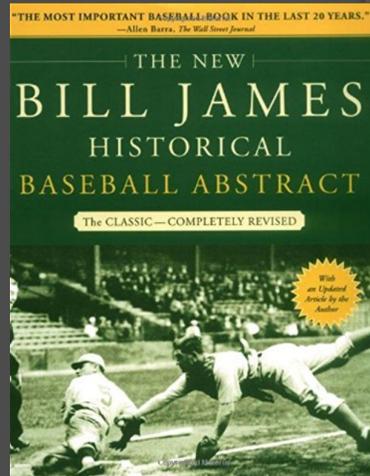
1. Security flaw in 3G, 4G LTE networks lets hackers track phone locations
2. Smart Vacuum Cleaners Making Map Of Your Home — And Wants to Sell It
3. Department of Transportation's National Highway Traffic Safety Administration (NHTSA) may be soon tasked with regulating cybersecurity of vehicles.
4. Girls Scouts launches new badges in robotics and **cyber security**
5. Pennsylvania Health Network Notifies Patients Months After Hackers Steal Medical Info
6. Tennessee Henry County's 911 system was hacked with ransomware, hackers found a back door through mobile police car and ambulance systems.
7. WiFi chips in Android and Apple devices found vulnerable, allows an attacker to take over a device remotely while it searches for Wi-Fi. aka Broadpwn
8. Killer Car Wash: Hackers Can Trap and Attack Vehicles, BHUSA

SPORTS DATA MINING

Data mining in sports

- ◉ The most well known implementation of data science in sports is sabermetrics.
- ◉ Sabermetrics has been used extensively in baseball since the 1970's.
- ◉ Data science is used in all team sports for player acquisition, game planning, adjustments, etc.

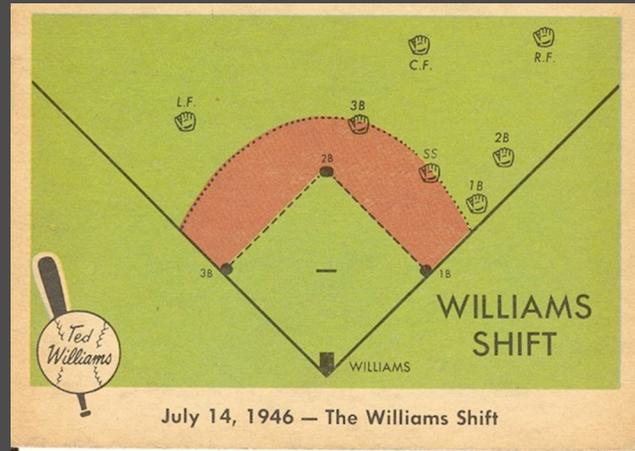
Popular Examples



Typical infield positioning



- “The Shift” was famously implemented against Ted Williams in the 1946 World Series.



- An offensive set of downs that doesn't result in a first down, turnover, offensive penalty or touchdown has 1,716 different possible combinations of plays (i.e. incomplete pass, run for no gain, sack, pass for less than first down, etc). On average an NFL team possesses the ball 12 times a game. Taken as separate and distinct events, that's 20,952 possible combinations of plays per game; per season that's 329,472 per team.

Scoring in fantasy football

- Points in fantasy football are calculated differently for every position.
- Scoring for quarterbacks is calculated with passing yards, touchdowns, interceptions, and fumbles.
- Scoring for running backs and wide receivers is calculated with yardage, touchdowns, and fumbles.

Offensive scoring in fantasy football

- Scoring is based on role.

PASSING	RUSHING	RECEIVING
<p>Standard scoring:</p> <ul style="list-style-type: none"> TD Pass = 4pts Every 25 passing yards = 1pts 2pt Passing Conversion = 2pts Interceptions Thrown = -2pts <p>Custom options:</p> <ul style="list-style-type: none"> Every <1, 5, 10, 20, 25, 50, 100> passing yards Every <1, 5, 10> completions Every <1, 5, 10> incomplete passes TD Pass 40+ yard TD pass bonus 50+ yard TD pass bonus Interceptions Thrown 2pt Passing Conversion 300-399 yard passing game 400+ yard passing game Each Pass Attempted Every Time Sacked 	<p>Standard scoring:</p> <ul style="list-style-type: none"> TD Rush = 6pts Every 10 rushing yards = 1pt 2pt Rushing Conversion = 2pts <p>Custom options:</p> <ul style="list-style-type: none"> Every <1, 5, 10, 20, 25, 50, 100> rushing yards Every <1, 5, 10> rushing attempts TD Rush 40+ yard TD rush bonus 50+ yard TD rush bonus 2pt Rushing Conversion 100-199 yard rushing game 200+ yard rushing game 	<p>Standard scoring:</p> <ul style="list-style-type: none"> TD Reception = 6pts Every 10 receiving yards = 1pt 2pt Receiving Conversion = 2pts <p>Custom options:</p> <ul style="list-style-type: none"> Every <1, 5, 10, 20, 25, 50, 100> receiving yards Every <1, 5, 10> receptions TD Reception 40+ yard TD rec bonus 50+ yard TD rec bonus 2pt Receiving Conversion 100-199 yard receiving game 200+ yard receiving game Receiving Target

Statistics in football

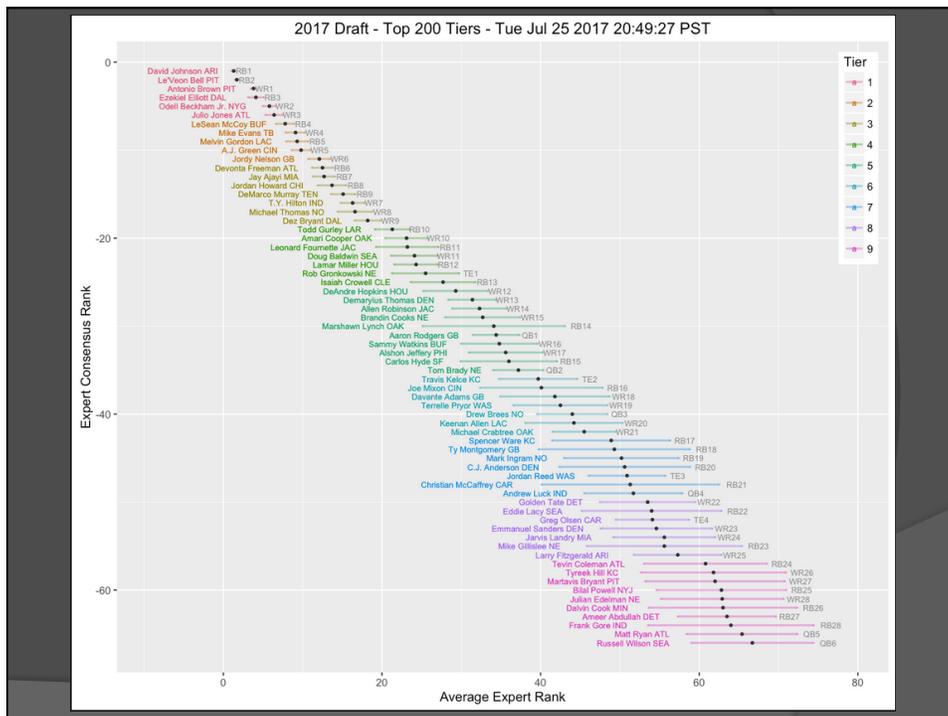
League Leaders - Offense				League Leaders - Defense			
Passing Yards		Complete List		Tackles		Complete List	
	1. Drew Brees	NO	5208		1. Bobby Wagner	SEA	167
	2. Matt Ryan	ATL	4944		2. Zach Brown	BUF	149
	3. Kirk Cousins	WAS	4917		3. Christian Kirksey	CLE	148
	4. Aaron Rodgers	GB	4428		4. Kwon Alexander	TB	145
	5. Philip Rivers	SD	4386		5. Sean Lee	DAL	145
Rushing Yards		Complete List		Sacks		Complete List	
	1. Ezekiel Elliott	DAL	1631		1. Vic Beasley	ATL	15.5
	2. Jordan Howard	CHI	1313		2. Von Miller	DEN	13.5
	3. DeMarco Murray	TEN	1287		3. Lorenzo Alexander	BUF	12.5
	4. Jay Ajayi	MIA	1272		4. Markus Golden	ARI	12.5
	5. Le'Veon Bell	PIT	1268		5. Danielle Hunter	MIN	12.5
Receiving Yards		Complete List		Interceptions		Complete List	
	1. T.Y. Hilton	IND	1448		1. Casey Hayward	SD	7
	2. Julio Jones	ATL	1409		2. Quintin Demps	HOU	6
	3. Odell Beckham	NYG	1367		3. Marcus Peters	KC	6
	4. Mike Evans	TB	1321		4. Dominique Rodgers-Cromartie	NYG	6
	5. Antonio Brown	PIT	1284		5. Ha Ha Clinton-Dix	GB	5

Quarterback																			
Rk	Player	Team	Pos	Comp	Att	Pct	Att/G	Yds	Avg	Yds/G	TD	Int	1st	1st%	Lng	20+	40+	Sck	Rate
1	Drew Brees	NO	QB	471	673	70.0	42.1	5,208	7.7	325.5	37	15	264	39.2	98T	70	10	27	101.7
2	Matt Ryan	ATL	QB	373	534	69.9	33.4	4,944	9.3	309.0	38	7	238	44.6	76T	69	17	37	117.1
3	Kirk Cousins	WAS	QB	406	606	67.0	37.9	4,917	8.1	307.3	25	12	225	37.1	80T	69	13	23	97.2
4	Aaron Rodgers	GB	QB	401	610	65.7	38.1	4,428	7.3	276.8	40	7	222	36.4	66T	57	10	35	104.2
5	Philip Rivers	SD	QB	349	578	60.4	36.1	4,386	7.6	274.1	33	21	214	37.0	59	57	16	36	87.9
6	Matthew Stafford	DET	QB	388	594	65.3	37.1	4,327	7.3	270.4	24	10	217	36.5	73T	52	10	37	93.3
7	Joe Flacco	BAL	QB	436	672	64.9	42.0	4,317	6.4	269.8	20	15	204	30.4	95T	40	11	33	83.5
8	Andrew Luck	IND	QB	346	545	63.5	36.3	4,240	7.8	282.7	31	13	206	37.8	64T	61	8	41	96.4
9	Carson Palmer	ARI	QB	364	597	61.0	39.8	4,233	7.1	282.2	26	14	218	36.5	80T	48	6	40	87.2
10	Russell Wilson	SEA	QB	353	546	64.7	34.1	4,219	7.7	263.7	21	11	193	35.3	59	51	11	41	92.6

Running Back															
Rk	Player	Team	Pos	Att	Att/G	Yds	Avg	Yds/G	TD	Lng	1st	1st%	20+	40+	FUM
1	Ezekiel Elliott	DAL	RB	322	21.5	1,631	5.1	108.7	15	60T	91	28.3	14	3	5
2	Jordan Howard	CHI	RB	252	16.8	1,313	5.2	87.5	6	69	70	27.8	10	2	1
3	DeMarco Murray	TEN	RB	293	18.3	1,287	4.4	80.4	9	75T	64	21.8	4	2	3
4	Jay Ajayi	MIA	RB	260	17.3	1,272	4.9	84.8	8	62T	60	23.1	10	4	4
5	Le'Veon Bell	PIT	RB	261	21.8	1,268	4.9	105.7	7	44	69	26.4	4	1	3
6	LeSean McCoy	BUF	RB	234	15.6	1,267	5.4	84.5	13	75T	55	23.5	11	3	3
7	David Johnson	ARI	RB	293	18.3	1,239	4.2	77.4	16	58T	72	24.6	6	2	5
8	LeGarrette Blount	NE	RB	299	18.7	1,161	3.9	72.6	18	44	67	22.4	7	3	2
9	Devonta Freeman	ATL	RB	227	14.2	1,079	4.8	67.4	11	75T	61	26.9	7	2	1
10	Lamar Miller	HOU	RB	268	19.1	1,073	4.0	76.6	5	45	52	19.4	7	1	2

Factors affecting offensive scoring

- Offensive line data is often one of the most important considerations when predicting fantasy points.
- Opposing team's defensive scheme and its historical effectiveness against your team's offensive tendencies.
- For example, the Patriots tend to attack a team's strengths to force them to play off balance. This leads to more scoring opportunities for regularly underutilized players.
- Amount of "garbage time"



Defensive scoring in fantasy football

- Defensive scoring is typically calculated as a combination of all defensive and special teams play.
- Scoring can be broken up to individual players, but it usually isn't for the sake of simplicity.

TEAM DEFENSE / SPECIAL TEAMS (D/ST)
Standard scoring:
· Kickoff Return TD = 6pts
· Punt Return TD = 6pts
· Interception Return TD = 6pts
· Fumble Return TD = 6pts
· Blocked Punt or FG return for TD = 6pts
· Each Interception = 2pts
· Each Fumble Recovered = 2pts
· Blocked Punt, PAT or FG = 2pts
· Each Safety = 2pts
· Each Sack = 1pts
· 0 points allowed = 5pts
· 1-6 points allowed = 4pts
· 7-13 points allowed = 3pts
· 14-17 points allowed = 1pts
· 18-27 points allowed = 0pts
· 28-34 points allowed = -1pts
· 35-45 points allowed = -3pts
· 46+ points allowed = -5pts

Predicting defensive scoring

- Touchdowns are both the most difficult to predict and also worth the most points.
- To predict the top scoring defenses of any given week, we need to focus on opportunities for defensive and special teams touchdowns.

Resources

- <http://sabr.org/sabermetrics/single-page>
- <https://www.cbssports.com/mlb/news/just-because-the-ted-williams-shift/>
- <http://www.borischen.co/>
- <https://empeopled.com/p/92946>