# ML Assignment 1

# Sean Bradford

## 1. & 2.

nfl\_data=read.csv('C:\\Users\\Sean\\OneDrive\\Desktop\\Grad School\\Machine Learning\\Module 2 - Intro
# Data Source: https://www.advancedsportsanalytics.com/nfl-raw-data
head(nfl\_data)

##		game_id p	olayer_id p	oos			p	olayer	team	pass_cmp	pass_att
##	1	201909050chi	RodgAa00	QB		Aaro		dgers	GNB	18	
##	2	201909050chi	JoneAa00	RB		Aa	aron	Jones	GNB	0	0
##	3	201909050chi	ValdMa00	WR Ma	rquez Va	aldes-	-Scan	tling	GNB	0	0
##	4	201909050chi	AdamDa01	WR		Dava	ante	Adams	GNB	0	0
##	5	201909050chi	GrahJi00	TE		Jin	nmy G	raham	GNB	0	0
##	6	201909050chi	DaviTr03	WR		Tre	evor	Davis	GNB	0	0
##		pass_yds pass_	_td pass_ir	nt pas	s_sacked	d pass	s_sac	ked_y	ds pas	ss_long p	ass_rating
##	1	203	1	0		5		;	37	47	91.4
##	2	0	0	0	(	)			0	0	0.0
##	3	0	0	0	(	)			0	0	0.0
##	4	0	0	0	(	)			0	0	0.0
##	5	0	0	0	(	)			0	0	0.0
##	6	0	0	0	(	)			0	0	0.0
##		rush_att rush_	_yds rush_t	td rus	h_long t	target	s re	c rec	_yds 1	rec_td re	c_long
##	1	3	8	0	10		0	0	0	0	0
##	2	13	39	0	9		1	1	0	0	0
##	3	1	0	0	0		6	4	52	0	47
##	4	0	0	0	0		8	4	36	0	11
##	5	0	0	0	0		5	3	30	1	16
##	6	0	0	0	0		1	1	28	0	28
##		fumbles_lost r	rush_scramb	oles d	$esigned_{-}$	_rush_	att	comb_	pass_1	rush_play	•
##	1	0		1			2			38	}
##	2	0		0			13			13	
##	3	0		0			1			1	
##	4	0		0			0			0	
##	5	0		0			0			0	
##	6	0		0			0			0	
##		comb_pass_play					Oppo	nent_a		=	
##	1	36		2		GNB			CH1		0
##	2	(		13		GNB			CH]		0
##	3	0		1 GNB		CHI				0	
##	4	(		0		GNB			CH]		0
##	5	(		0		GNB			CH]		0
##	6	)	•	0 - 1		GNB		1	CH]		0
##	4	total_ret_td o	orrensive_1	rumble	_recove		pass	s_yas_l		rusn_yds	
##	1	0				0			0		0

```
## 2
                  0
                                                  0
                                                                   0
                                                                                    0
## 3
                  0
                                                  0
                                                                   0
                                                                                    0
## 4
                                                  0
                                                                                    0
                  0
                                                                   0
## 5
                  0
                                                  0
                                                                   0
                                                                                    0
## 6
                  0
                                                  0
                                                                                    0
     rec yds bonus Total DKP Off DKP Total FDP Off FDP Total SDP Off SDP
##
## 1
                         12.92
                                  12.92
                                              12.92
                                                       12.92
                                                                  12.92
                  0
## 2
                                   4.90
                                                        4.40
                                                                   4.40
                  0
                           4.90
                                               4.40
                                                                            4.40
## 3
                  0
                          9.20
                                   9.20
                                               7.20
                                                        7.20
                                                                   7.20
                                                                            7.20
## 4
                   0
                                               5.60
                                                        5.60
                                                                   5.60
                                                                            5.60
                          7.60
                                   7.60
## 5
                   0
                         12.00
                                  12.00
                                              10.50
                                                       10.50
                                                                  10.50
                                                                           10.50
## 6
                   0
                           3.80
                                   3.80
                                               3.30
                                                        3.30
                                                                   3.30
                                                                            3.30
##
     pass_target_yds pass_poor_throws pass_blitzed pass_hurried
## 1
                   300
                                        5
                                                       8
                                                                     6
## 2
                     0
                                        0
                                                       0
                                                                     0
## 3
                     0
                                        0
                                                       0
                                                                     0
## 4
                     0
                                        0
                                                       0
                                                                     0
                     0
                                                                     0
## 5
                                        0
                                                       0
## 6
                     0
                                        0
                                                       0
                                                                     0
##
     rush_yds_before_contact rush_yac rush_broken_tackles rec_air_yds rec_yac
## 1
                              6
                                        2
                                                              0
                                                                         0.0
                                                                                     0
## 2
                             21
                                       18
                                                              1
                                                                         -1.0
                                                                                     1
                                                                                     2
## 3
                              0
                                        0
                                                              0
                                                                         81.0
## 4
                              0
                                        0
                                                              0
                                                                         63.2
                                                                                    19
                                        0
## 5
                              0
                                                              0
                                                                                    17
                                                                         58.0
## 6
                              0
                                        0
                                                              0
                                                                         18.0
                                                                                    10
##
     rec_drops offense off_pct vis_team home_team vis_score home_score
                                                                                   OT
## 1
              0
                              100
                                        GNB
                                                   CHI
                                                                             3 FALSE
                      61
                                                               10
## 2
              0
                                        GNB
                                                                             3 FALSE
                      37
                               61
                                                   CHI
                                                                10
                                                   CHI
## 3
              0
                      41
                               67
                                        GNB
                                                                10
                                                                             3 FALSE
## 4
              0
                      59
                               97
                                        GNB
                                                   CHI
                                                                10
                                                                             3 FALSE
## 5
              0
                      33
                               54
                                        GNB
                                                   CHI
                                                                10
                                                                             3 FALSE
                                                   CHI
                                                                10
## 6
                      17
                               28
                                        GNB
                                                                             3 FALSE
##
          Roof Surface Temperature Humidity Wind_Speed Vegas_Line Vegas_Favorite
                 grass
## 1 outdoors
                                  65
                                             69
                                                         10
                                                                   -3.5
                                                                                     CHI
## 2 outdoors
                                  65
                                            69
                                                         10
                                                                   -3.5
                                                                                     CHI
                  grass
## 3 outdoors
                 grass
                                  65
                                            69
                                                         10
                                                                   -3.5
                                                                                     CHI
## 4 outdoors
                                  65
                                             69
                                                         10
                                                                   -3.5
                                                                                     CHI
                 grass
## 5 outdoors
                                  65
                                             69
                                                         10
                                                                   -3.5
                                                                                     CHI
                  grass
## 6 outdoors
                                  65
                                             69
                                                         10
                                                                   -3.5
                                                                                     CHI
                  grass
     Over_Under game_date
## 1
              47
                  9/5/2019
## 2
                  9/5/2019
              47
## 3
              47
                  9/5/2019
## 4
              47
                  9/5/2019
              47
                  9/5/2019
## 5
                  9/5/2019
## 6
              47
```

The dataset contains statistics for passing, rushing, and receiving per game for NFL players since 2019.

3.

#### summary(nfl\_data[,c("player","team","pass\_yds","pass\_td")]) ## player team pass\_yds pass\_td Length: 19973 Length: 19973 : -2.00 :0.0000 ## Min. Min. Class : character Class : character 1st Qu.: 0.00 1st Qu.:0.0000 ## Mode :character Mode :character Median : 0.00 Median :0.0000 ## : 20.57 :0.1317 Mean Mean ## 3rd Qu.: 0.00 3rd Qu.:0.0000 ## :525.00 Max. Max. :5.0000 Qualitative Variables: 'player' & 'team' Quantitative Variables: 'pass yds' & 'pass td' 4. library(dplyr) ## ## Attaching package: 'dplyr' ## The following objects are masked from 'package:stats': ## ## filter, lag ## The following objects are masked from 'package:base': ## ## intersect, setdiff, setequal, union nfl\_data=nfl\_data%>%mutate(pass\_cmp=(pass\_cmp/pass\_att)) head(nfl\_data) ## game\_id player\_id pos player team pass\_cmp pass\_att ## 1 201909050chi RodgAa00 Aaron Rodgers GNB 0.6 30 ## 2 201909050chi JoneAa00 RBAaron Jones NaN 0 GNB ## 3 201909050chi ValdMa00 WR Marquez Valdes-Scantling GNB NaN 0 ## 4 201909050chi AdamDa01 WR 0 Davante Adams GNB NaN 0 ## 5 201909050chi GrahJi00 TE Jimmy Graham GNB NaN ## 6 201909050chi DaviTr03 Trevor Davis WR GNB NaN0 pass\_yds pass\_td pass\_int pass\_sacked pass\_sacked\_yds pass\_long pass\_rating 203 37 ## 1 1 0 5 47 91.4 ## 2 0 0 0 0 0 0 0.0 ## 3 0 0 0 0 0 0 0.0 ## 4 0 0 0 0 0 0 0.0 ## 5 0 0 0 0 0 0 0.0 ## 6 0 0 0 0 0 0 0.0 rush\_att rush\_yds rush\_td rush\_long targets rec rec\_yds rec\_td rec\_long ## ## 1 3 8 0 10 0 0 0 ## 2 13 39 0 9 1 0 0 0 1

6

8

5

4

4

52

36

30

0

0

47

11

16

0

0

0

## 3

## 4

## 5

1

0

0

0

0

0

0

0

0

```
0
                                      0
                                                              28
## 6
                               0
                                             1 1
     fumbles_lost rush_scrambles designed_rush_att comb_pass_rush_play
                                                    2
## 2
                 0
                                 0
                                                                         13
                                                    13
## 3
                 0
                                 0
                                                     1
                                                                          1
## 4
                 0
                                 0
                                                     0
                                                                          0
## 5
## 6
                                 0
                 0
                                                     0
     comb_pass_play comb_rush_play Team_abbrev Opponent_abbrev two_point_conv
## 1
                  36
                                   2
                                              GNB
                                                               CHI
## 2
                   0
                                  13
                                              GNB
                                                               CHI
                                                                                  0
## 3
                   0
                                              GNB
                                                               CHI
                                                                                  0
                                   1
                   0
                                   0
                                              GNB
                                                               CHI
                                                                                  0
## 4
                                   0
                                              GNB
## 5
                   0
                                                               CHI
                                                                                  0
## 6
                   0
                                   0
                                              GNB
                                                               CHI
                                                                                  0
     total_ret_td offensive_fumble_recovery_td pass_yds_bonus rush_yds_bonus
## 1
                 0
                                                0
                                                                 0
## 2
                 0
                                                0
                                                                                 0
                                                                 0
## 3
                 0
                                                0
                                                                 0
                                                                                 0
                                                                                 0
## 4
                 0
                                                0
                                                                 0
## 5
                 0
                                                0
                                                                 0
                                                                                 0
## 6
     rec_yds_bonus Total_DKP Off_DKP Total_FDP Off_FDP Total_SDP Off_SDP
## 1
                  0
                        12.92
                               12.92
                                            12.92
                                                     12.92
                                                               12.92
## 2
                                  4.90
                                                      4.40
                                                                 4.40
                         4.90
                                             4.40
                                                                         4.40
                  0
## 3
                  0
                         9.20
                                  9.20
                                             7.20
                                                      7.20
                                                                 7.20
                                                                         7.20
## 4
                  0
                         7.60
                                  7.60
                                             5.60
                                                      5.60
                                                                 5.60
                                                                         5.60
## 5
                  0
                         12.00
                                 12.00
                                            10.50
                                                     10.50
                                                               10.50
                                                                        10.50
## 6
                  0
                         3.80
                                  3.80
                                             3.30
                                                      3.30
                                                                 3.30
                                                                         3.30
     pass_target_yds pass_poor_throws pass_blitzed pass_hurried
## 1
                  300
                                      5
                                                     8
## 2
                    0
                                      0
                                                     0
                                                                   0
## 3
                    0
                                       0
                                                     0
                                                                   0
## 4
                    0
                                       0
                                                     0
                                                                   0
## 5
                    0
                                       0
                                                                   0
## 6
                    0
                                      0
                                                     0
     rush_yds_before_contact rush_yac rush_broken_tackles rec_air_yds rec_yac
## 1
                             6
                                      2
                                                            0
                                                                       0.0
## 2
                            21
                                      18
                                                            1
                                                                      -1.0
                                                                                  1
## 3
                             0
                                      0
                                                            0
                                                                      81.0
                                                                                  2
## 4
                             0
                                       0
                                                                      63.2
                                                                                 19
                                       0
                                                                      58.0
## 5
                             0
                                                            0
                                                                                 17
## 6
                             0
                                       0
                                                            0
                                                                      18.0
                                                                                 10
     rec_drops offense off_pct vis_team home_team vis_score home_score
## 1
             0
                     61
                             100
                                      GNB
                                                 CHI
                                                             10
                                                                          3 FALSE
                                                                          3 FALSE
## 2
                     37
                              61
                                      GNB
                                                 CHI
             0
                                                             10
## 3
                     41
                              67
                                      GNB
                                                 CHI
                                                                          3 FALSE
             0
                                                             10
## 4
                     59
                              97
                                      GNB
                                                 CHI
                                                              10
                                                                          3 FALSE
             0
## 5
             0
                     33
                              54
                                      GNB
                                                 CHI
                                                             10
                                                                          3 FALSE
                              28
                                      GNB
                                                 CHI
## 6
             0
                     17
                                                             10
                                                                          3 FALSE
         Roof Surface Temperature Humidity Wind_Speed Vegas_Line Vegas_Favorite
                                                                 -3.5
## 1 outdoors
                 grass
                                 65
                                           69
                                                       10
## 2 outdoors
                 grass
                                 65
                                           69
                                                       10
                                                                 -3.5
                                                                                  CHI
                                           69
                                                                                  CHI
## 3 outdoors
                 grass
                                 65
                                                       10
                                                                 -3.5
```

```
-3.5
                                                                                   CHI
## 4 outdoors
                 grass
                                  65
                                            69
                                                        10
                                                        10
                                                                                   CHI
## 5 outdoors
                                  65
                                            69
                                                                  -3.5
                 grass
                                                                                   CHI
## 6 outdoors
                 grass
                                  65
                                            69
                                                        10
                                                                  -3.5
     Over_Under game_date
##
## 1
              47
                  9/5/2019
## 2
              47
                  9/5/2019
## 3
                  9/5/2019
                  9/5/2019
## 4
              47
## 5
              47
                  9/5/2019
## 6
                  9/5/2019
```

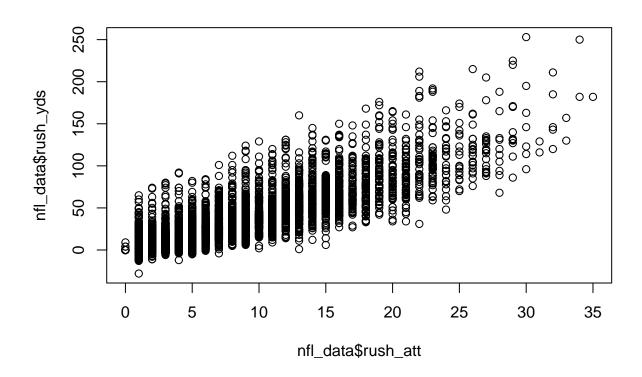
### summary(nfl\_data\$pass\_cmp)

```
## Min. 1st Qu. Median Mean 3rd Qu. Max. NA's
## 0.000 0.571 0.652 0.636 0.724 1.000 17963
```

Changed variable pass\_cmp to return the ratio of passes completed instead of the total number of passes completed.

5.

### plot(nfl\_data\$rush\_att,nfl\_data\$rush\_yds)



Created scatterplot to show relationship between rushing attempts and rushing yards.