

Predicting UFC Fight Results

2023-12-11

Introduction

The UFC began as a professional mixed martial arts organization in 1993 serving as an alternative hand-to-hand combat sport that combined traditional boxing with wrestling, karate, kickboxing, and jiu-jitsu fighting techniques. The entity was acquired by a group led by Dana White in 2001, who has served as the President for over two decades. Since establishing control, Dana White has exponentially grown the reach of UFC's product while also creating more structure and sanction to the sport of MMA. UFC currently has over 60 global broadcasting partners and is able to be accessed in over 165 different countries. With a traveling, tour-like model, the UFC has been able to sell-out many arenas across the world as equally become a highly-touted event to attend similar to boxing matches with well-known participants involved.

In many other North-american based sports, organizations have invested and founded their own analytics departments. These departments are responsible for using data to acquire and develop the right talent that will lead to on-field success and improve the team's product. Since the UFC's participants are individual fighters that often follow their own training regiment, there is a smaller focus on analytics within the sport.

The purpose of our project is two-fold. We want to evaluate fighters' historical data to determine fight styles that may possess a stronger correlation to success within the octagon. Identifying important factors will allow UFC fighters and their hired trainers to optimize their training regime, and will also benefit commentators in pointing out facets of the match the audience should keep in mind while spectating.

Additionally, we want to create a model that maximizes predictive accuracy for the purposes of assisting sports bettors in finding potential opportunities for value not seen by the public. Dana White and the UFC have fully embraced the recent popularity of sports betting, forming sponsorships with companies such as bet365 in the UK, DraftKings in the US, as well as many others located worldwide. There is an established market for sports betting in the UFC, and we hope to create a model that provides an estimation of a winner between two fighters along with some form of uncertainty that allows a sports-better to determine if the predicted odds over or under-estimate a fighter's chance of winning compared to the sportsbook odds given to the public.

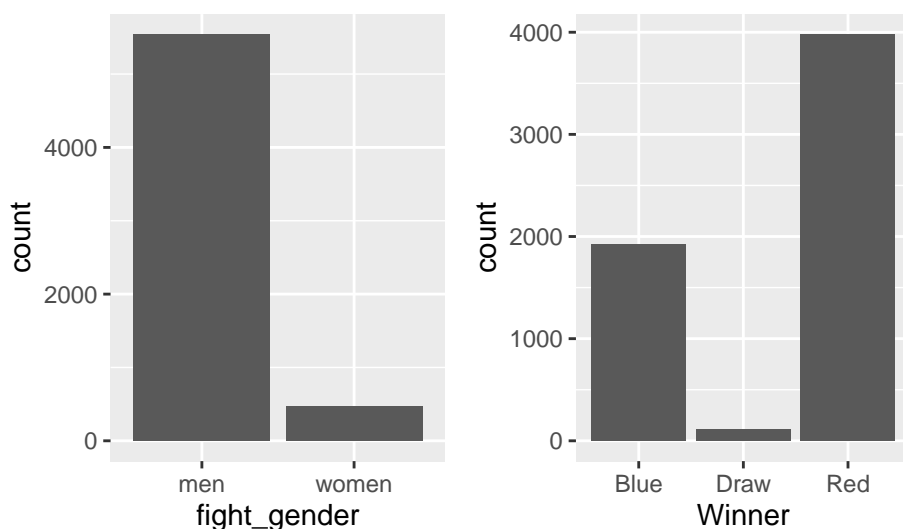
Our data is each UFC fight from 1994-2021, containing each fighter's names, physical information (age, height, weight), the amount of wins and losses in their UFC history, and various fighting data. The fighting data includes the average amount of attempted and landed attacks over their UFC career, as well as the frequency of different types of attacks they have faced from their previous opponents. We plan to fit an elastic net model that incorporates the standardization of a ridge regression model, and the variable selection of a lasso regression model, to determine which predictors in our dataset are most influential. Our response variable will be the winner in each fight, with that value randomized dependent on the color of the corner assigned during the fight (red or blue). The elastic net model will be best served for UFC commentators and trainers interested in how prior fighting strategies can lead to success in the future. The estimated probability values can be compared against the moneyline odds to determine value, and the significant coefficients can be used by trainers and coaches to adjust their fighter's strategies.

Data Description and EDA

The dataset used for modeling was initially sourced from [ufcstats.com](https://www.ufcstats.com), where the data was processed and published on [kaggle.com](https://www.kaggle.com). The dataset contains roughly 6,012 unique fights over a 27 year span, with each

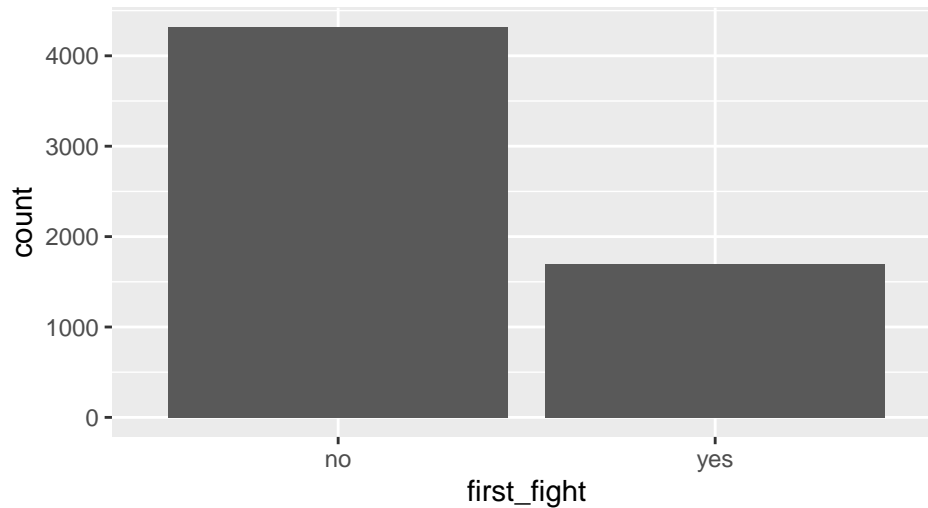
row containing data on fighters in the red and blue corner, a universal classification system used throughout all rows. Since a given fighter could be in the red corner for one fight and in the blue corner for another, we don't place any value in the classification. The historical data for a given strike is split into four different columns. There is a separate column for the average amount of attempt and the average amount of strikes landed for a fighter's prior fight. Additionally, for that given strike there includes identical metrics for the averages of their prior opponents. For example, if Conor McGregor had one prior fight in which his opponent attempted 20 strikes to Conor's head and connected on 8, the row for Conor's second fight would display `avg_opp_HEAD_att` equal to 20 and `avg_opp_HEAD_landed` to 8.

In the UFC, fighters can win in a variety of different ways. If both fighters are still standing at the end of the fight, the judges will issue a decision that is either unanimous, split, or a majority decision. The dataset includes the amount of victories by each form of decision, as well as by knockout or by the on-hand doctor stopping the fight. Our dataset also provides the current winning or losing streak for each fighter, which can be useful as it can reflect the momentum and confidence a fighter may possess.



The plots above provide a better idea on the breakdown of the amount of male and female fights in UFC's history, as well as the results based on which corner was victorious. Similar to men's and women's lacrosse or men's and women's soccer, we believe that men's and women's UFC fights should be considered different sports given the difference in fighting style. Men's MMA is centered around wrestling, while women's MMA is centered around jiu-jitsu and judo with a strong preference for striking than grappling seen more commonly on the men's side. Since roughly 92% of the data are men's UFC fights, we will remove the observations in which the two fighters are female. The right plot above reveals that about 2/3 of fights with a winner are assigned to the red corner. Since the corners are simply a classifier and we are concerned that our models will be biased towards the red corner, we will randomize the fighters within each fight and reassign their corresponding statistics if necessary.

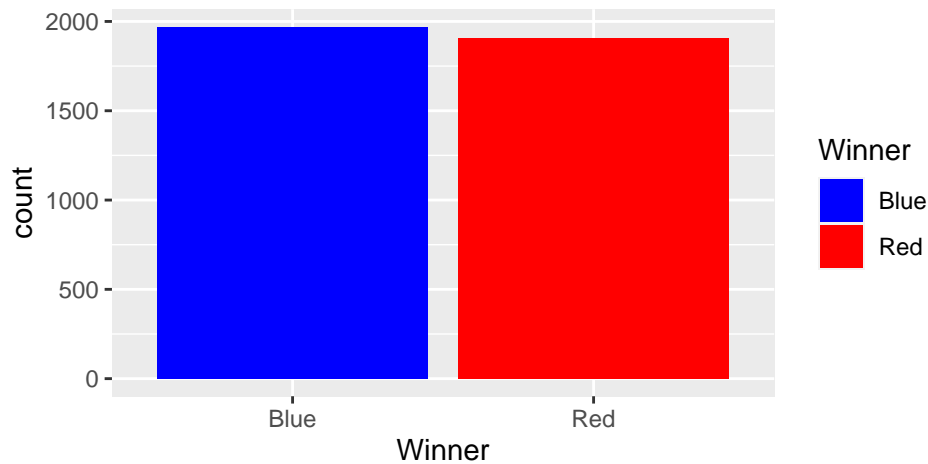
Calculating Instances of a Fighter's 1st Fight



Another limitation within our data is that for a fighter's first career UFC fight, they have no historical data and thus their respective columns are N/A in our dataset. Since our modeling techniques require clean data without missing data, we will need to remove instances of a fighter's first fight.

New Distribution of Blue & Red Winners

After Randomization of Classification



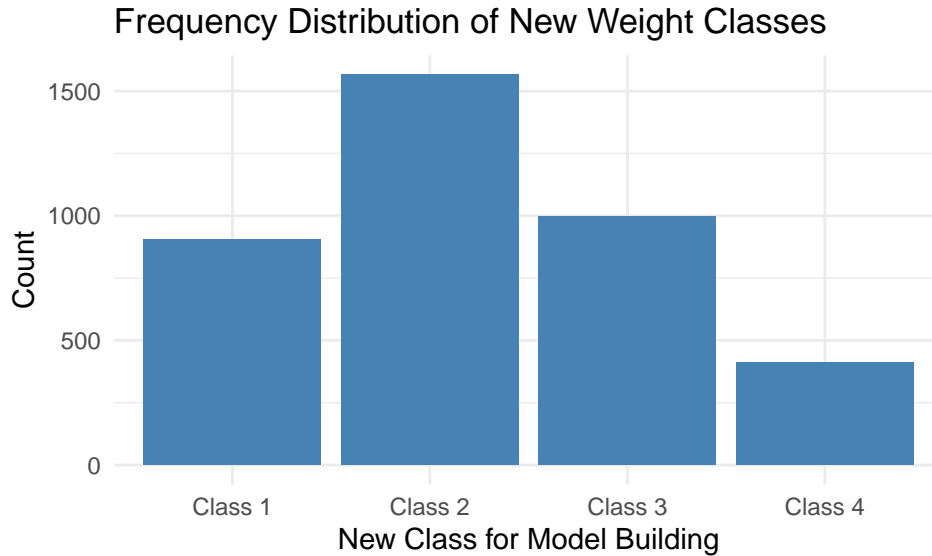
After shuffling the data, we see a much more even distribution of fight winners between the red and blue corner. Similar to comparing the difference between men's and women's MMA, we believe the fighting styles begin to differ as fighters increase in weight class. Therefore, rather than creating nine different models for each class, we will group weight classes together as seen below:

Table 1: Frequency of Weight Class Fights

new_class	weight_class	max_weight	count
Class 1	Flyweight	125	173
Class 1	Bantamweight	135	331
Class 1	Featherweight	145	401
Class 2	Lightweight	155	782
Class 2	Welterweight	170	783
Class 3	Middleweight	185	582
Class 3	LightHeavyweight	205	416
Class 4	Heavyweight	265	381
Class 4	OpenWeight	300	29

Table 2: Avg Attempt of Different Style Attacks

new_class	Rmean_head	Rmean_body	Rmean_leg	Rmean_clinch	Rmean_ground	Rmean_ctrltime
Class 1	73.7	12.0	8.0	7.5	8.5	143.6
Class 2	62.8	10.0	6.9	7.8	8.3	150.5
Class 3	51.9	7.8	6.0	8.0	9.1	138.7
Class 4	43.5	6.3	4.8	6.6	8.9	105.7



The plot above displays the new distribution of observations by the new weight classes. While we were unable to create a completely even split of observations, we believe we have enough fights within each new segmentation to proceed in fitting four models. The table below shows the average attempts of different types of strikes for one classification of the fighters. We see that numbers tend to decrease for standing strikes such as the head, body, and leg as the weight class increases. This could be because heavier fighters prefer to spend more of the fight wrestling on the floor, or heavier fights typically lasting less time, with such cases not mutually exclusive.

Inference EDA/make model

Removing Columns that will provide no meaning to our models

```
## # A tibble: 1 x 2
##   R_draw count
##   <dbl> <int>
## 1      0  3878
```

```
## # A tibble: 1 x 2
##   B_draw count
##   <dbl> <int>
## 1      0  3878
```

No draws. Going to remove this as well.

checking for NA values

```
## [1] TRUE
```

```
## [1] 500
```

```
##           Winner           title_bout
##           0           0
##   B_avg_KD   B_avg_opp_KD
##           0           0
##   B_avg_SIG_STR_pct   B_avg_opp_SIG_STR_pct
##           0           0
##   B_avg_TD_pct   B_avg_opp_TD_pct
##           0           0
##   B_avg_SUB_ATT   B_avg_opp_SUB_ATT
##           0           0
##   B_avg_REV   B_avg_opp_REV
##           0           0
##   B_avg_SIG_STR_att   B_avg_SIG_STR_landed
##           0           0
##   B_avg_opp_SIG_STR_att   B_avg_opp_SIG_STR_landed
##           0           0
##   B_avg_TOTAL_STR_att   B_avg_TOTAL_STR_landed
##           0           0
##   B_avg_opp_TOTAL_STR_att   B_avg_opp_TOTAL_STR_landed
##           0           0
##   B_avg_TD_att   B_avg_TD_landed
##           0           0
##   B_avg_opp_TD_att   B_avg_opp_TD_landed
##           0           0
##   B_avg_HEAD_att   B_avg_HEAD_landed
##           0           0
##   B_avg_opp_HEAD_att   B_avg_opp_HEAD_landed
##           0           0
##   B_avg_BODY_att   B_avg_BODY_landed
```

##	0	0
##	B_avg_opp_BODY_att	B_avg_opp_BODY_landed
##	0	0
##	B_avg_LEG_att	B_avg_LEG_landed
##	0	0
##	B_avg_opp_LEG_att	B_avg_opp_LEG_landed
##	0	0
##	B_avg_DISTANCE_att	B_avg_DISTANCE_landed
##	0	0
##	B_avg_opp_DISTANCE_att	B_avg_opp_DISTANCE_landed
##	0	0
##	B_avg_CLINCH_att	B_avg_CLINCH_landed
##	0	0
##	B_avg_opp_CLINCH_att	B_avg_opp_CLINCH_landed
##	0	0
##	B_avg_GROUND_att	B_avg_GROUND_landed
##	0	0
##	B_avg_opp_GROUND_att	B_avg_opp_GROUND_landed
##	0	0
##	B_avg_CTRL_time.seconds.	B_avg_opp_CTRL_time.seconds.
##	0	0
##	B_total_time_fought.seconds.	B_total_rounds_fought
##	0	0
##	B_total_title_bouts	B_current_win_streak
##	0	0
##	B_current_lose_streak	B_longest_win_streak
##	0	0
##	B_wins	B_losses
##	0	0
##	B_win_by_Decision_Majority	B_win_by_Decision_Split
##	0	0
##	B_win_by_Decision_Unanimous	B_win_by_KO.TKO
##	0	0
##	B_win_by_Submission	B_win_by_TKO_Doctor_Stoppage
##	0	0
##	B_Stance	B_Height_cms
##	6	1
##	B_Reach_cms	B_Weight_lbs
##	211	0
##	R_avg_KD	R_avg_opp_KD
##	0	0
##	R_avg_SIG_STR_pct	R_avg_opp_SIG_STR_pct
##	0	0
##	R_avg_TD_pct	R_avg_opp_TD_pct
##	0	0
##	R_avg_SUB_ATT	R_avg_opp_SUB_ATT
##	0	0
##	R_avg_REV	R_avg_opp_REV
##	0	0
##	R_avg_SIG_STR_att	R_avg_SIG_STR_landed
##	0	0
##	R_avg_opp_SIG_STR_att	R_avg_opp_SIG_STR_landed
##	0	0
##	R_avg_TOTAL_STR_att	R_avg_TOTAL_STR_landed

##	0	0
##	R_avg_opp_TOTAL_STR_att	R_avg_opp_TOTAL_STR_landed
##	0	0
##	R_avg_TD_att	R_avg_TD_landed
##	0	0
##	R_avg_opp_TD_att	R_avg_opp_TD_landed
##	0	0
##	R_avg_HEAD_att	R_avg_HEAD_landed
##	0	0
##	R_avg_opp_HEAD_att	R_avg_opp_HEAD_landed
##	0	0
##	R_avg_BODY_att	R_avg_BODY_landed
##	0	0
##	R_avg_opp_BODY_att	R_avg_opp_BODY_landed
##	0	0
##	R_avg_LEG_att	R_avg_LEG_landed
##	0	0
##	R_avg_opp_LEG_att	R_avg_opp_LEG_landed
##	0	0
##	R_avg_DISTANCE_att	R_avg_DISTANCE_landed
##	0	0
##	R_avg_opp_DISTANCE_att	R_avg_opp_DISTANCE_landed
##	0	0
##	R_avg_CLINCH_att	R_avg_CLINCH_landed
##	0	0
##	R_avg_opp_CLINCH_att	R_avg_opp_CLINCH_landed
##	0	0
##	R_avg_GROUND_att	R_avg_GROUND_landed
##	0	0
##	R_avg_opp_GROUND_att	R_avg_opp_GROUND_landed
##	0	0
##	R_avg_CTRL_time.seconds.	R_avg_opp_CTRL_time.seconds.
##	0	0
##	R_total_time_fought.seconds.	R_total_rounds_fought
##	0	0
##	R_total_title_bouts	R_current_win_streak
##	0	0
##	R_current_lose_streak	R_longest_win_streak
##	0	0
##	R_wins	R_losses
##	0	0
##	R_win_by_Decision_Majority	R_win_by_Decision_Split
##	0	0
##	R_win_by_Decision_Unanimous	R_win_by_KO.TKO
##	0	0
##	R_win_by_Submission	R_win_by_TKO_Doctor_Stoppage
##	0	0
##	R_Stance	R_Height_cms
##	7	0
##	R_Reach_cms	R_Weight_lbs
##	219	0
##	B_age	R_age
##	32	24
##	new_class	

```
##
```

```
0
```

removing all rows with NA values

```
## [1] 3878
```

```
## [1] 3511
```

```
## [1] 367
```

creating 4 different dataframes, dividing up by our weight class division

```
## [1] 859
```

```
## [1] 1430
```

```
## [1] 911
```

```
## [1] 311
```

```
#check multicollinearity
```

##	Var1	Var2	Correlation
## 1	B_avg_SIG_STR_att	B_avg_SIG_STR_landed	0.9144420
## 2	B_avg_SIG_STR_att	B_avg_opp_SIG_STR_att	0.8027941
## 3	B_avg_SIG_STR_att	B_avg_TOTAL_STR_att	0.9222030
## 4	B_avg_SIG_STR_att	B_avg_opp_TOTAL_STR_att	0.7173703
## 5	B_avg_SIG_STR_att	B_avg_HEAD_att	0.9776199
## 6	B_avg_SIG_STR_att	B_avg_HEAD_landed	0.8584251
## 7	B_avg_SIG_STR_att	B_avg_opp_HEAD_att	0.7784147
## 8	B_avg_SIG_STR_att	B_avg_BODY_att	0.7164013
## 9	B_avg_SIG_STR_att	B_avg_DISTANCE_att	0.9697865
## 10	B_avg_SIG_STR_att	B_avg_DISTANCE_landed	0.9030834
## 11	B_avg_SIG_STR_att	B_avg_opp_DISTANCE_att	0.8268501
## 12	B_avg_SIG_STR_att	B_avg_opp_DISTANCE_landed	0.7784253
## 13	B_avg_SIG_STR_landed	B_avg_opp_SIG_STR_att	0.7156805
## 14	B_avg_SIG_STR_landed	B_avg_TOTAL_STR_att	0.8767102
## 15	B_avg_SIG_STR_landed	B_avg_TOTAL_STR_landed	0.7890043
## 16	B_avg_SIG_STR_landed	B_avg_HEAD_att	0.8671858
## 17	B_avg_SIG_STR_landed	B_avg_HEAD_landed	0.9318126
## 18	B_avg_SIG_STR_landed	B_avg_BODY_att	0.7547978
## 19	B_avg_SIG_STR_landed	B_avg_BODY_landed	0.7665473
## 20	B_avg_SIG_STR_landed	B_avg_DISTANCE_att	0.8430993
## 21	B_avg_SIG_STR_landed	B_avg_DISTANCE_landed	0.9152477
## 22	B_avg_SIG_STR_landed	B_avg_opp_DISTANCE_att	0.7391462
## 23	B_avg_opp_SIG_STR_att	B_avg_opp_SIG_STR_landed	0.8968200
## 24	B_avg_opp_SIG_STR_att	B_avg_TOTAL_STR_att	0.7008243
## 25	B_avg_opp_SIG_STR_att	B_avg_opp_TOTAL_STR_att	0.9476280

## 26	B_avg_opp_SIG_STR_att	B_avg_HEAD_att	0.7912030
## 27	B_avg_opp_SIG_STR_att	B_avg_opp_HEAD_att	0.9821888
## 28	B_avg_opp_SIG_STR_att	B_avg_opp_HEAD_landed	0.8314416
## 29	B_avg_opp_SIG_STR_att	B_avg_opp_BODY_att	0.7185923
## 30	B_avg_opp_SIG_STR_att	B_avg_DISTANCE_att	0.8228050
## 31	B_avg_opp_SIG_STR_att	B_avg_DISTANCE_landed	0.7810305
## 32	B_avg_opp_SIG_STR_att	B_avg_opp_DISTANCE_att	0.9733084
## 33	B_avg_opp_SIG_STR_att	B_avg_opp_DISTANCE_landed	0.9077650
## 34	B_avg_opp_SIG_STR_landed	B_avg_opp_TOTAL_STR_att	0.8890956
## 35	B_avg_opp_SIG_STR_landed	B_avg_opp_TOTAL_STR_landed	0.8353020
## 36	B_avg_opp_SIG_STR_landed	B_avg_opp_HEAD_att	0.8572718
## 37	B_avg_opp_SIG_STR_landed	B_avg_opp_HEAD_landed	0.9339982
## 38	B_avg_opp_SIG_STR_landed	B_avg_opp_BODY_att	0.7263449
## 39	B_avg_opp_SIG_STR_landed	B_avg_opp_BODY_landed	0.7284428
## 40	B_avg_opp_SIG_STR_landed	B_avg_DISTANCE_att	0.7108849
## 41	B_avg_opp_SIG_STR_landed	B_avg_opp_DISTANCE_att	0.8191182
## 42	B_avg_opp_SIG_STR_landed	B_avg_opp_DISTANCE_landed	0.9154303
## 43	B_avg_TOTAL_STR_att	B_avg_TOTAL_STR_landed	0.8837696
## 44	B_avg_TOTAL_STR_att	B_avg_HEAD_att	0.9012868
## 45	B_avg_TOTAL_STR_att	B_avg_HEAD_landed	0.8300806
## 46	B_avg_TOTAL_STR_att	B_avg_DISTANCE_att	0.8441816
## 47	B_avg_TOTAL_STR_att	B_avg_DISTANCE_landed	0.7794928
## 48	B_avg_TOTAL_STR_att	B_avg_opp_DISTANCE_att	0.7137192
## 49	B_avg_TOTAL_STR_att	B_total_time_fought.seconds.	0.7104827
## 50	B_avg_TOTAL_STR_landed	B_avg_HEAD_landed	0.7460407
## 51	B_avg_opp_TOTAL_STR_att	B_avg_opp_TOTAL_STR_landed	0.8571355
## 52	B_avg_opp_TOTAL_STR_att	B_avg_HEAD_att	0.7061917
## 53	B_avg_opp_TOTAL_STR_att	B_avg_opp_HEAD_att	0.9284677
## 54	B_avg_opp_TOTAL_STR_att	B_avg_opp_HEAD_landed	0.8308053
## 55	B_avg_opp_TOTAL_STR_att	B_avg_opp_BODY_att	0.7042508
## 56	B_avg_opp_TOTAL_STR_att	B_avg_DISTANCE_att	0.7282958
## 57	B_avg_opp_TOTAL_STR_att	B_avg_opp_DISTANCE_att	0.8833734
## 58	B_avg_opp_TOTAL_STR_att	B_avg_opp_DISTANCE_landed	0.8277233
## 59	B_avg_opp_TOTAL_STR_att	B_total_time_fought.seconds.	0.7107317
## 60	B_avg_opp_TOTAL_STR_landed	B_avg_opp_HEAD_landed	0.7888042
## 61	B_avg_TD_att	B_avg_TD_landed	0.8219788
## 62	B_avg_TD_landed	B_avg_CTRL_time.seconds.	0.7336974
## 63	B_avg_opp_TD_att	B_avg_opp_TD_landed	0.7326514
## 64	B_avg_HEAD_att	B_avg_HEAD_landed	0.8832804
## 65	B_avg_HEAD_att	B_avg_opp_HEAD_att	0.7755593
## 66	B_avg_HEAD_att	B_avg_DISTANCE_att	0.9514359
## 67	B_avg_HEAD_att	B_avg_DISTANCE_landed	0.8618987
## 68	B_avg_HEAD_att	B_avg_opp_DISTANCE_att	0.8191417
## 69	B_avg_HEAD_att	B_avg_opp_DISTANCE_landed	0.7658196
## 70	B_avg_HEAD_landed	B_avg_DISTANCE_att	0.7862313
## 71	B_avg_HEAD_landed	B_avg_DISTANCE_landed	0.8446951
## 72	B_avg_HEAD_landed	B_avg_opp_DISTANCE_att	0.7065600
## 73	B_avg_opp_HEAD_att	B_avg_opp_HEAD_landed	0.8536456
## 74	B_avg_opp_HEAD_att	B_avg_DISTANCE_att	0.7996934
## 75	B_avg_opp_HEAD_att	B_avg_DISTANCE_landed	0.7549583
## 76	B_avg_opp_HEAD_att	B_avg_opp_DISTANCE_att	0.9592315
## 77	B_avg_opp_HEAD_att	B_avg_opp_DISTANCE_landed	0.8740603
## 78	B_avg_opp_HEAD_landed	B_avg_opp_DISTANCE_att	0.7515932
## 79	B_avg_opp_HEAD_landed	B_avg_opp_DISTANCE_landed	0.8426272

## 80	B_avg_BODY_att	B_avg_BODY_landed	0.9566996
## 81	B_avg_BODY_att	B_avg_DISTANCE_landed	0.7067096
## 82	B_avg_opp_BODY_att	B_avg_opp_BODY_landed	0.9437856
## 83	B_avg_LEG_att	B_avg_LEG_landed	0.9690741
## 84	B_avg_opp_LEG_att	B_avg_opp_LEG_landed	0.9665108
## 85	B_avg_DISTANCE_att	B_avg_DISTANCE_landed	0.9294292
## 86	B_avg_DISTANCE_att	B_avg_opp_DISTANCE_att	0.8538736
## 87	B_avg_DISTANCE_att	B_avg_opp_DISTANCE_landed	0.8102665
## 88	B_avg_DISTANCE_landed	B_avg_opp_DISTANCE_att	0.8166205
## 89	B_avg_DISTANCE_landed	B_avg_opp_DISTANCE_landed	0.7727396
## 90	B_avg_opp_DISTANCE_att	B_avg_opp_DISTANCE_landed	0.9212232
## 91	B_avg_CLINCH_att	B_avg_CLINCH_landed	0.9641752
## 92	B_avg_opp_CLINCH_att	B_avg_opp_CLINCH_landed	0.9643909
## 93	B_avg_GROUND_att	B_avg_GROUND_landed	0.9708085
## 94	B_avg_opp_GROUND_att	B_avg_opp_GROUND_landed	0.9734192
## 95	B_total_rounds_fought	B_wins	0.9320144
## 96	B_total_rounds_fought	B_losses	0.8136857
## 97	B_total_rounds_fought	B_win_by_Decision_Unanimous	0.7917175
## 98	B_longest_win_streak	B_wins	0.8029149
## 99	B_wins	B_win_by_Decision_Unanimous	0.8105147
## 100	B_wins	B_win_by_KO.TKO	0.7182274
## 101	B_Height_cms	B_Reach_cms	0.7595662
## 102	B_Weight_lbs	R_Weight_lbs	0.7372873
## 103	R_avg_SIG_STR_att	R_avg_SIG_STR_landed	0.9043743
## 104	R_avg_SIG_STR_att	R_avg_opp_SIG_STR_att	0.8053286
## 105	R_avg_SIG_STR_att	R_avg_opp_SIG_STR_landed	0.7094494
## 106	R_avg_SIG_STR_att	R_avg_TOTAL_STR_att	0.9368059
## 107	R_avg_SIG_STR_att	R_avg_opp_TOTAL_STR_att	0.7402675
## 108	R_avg_SIG_STR_att	R_avg_HEAD_att	0.9769091
## 109	R_avg_SIG_STR_att	R_avg_HEAD_landed	0.8463740
## 110	R_avg_SIG_STR_att	R_avg_opp_HEAD_att	0.7897987
## 111	R_avg_SIG_STR_att	R_avg_DISTANCE_att	0.9722080
## 112	R_avg_SIG_STR_att	R_avg_DISTANCE_landed	0.9121465
## 113	R_avg_SIG_STR_att	R_avg_opp_DISTANCE_att	0.8227067
## 114	R_avg_SIG_STR_att	R_avg_opp_DISTANCE_landed	0.7722750
## 115	R_avg_SIG_STR_landed	R_avg_TOTAL_STR_att	0.8808484
## 116	R_avg_SIG_STR_landed	R_avg_TOTAL_STR_landed	0.8080185
## 117	R_avg_SIG_STR_landed	R_avg_HEAD_att	0.8475478
## 118	R_avg_SIG_STR_landed	R_avg_HEAD_landed	0.9203950
## 119	R_avg_SIG_STR_landed	R_avg_BODY_att	0.7305852
## 120	R_avg_SIG_STR_landed	R_avg_BODY_landed	0.7342817
## 121	R_avg_SIG_STR_landed	R_avg_DISTANCE_att	0.8273869
## 122	R_avg_SIG_STR_landed	R_avg_DISTANCE_landed	0.9123370
## 123	R_avg_SIG_STR_landed	R_avg_opp_DISTANCE_att	0.7035357
## 124	R_avg_opp_SIG_STR_att	R_avg_opp_SIG_STR_landed	0.9176499
## 125	R_avg_opp_SIG_STR_att	R_avg_TOTAL_STR_att	0.7065810
## 126	R_avg_opp_SIG_STR_att	R_avg_opp_TOTAL_STR_att	0.9517534
## 127	R_avg_opp_SIG_STR_att	R_avg_opp_TOTAL_STR_landed	0.7458657
## 128	R_avg_opp_SIG_STR_att	R_avg_HEAD_att	0.7971591
## 129	R_avg_opp_SIG_STR_att	R_avg_opp_HEAD_att	0.9827113
## 130	R_avg_opp_SIG_STR_att	R_avg_opp_HEAD_landed	0.8667495
## 131	R_avg_opp_SIG_STR_att	R_avg_opp_BODY_att	0.7266636
## 132	R_avg_opp_SIG_STR_att	R_avg_DISTANCE_att	0.8353437
## 133	R_avg_opp_SIG_STR_att	R_avg_DISTANCE_landed	0.7851266

## 134	R_avg_opp_SIG_STR_att	R_avg_opp_DISTANCE_att	0.9778736
## 135	R_avg_opp_SIG_STR_att	R_avg_opp_DISTANCE_landed	0.9199047
## 136	R_avg_opp_SIG_STR_landed	R_avg_opp_TOTAL_STR_att	0.9017488
## 137	R_avg_opp_SIG_STR_landed	R_avg_opp_TOTAL_STR_landed	0.8571825
## 138	R_avg_opp_SIG_STR_landed	R_avg_opp_HEAD_att	0.8810986
## 139	R_avg_opp_SIG_STR_landed	R_avg_opp_HEAD_landed	0.9385979
## 140	R_avg_opp_SIG_STR_landed	R_avg_opp_BODY_att	0.7498930
## 141	R_avg_opp_SIG_STR_landed	R_avg_opp_BODY_landed	0.7299729
## 142	R_avg_opp_SIG_STR_landed	R_avg_DISTANCE_att	0.7319447
## 143	R_avg_opp_SIG_STR_landed	R_avg_opp_DISTANCE_att	0.8573067
## 144	R_avg_opp_SIG_STR_landed	R_avg_opp_DISTANCE_landed	0.9362604
## 145	R_avg_TOTAL_STR_att	R_avg_TOTAL_STR_landed	0.8663934
## 146	R_avg_TOTAL_STR_att	R_avg_HEAD_att	0.9138069
## 147	R_avg_TOTAL_STR_att	R_avg_HEAD_landed	0.8310961
## 148	R_avg_TOTAL_STR_att	R_avg_DISTANCE_att	0.8679943
## 149	R_avg_TOTAL_STR_att	R_avg_DISTANCE_landed	0.8100051
## 150	R_avg_TOTAL_STR_att	R_avg_opp_DISTANCE_att	0.7137369
## 151	R_avg_TOTAL_STR_att	R_total_time_fought.seconds.	0.7244121
## 152	R_avg_TOTAL_STR_landed	R_avg_HEAD_landed	0.7540863
## 153	R_avg_opp_TOTAL_STR_att	R_avg_opp_TOTAL_STR_landed	0.8904219
## 154	R_avg_opp_TOTAL_STR_att	R_avg_HEAD_att	0.7347063
## 155	R_avg_opp_TOTAL_STR_att	R_avg_opp_HEAD_att	0.9349465
## 156	R_avg_opp_TOTAL_STR_att	R_avg_opp_HEAD_landed	0.8575654
## 157	R_avg_opp_TOTAL_STR_att	R_avg_opp_BODY_att	0.7089072
## 158	R_avg_opp_TOTAL_STR_att	R_avg_DISTANCE_att	0.7577053
## 159	R_avg_opp_TOTAL_STR_att	R_avg_DISTANCE_landed	0.7076524
## 160	R_avg_opp_TOTAL_STR_att	R_avg_opp_DISTANCE_att	0.8966841
## 161	R_avg_opp_TOTAL_STR_att	R_avg_opp_DISTANCE_landed	0.8437609
## 162	R_avg_opp_TOTAL_STR_landed	R_avg_opp_HEAD_att	0.7156642
## 163	R_avg_opp_TOTAL_STR_landed	R_avg_opp_HEAD_landed	0.8142964
## 164	R_avg_opp_TOTAL_STR_landed	R_avg_opp_DISTANCE_landed	0.7041342
## 165	R_avg_TD_att	R_avg_TD_landed	0.8132454
## 166	R_avg_TD_landed	R_avg_CTRL_time.seconds.	0.7318312
## 167	R_avg_opp_TD_att	R_avg_opp_TD_landed	0.7456735
## 168	R_avg_opp_TD_landed	R_avg_opp_CTRL_time.seconds.	0.7059867
## 169	R_avg_HEAD_att	R_avg_HEAD_landed	0.8687382
## 170	R_avg_HEAD_att	R_avg_opp_HEAD_att	0.7932968
## 171	R_avg_HEAD_att	R_avg_DISTANCE_att	0.9561058
## 172	R_avg_HEAD_att	R_avg_DISTANCE_landed	0.8682706
## 173	R_avg_HEAD_att	R_avg_opp_DISTANCE_att	0.8160472
## 174	R_avg_HEAD_att	R_avg_opp_DISTANCE_landed	0.7613807
## 175	R_avg_HEAD_landed	R_avg_DISTANCE_att	0.7705656
## 176	R_avg_HEAD_landed	R_avg_DISTANCE_landed	0.8357102
## 177	R_avg_opp_HEAD_att	R_avg_opp_HEAD_landed	0.8911846
## 178	R_avg_opp_HEAD_att	R_avg_DISTANCE_att	0.8200917
## 179	R_avg_opp_HEAD_att	R_avg_DISTANCE_landed	0.7634922
## 180	R_avg_opp_HEAD_att	R_avg_opp_DISTANCE_att	0.9625529
## 181	R_avg_opp_HEAD_att	R_avg_opp_DISTANCE_landed	0.8864419
## 182	R_avg_opp_HEAD_landed	R_avg_opp_DISTANCE_att	0.8031642
## 183	R_avg_opp_HEAD_landed	R_avg_opp_DISTANCE_landed	0.8696988
## 184	R_avg_BODY_att	R_avg_BODY_landed	0.9531166
## 185	R_avg_opp_BODY_att	R_avg_opp_BODY_landed	0.9482364
## 186	R_avg_opp_BODY_att	R_avg_opp_DISTANCE_landed	0.7045862
## 187	R_avg_LEG_att	R_avg_LEG_landed	0.9792124

## 188	R_avg_opp_LEG_att	R_avg_opp_LEG_landed	0.9772406
## 189	R_avg_DISTANCE_att	R_avg_DISTANCE_landed	0.9302356
## 190	R_avg_DISTANCE_att	R_avg_opp_DISTANCE_att	0.8606069
## 191	R_avg_DISTANCE_att	R_avg_opp_DISTANCE_landed	0.8085918
## 192	R_avg_DISTANCE_landed	R_avg_opp_DISTANCE_att	0.8151163
## 193	R_avg_DISTANCE_landed	R_avg_opp_DISTANCE_landed	0.7701946
## 194	R_avg_opp_DISTANCE_att	R_avg_opp_DISTANCE_landed	0.9316523
## 195	R_avg_CLINCH_att	R_avg_CLINCH_landed	0.9694010
## 196	R_avg_opp_CLINCH_att	R_avg_opp_CLINCH_landed	0.9598072
## 197	R_avg_GROUND_att	R_avg_GROUND_landed	0.9751036
## 198	R_avg_opp_GROUND_att	R_avg_opp_GROUND_landed	0.9706941
## 199	R_total_rounds_fought	R_wins	0.9311501
## 200	R_total_rounds_fought	R_losses	0.8105799
## 201	R_total_rounds_fought	R_win_by_Decision_Unanimous	0.8322683
## 202	R_longest_win_streak	R_wins	0.8154992
## 203	R_wins	R_win_by_Decision_Unanimous	0.8470893
## 204	R_wins	R_win_by_KO.TKO	0.7077040
## 205	R_Height_cms	R_Reach_cms	0.7215413

##	Var1	Var2	Correlation
## 1	B_avg_SIG_STR_att	B_avg_SIG_STR_landed	0.9143492
## 2	B_avg_SIG_STR_att	B_avg_opp_SIG_STR_att	0.7925128
## 3	B_avg_SIG_STR_att	B_avg_TOTAL_STR_att	0.9157888
## 4	B_avg_SIG_STR_att	B_avg_opp_TOTAL_STR_att	0.7024520
## 5	B_avg_SIG_STR_att	B_avg_HEAD_att	0.9754681
## 6	B_avg_SIG_STR_att	B_avg_HEAD_landed	0.8422348
## 7	B_avg_SIG_STR_att	B_avg_opp_HEAD_att	0.7728747
## 8	B_avg_SIG_STR_att	B_avg_DISTANCE_att	0.9610712
## 9	B_avg_SIG_STR_att	B_avg_DISTANCE_landed	0.8983882
## 10	B_avg_SIG_STR_att	B_avg_opp_DISTANCE_att	0.8131356
## 11	B_avg_SIG_STR_att	B_avg_opp_DISTANCE_landed	0.7686485
## 12	B_avg_SIG_STR_landed	B_avg_TOTAL_STR_att	0.8821178
## 13	B_avg_SIG_STR_landed	B_avg_TOTAL_STR_landed	0.7888788
## 14	B_avg_SIG_STR_landed	B_avg_HEAD_att	0.8627591
## 15	B_avg_SIG_STR_landed	B_avg_HEAD_landed	0.9178178
## 16	B_avg_SIG_STR_landed	B_avg_BODY_att	0.7264463
## 17	B_avg_SIG_STR_landed	B_avg_BODY_landed	0.7231335
## 18	B_avg_SIG_STR_landed	B_avg_DISTANCE_att	0.8274141
## 19	B_avg_SIG_STR_landed	B_avg_DISTANCE_landed	0.8993264
## 20	B_avg_SIG_STR_landed	B_avg_opp_DISTANCE_att	0.7066738
## 21	B_avg_opp_SIG_STR_att	B_avg_opp_SIG_STR_landed	0.9055164
## 22	B_avg_opp_SIG_STR_att	B_avg_opp_TOTAL_STR_att	0.9310837
## 23	B_avg_opp_SIG_STR_att	B_avg_HEAD_att	0.7766087
## 24	B_avg_opp_SIG_STR_att	B_avg_opp_HEAD_att	0.9826437
## 25	B_avg_opp_SIG_STR_att	B_avg_opp_HEAD_landed	0.8374686
## 26	B_avg_opp_SIG_STR_att	B_avg_opp_BODY_att	0.7438404
## 27	B_avg_opp_SIG_STR_att	B_avg_DISTANCE_att	0.8261820
## 28	B_avg_opp_SIG_STR_att	B_avg_DISTANCE_landed	0.7839889
## 29	B_avg_opp_SIG_STR_att	B_avg_opp_DISTANCE_att	0.9697257
## 30	B_avg_opp_SIG_STR_att	B_avg_opp_DISTANCE_landed	0.9073489
## 31	B_avg_opp_SIG_STR_landed	B_avg_opp_TOTAL_STR_att	0.8700991
## 32	B_avg_opp_SIG_STR_landed	B_avg_opp_TOTAL_STR_landed	0.7868369
## 33	B_avg_opp_SIG_STR_landed	B_avg_opp_HEAD_att	0.8695749
## 34	B_avg_opp_SIG_STR_landed	B_avg_opp_HEAD_landed	0.9354774

## 35	B_avg_opp_SIG_STR_landed	B_avg_opp_BODY_att	0.7556976
## 36	B_avg_opp_SIG_STR_landed	B_avg_opp_BODY_landed	0.7620676
## 37	B_avg_opp_SIG_STR_landed	B_avg_DISTANCE_att	0.7237603
## 38	B_avg_opp_SIG_STR_landed	B_avg_DISTANCE_landed	0.7046922
## 39	B_avg_opp_SIG_STR_landed	B_avg_opp_DISTANCE_att	0.8270996
## 40	B_avg_opp_SIG_STR_landed	B_avg_opp_DISTANCE_landed	0.9152108
## 41	B_avg_TOTAL_STR_att	B_avg_TOTAL_STR_landed	0.8890515
## 42	B_avg_TOTAL_STR_att	B_avg_HEAD_att	0.8896775
## 43	B_avg_TOTAL_STR_att	B_avg_HEAD_landed	0.8150329
## 44	B_avg_TOTAL_STR_att	B_avg_DISTANCE_att	0.8145068
## 45	B_avg_TOTAL_STR_att	B_avg_DISTANCE_landed	0.7619508
## 46	B_avg_TOTAL_STR_att	B_total_time_fought.seconds.	0.7417441
## 47	B_avg_TOTAL_STR_landed	B_avg_HEAD_landed	0.7262126
## 48	B_avg_opp_TOTAL_STR_att	B_avg_opp_TOTAL_STR_landed	0.8714003
## 49	B_avg_opp_TOTAL_STR_att	B_avg_opp_HEAD_att	0.9168587
## 50	B_avg_opp_TOTAL_STR_att	B_avg_opp_HEAD_landed	0.8134297
## 51	B_avg_opp_TOTAL_STR_att	B_avg_DISTANCE_att	0.7093868
## 52	B_avg_opp_TOTAL_STR_att	B_avg_opp_DISTANCE_att	0.8539701
## 53	B_avg_opp_TOTAL_STR_att	B_avg_opp_DISTANCE_landed	0.7903985
## 54	B_avg_opp_TOTAL_STR_att	B_total_time_fought.seconds.	0.7214106
## 55	B_avg_opp_TOTAL_STR_landed	B_avg_opp_HEAD_landed	0.7482019
## 56	B_avg_TD_att	B_avg_TD_landed	0.7891920
## 57	B_avg_TD_landed	B_avg_CTRL_time.seconds.	0.7918108
## 58	B_avg_opp_TD_landed	B_avg_opp_CTRL_time.seconds.	0.7580895
## 59	B_avg_HEAD_att	B_avg_HEAD_landed	0.8738385
## 60	B_avg_HEAD_att	B_avg_opp_HEAD_att	0.7629568
## 61	B_avg_HEAD_att	B_avg_DISTANCE_att	0.9371935
## 62	B_avg_HEAD_att	B_avg_DISTANCE_landed	0.8485865
## 63	B_avg_HEAD_att	B_avg_opp_DISTANCE_att	0.7984131
## 64	B_avg_HEAD_att	B_avg_opp_DISTANCE_landed	0.7518684
## 65	B_avg_HEAD_landed	B_avg_DISTANCE_att	0.7488087
## 66	B_avg_HEAD_landed	B_avg_DISTANCE_landed	0.8068470
## 67	B_avg_opp_HEAD_att	B_avg_opp_HEAD_landed	0.8625363
## 68	B_avg_opp_HEAD_att	B_avg_DISTANCE_att	0.8051418
## 69	B_avg_opp_HEAD_att	B_avg_DISTANCE_landed	0.7569585
## 70	B_avg_opp_HEAD_att	B_avg_opp_DISTANCE_att	0.9505855
## 71	B_avg_opp_HEAD_att	B_avg_opp_DISTANCE_landed	0.8695815
## 72	B_avg_opp_HEAD_landed	B_avg_opp_DISTANCE_att	0.7462785
## 73	B_avg_opp_HEAD_landed	B_avg_opp_DISTANCE_landed	0.8301938
## 74	B_avg_BODY_att	B_avg_BODY_landed	0.9544961
## 75	B_avg_opp_BODY_att	B_avg_opp_BODY_landed	0.9451332
## 76	B_avg_opp_BODY_att	B_avg_opp_DISTANCE_att	0.7121730
## 77	B_avg_opp_BODY_att	B_avg_opp_DISTANCE_landed	0.7325367
## 78	B_avg_LEG_att	B_avg_LEG_landed	0.9806243
## 79	B_avg_opp_LEG_att	B_avg_opp_LEG_landed	0.9739077
## 80	B_avg_DISTANCE_att	B_avg_DISTANCE_landed	0.9321247
## 81	B_avg_DISTANCE_att	B_avg_opp_DISTANCE_att	0.8588292
## 82	B_avg_DISTANCE_att	B_avg_opp_DISTANCE_landed	0.8228732
## 83	B_avg_DISTANCE_landed	B_avg_opp_DISTANCE_att	0.8160645
## 84	B_avg_DISTANCE_landed	B_avg_opp_DISTANCE_landed	0.7988454
## 85	B_avg_opp_DISTANCE_att	B_avg_opp_DISTANCE_landed	0.9258966
## 86	B_avg_CLINCH_att	B_avg_CLINCH_landed	0.9668683
## 87	B_avg_opp_CLINCH_att	B_avg_opp_CLINCH_landed	0.9598881
## 88	B_avg_GROUND_att	B_avg_GROUND_landed	0.9704378

## 89	B_avg_opp_GROUND_att	B_avg_opp_GROUND_landed	0.9722015
## 90	B_total_rounds_fought	B_longest_win_streak	0.7068645
## 91	B_total_rounds_fought	B_wins	0.9349517
## 92	B_total_rounds_fought	B_losses	0.8433440
## 93	B_total_rounds_fought	B_win_by_Decision_Unanimous	0.7999276
## 94	B_longest_win_streak	B_wins	0.8267300
## 95	B_wins	B_win_by_Decision_Unanimous	0.7903970
## 96	B_wins	B_win_by_KO.TKO	0.7208398
## 97	B_Height_cms	B_Reach_cms	0.7000220
## 98	R_avg_SIG_STR_att	R_avg_SIG_STR_landed	0.9243669
## 99	R_avg_SIG_STR_att	R_avg_opp_SIG_STR_att	0.8001668
## 100	R_avg_SIG_STR_att	R_avg_opp_SIG_STR_landed	0.7194823
## 101	R_avg_SIG_STR_att	R_avg_TOTAL_STR_att	0.9284102
## 102	R_avg_SIG_STR_att	R_avg_TOTAL_STR_landed	0.7008565
## 103	R_avg_SIG_STR_att	R_avg_opp_TOTAL_STR_att	0.7034561
## 104	R_avg_SIG_STR_att	R_avg_HEAD_att	0.9801963
## 105	R_avg_SIG_STR_att	R_avg_HEAD_landed	0.8563531
## 106	R_avg_SIG_STR_att	R_avg_opp_HEAD_att	0.7887096
## 107	R_avg_SIG_STR_att	R_avg_BODY_att	0.7303261
## 108	R_avg_SIG_STR_att	R_avg_DISTANCE_att	0.9719546
## 109	R_avg_SIG_STR_att	R_avg_DISTANCE_landed	0.9151493
## 110	R_avg_SIG_STR_att	R_avg_opp_DISTANCE_att	0.8205181
## 111	R_avg_SIG_STR_att	R_avg_opp_DISTANCE_landed	0.7761758
## 112	R_avg_SIG_STR_landed	R_avg_opp_SIG_STR_att	0.7485666
## 113	R_avg_SIG_STR_landed	R_avg_TOTAL_STR_att	0.8852651
## 114	R_avg_SIG_STR_landed	R_avg_TOTAL_STR_landed	0.7985427
## 115	R_avg_SIG_STR_landed	R_avg_HEAD_att	0.8867078
## 116	R_avg_SIG_STR_landed	R_avg_HEAD_landed	0.9311218
## 117	R_avg_SIG_STR_landed	R_avg_opp_HEAD_att	0.7356904
## 118	R_avg_SIG_STR_landed	R_avg_BODY_att	0.7324245
## 119	R_avg_SIG_STR_landed	R_avg_BODY_landed	0.7398470
## 120	R_avg_SIG_STR_landed	R_avg_DISTANCE_att	0.8593205
## 121	R_avg_SIG_STR_landed	R_avg_DISTANCE_landed	0.9238372
## 122	R_avg_SIG_STR_landed	R_avg_opp_DISTANCE_att	0.7674647
## 123	R_avg_SIG_STR_landed	R_avg_opp_DISTANCE_landed	0.7380190
## 124	R_avg_opp_SIG_STR_att	R_avg_opp_SIG_STR_landed	0.9216880
## 125	R_avg_opp_SIG_STR_att	R_avg_TOTAL_STR_att	0.7051987
## 126	R_avg_opp_SIG_STR_att	R_avg_opp_TOTAL_STR_att	0.9339666
## 127	R_avg_opp_SIG_STR_att	R_avg_HEAD_att	0.7785781
## 128	R_avg_opp_SIG_STR_att	R_avg_opp_HEAD_att	0.9814099
## 129	R_avg_opp_SIG_STR_att	R_avg_opp_HEAD_landed	0.8547824
## 130	R_avg_opp_SIG_STR_att	R_avg_opp_BODY_att	0.7622264
## 131	R_avg_opp_SIG_STR_att	R_avg_opp_BODY_landed	0.7129924
## 132	R_avg_opp_SIG_STR_att	R_avg_DISTANCE_att	0.8207233
## 133	R_avg_opp_SIG_STR_att	R_avg_DISTANCE_landed	0.8104700
## 134	R_avg_opp_SIG_STR_att	R_avg_opp_DISTANCE_att	0.9740427
## 135	R_avg_opp_SIG_STR_att	R_avg_opp_DISTANCE_landed	0.9135800
## 136	R_avg_opp_SIG_STR_landed	R_avg_opp_TOTAL_STR_att	0.8904634
## 137	R_avg_opp_SIG_STR_landed	R_avg_opp_TOTAL_STR_landed	0.8030488
## 138	R_avg_opp_SIG_STR_landed	R_avg_opp_HEAD_att	0.8829509
## 139	R_avg_opp_SIG_STR_landed	R_avg_opp_HEAD_landed	0.9361684
## 140	R_avg_opp_SIG_STR_landed	R_avg_opp_BODY_att	0.7749254
## 141	R_avg_opp_SIG_STR_landed	R_avg_opp_BODY_landed	0.7820505
## 142	R_avg_opp_SIG_STR_landed	R_avg_DISTANCE_att	0.7404208

## 143	R_avg_opp_SIG_STR_landed	R_avg_DISTANCE_landed	0.7428179
## 144	R_avg_opp_SIG_STR_landed	R_avg_opp_DISTANCE_att	0.8636868
## 145	R_avg_opp_SIG_STR_landed	R_avg_opp_DISTANCE_landed	0.9359944
## 146	R_avg_TOTAL_STR_att	R_avg_TOTAL_STR_landed	0.8938762
## 147	R_avg_TOTAL_STR_att	R_avg_HEAD_att	0.9116158
## 148	R_avg_TOTAL_STR_att	R_avg_HEAD_landed	0.8293939
## 149	R_avg_TOTAL_STR_att	R_avg_DISTANCE_att	0.8552787
## 150	R_avg_TOTAL_STR_att	R_avg_DISTANCE_landed	0.8003391
## 151	R_avg_TOTAL_STR_att	R_avg_opp_DISTANCE_att	0.7072518
## 152	R_avg_TOTAL_STR_att	R_total_time_fought.seconds.	0.7408673
## 153	R_avg_TOTAL_STR_landed	R_avg_HEAD_landed	0.7572592
## 154	R_avg_TOTAL_STR_landed	R_total_time_fought.seconds.	0.7007889
## 155	R_avg_opp_TOTAL_STR_att	R_avg_opp_TOTAL_STR_landed	0.8802815
## 156	R_avg_opp_TOTAL_STR_att	R_avg_opp_HEAD_att	0.9148592
## 157	R_avg_opp_TOTAL_STR_att	R_avg_opp_HEAD_landed	0.8289642
## 158	R_avg_opp_TOTAL_STR_att	R_avg_opp_BODY_att	0.7284565
## 159	R_avg_opp_TOTAL_STR_att	R_avg_opp_BODY_landed	0.7063983
## 160	R_avg_opp_TOTAL_STR_att	R_avg_DISTANCE_att	0.7067880
## 161	R_avg_opp_TOTAL_STR_att	R_avg_opp_DISTANCE_att	0.8620021
## 162	R_avg_opp_TOTAL_STR_att	R_avg_opp_DISTANCE_landed	0.8089473
## 163	R_avg_opp_TOTAL_STR_att	R_total_time_fought.seconds.	0.7153311
## 164	R_avg_opp_TOTAL_STR_landed	R_avg_opp_HEAD_landed	0.7557644
## 165	R_avg_TD_att	R_avg_TD_landed	0.7854805
## 166	R_avg_TD_landed	R_avg_CTRL_time.seconds.	0.7816690
## 167	R_avg_opp_TD_att	R_avg_opp_TD_landed	0.7241694
## 168	R_avg_opp_TD_landed	R_avg_opp_CTRL_time.seconds.	0.7517924
## 169	R_avg_HEAD_att	R_avg_HEAD_landed	0.8871980
## 170	R_avg_HEAD_att	R_avg_opp_HEAD_att	0.7702111
## 171	R_avg_HEAD_att	R_avg_DISTANCE_att	0.9509603
## 172	R_avg_HEAD_att	R_avg_DISTANCE_landed	0.8764212
## 173	R_avg_HEAD_att	R_avg_opp_DISTANCE_att	0.8001721
## 174	R_avg_HEAD_att	R_avg_opp_DISTANCE_landed	0.7533207
## 175	R_avg_HEAD_landed	R_avg_DISTANCE_att	0.7831232
## 176	R_avg_HEAD_landed	R_avg_DISTANCE_landed	0.8416924
## 177	R_avg_HEAD_landed	R_avg_opp_DISTANCE_att	0.7030211
## 178	R_avg_opp_HEAD_att	R_avg_opp_HEAD_landed	0.8783261
## 179	R_avg_opp_HEAD_att	R_avg_DISTANCE_att	0.8079495
## 180	R_avg_opp_HEAD_att	R_avg_DISTANCE_landed	0.7964956
## 181	R_avg_opp_HEAD_att	R_avg_opp_DISTANCE_att	0.9570363
## 182	R_avg_opp_HEAD_att	R_avg_opp_DISTANCE_landed	0.8783584
## 183	R_avg_opp_HEAD_landed	R_avg_opp_DISTANCE_att	0.7933409
## 184	R_avg_opp_HEAD_landed	R_avg_opp_DISTANCE_landed	0.8671617
## 185	R_avg_BODY_att	R_avg_BODY_landed	0.9543110
## 186	R_avg_opp_BODY_att	R_avg_opp_BODY_landed	0.9542727
## 187	R_avg_opp_BODY_att	R_avg_opp_DISTANCE_att	0.7229897
## 188	R_avg_opp_BODY_att	R_avg_opp_DISTANCE_landed	0.7294488
## 189	R_avg_opp_BODY_landed	R_avg_opp_DISTANCE_landed	0.7047508
## 190	R_avg_LEG_att	R_avg_LEG_landed	0.9802785
## 191	R_avg_opp_LEG_att	R_avg_opp_LEG_landed	0.9808604
## 192	R_avg_DISTANCE_att	R_avg_DISTANCE_landed	0.9388924
## 193	R_avg_DISTANCE_att	R_avg_opp_DISTANCE_att	0.8504474
## 194	R_avg_DISTANCE_att	R_avg_opp_DISTANCE_landed	0.8109810
## 195	R_avg_DISTANCE_landed	R_avg_opp_DISTANCE_att	0.8442854
## 196	R_avg_DISTANCE_landed	R_avg_opp_DISTANCE_landed	0.8202149

## 197	R_avg_opp_DISTANCE_att	R_avg_opp_DISTANCE_landed	0.9335455
## 198	R_avg_CLINCH_att	R_avg_CLINCH_landed	0.9663859
## 199	R_avg_opp_CLINCH_att	R_avg_opp_CLINCH_landed	0.9693263
## 200	R_avg_GROUND_att	R_avg_GROUND_landed	0.9662308
## 201	R_avg_opp_GROUND_att	R_avg_opp_GROUND_landed	0.9580675
## 202	R_total_rounds_fought	R_longest_win_streak	0.7022782
## 203	R_total_rounds_fought	R_wins	0.9409881
## 204	R_total_rounds_fought	R_losses	0.8650970
## 205	R_total_rounds_fought	R_win_by_Decision_Unanimous	0.7989617
## 206	R_longest_win_streak	R_wins	0.8196516
## 207	R_wins	R_losses	0.7208830
## 208	R_wins	R_win_by_Decision_Unanimous	0.7967301
## 209	R_wins	R_win_by_KO.TKO	0.7060158
## 210	R_Height_cms	R_Reach_cms	0.7222877

##	Var1	Var2	Correlation
## 1	B_avg_SIG_STR_att	B_avg_SIG_STR_landed	0.9134500
## 2	B_avg_SIG_STR_att	B_avg_opp_SIG_STR_att	0.7849717
## 3	B_avg_SIG_STR_att	B_avg_TOTAL_STR_att	0.9118560
## 4	B_avg_SIG_STR_att	B_avg_HEAD_att	0.9730621
## 5	B_avg_SIG_STR_att	B_avg_HEAD_landed	0.8586245
## 6	B_avg_SIG_STR_att	B_avg_opp_HEAD_att	0.7599433
## 7	B_avg_SIG_STR_att	B_avg_DISTANCE_att	0.9588438
## 8	B_avg_SIG_STR_att	B_avg_DISTANCE_landed	0.9031225
## 9	B_avg_SIG_STR_att	B_avg_opp_DISTANCE_att	0.8074255
## 10	B_avg_SIG_STR_att	B_avg_opp_DISTANCE_landed	0.7561362
## 11	B_avg_SIG_STR_landed	B_avg_TOTAL_STR_att	0.8768196
## 12	B_avg_SIG_STR_landed	B_avg_TOTAL_STR_landed	0.7901891
## 13	B_avg_SIG_STR_landed	B_avg_HEAD_att	0.8485220
## 14	B_avg_SIG_STR_landed	B_avg_HEAD_landed	0.9125061
## 15	B_avg_SIG_STR_landed	B_avg_BODY_att	0.7459568
## 16	B_avg_SIG_STR_landed	B_avg_BODY_landed	0.7321399
## 17	B_avg_SIG_STR_landed	B_avg_DISTANCE_att	0.8160869
## 18	B_avg_SIG_STR_landed	B_avg_DISTANCE_landed	0.8901176
## 19	B_avg_SIG_STR_landed	B_avg_opp_DISTANCE_att	0.7040648
## 20	B_avg_opp_SIG_STR_att	B_avg_opp_SIG_STR_landed	0.9223212
## 21	B_avg_opp_SIG_STR_att	B_avg_opp_TOTAL_STR_att	0.9349471
## 22	B_avg_opp_SIG_STR_att	B_avg_opp_TOTAL_STR_landed	0.7161057
## 23	B_avg_opp_SIG_STR_att	B_avg_HEAD_att	0.7635519
## 24	B_avg_opp_SIG_STR_att	B_avg_opp_HEAD_att	0.9800355
## 25	B_avg_opp_SIG_STR_att	B_avg_opp_HEAD_landed	0.8567197
## 26	B_avg_opp_SIG_STR_att	B_avg_opp_BODY_att	0.7634517
## 27	B_avg_opp_SIG_STR_att	B_avg_opp_BODY_landed	0.7005033
## 28	B_avg_opp_SIG_STR_att	B_avg_DISTANCE_att	0.8122065
## 29	B_avg_opp_SIG_STR_att	B_avg_DISTANCE_landed	0.7780405
## 30	B_avg_opp_SIG_STR_att	B_avg_opp_DISTANCE_att	0.9646667
## 31	B_avg_opp_SIG_STR_att	B_avg_opp_DISTANCE_landed	0.9192453
## 32	B_avg_opp_SIG_STR_att	B_total_time_fought.seconds.	0.7030929
## 33	B_avg_opp_SIG_STR_landed	B_avg_opp_TOTAL_STR_att	0.9070269
## 34	B_avg_opp_SIG_STR_landed	B_avg_opp_TOTAL_STR_landed	0.8344124
## 35	B_avg_opp_SIG_STR_landed	B_avg_opp_HEAD_att	0.8832466
## 36	B_avg_opp_SIG_STR_landed	B_avg_opp_HEAD_landed	0.9324728
## 37	B_avg_opp_SIG_STR_landed	B_avg_opp_BODY_att	0.7727451
## 38	B_avg_opp_SIG_STR_landed	B_avg_opp_BODY_landed	0.7762859

## 39	B_avg_opp_SIG_STR_landed	B_avg_opp_DISTANCE_att	0.8359990
## 40	B_avg_opp_SIG_STR_landed	B_avg_opp_DISTANCE_landed	0.9098150
## 41	B_avg_TOTAL_STR_att	B_avg_TOTAL_STR_landed	0.8975863
## 42	B_avg_TOTAL_STR_att	B_avg_HEAD_att	0.8764961
## 43	B_avg_TOTAL_STR_att	B_avg_HEAD_landed	0.8128275
## 44	B_avg_TOTAL_STR_att	B_avg_DISTANCE_att	0.8104410
## 45	B_avg_TOTAL_STR_att	B_avg_DISTANCE_landed	0.7593176
## 46	B_avg_TOTAL_STR_att	B_total_time_fought.seconds.	0.7436424
## 47	B_avg_TOTAL_STR_landed	B_avg_HEAD_landed	0.7062783
## 48	B_avg_opp_TOTAL_STR_att	B_avg_opp_TOTAL_STR_landed	0.8997047
## 49	B_avg_opp_TOTAL_STR_att	B_avg_opp_HEAD_att	0.9127847
## 50	B_avg_opp_TOTAL_STR_att	B_avg_opp_HEAD_landed	0.8454833
## 51	B_avg_opp_TOTAL_STR_att	B_avg_opp_BODY_att	0.7281362
## 52	B_avg_opp_TOTAL_STR_att	B_avg_opp_DISTANCE_att	0.8483259
## 53	B_avg_opp_TOTAL_STR_att	B_avg_opp_DISTANCE_landed	0.8144964
## 54	B_avg_opp_TOTAL_STR_att	B_total_time_fought.seconds.	0.7487514
## 55	B_avg_opp_TOTAL_STR_landed	B_avg_opp_HEAD_landed	0.7808720
## 56	B_avg_TD_att	B_avg_TD_landed	0.8161642
## 57	B_avg_TD_landed	B_avg_CTRL_time.seconds.	0.7449875
## 58	B_avg_opp_TD_landed	B_avg_opp_CTRL_time.seconds.	0.7239254
## 59	B_avg_HEAD_att	B_avg_HEAD_landed	0.8845024
## 60	B_avg_HEAD_att	B_avg_opp_HEAD_att	0.7465544
## 61	B_avg_HEAD_att	B_avg_DISTANCE_att	0.9410095
## 62	B_avg_HEAD_att	B_avg_DISTANCE_landed	0.8539972
## 63	B_avg_HEAD_att	B_avg_opp_DISTANCE_att	0.7892653
## 64	B_avg_HEAD_att	B_avg_opp_DISTANCE_landed	0.7441188
## 65	B_avg_HEAD_landed	B_avg_DISTANCE_att	0.7641369
## 66	B_avg_HEAD_landed	B_avg_DISTANCE_landed	0.8097168
## 67	B_avg_opp_HEAD_att	B_avg_opp_HEAD_landed	0.8848650
## 68	B_avg_opp_HEAD_att	B_avg_DISTANCE_att	0.7893316
## 69	B_avg_opp_HEAD_att	B_avg_DISTANCE_landed	0.7497830
## 70	B_avg_opp_HEAD_att	B_avg_opp_DISTANCE_att	0.9480385
## 71	B_avg_opp_HEAD_att	B_avg_opp_DISTANCE_landed	0.8860757
## 72	B_avg_opp_HEAD_landed	B_avg_opp_DISTANCE_att	0.7675160
## 73	B_avg_opp_HEAD_landed	B_avg_opp_DISTANCE_landed	0.8377582
## 74	B_avg_BODY_att	B_avg_BODY_landed	0.9523034
## 75	B_avg_opp_BODY_att	B_avg_opp_BODY_landed	0.9464861
## 76	B_avg_opp_BODY_att	B_avg_opp_DISTANCE_att	0.7135838
## 77	B_avg_opp_BODY_att	B_avg_opp_DISTANCE_landed	0.7257777
## 78	B_avg_LEG_att	B_avg_LEG_landed	0.9850965
## 79	B_avg_opp_LEG_att	B_avg_opp_LEG_landed	0.9780579
## 80	B_avg_DISTANCE_att	B_avg_DISTANCE_landed	0.9354347
## 81	B_avg_DISTANCE_att	B_avg_opp_DISTANCE_att	0.8473952
## 82	B_avg_DISTANCE_att	B_avg_opp_DISTANCE_landed	0.7986186
## 83	B_avg_DISTANCE_landed	B_avg_opp_DISTANCE_att	0.8160021
## 84	B_avg_DISTANCE_landed	B_avg_opp_DISTANCE_landed	0.7653938
## 85	B_avg_opp_DISTANCE_att	B_avg_opp_DISTANCE_landed	0.9409028
## 86	B_avg_CLINCH_att	B_avg_CLINCH_landed	0.9676804
## 87	B_avg_opp_CLINCH_att	B_avg_opp_CLINCH_landed	0.9619889
## 88	B_avg_GROUND_att	B_avg_GROUND_landed	0.9722635
## 89	B_avg_opp_GROUND_att	B_avg_opp_GROUND_landed	0.9678696
## 90	B_total_rounds_fought	B_wins	0.9280156
## 91	B_total_rounds_fought	B_losses	0.7697570
## 92	B_total_rounds_fought	B_win_by_Decision_Unanimous	0.7305606

## 93	B_current_win_streak	B_longest_win_streak	0.7084615
## 94	B_longest_win_streak	B_wins	0.8069918
## 95	B_wins	B_win_by_Decision_Unanimous	0.7260675
## 96	B_wins	B_win_by_KO.TKO	0.7992708
## 97	R_avg_SIG_STR_att	R_avg_SIG_STR_landed	0.9188075
## 98	R_avg_SIG_STR_att	R_avg_opp_SIG_STR_att	0.7718282
## 99	R_avg_SIG_STR_att	R_avg_TOTAL_STR_att	0.9193354
## 100	R_avg_SIG_STR_att	R_avg_HEAD_att	0.9763668
## 101	R_avg_SIG_STR_att	R_avg_HEAD_landed	0.8539745
## 102	R_avg_SIG_STR_att	R_avg_opp_HEAD_att	0.7598340
## 103	R_avg_SIG_STR_att	R_avg_DISTANCE_att	0.9550817
## 104	R_avg_SIG_STR_att	R_avg_DISTANCE_landed	0.9035856
## 105	R_avg_SIG_STR_att	R_avg_opp_DISTANCE_att	0.8035939
## 106	R_avg_SIG_STR_att	R_avg_opp_DISTANCE_landed	0.7455361
## 107	R_avg_SIG_STR_landed	R_avg_TOTAL_STR_att	0.8826412
## 108	R_avg_SIG_STR_landed	R_avg_TOTAL_STR_landed	0.8004948
## 109	R_avg_SIG_STR_landed	R_avg_HEAD_att	0.8722283
## 110	R_avg_SIG_STR_landed	R_avg_HEAD_landed	0.9232100
## 111	R_avg_SIG_STR_landed	R_avg_DISTANCE_att	0.8159129
## 112	R_avg_SIG_STR_landed	R_avg_DISTANCE_landed	0.8824761
## 113	R_avg_opp_SIG_STR_att	R_avg_opp_SIG_STR_landed	0.9237160
## 114	R_avg_opp_SIG_STR_att	R_avg_opp_TOTAL_STR_att	0.9206678
## 115	R_avg_opp_SIG_STR_att	R_avg_HEAD_att	0.7587902
## 116	R_avg_opp_SIG_STR_att	R_avg_opp_HEAD_att	0.9742898
## 117	R_avg_opp_SIG_STR_att	R_avg_opp_HEAD_landed	0.8550628
## 118	R_avg_opp_SIG_STR_att	R_avg_DISTANCE_att	0.7966260
## 119	R_avg_opp_SIG_STR_att	R_avg_DISTANCE_landed	0.7587205
## 120	R_avg_opp_SIG_STR_att	R_avg_opp_DISTANCE_att	0.9569185
## 121	R_avg_opp_SIG_STR_att	R_avg_opp_DISTANCE_landed	0.9080439
## 122	R_avg_opp_SIG_STR_landed	R_avg_opp_TOTAL_STR_att	0.8920054
## 123	R_avg_opp_SIG_STR_landed	R_avg_opp_TOTAL_STR_landed	0.8079602
## 124	R_avg_opp_SIG_STR_landed	R_avg_opp_HEAD_att	0.8735671
## 125	R_avg_opp_SIG_STR_landed	R_avg_opp_HEAD_landed	0.9197394
## 126	R_avg_opp_SIG_STR_landed	R_avg_opp_BODY_att	0.7317657
## 127	R_avg_opp_SIG_STR_landed	R_avg_opp_BODY_landed	0.7348878
## 128	R_avg_opp_SIG_STR_landed	R_avg_opp_DISTANCE_att	0.8273744
## 129	R_avg_opp_SIG_STR_landed	R_avg_opp_DISTANCE_landed	0.8956727
## 130	R_avg_TOTAL_STR_att	R_avg_TOTAL_STR_landed	0.9006147
## 131	R_avg_TOTAL_STR_att	R_avg_HEAD_att	0.8964209
## 132	R_avg_TOTAL_STR_att	R_avg_HEAD_landed	0.8263262
## 133	R_avg_TOTAL_STR_att	R_avg_DISTANCE_att	0.8156577
## 134	R_avg_TOTAL_STR_att	R_avg_DISTANCE_landed	0.7631472
## 135	R_avg_TOTAL_STR_att	R_total_time_fought.seconds.	0.7535339
## 136	R_avg_TOTAL_STR_landed	R_avg_HEAD_landed	0.7462398
## 137	R_avg_opp_TOTAL_STR_att	R_avg_opp_TOTAL_STR_landed	0.9026439
## 138	R_avg_opp_TOTAL_STR_att	R_avg_opp_HEAD_att	0.8952957
## 139	R_avg_opp_TOTAL_STR_att	R_avg_opp_HEAD_landed	0.8324912
## 140	R_avg_opp_TOTAL_STR_att	R_avg_opp_DISTANCE_att	0.8229907
## 141	R_avg_opp_TOTAL_STR_att	R_avg_opp_DISTANCE_landed	0.7830161
## 142	R_avg_opp_TOTAL_STR_att	R_total_time_fought.seconds.	0.7629180
## 143	R_avg_opp_TOTAL_STR_landed	R_avg_opp_HEAD_landed	0.7537124
## 144	R_avg_TD_att	R_avg_TD_landed	0.8059683
## 145	R_avg_TD_landed	R_avg_CTRL_time.seconds.	0.7523306
## 146	R_avg_opp_TD_att	R_avg_opp_TD_landed	0.7581813

## 147	R_avg_opp_TD_landed	R_avg_opp_CTRL_time.seconds.	0.7074494
## 148	R_avg_HEAD_att	R_avg_HEAD_landed	0.8866035
## 149	R_avg_HEAD_att	R_avg_opp_HEAD_att	0.7594173
## 150	R_avg_HEAD_att	R_avg_DISTANCE_att	0.9345134
## 151	R_avg_HEAD_att	R_avg_DISTANCE_landed	0.8642905
## 152	R_avg_HEAD_att	R_avg_opp_DISTANCE_att	0.7964766
## 153	R_avg_HEAD_att	R_avg_opp_DISTANCE_landed	0.7324434
## 154	R_avg_HEAD_landed	R_avg_DISTANCE_att	0.7448120
## 155	R_avg_HEAD_landed	R_avg_DISTANCE_landed	0.7988317
## 156	R_avg_opp_HEAD_att	R_avg_opp_HEAD_landed	0.8898803
## 157	R_avg_opp_HEAD_att	R_avg_DISTANCE_att	0.7868875
## 158	R_avg_opp_HEAD_att	R_avg_DISTANCE_landed	0.7414895
## 159	R_avg_opp_HEAD_att	R_avg_opp_DISTANCE_att	0.9335128
## 160	R_avg_opp_HEAD_att	R_avg_opp_DISTANCE_landed	0.8606357
## 161	R_avg_opp_HEAD_landed	R_avg_opp_DISTANCE_att	0.7539227
## 162	R_avg_opp_HEAD_landed	R_avg_opp_DISTANCE_landed	0.8065049
## 163	R_avg_BODY_att	R_avg_BODY_landed	0.9451470
## 164	R_avg_opp_BODY_att	R_avg_opp_BODY_landed	0.9512305
## 165	R_avg_LEG_att	R_avg_LEG_landed	0.9793787
## 166	R_avg_opp_LEG_att	R_avg_opp_LEG_landed	0.9792892
## 167	R_avg_DISTANCE_att	R_avg_DISTANCE_landed	0.9412352
## 168	R_avg_DISTANCE_att	R_avg_opp_DISTANCE_att	0.8414795
## 169	R_avg_DISTANCE_att	R_avg_opp_DISTANCE_landed	0.7899062
## 170	R_avg_DISTANCE_landed	R_avg_opp_DISTANCE_att	0.8013537
## 171	R_avg_DISTANCE_landed	R_avg_opp_DISTANCE_landed	0.7601906
## 172	R_avg_opp_DISTANCE_att	R_avg_opp_DISTANCE_landed	0.9395032
## 173	R_avg_CLINCH_att	R_avg_CLINCH_landed	0.9695042
## 174	R_avg_opp_CLINCH_att	R_avg_opp_CLINCH_landed	0.9621602
## 175	R_avg_GROUND_att	R_avg_GROUND_landed	0.9757968
## 176	R_avg_opp_GROUND_att	R_avg_opp_GROUND_landed	0.9638686
## 177	R_total_rounds_fought	R_wins	0.9204873
## 178	R_total_rounds_fought	R_losses	0.7783437
## 179	R_total_rounds_fought	R_win_by_Decision_Unanimous	0.7347500
## 180	R_current_win_streak	R_longest_win_streak	0.7749474
## 181	R_longest_win_streak	R_wins	0.7951772
## 182	R_wins	R_win_by_KO.TKO	0.8147927

##	Var1	Var2	Correlation
## 1	B_avg_SIG_STR_att	B_avg_SIG_STR_landed	0.9205817
## 2	B_avg_SIG_STR_att	B_avg_opp_SIG_STR_att	0.7942455
## 3	B_avg_SIG_STR_att	B_avg_TOTAL_STR_att	0.9325557
## 4	B_avg_SIG_STR_att	B_avg_TOTAL_STR_landed	0.7602725
## 5	B_avg_SIG_STR_att	B_avg_opp_TOTAL_STR_att	0.7135583
## 6	B_avg_SIG_STR_att	B_avg_HEAD_att	0.9747062
## 7	B_avg_SIG_STR_att	B_avg_HEAD_landed	0.8726057
## 8	B_avg_SIG_STR_att	B_avg_opp_HEAD_att	0.7617002
## 9	B_avg_SIG_STR_att	B_avg_DISTANCE_att	0.9517316
## 10	B_avg_SIG_STR_att	B_avg_DISTANCE_landed	0.8881583
## 11	B_avg_SIG_STR_att	B_avg_opp_DISTANCE_att	0.8261615
## 12	B_avg_SIG_STR_att	B_avg_opp_DISTANCE_landed	0.7485029
## 13	B_avg_SIG_STR_att	B_total_time_fought.seconds.	0.7640879
## 14	B_avg_SIG_STR_landed	B_avg_TOTAL_STR_att	0.8990280
## 15	B_avg_SIG_STR_landed	B_avg_TOTAL_STR_landed	0.8668021
## 16	B_avg_SIG_STR_landed	B_avg_HEAD_att	0.8577893

## 17	B_avg_SIG_STR_landed	B_avg_HEAD_landed	0.9302264
## 18	B_avg_SIG_STR_landed	B_avg_BODY_att	0.7411099
## 19	B_avg_SIG_STR_landed	B_avg_BODY_landed	0.7500608
## 20	B_avg_SIG_STR_landed	B_avg_DISTANCE_att	0.8189211
## 21	B_avg_SIG_STR_landed	B_avg_DISTANCE_landed	0.8894161
## 22	B_avg_opp_SIG_STR_att	B_avg_opp_SIG_STR_landed	0.9255646
## 23	B_avg_opp_SIG_STR_att	B_avg_TOTAL_STR_att	0.7072422
## 24	B_avg_opp_SIG_STR_att	B_avg_opp_TOTAL_STR_att	0.9272549
## 25	B_avg_opp_SIG_STR_att	B_avg_opp_TOTAL_STR_landed	0.7258918
## 26	B_avg_opp_SIG_STR_att	B_avg_HEAD_att	0.7771772
## 27	B_avg_opp_SIG_STR_att	B_avg_opp_HEAD_att	0.9795920
## 28	B_avg_opp_SIG_STR_att	B_avg_opp_HEAD_landed	0.8696088
## 29	B_avg_opp_SIG_STR_att	B_avg_opp_BODY_att	0.7038301
## 30	B_avg_opp_SIG_STR_att	B_avg_DISTANCE_att	0.8406398
## 31	B_avg_opp_SIG_STR_att	B_avg_DISTANCE_landed	0.7583215
## 32	B_avg_opp_SIG_STR_att	B_avg_opp_DISTANCE_att	0.9501852
## 33	B_avg_opp_SIG_STR_att	B_avg_opp_DISTANCE_landed	0.8928418
## 34	B_avg_opp_SIG_STR_att	B_total_time_fought.seconds.	0.7698281
## 35	B_avg_opp_SIG_STR_landed	B_avg_opp_TOTAL_STR_att	0.9003007
## 36	B_avg_opp_SIG_STR_landed	B_avg_opp_TOTAL_STR_landed	0.8366046
## 37	B_avg_opp_SIG_STR_landed	B_avg_opp_HEAD_att	0.8861846
## 38	B_avg_opp_SIG_STR_landed	B_avg_opp_HEAD_landed	0.9436213
## 39	B_avg_opp_SIG_STR_landed	B_avg_opp_BODY_att	0.7141697
## 40	B_avg_opp_SIG_STR_landed	B_avg_opp_BODY_landed	0.7384309
## 41	B_avg_opp_SIG_STR_landed	B_avg_DISTANCE_att	0.7376098
## 42	B_avg_opp_SIG_STR_landed	B_avg_opp_DISTANCE_att	0.8420837
## 43	B_avg_opp_SIG_STR_landed	B_avg_opp_DISTANCE_landed	0.9133951
## 44	B_avg_TOTAL_STR_att	B_avg_TOTAL_STR_landed	0.9211898
## 45	B_avg_TOTAL_STR_att	B_avg_HEAD_att	0.9253458
## 46	B_avg_TOTAL_STR_att	B_avg_HEAD_landed	0.8919451
## 47	B_avg_TOTAL_STR_att	B_avg_DISTANCE_att	0.8220134
## 48	B_avg_TOTAL_STR_att	B_avg_DISTANCE_landed	0.7725180
## 49	B_avg_TOTAL_STR_att	B_avg_opp_DISTANCE_att	0.7216946
## 50	B_avg_TOTAL_STR_att	B_total_time_fought.seconds.	0.7950166
## 51	B_avg_TOTAL_STR_landed	B_avg_HEAD_att	0.7348061
## 52	B_avg_TOTAL_STR_landed	B_avg_HEAD_landed	0.8630806
## 53	B_avg_opp_TOTAL_STR_att	B_avg_opp_TOTAL_STR_landed	0.9112097
## 54	B_avg_opp_TOTAL_STR_att	B_avg_opp_HEAD_att	0.9114933
## 55	B_avg_opp_TOTAL_STR_att	B_avg_opp_HEAD_landed	0.8604444
## 56	B_avg_opp_TOTAL_STR_att	B_avg_DISTANCE_att	0.7395661
## 57	B_avg_opp_TOTAL_STR_att	B_avg_opp_DISTANCE_att	0.8250962
## 58	B_avg_opp_TOTAL_STR_att	B_avg_opp_DISTANCE_landed	0.7824696
## 59	B_avg_opp_TOTAL_STR_att	B_total_time_fought.seconds.	0.8177533
## 60	B_avg_opp_TOTAL_STR_landed	B_avg_opp_HEAD_att	0.7003491
## 61	B_avg_opp_TOTAL_STR_landed	B_avg_opp_HEAD_landed	0.8088852
## 62	B_avg_opp_TOTAL_STR_landed	B_total_time_fought.seconds.	0.7077755
## 63	B_avg_TD_att	B_avg_TD_landed	0.8776953
## 64	B_avg_TD_att	B_avg_CTRL_time.seconds.	0.7759489
## 65	B_avg_TD_landed	B_avg_CTRL_time.seconds.	0.8176615
## 66	B_avg_opp_TD_att	B_avg_opp_TD_landed	0.7671965
## 67	B_avg_opp_TD_att	B_avg_opp_CTRL_time.seconds.	0.7411223
## 68	B_avg_opp_TD_landed	B_avg_opp_CTRL_time.seconds.	0.8002859
## 69	B_avg_HEAD_att	B_avg_HEAD_landed	0.8855673
## 70	B_avg_HEAD_att	B_avg_opp_HEAD_att	0.7455274

## 71	B_avg_HEAD_att	B_avg_DISTANCE_att	0.9218500
## 72	B_avg_HEAD_att	B_avg_DISTANCE_landed	0.8178822
## 73	B_avg_HEAD_att	B_avg_opp_DISTANCE_att	0.8127721
## 74	B_avg_HEAD_att	B_avg_opp_DISTANCE_landed	0.7406912
## 75	B_avg_HEAD_att	B_total_time_fought.seconds.	0.7407164
## 76	B_avg_HEAD_landed	B_avg_DISTANCE_att	0.7468794
## 77	B_avg_HEAD_landed	B_avg_DISTANCE_landed	0.7861049
## 78	B_avg_opp_HEAD_att	B_avg_opp_HEAD_landed	0.8923317
## 79	B_avg_opp_HEAD_att	B_avg_DISTANCE_att	0.8060756
## 80	B_avg_opp_HEAD_att	B_avg_DISTANCE_landed	0.7381036
## 81	B_avg_opp_HEAD_att	B_avg_opp_DISTANCE_att	0.9192959
## 82	B_avg_opp_HEAD_att	B_avg_opp_DISTANCE_landed	0.8428459
## 83	B_avg_opp_HEAD_att	B_total_time_fought.seconds.	0.7271426
## 84	B_avg_opp_HEAD_landed	B_avg_opp_DISTANCE_att	0.7640193
## 85	B_avg_opp_HEAD_landed	B_avg_opp_DISTANCE_landed	0.8317147
## 86	B_avg_BODY_att	B_avg_BODY_landed	0.9655487
## 87	B_avg_BODY_att	B_avg_DISTANCE_landed	0.7180711
## 88	B_avg_opp_BODY_att	B_avg_opp_BODY_landed	0.9631181
## 89	B_avg_opp_BODY_att	B_avg_opp_DISTANCE_att	0.7074427
## 90	B_avg_opp_BODY_att	B_avg_opp_DISTANCE_landed	0.7360584
## 91	B_avg_opp_BODY_landed	B_avg_opp_DISTANCE_landed	0.7275248
## 92	B_avg_LEG_att	B_avg_LEG_landed	0.9873714
## 93	B_avg_opp_LEG_att	B_avg_opp_LEG_landed	0.9687279
## 94	B_avg_DISTANCE_att	B_avg_DISTANCE_landed	0.9292303
## 95	B_avg_DISTANCE_att	B_avg_opp_DISTANCE_att	0.8791529
## 96	B_avg_DISTANCE_att	B_avg_opp_DISTANCE_landed	0.8077295
## 97	B_avg_DISTANCE_att	B_total_time_fought.seconds.	0.7203262
## 98	B_avg_DISTANCE_landed	B_avg_opp_DISTANCE_att	0.7902125
## 99	B_avg_DISTANCE_landed	B_avg_opp_DISTANCE_landed	0.7083293
## 100	B_avg_opp_DISTANCE_att	B_avg_opp_DISTANCE_landed	0.9325804
## 101	B_avg_opp_DISTANCE_att	B_total_time_fought.seconds.	0.7219149
## 102	B_avg_CLINCH_att	B_avg_CLINCH_landed	0.9840615
## 103	B_avg_opp_CLINCH_att	B_avg_opp_CLINCH_landed	0.9815526
## 104	B_avg_GROUND_att	B_avg_GROUND_landed	0.9790788
## 105	B_avg_opp_GROUND_att	B_avg_opp_GROUND_landed	0.9325202
## 106	B_total_rounds_fought	B_longest_win_streak	0.7479680
## 107	B_total_rounds_fought	B_wins	0.9250467
## 108	B_total_rounds_fought	B_losses	0.8464769
## 109	B_total_rounds_fought	B_win_by_Decision_Unanimous	0.7334441
## 110	B_total_rounds_fought	B_win_by_KO.TKO	0.7959413
## 111	B_longest_win_streak	B_wins	0.8473199
## 112	B_longest_win_streak	B_win_by_KO.TKO	0.8346312
## 113	B_wins	B_losses	0.7230789
## 114	B_wins	B_win_by_KO.TKO	0.8646854
## 115	B_Height_cms	B_Reach_cms	0.7393998
## 116	R_avg_SIG_STR_att	R_avg_SIG_STR_landed	0.9189356
## 117	R_avg_SIG_STR_att	R_avg_opp_SIG_STR_att	0.7298773
## 118	R_avg_SIG_STR_att	R_avg_TOTAL_STR_att	0.9148865
## 119	R_avg_SIG_STR_att	R_avg_TOTAL_STR_landed	0.7320127
## 120	R_avg_SIG_STR_att	R_avg_HEAD_att	0.9764962
## 121	R_avg_SIG_STR_att	R_avg_HEAD_landed	0.8689835
## 122	R_avg_SIG_STR_att	R_avg_opp_HEAD_att	0.7152629
## 123	R_avg_SIG_STR_att	R_avg_DISTANCE_att	0.9317989
## 124	R_avg_SIG_STR_att	R_avg_DISTANCE_landed	0.8877290

## 125	R_avg_SIG_STR_att	R_avg_opp_DISTANCE_att	0.7790163
## 126	R_avg_SIG_STR_att	R_avg_opp_DISTANCE_landed	0.7244118
## 127	R_avg_SIG_STR_att	R_total_time_fought.seconds.	0.7131231
## 128	R_avg_SIG_STR_landed	R_avg_TOTAL_STR_att	0.8796677
## 129	R_avg_SIG_STR_landed	R_avg_TOTAL_STR_landed	0.8343801
## 130	R_avg_SIG_STR_landed	R_avg_HEAD_att	0.8699022
## 131	R_avg_SIG_STR_landed	R_avg_HEAD_landed	0.9353214
## 132	R_avg_SIG_STR_landed	R_avg_BODY_landed	0.7082813
## 133	R_avg_SIG_STR_landed	R_avg_DISTANCE_att	0.7959966
## 134	R_avg_SIG_STR_landed	R_avg_DISTANCE_landed	0.8741949
## 135	R_avg_opp_SIG_STR_att	R_avg_opp_SIG_STR_landed	0.9056755
## 136	R_avg_opp_SIG_STR_att	R_avg_opp_TOTAL_STR_att	0.9241317
## 137	R_avg_opp_SIG_STR_att	R_avg_opp_TOTAL_STR_landed	0.7399366
## 138	R_avg_opp_SIG_STR_att	R_avg_HEAD_att	0.7191480
## 139	R_avg_opp_SIG_STR_att	R_avg_opp_HEAD_att	0.9722965
## 140	R_avg_opp_SIG_STR_att	R_avg_opp_HEAD_landed	0.8405675
## 141	R_avg_opp_SIG_STR_att	R_avg_DISTANCE_att	0.7722866
## 142	R_avg_opp_SIG_STR_att	R_avg_opp_DISTANCE_att	0.9538961
## 143	R_avg_opp_SIG_STR_att	R_avg_opp_DISTANCE_landed	0.8820648
## 144	R_avg_opp_SIG_STR_att	R_total_time_fought.seconds.	0.7581405
## 145	R_avg_opp_SIG_STR_landed	R_avg_opp_TOTAL_STR_att	0.8741284
## 146	R_avg_opp_SIG_STR_landed	R_avg_opp_TOTAL_STR_landed	0.8510417
## 147	R_avg_opp_SIG_STR_landed	R_avg_opp_HEAD_att	0.8466671
## 148	R_avg_opp_SIG_STR_landed	R_avg_opp_HEAD_landed	0.9195677
## 149	R_avg_opp_SIG_STR_landed	R_avg_opp_BODY_att	0.7343911
## 150	R_avg_opp_SIG_STR_landed	R_avg_opp_BODY_landed	0.7314094
## 151	R_avg_opp_SIG_STR_landed	R_avg_opp_DISTANCE_att	0.8049692
## 152	R_avg_opp_SIG_STR_landed	R_avg_opp_DISTANCE_landed	0.8890754
## 153	R_avg_TOTAL_STR_att	R_avg_TOTAL_STR_landed	0.9220859
## 154	R_avg_TOTAL_STR_att	R_avg_HEAD_att	0.9012241
## 155	R_avg_TOTAL_STR_att	R_avg_HEAD_landed	0.8514982
## 156	R_avg_TOTAL_STR_att	R_avg_DISTANCE_att	0.7914201
## 157	R_avg_TOTAL_STR_att	R_avg_DISTANCE_landed	0.7562153
## 158	R_avg_TOTAL_STR_att	R_total_time_fought.seconds.	0.7798689
## 159	R_avg_TOTAL_STR_landed	R_avg_HEAD_att	0.7058564
## 160	R_avg_TOTAL_STR_landed	R_avg_HEAD_landed	0.8073836
## 161	R_avg_opp_TOTAL_STR_att	R_avg_opp_TOTAL_STR_landed	0.9117909
## 162	R_avg_opp_TOTAL_STR_att	R_avg_opp_HEAD_att	0.9096599
## 163	R_avg_opp_TOTAL_STR_att	R_avg_opp_HEAD_landed	0.8398404
## 164	R_avg_opp_TOTAL_STR_att	R_avg_opp_DISTANCE_att	0.8189884
## 165	R_avg_opp_TOTAL_STR_att	R_avg_opp_DISTANCE_landed	0.7518263
## 166	R_avg_opp_TOTAL_STR_att	R_total_time_fought.seconds.	0.8035572
## 167	R_avg_opp_TOTAL_STR_landed	R_avg_opp_HEAD_att	0.7101386
## 168	R_avg_opp_TOTAL_STR_landed	R_avg_opp_HEAD_landed	0.8229552
## 169	R_avg_opp_TOTAL_STR_landed	R_total_time_fought.seconds.	0.7130743
## 170	R_avg_TD_att	R_avg_TD_landed	0.8283321
## 171	R_avg_TD_landed	R_avg_CTRL_time.seconds.	0.7898072
## 172	R_avg_opp_TD_att	R_avg_opp_TD_landed	0.7309029
## 173	R_avg_opp_TD_landed	R_avg_opp_CTRL_time.seconds.	0.7116297
## 174	R_avg_HEAD_att	R_avg_HEAD_landed	0.8932464
## 175	R_avg_HEAD_att	R_avg_opp_HEAD_att	0.7135826
## 176	R_avg_HEAD_att	R_avg_DISTANCE_att	0.9070702
## 177	R_avg_HEAD_att	R_avg_DISTANCE_landed	0.8416685
## 178	R_avg_HEAD_att	R_avg_opp_DISTANCE_att	0.7722401

## 179	R_avg_HEAD_att	R_avg_opp_DISTANCE_landed	0.7191866
## 180	R_avg_HEAD_landed	R_avg_DISTANCE_att	0.7378072
## 181	R_avg_HEAD_landed	R_avg_DISTANCE_landed	0.8035052
## 182	R_avg_opp_HEAD_att	R_avg_opp_HEAD_landed	0.8693576
## 183	R_avg_opp_HEAD_att	R_avg_DISTANCE_att	0.7578633
## 184	R_avg_opp_HEAD_att	R_avg_opp_DISTANCE_att	0.9239005
## 185	R_avg_opp_HEAD_att	R_avg_opp_DISTANCE_landed	0.8195156
## 186	R_avg_opp_HEAD_att	R_total_time_fought.seconds.	0.7231312
## 187	R_avg_opp_HEAD_landed	R_avg_opp_DISTANCE_att	0.7254547
## 188	R_avg_opp_HEAD_landed	R_avg_opp_DISTANCE_landed	0.7864953
## 189	R_avg_BODY_att	R_avg_BODY_landed	0.9584876
## 190	R_avg_opp_BODY_att	R_avg_opp_BODY_landed	0.9556126
## 191	R_avg_LEG_att	R_avg_LEG_landed	0.9857106
## 192	R_avg_opp_LEG_att	R_avg_opp_LEG_landed	0.9826462
## 193	R_avg_DISTANCE_att	R_avg_DISTANCE_landed	0.9364292
## 194	R_avg_DISTANCE_att	R_avg_opp_DISTANCE_att	0.8378480
## 195	R_avg_DISTANCE_att	R_avg_opp_DISTANCE_landed	0.7771121
## 196	R_avg_DISTANCE_landed	R_avg_opp_DISTANCE_att	0.7621163
## 197	R_avg_DISTANCE_landed	R_avg_opp_DISTANCE_landed	0.7118459
## 198	R_avg_opp_DISTANCE_att	R_avg_opp_DISTANCE_landed	0.9192377
## 199	R_avg_CLINCH_att	R_avg_CLINCH_landed	0.9667693
## 200	R_avg_opp_CLINCH_att	R_avg_opp_CLINCH_landed	0.9718499
## 201	R_avg_GROUND_att	R_avg_GROUND_landed	0.9222969
## 202	R_avg_opp_GROUND_att	R_avg_opp_GROUND_landed	0.9755121
## 203	R_total_rounds_fought	R_longest_win_streak	0.7118595
## 204	R_total_rounds_fought	R_wins	0.9142004
## 205	R_total_rounds_fought	R_losses	0.8358545
## 206	R_total_rounds_fought	R_win_by_KO.TKO	0.7950043
## 207	R_longest_win_streak	R_wins	0.8226895
## 208	R_longest_win_streak	R_win_by_KO.TKO	0.7940832
## 209	R_wins	R_losses	0.7128999
## 210	R_wins	R_win_by_KO.TKO	0.8440467
## 211	R_Height_cms	R_Reach_cms	0.7773429

There are so many predictor variables (over 100), we need to reduce that number. First, creating correlation matrix to identify variables that are highly correlated with each other. It would be much to visualize all combinations, so we will only extract high correlation combos (correlation > 0.7), for each class dataframe.

over 180 combinations in every class have high correlation. A lot.

Now need to deal with multicollinearity and perform variable selection. Will use ridge regression (to reduce multicollinearity) and lasso (to select variables). This is known as Elastic Net (linear regression model that includes both the L1 penalty of Lasso and the L2 penalty of Ridge regression). Elastic Net combines both L2 and L1 penalties of ridge regression and lasso. It controls the mixing of the two penalties through a parameter (lambda).

#scale numerical predictors

## [1]	"B_avg_KD"	"B_avg_opp_KD"
## [3]	"B_avg_SIG_STR_pct"	"B_avg_opp_SIG_STR_pct"
## [5]	"B_avg_TD_pct"	"B_avg_opp_TD_pct"
## [7]	"B_avg_SUB_ATT"	"B_avg_opp_SUB_ATT"
## [9]	"B_avg_REV"	"B_avg_opp_REV"
## [11]	"B_avg_SIG_STR_att"	"B_avg_SIG_STR_landed"
## [13]	"B_avg_opp_SIG_STR_att"	"B_avg_opp_SIG_STR_landed"

## [15]	"B_avg_TOTAL_STR_att"	"B_avg_TOTAL_STR_landed"
## [17]	"B_avg_opp_TOTAL_STR_att"	"B_avg_opp_TOTAL_STR_landed"
## [19]	"B_avg_TD_att"	"B_avg_TD_landed"
## [21]	"B_avg_opp_TD_att"	"B_avg_opp_TD_landed"
## [23]	"B_avg_HEAD_att"	"B_avg_HEAD_landed"
## [25]	"B_avg_opp_HEAD_att"	"B_avg_opp_HEAD_landed"
## [27]	"B_avg_BODY_att"	"B_avg_BODY_landed"
## [29]	"B_avg_opp_BODY_att"	"B_avg_opp_BODY_landed"
## [31]	"B_avg_LEG_att"	"B_avg_LEG_landed"
## [33]	"B_avg_opp_LEG_att"	"B_avg_opp_LEG_landed"
## [35]	"B_avg_DISTANCE_att"	"B_avg_DISTANCE_landed"
## [37]	"B_avg_opp_DISTANCE_att"	"B_avg_opp_DISTANCE_landed"
## [39]	"B_avg_CLINCH_att"	"B_avg_CLINCH_landed"
## [41]	"B_avg_opp_CLINCH_att"	"B_avg_opp_CLINCH_landed"
## [43]	"B_avg_GROUND_att"	"B_avg_GROUND_landed"
## [45]	"B_avg_opp_GROUND_att"	"B_avg_opp_GROUND_landed"
## [47]	"B_avg_CTRL_time.seconds."	"B_avg_opp_CTRL_time.seconds."
## [49]	"B_total_time_fought.seconds."	"B_total_rounds_fought"
## [51]	"B_total_title_bouts"	"B_current_win_streak"
## [53]	"B_current_lose_streak"	"B_longest_win_streak"
## [55]	"B_wins"	"B_losses"
## [57]	"B_win_by_Decision_Majority"	"B_win_by_Decision_Split"
## [59]	"B_win_by_Decision_Unanimous"	"B_win_by_KO.TKO"
## [61]	"B_win_by_Submission"	"B_win_by_TKO_Doctor_Stoppage"
## [63]	"B_Height_cms"	"B_Reach_cms"
## [65]	"B_Weight_lbs"	"R_avg_KD"
## [67]	"R_avg_opp_KD"	"R_avg_SIG_STR_pct"
## [69]	"R_avg_opp_SIG_STR_pct"	"R_avg_TD_pct"
## [71]	"R_avg_opp_TD_pct"	"R_avg_SUB_ATT"
## [73]	"R_avg_opp_SUB_ATT"	"R_avg_REV"
## [75]	"R_avg_opp_REV"	"R_avg_SIG_STR_att"
## [77]	"R_avg_SIG_STR_landed"	"R_avg_opp_SIG_STR_att"
## [79]	"R_avg_opp_SIG_STR_landed"	"R_avg_TOTAL_STR_att"
## [81]	"R_avg_TOTAL_STR_landed"	"R_avg_opp_TOTAL_STR_att"
## [83]	"R_avg_opp_TOTAL_STR_landed"	"R_avg_TD_att"
## [85]	"R_avg_TD_landed"	"R_avg_opp_TD_att"
## [87]	"R_avg_opp_TD_landed"	"R_avg_HEAD_att"
## [89]	"R_avg_HEAD_landed"	"R_avg_opp_HEAD_att"
## [91]	"R_avg_opp_HEAD_landed"	"R_avg_BODY_att"
## [93]	"R_avg_BODY_landed"	"R_avg_opp_BODY_att"
## [95]	"R_avg_opp_BODY_landed"	"R_avg_LEG_att"
## [97]	"R_avg_LEG_landed"	"R_avg_opp_LEG_att"
## [99]	"R_avg_opp_LEG_landed"	"R_avg_DISTANCE_att"
## [101]	"R_avg_DISTANCE_landed"	"R_avg_opp_DISTANCE_att"
## [103]	"R_avg_opp_DISTANCE_landed"	"R_avg_CLINCH_att"
## [105]	"R_avg_CLINCH_landed"	"R_avg_opp_CLINCH_att"
## [107]	"R_avg_opp_CLINCH_landed"	"R_avg_GROUND_att"
## [109]	"R_avg_GROUND_landed"	"R_avg_opp_GROUND_att"
## [111]	"R_avg_opp_GROUND_landed"	"R_avg_CTRL_time.seconds."
## [113]	"R_avg_opp_CTRL_time.seconds."	"R_total_time_fought.seconds."
## [115]	"R_total_rounds_fought"	"R_total_title_bouts"
## [117]	"R_current_win_streak"	"R_current_lose_streak"
## [119]	"R_longest_win_streak"	"R_wins"
## [121]	"R_losses"	"R_win_by_Decision_Majority"


```
## [123] "R_win_by_Decision_Split"      "R_win_by_Decision_Unanimous"
## [125] "R_win_by_KO.TKO"             "R_win_by_Submission"
## [127] "R_win_by_TKO_Doctor_Stoppage" "R_Height_cms"
## [129] "R_Reach_cms"                 "R_Weight_lbs"
## [131] "B_age"                       "R_age"
```

I scaled the numerical predictors for each dataset because these techniques are sensitive to scale.

#transform categorical predictors

I will transform the categorical variables (including our response variable) into numerical format so they can be used in Elastic Net. I will do this by using dummy variables. I am removing the additional dummy variable for the response, so it is only in the context of Red winning or losing (1 = Red win, 0 = Red lose).

#create test and train datasets

use 70% of dataset as training set and 30% as test set. separate the response variable from the predictor variables

final model (class 1)

Table 3: Class 1 Model Stats

	Values
Accuracy	0.539
Precision	0.512
Recall	0.525
F1	0.518

Table 4: Most Important Predictors for Class 1 Red Fighter

	s1		s1
B_age	0.216	B_StanceSwitch	-0.322
R_current_win_streak	0.141	R_age	-0.239
B_avg_opp_SIG_STR_pct	0.137	B_win_by_Decision_Unanimous	-0.186
B_win_by_Decision_Majority	0.136	R_avg_opp_SIG_STR_pct	-0.183
R_avg_BODY_landed	0.120	B_avg_CLINCH_att	-0.089
R_avg_SIG_STR_landed	0.098	B_avg_TD_att	-0.085
R_win_by_KO.TKO	0.077	R_avg_opp_CLINCH_att	-0.074
B_avg_KD	0.053	R_avg_opp_TD_pct	-0.062

Now moving to models, perform cross-validation to find best lambda value. Will use to find the optimal lambda and alpha parameters. Alpha is the mixing parameter between Lasso (alpha = 1) and Ridge (alpha = 0) regression. Run cross-validation for each alpha value to find the optimal lambda. Find the combination that gives the best performance (e.g., the lowest deviance). Fit the Elastic Net model using the optimal alpha and lambda values. Evaluate the model on test set to check its performance.

Accuracy: proportion of the total number of predictions that were correct. Precision: ratio of correctly predicted positive observations to the total predicted positives. Recall (Sensitivity): ratio of correctly predicted positive observations to all observations in the actual class. F1-Score: weighted average of Precision and Recall.

Repeat with classes 2-4

final model (class 2)

Table 5: Class 2 Model Stats

	Values
Accuracy	0.597
Precision	0.610
Recall	0.573
F1	0.591

Table 6: Most Important Predictors for Class 2 Red Fighter

	s1		s1
B_age	0.317	B_StanceSouthpaw	-0.199
B_avg_opp_SIG_STR_pct	0.114	R_win_by_Decision_Split	-0.196
R_current_win_streak	0.064	R_age	-0.164
R_win_by_Decision_Unanimous	0.062	B_avg_TD_landed	-0.133
B_avg_REV	0.051	R_avg_opp_CTRL_time.seconds.	-0.118
B_win_by_TKO_Doctor_Stoppage	0.046	R_avg_opp_CLINCH_att	-0.108
R_avg_SUB_ATT	0.045	B_win_by_Submission	-0.096
B_current_lose_streak	0.040	B_total_title_bouts	-0.080

Test explanation for class 2 models

final model (class 3)

[!h]

Table 7: Class 3 Model Stats

	Values
Accuracy	0.626
Precision	0.606
Recall	0.803
F1	0.691

Table 8: Most Important Predictors for Class 3 Red Fighter

	s1		s1
R_StanceOpen Stance	0.088	R_StanceSwitch	-0.320
B_StanceOrthodox	0.056	B_StanceOpen Stance	-0.319
R_StanceSouthpaw	0.055	(Intercept)	-0.178
B_avg_opp_TD_pct	0.053	R_age	-0.101
R_avg_KD	0.049	B_StanceSwitch	-0.098
B_avg_opp_TOTAL_STR_landed	0.048	B_Weight_lbs	-0.069
R_avg_opp_TD_att	0.044	B_Reach_cms	-0.049
B_avg_opp_SIG_STR_pct	0.042	R_losses	-0.049

test explanation for class 3 models

final model (class 4)

Table 9: Class 4 Model Stats

	Values
Accuracy	0.570
Precision	0.645
Recall	0.408
F1	0.500

Table 10: Most Important Predictors for Class 4 Red Fighter

	s1		s1
(Intercept)	0.213	B_Reach_cms	-0.136
B_avg_opp_SIG_STR_pct	0.138	R_avg_opp_GROUND_att	-0.080
R_win_by_TKO_Doctor_Stoppage	0.125	R_avg_opp_LEG_landed	-0.076
B_avg_opp_KD	0.108	R_avg_opp_LEG_att	-0.050
B_avg_opp_TD_pct	0.089	R_win_by_Decision_Majority	-0.044
B_win_by_Submission	0.062	B_StanceOrthodox	-0.031
B_win_by_Decision_Majority	0.055	R_avg_opp_GROUND_landed	-0.020
B_avg_opp_REV	0.038	B_avg_KD	0.000

test explanation for class 4 models

Appendix

Data Dictionary

R_ and B_: Prefix signifies red and blue corner fighter stats respectively

opp: Containing in columns is the action done by the opponent on the fighter

fighter: Name of the fighter

Referee: Referee/On-Hand Doctor of the fight. They are responsible for ending a fight if they believe a fighter is unable to continue

date: Date of the fight

location: Location of the fight

Winner: The corner of the winning fighter. We will turn this into a dummy variable and will serve as our model's response variable

title_bout: True/False indicator of a championship fight for a weightclass

weight_class: Categorical variable indicating the division of the fight. There are nine male divisions and four female divisions. We will reassign the male divisions to create our models

KD: the number of knockdowns

SIG_STR: the of significant strikes 'landed of attempted'

SIG_STR_pct: significant strikes percentage

TOTAL_STR: total strikes 'landed of attempted'

TD: number of takedowns

TD_pct: takedown percentages

SUB_ATT: number of submission attempts

REV: number of reversals landed

HEAD: number significant strikes to the head (att = attempted, landed = successful attempts)

BODY: number of significant strikes to the body (att = attempted, landed = successful attempts)

LEG: number of significant strikes to the leg (att = attempted, landed = successful attempts)

CLINCH: number of significant strikes in the clinch, also known as close quarters (att = attempted, landed = successful attempts)

GROUND: number of significant strikes on the ground (att = attempted, landed = successful attempts)

Stance: the stance of the fighter (orthodox, southpaw, etc.)

Height_cms: the height of the fighter in centimeters

Reach_cms: the reach of the fighter (arm span) in centimeters

Weight_lbs: the weight of the fighter in pounds (lbs)

age: the age of the fighter

current_lose_streak: the amount of consecutive previous fights the fighter has lost (0 if they won their previous fight)

current_win_streak: the amount of consecutive previous fights the fighter has won (0 if they lost their previous fight)

draw: the number of draws in the fighter's ufc career

wins: the number of wins in the fighter's ufc career

losses: the number of losses in the fighter's ufc career

total_rounds_fought: the average of total rounds fought by the fighter

total_time_fought(seconds): the count of total time spent fighting in seconds

total_title_bouts: the total number of title bouts taken part in by the fighter

win_by_Decision_Majority: the number of wins by majority judges decision in the fighter's ufc career (often 2-0 with one judge deciding a draw)

win_by_Decision_Split: the number of wins by split judges decision in the fighter's ufc career (often 2-1 in favor of one fighter)

win_by_Decision_Unanimous: the number of wins by unanimous judges decision in the fighter's ufc career

win_by_KO/TKO: the number of wins by knockout in the fighter's ufc career

win_by_Submission: the number of wins by submission in the fighter's ufc career

win_by_TKO_Doctor_Stoppage: the number of wins by doctor stoppage in the fighter's ufc career