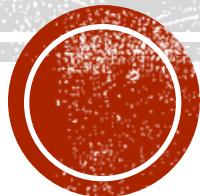


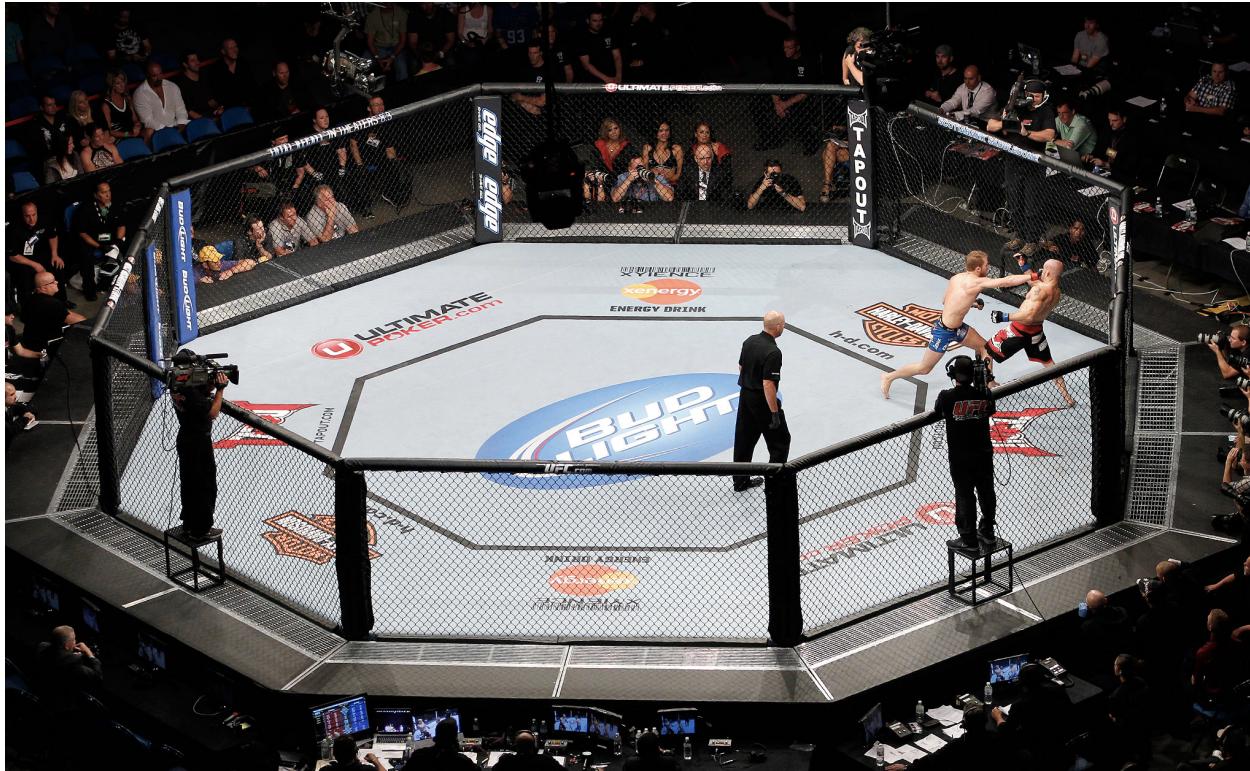


MIXED MARTIAL ARTS

Louis

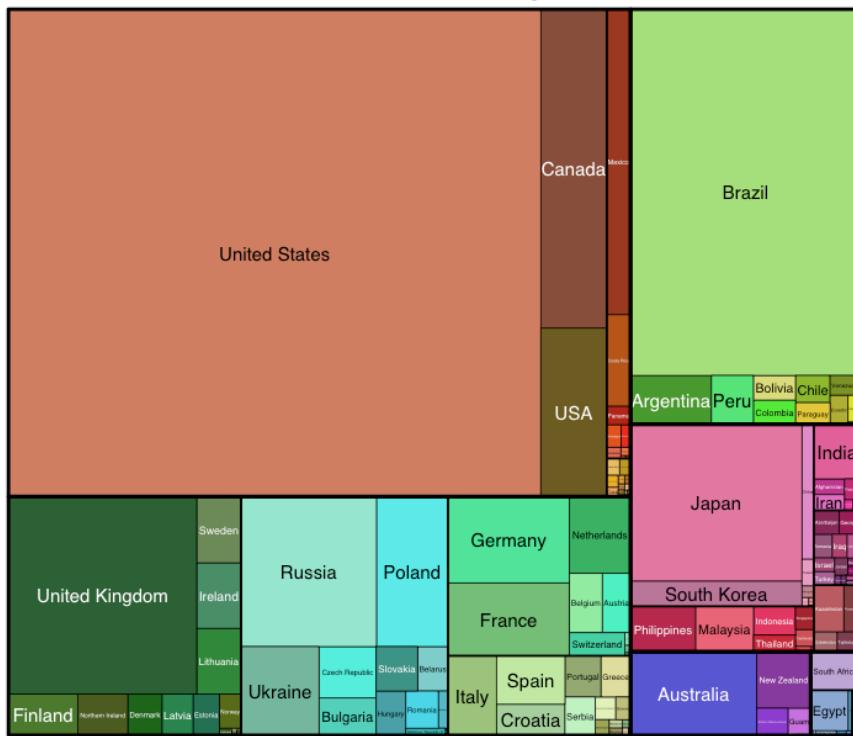


WHAT IS IT?



WHAT IS IT?

Locations of MMA fighters



WHAT IS IT?

UFC 167 | SAT. NOV. 16 | LIVE ON PAY-PER-VIEW
10PM/7PM ETPT | Las Vegas, Nevada

FIGHT CARD | LIVE STATS | ODDS | TICKETS | HOW TO WATCH | PROGRAM | VIDEOS | NEWS | PRINT

WELTERWEIGHT TITLE FIGHT

Georges St-Pierre "Rush" VS **Johny Hendricks** "Bigg Rigg"

24-2-0 RECORD 15-1-0
33% KO/TKO 47%
21% SUB 7%
46% DEC 47%
71 in HEIGHT 69 in
170 lbs WEIGHT 170 lbs

SIGNIFICANT STRIKES
3.75 LANDED PER MINUTE 3.09
54.61% ACCURACY 50.34%
1.23 ATTEMPTED P/M 3.04
74.59% DEFENSE 57.99%

GRAPPLING
4.38 TAKEDOWN AVERAGE 5.52
75.59% TAKEDOWN ACCURACY 50%
86.21% TAKEDOWNS DEFENDED 63.33%
1.14 SUBMISSION AVERAGE 0.63

MAIN CARD 10PM/7PM ETPT

St-Pierre vs Evans vs MacDonald
Hendricks vs Sonnen vs Lawler
Koscheck vs Elliott
Woodley vs Bagautinov

FOX SPORTS 1 PRELIMS 8PM/5PM ETPT

Cerrone vs Herman vs Ebersole vs Perez
Dunham vs Leites vs Story vs Figueroa

ONLINE PRELIMS 6:30PM/3:30PM ETPT

High vs Campuzano vs Donovan
Lapsley vs Pettis vs Villante

*FIGHTS ARE VERBALLY AGREED UPON AND CARD MAY CHANGE AT ANY TIME. SOME FIGHTS MAY NOT BE BROADCAST.

UFC PICKEM
MAKE YOUR PICKS NOW!
FANTASY UFC



MAJOR PLAYERS

1. UFC (+Pride, WEC, Strikeforce)
2. Bellator MMA
3. ONE championship
4. World series of fighting
5. Invicta fc
6. Rizin fighting federation

Etc...



BUSINESS Q. – INITIAL THOUGHTS

1. Based on a fighter's attributes, can you determine whether he/she would be victorious before he/she enters the ring?
2. Are there attributes which gives a fighter the “extra edge”? (E.g. does having longer arms make you a better fighter?)



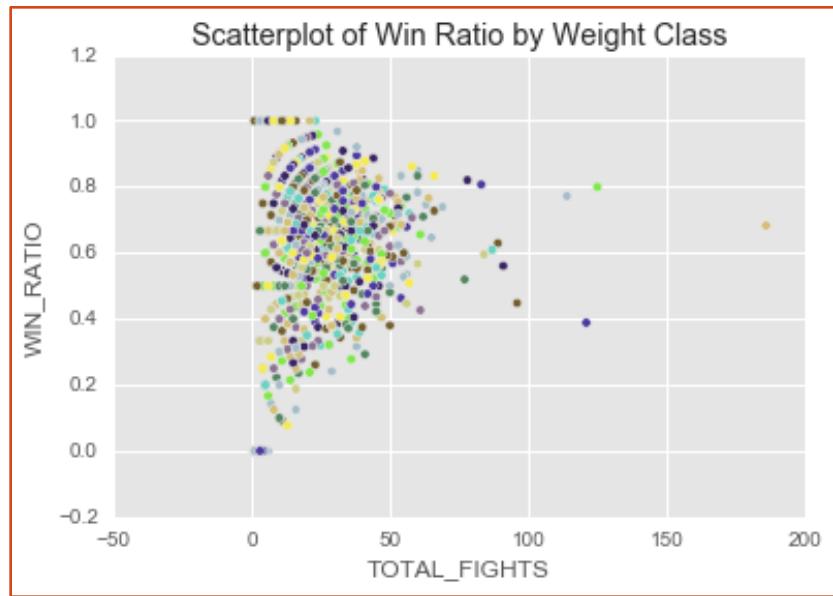
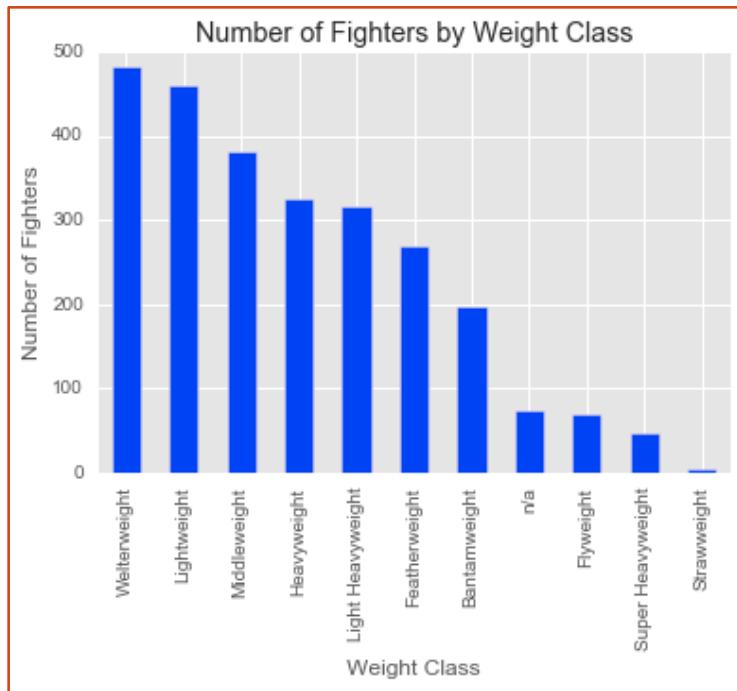
DATA

- Data on MMA fighters/Fights not readily available
 - The sport is still in its Infancy
 - Many leagues of different sizes with different rules
- <http://www.fightmetric.com/>
 - ...Started in 2007, FightMetric® is the world's only comprehensive mixed martial arts statistics and analysis provider, and is the official statistics provider of the UFC®...
- <http://www.sherdog.com/>
 - Sherdog is an American website devoted to the sport of mixed martial arts. The site is a member of the Crave Online network and provides MMA related content for ESPN.com.



DATA INVESTIGATION

...Example...



DATA INVESTIGATION

Details about the fight

	FIGHT ORDER
	KEY
	ROUND FORMAT
	EVENT_TYPE
	EVENT_NAME
	EVENT_YEAR
	EVENT_MONTH
	EVENT_DAY
	LOCATION
	COUNTRY
	LOCATION CITY
	VENUE
	ATTENDANCE
	MAIN FIGHT
	MID
	WEIGHT CLASS
	REF
Details about the fight	

Win Details

Win	OUTCOME
Details	METHOD
	METHOD_D
	ROUND
	FINISH_ROUND_MIN
	FINISH_ROUND_SEC
	FINISH_ROUND_INSECONDS
	TOTAL_INSECONDS
	STR
	TD
	SUB
	PASS

Fighter Details

Fighter Details	FIGHTER NAME
	FIGHER NO
	FIGHTER ID
	NICK
	ASSOCIATION
	LOCALITY
	COUNTRY
	BIRTH_YEAR
	AGE_AT_FIGHT
	HEIGHT_CM
	WEIGHT_KG
	REACH_INCH
	REACH_INCH1
	STANCE
	WIN_AT_FIGHT
	NOTWIN_AT_FIGH T
	TOTAL_AT_FIGHT
	WINRATIO_AT_FIG HT
	STRAVG_AT_FIGHT
	TDAVG_AT_FIGHT
	SUBAVG_AT_FIGH T
	PASSAVG_AT_FIGH T
	AGE_DIFF



DATA INVESTIGATION

- Fights occur in weight classes and are meant to be “fair”
- We are trying to predict when you enter the cage vs. an opponent, what are your chances of winning?
- A fighter’s attributes vs. his opponent might be more suitable...

Difference between fighter and his opponent	HEIGHT_DIFF WEIGHT_DIFF REACH_DIFF EXP_DIFF STRAVG_AT_FIGHT_DIFF TDAVG_AT_FIGHT_DIFF SUBAVG_AT_FIGHT_DIFF PASSAVG_AT_FIGHT_DIFF WINRATIO_DIFF STANCE_DIFF REACH_DIFF1
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BUSINESS Q. – REVISED

1. Based on a fighter's attributes vs. his opponent's, can we determine whether he would be victorious (i.e. what are his chances of winning)?
2. IF we assume a fighter is victorious, can we predict how he might win, based on his attributes, his opponents' attributes and other factors?



WIN/NOT WIN MODEL

1. Fights are banded into three categories:
 - Light: Flyweight, bantamweight, featherweight (52.2 kg - 65.8kg)
 - Middle: Lightweight, Welterweight (65.8kb – 77.1 kg)
 - Heavy: Middleweight, light heavyweight, heavyweight (77.1kg - 120.2kg)
2. Logistic Regression
 - Predicts WIN = 1, NOT WIN = 0 **Outcome**
 - Using “Difference” Variables
 - E.g. if the fighter is 185cm and your opponent is 180cm, the difference variable for height is +5
 - E.g. if the fighter is 70kg and your opponent is 76kg, the difference variable for weight is -6



WIN/NOT WIN MODEL

Based on a fighter's attributes vs. his opponent's, can we determine whether he would be victorious (i.e. what are his chances of winning)?

Description	WIN/NOT WIN MODEL					
	"LIGHT" MODEL	COEF_	"MIDDLE" MODEL	COEF_	"HEAVY" MODEL	COEF_
Difference of Ages	INTERCEPT_	-0.058	INTERCEPT_	-0.035	INTERCEPT_	-0.041
Difference in Height (cm)	AGE_DIFF	-0.073	AGE_DIFF	-0.063	AGE_DIFF	-0.024
Difference in Weight (kg)	HEIGHT_DIFF	-0.051	HEIGHT_DIFF	0.013	HEIGHT_DIFF	-0.011
Difference in the number of fights	WEIGHT_DIFF	0.047	WEIGHT_DIFF	-0.010	WEIGHT_DIFF	0.001
Difference in average strikes per fight	EXP_DIFF	0.014	EXP_DIFF	0.040	EXP_DIFF	0.005
Difference in average takedowns per fight	STRAVG_AT_FIGH	0.006	STRAVG_AT_FIGH	0.004	STRAVG_AT_FIGH	0.004
Difference in average submissions per fight	TDAVG_AT_FIGH	0.014	TDAVG_AT_FIGH	0.149	TDAVG_AT_FIGH	0.080
Difference in average passes per fight	SUBAVG_AT_FIGH	-0.025	SUBAVG_AT_FIGH	0.019	SUBAVG_AT_FIGH	-0.190
Difference in win ratio	PASSAVG_AT_FIGH	0.048	PASSAVG_AT_FIGH	0.018	PASSAVG_AT_FIGH	0.067
Difference in Reach (inch)	WINRATIO_DIFF	0.027	WINRATIO_DIFF	0.170	WINRATIO_DIFF	0.471
	REACH_DIFF1	0.016	REACH_DIFF1	0.027	REACH_DIFF1	0.075



WIN TYPE MODEL

1. Fights are banded into three categories:
 - Light: Flyweight, bantamweight, featherweight (52.2 kg - 65.8kg)
 - Middle: Lightweight, Welterweight (65.8kb – 77.1 kg)
 - Heavy: Middleweight, light heavyweight, heavyweight (77.1kg - 120.2kg)
2. Multinomial Logistic Regression / Decision tree
 - Given a fighter Wins, PREDICT **How he will win**
 - Predicts Win by Decision = 0, Win by TKO/KO = 1, Win by Submission = 2
 - Using more variables, both absolute and difference variables



WIN TYPE MODEL

IF we assume a fighter is victorious, can we predict how he might win, based on his attributes, his opponents' attributes and other factors?

Description	WIN METHOD MODEL													
	"LIGHT" MODEL		"MIDDLE" MODEL		"HEAVY" MODEL									
Decision	TKO/KO = Submission	= 0	1	= 2	Decision	TKO/KO = Submission	= 0	1	= 2	Decision	TKO/KO = Submission	= 0	1	= 2
	COEF_	COEF_				COEF_	COEF_				COEF_	COEF_		
Order of Fight		0.011	0.098				-0.109	-0.033				0.047	-0.022	
Round														
Age of the Fighter		-0.072	-0.125				-0.024	-0.037				0.061	-0.019	
Height of the Fighter (cm)		-0.043	0.039				-0.013	-0.002				-0.039	-0.099	
Weight of the Fighter (kg)		0.049	-0.028				0.082	-0.015				0.034	0.002	
Reach of the Fighter (inch)		0.080	-0.038				-0.047	0.032				0.032	0.246	
No. of fights the fighter has fought		-0.012	0.047				0.076	0.019				-0.011	-0.019	
Win Ratio of the Fighter (%)		1.058	-0.880				0.817	0.564				0.049	0.434	
Average strikes per fight		-0.004	-0.028				-0.010	-0.027				-0.012	-0.029	
Average takedowns per fight		-0.222	0.173				-0.057	-0.105				-0.147	0.176	
Average submissions per fight		-0.288	0.730				-0.070	-0.048				0.256	0.486	
Average passes per fight		-0.081	-0.013				-0.159	-0.010				-0.124	-0.320	
Difference of Ages		-0.039	0.074				-0.016	0.005				-0.061	-0.040	
Difference in Height (cm)		0.030	-0.062				0.006	0.040				-0.005	0.041	
Difference in Weight (kg)		0.031	0.031				-0.040	-0.026				0.004	-0.009	
Difference in the number of fights		-0.022	0.005				-0.033	0.018				-0.010	0.017	
Difference in average strikes per fight		0.007	0.008				0.007	0.011				0.005	0.006	
Difference in average takedowns per fight		0.099	-0.019				-0.043	-0.092				0.131	-0.272	
Difference in average submissions per fight		0.259	-0.166				-0.110	0.252				-0.098	-0.015	
Difference in average passes per fight		0.088	0.074				-0.018	0.025				-0.041	0.404	
Difference in win ratio		-1.042	0.425				0.296	-0.295				0.045	0.114	
Difference in Reach (inch)		-0.063	0.078				0.074	-0.035				0.013	-0.045	
Stance		0.143	-0.094				-0.512	-0.163				0.577	0.606	



WIN TYPE MODEL

IF we assume a fighter is victorious, can we predict how he might win, based on his attributes, his opponents' attributes and other factors?

Description	WIN METHOD MODEL					
	"LIGHT" MODEL		"MIDDLE" MODEL		"HEAVY" MODEL	
	Decision = 0	1	= 2	Decision = 0	1	= 2
Order of Fight	COEF_		COEF_		COEF_	
Round	0.163	0.244	-0.063	0.024	0.077	0.019
Age of the Fighter	-3.519		-4.393		-3.179	
Height of the Fighter (cm)	-0.067	-0.126	0.026	0.003	0.097	0.011
Weight of the Fighter (kg)	-0.049	0.045	0.032	0.040	-0.002	-0.068
Reach of the Fighter (inch)	-0.055	-0.109	-0.012	-0.098	0.020	-0.015
No. of fights the fighter has fought	0.295	0.114	0.066	0.138	0.042	0.269
Win Ratio of the Fighter (%)	-0.013	0.020	0.103	0.043	-0.005	-0.016
Average strikes per fight	0.964	-0.939	0.352	0.017	0.603	0.752
Average takedowns per fight	0.018		0.010		-0.009	
Average submissions per fight	-0.109	0.387	0.057	-0.031	-0.064	0.290
Average passes per fight	-0.423	0.557	0.083	0.045	-0.256	0.081
Difference of Ages	-0.423	0.557	-0.230	-0.042	-0.136	-0.370
Difference in Height (cm)	-0.078	-0.052	-0.035	-0.008	-0.061	-0.047
Difference in Weight (kg)	-0.052	0.065	0.009	0.047	-0.013	0.032
Difference in the number of fights	0.029	-0.061	0.003	0.016	0.009	0.001
Difference in average strikes per fight	0.079	0.070	-0.012	0.039	-0.014	0.014
Difference in average takedowns per fight	0.006	0.048	-0.001	0.005	0.008	0.007
Difference in average submissions per fight	0.006	0.005	-0.102	-0.145	0.277	-0.130
Difference in average passes per fight	0.056	-0.089	-0.173	0.243	0.074	0.116
Difference in win ratio	0.238		-0.176		-0.098	
Difference in Reach (inch)	0.114	0.145	0.082	0.077	-0.026	0.133
Stance	-1.920	-0.171	0.250	-0.181	0.023	-0.050
	-0.246	-0.045	-0.014	-0.142	0.621	0.713
	-0.546	-0.578	-0.610	-0.335		



APPLICATION

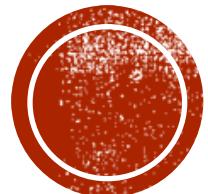
- JJ vs DC (upcoming fights)
- CM vs ND (different division)



LIMITATION AND FUTURE ENHANCEMENTS

- Data – not enough...yet...
 - Other brands and organisations
 - Other variables (e.g. Type of training a fighter has had, coach, etc...)
- Linking the two models together
 - Problem with Stance
 - Problem with duration of the fight/round
 - A few others....
- More granular segmentation (e.g. Womens' divisions)
- Structural Changes!!!
- Odds Data – how does this model/result line up with odd makers





APPENDIX

Appendix + What did you Achieve? + What did you learn?

APPENDIX

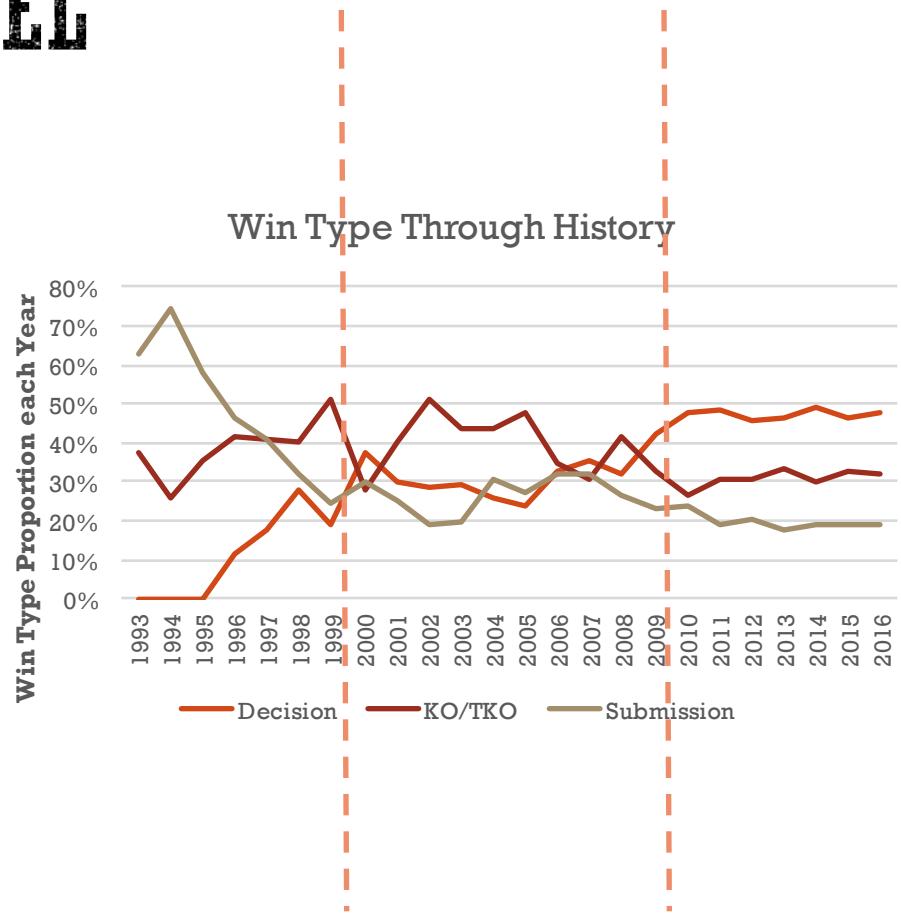
- Win/Not Win Model – Investigation of whether fights are becoming more "fair"
- Some interesting plots...



WIN/NOT WIN MODEL

Why is the accuracy so low?

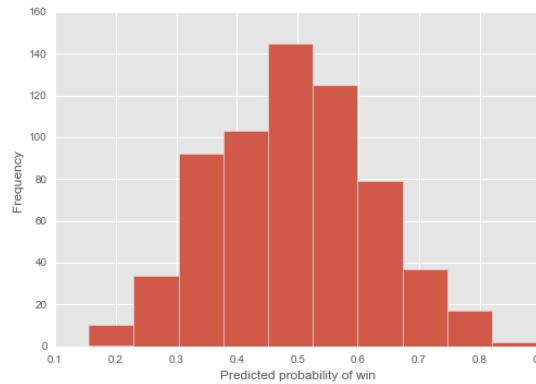
- Is my model no good?
- Is my data no good?
- Structural changes in my Data?
 - Decision wins are now more common, meaning fights are lasting the full 3 or 5 rounds
 - Does this mean fights have been set to be “more Fair”?
- This needs more investigation!



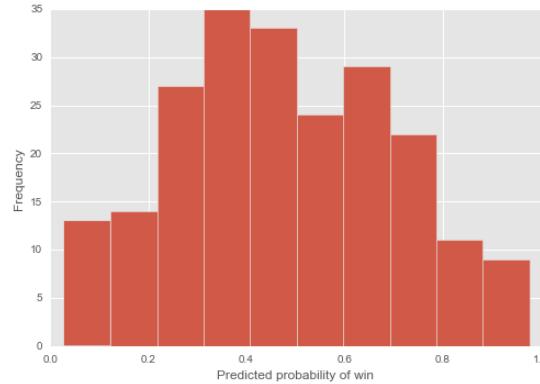
WIN/NOT WIN MODEL

ALL data (1999 –
2016)

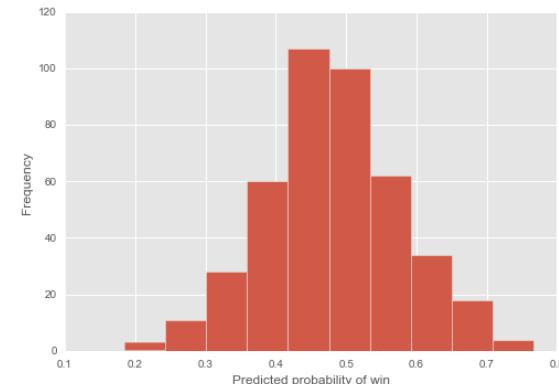
Middle Model



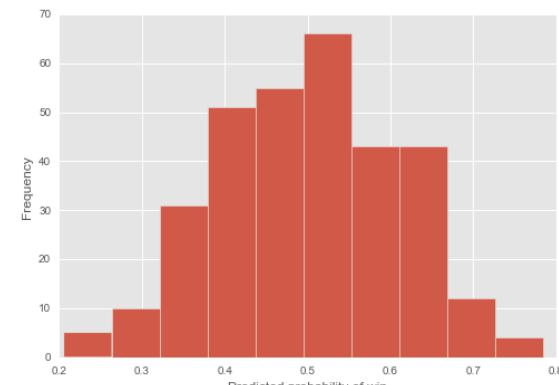
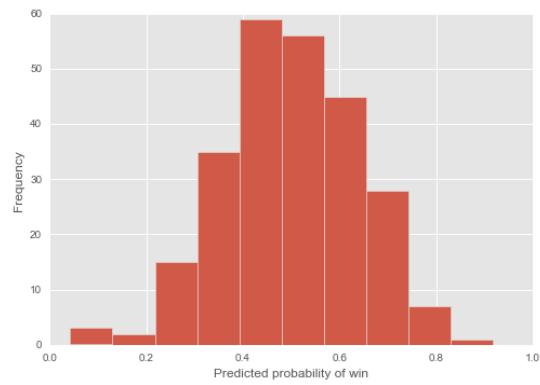
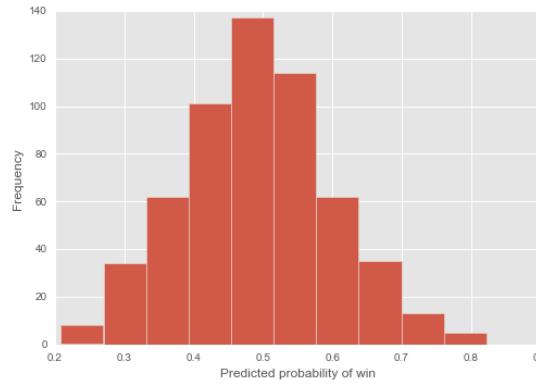
1999-2009 only



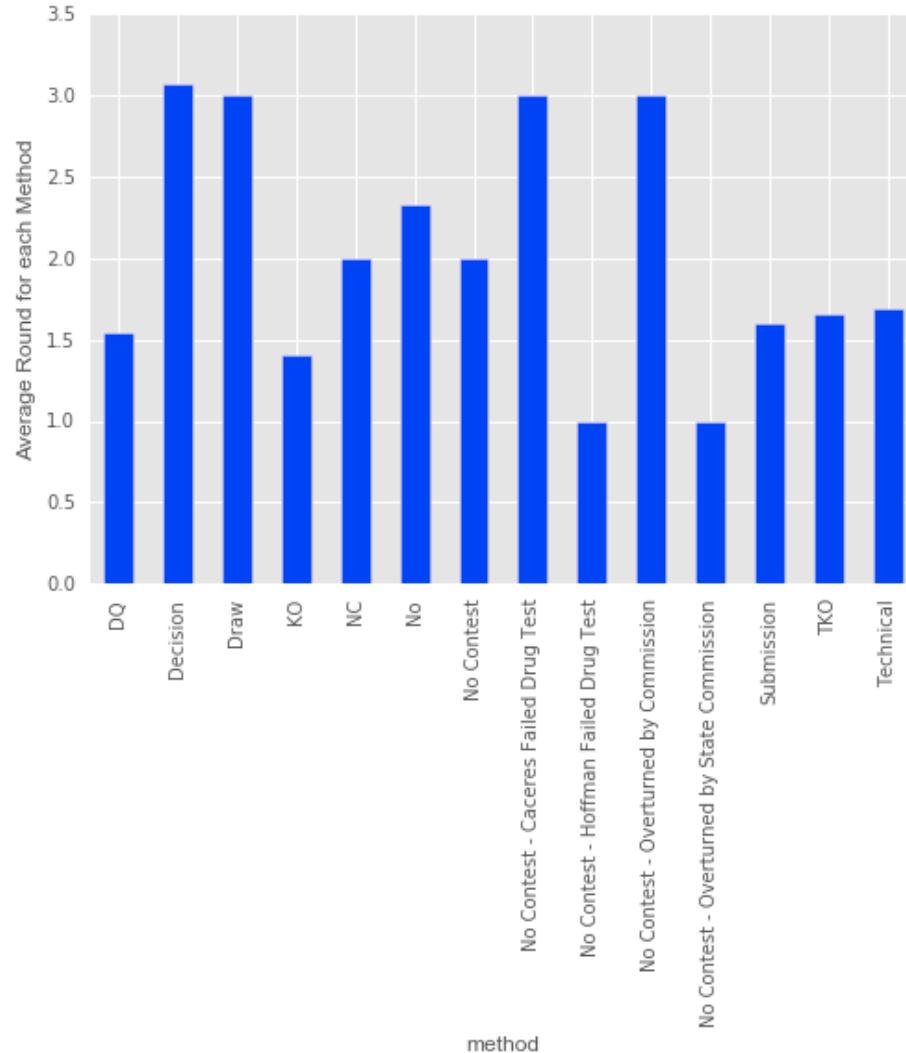
2010 onwards only



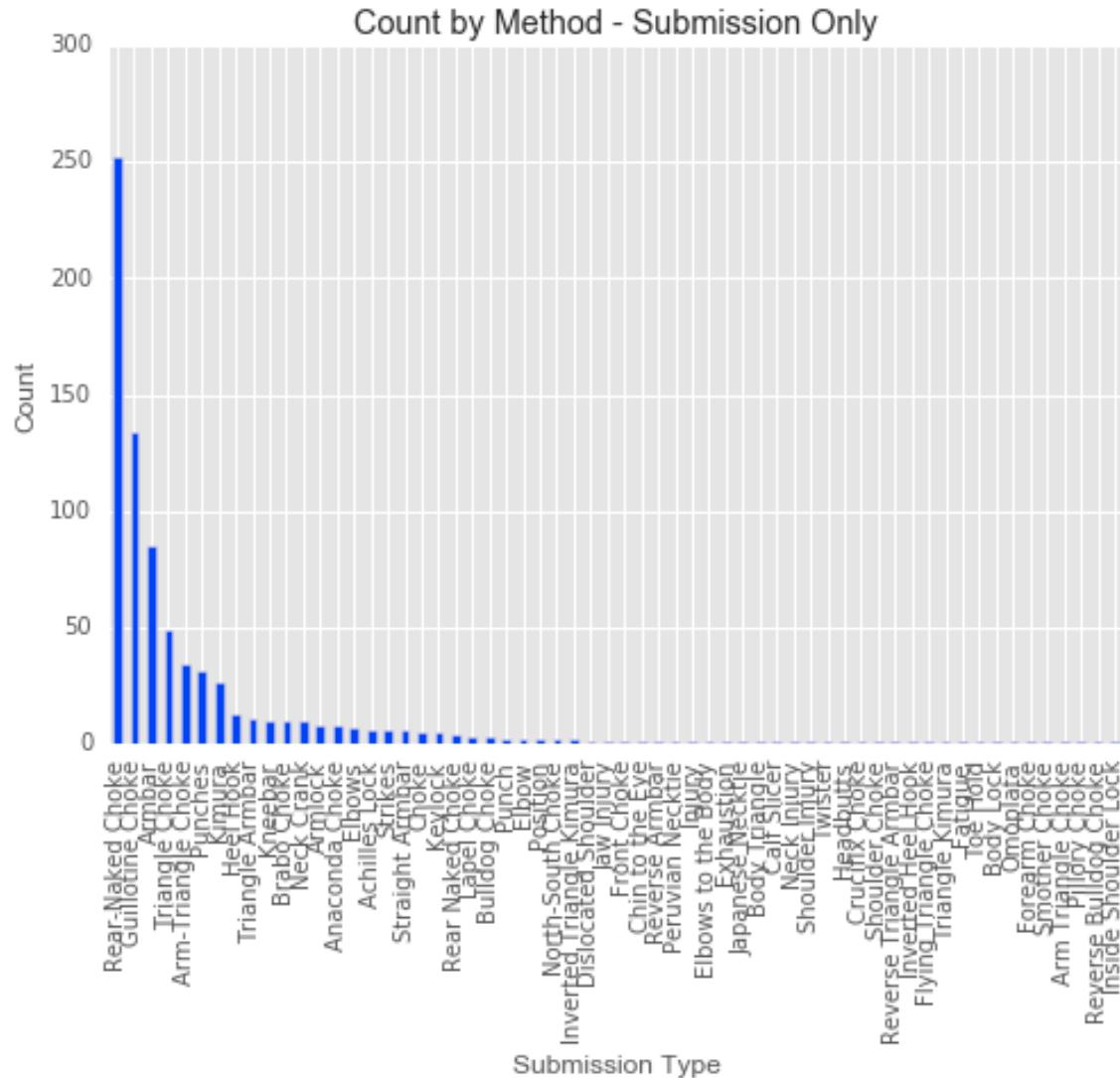
Heavy Model



SCATTERPLOTS



SCATTERPLOTS



SCATTERPLOTS

