# How to Succeed in E-Sports: A Data Analysis on PlayerUnknown's Battlegrounds

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STAT 612 Statistical Programming in R
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# PUBG - Ready for Chicken Dinner



- shooter battle royale game
- parachute 100 players
- transports, weapons, and medical supplies
- blue field will shrink from time to time
- Solo, duo, squad



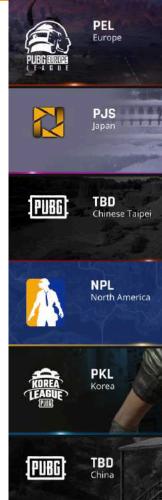
## The rapid growth of eSports

- Series game in 9 independent regions
- Global Championship
- All-Star Games and Exhibition
- Large prize pool \$
- Fortnite World Cup
- League of Legends World Championship









# INITIAL EXPLORATION

**Datasets** 

**Correlation Matrix** 



### Dataset 1 - Game

- 5000 objects of 15 variables
- Players' performance

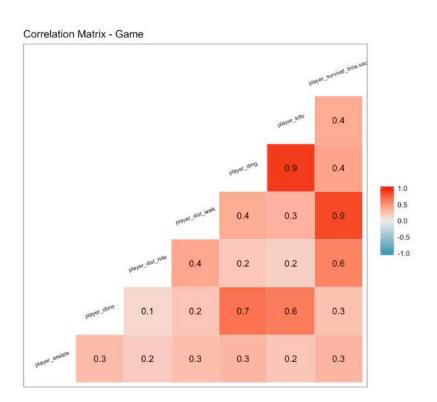
	date	game_size =	match_id		÷	match_mo	ode ÷	party_size	-	player_assists ÷	player_c	dbno ÷	
1	2017-11-19 10:18:0	27 CONSOT SOATON	2U4GBNA0YmkeesbL4ngdUi	KfY4H4_kZff5aPRg3ji	XyoXr	tpp		2	2	0		1	
2	2017-10-25 14:21:2	4 92	2U4GBNA0Ymkr-kC4PH4Ca	9PnF45wdRqkMjund	E7D	tpp		1	1	0		0	
3	2017-10-21 14:10:1	4 28	2U4GBNA0Ymn_91KQstDwB	FXLnJbSsbRMLDHI_N	8QZ	tpp		4	4	0		0	
4	2018-01-08 15:33:0	94	2U4GBNA0YmlwTNI8xdP-O3	3fM5BYv9jCsEtZf7L2	ao2Ll	tpp		1	1	0		0	
5	2017-12-28 05:02:3	2 26	2U4GBNA0YmlFOBn4YEKy7E	08tAbh2TEztZMrFtL_	wKW	tpp		4	4	2		3	
6	2017-12-27 15:23:5	7 22	2U4GBNA0Ymn0JxNc24MOC	8Kef91rbY9o7p_eql	C_7	tpp		4	4	0		1	
7	2017-11-17 08:22 p	layer_dist_ride	player_dist_walk	player_dmg =	player	_kills =	playe	r_name	\$	player_survive_t	ime ‡	team_id	team_placement =
8	2017-11-19 04:12	3244.5241	70 1666.484860	285		2	nime	ngdefuqin		9	26.553	49	24
9	2017-12-28 22:06	0.0000	00 485.559540	0		0	zhula	hu	Ť	2	72.093	100088	62
10	2017-11-12 05:46	0.0000		20		1940	cynth	O.			50.520	20	
11	2017-12-02 13:35												900
12	2017-10-23 23:52	0.0000	00 1209.209230 364	47		0	MRyu	xuang	4		94.169	100099	90
13	2017-11-10 10:42	1210.2401	10 2327.965330	242		2	Godli	keLIJING		19	63.921	16	1
14	2017-12-25 06:02	1406.3107	90 1547.320680	110		1	hywb	gyw		10	01.365	7	10
15	2017-10-30 06:14	3247.9211	40 1645.593750	329		1	leizhi	jie		14	05.497	20	14
40	2017 11 21 05 51	0.0000	00 111 16775				0.1/-	o.Ee			CO E 70	100004	0.1

### Dataset 2 - Death

- 5000 objects of 12 variables
- killer and victims' profile

*	killed_by =	killer_name *	killer_placement	killer_position_x	killer_position_y	map ÷	ap <sup>‡</sup> match_id		
1	AKM	ZhangDaDaZZZ	7	440380.3	548100.60	MIRAMAR	2U4GBNA0Ymm23kvxZaf0h-1hQIHA8SBhs4		Bhs4bxqrktYE
2	AKM	MJC1025	13	490535.7	348498.50	ERANGEL	2U4GBNA0Ymn1uko0Y5ROEf2A63zJTyPBD8XwqO		PBD8XwqOYfAJ
3	M16A4	KlausWasTaken	11	665946.2	107312.30	ERANGEL	2U4GBNA0YmlnyReM2OZY4P6RmziiGXILQzZ2jXeVHD		
4	Micro UZI	ChiggaJay	7	570725.8	247507.00	ERANGEL	2U4GBNA0Ymks-ml_1zDvD49Vnr1kfSEHlprTwjnOnpi		
5	51897	chrie-Z	23	344463.8	306297.60	ERANGEL 2U4GBNA0Ym		mlWWPz0Njvfj82grK8n2e76SK8hyFsdlbLo	
6	M416	Night_Knight	16	time ‡	victim_name	victim_placement +		victim_position_x	victim_position_y
7	S1897	czb123	13	609	Plutonord	26		440490.5	547786.
8	M16A4	Longbros3	11	989	Dumbassgeek	18		490739.8	348909
9	Mini 14	C137-Rick	46	158	CoolHaoChen	9		665270.2	111872
10	AUG	LieNyL	7	214	SKHY	20		570416.9	247717
11	Kar98k	YANSHENI	11	100000	2000 (Alex 1800)	13 15		2002/2007/2004	1000000000
12	M416	666qaz	1	255	OutMePub			344455.1	306165
13	SKS	Chastlove7	3	607	Adelus			152984.0 28	
14	M16A4	YVR-AirportBear	8	314	Haozishu85		17	456695.3	99302

### **Correlation Matrix**









### 3 main factors

- Vehicle use and Mobility
- Killing and Damaging values
- Location and Weapon use



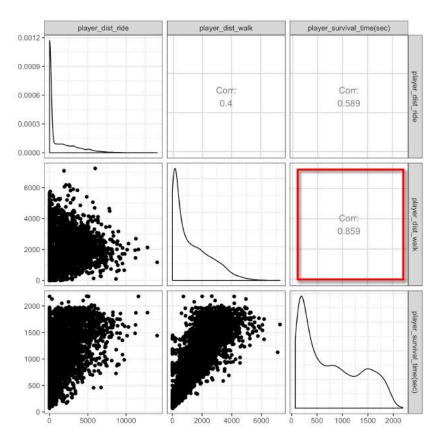


### HYPOTHESES #1

How can we conclude the relationship of distance of walk, distance of ride, and the player's survival time? Does it increase one's chance for survival if they utilize vehicles? Joining the kill dataset to make an inference from player placement, and explore the player's strategy and decision-making.



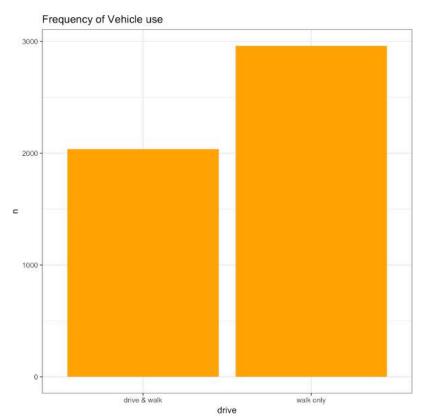
### **Bivariate Associations**





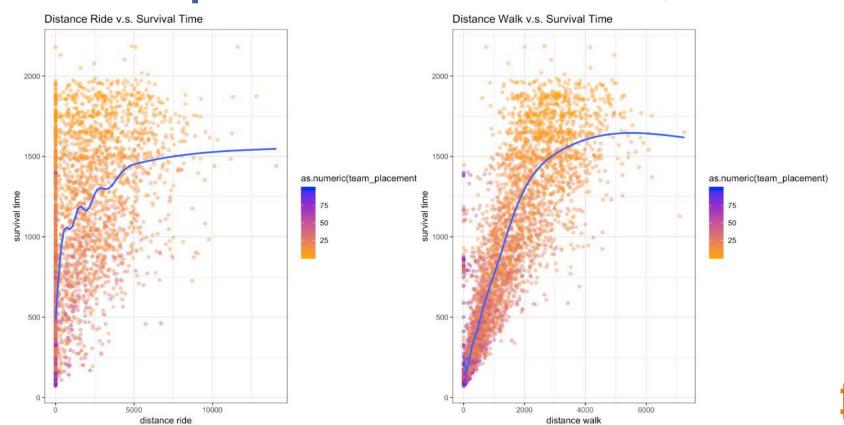
# Frequency of Vehicle Use

player_dist_ride 🏺	player_dist_walk
0.00000	62.64172
2739.95166	5810.97949
4641.17000	2892.69629
1270.91638	2363.67651
1366.78625	2084.21900
1158.89441	3692.91626
1201.69983	3432.21313
1599.26843	4168.84766
424.28235	3421.78320
5458.34200	2544.03149
4197.64453	2344.97778
4588.51758	3037.72778
0.00000	1136.39893
3153.80273	2387.56152





# Scatter plot of Distance Ride/Walk



# Summary for hypotheses #1

- Using Vehicles increases the possibility of being killed
- The difficulties of controlling Vehicles, shooting, and defending the enemies
- Teamwork may work but increasing the risks of being killed together

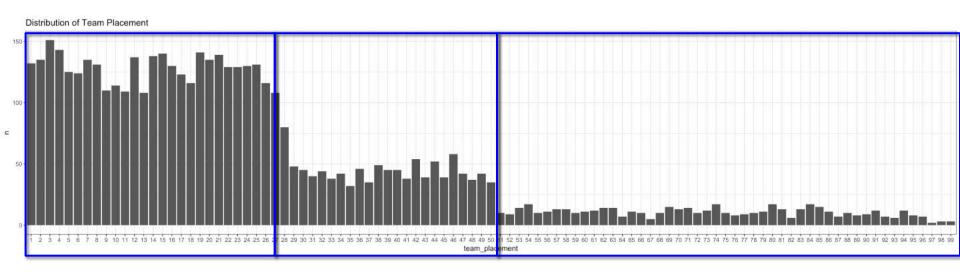


## **HYPOTHESES #2**

Compare with player statistics such as knockdown point (dbno), hit point (dmg), and kills. Does a higher knockdown point or hit points determine number of kills? How about the association between each other? Is that relating to win/lose?

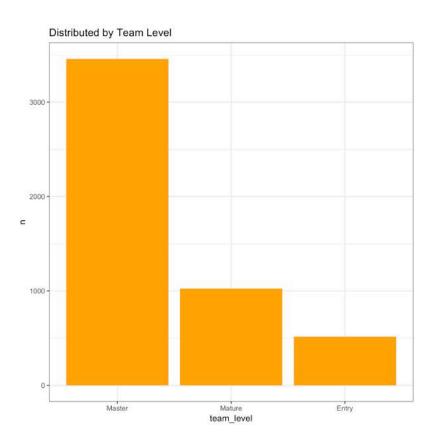


### **Team Placement**





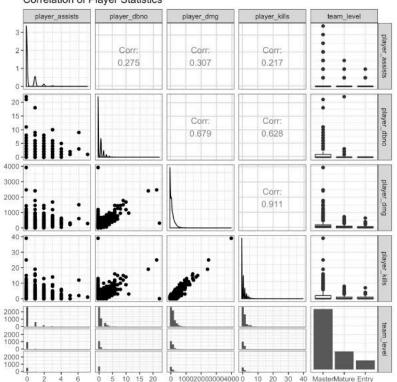
### **Team Placement**



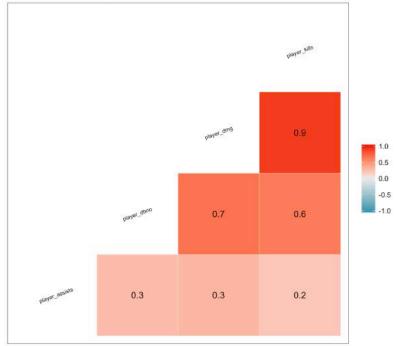


### Correlation

#### Correlation of Player Statistics

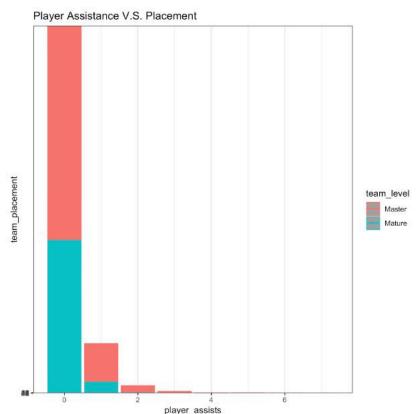


#### Correlation Coefficient - Player Statictics





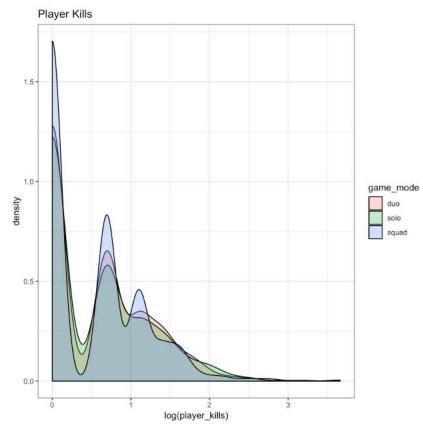
# Player Assists



- No direct impact
- Teamwork



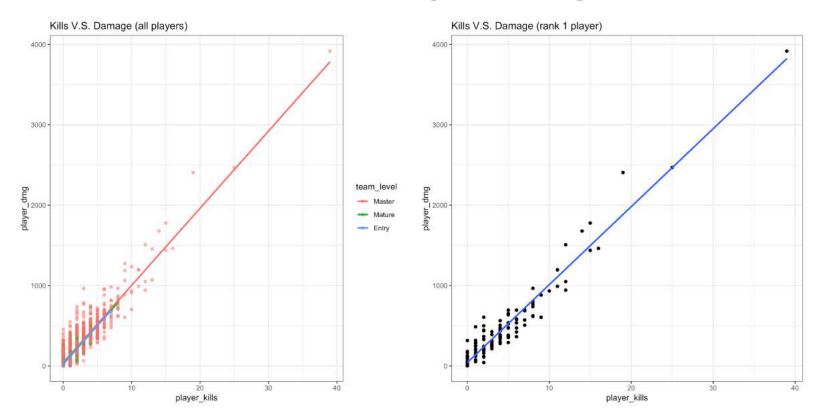
# Density Plot of Kills



- Team Strategies
- Player Performance



# Kills versus Damage(Hit points)





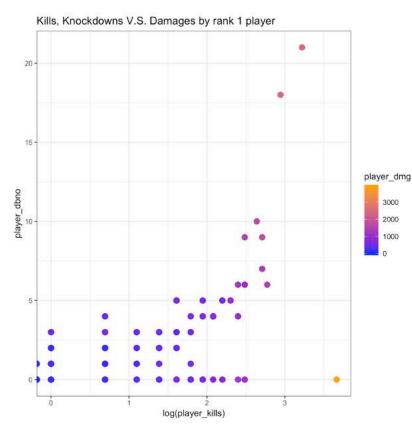
# Descending "down but not out"

*	player_name	player_dbno +	player_assists ‡	player_kills ‡	player_dmg +	team_placement +	team_level =	player_survival_time(sec)
1	lan47	22	.0	0	310	28	Mature	447.492
2	SZSLNMP	21	0	25	2469	1	Master	1618.602
3	MRMO666	18	1	19	2406	1	Master	1735.009
4	TuTukiler	11	0	3	962	2	Master	1886.879
5	HZ334	10	3	9	1188	6	Master	1608.570
6	King19940823	10	3	14	1678	1	Master	1869.534
7	SoMuchILoVeYoU	9	1	15	1777	1	Master	1841.275
8	Rhythm3111	9	6	12	1507	1	Master	2050.701
9	JF_mQ	8	0	10	1234	6	Master	1261.959
10	Say_Never	8	2	13	1456	3	Master	1810.111
11	Arnmb	8	1	6	950	2	Master	1869.321
12	Xy106614-	7	2	9	1274	2	Master	1890.606
13	zupaidashen	7	0	6	571	14	Master	786.808
14	Ardhemon	7	0	3	784	3	Master	1748.640
15	baichuan2	7	0	15	1438	1	Master	1720.202
16	Orda	6	1	9	4ED	c	Master	1616 204



### kills, dbno, and dmg by rank 1st player

1000



- Damage (hit point) = kills + knockdown
- Master player may get higher hit points

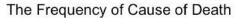


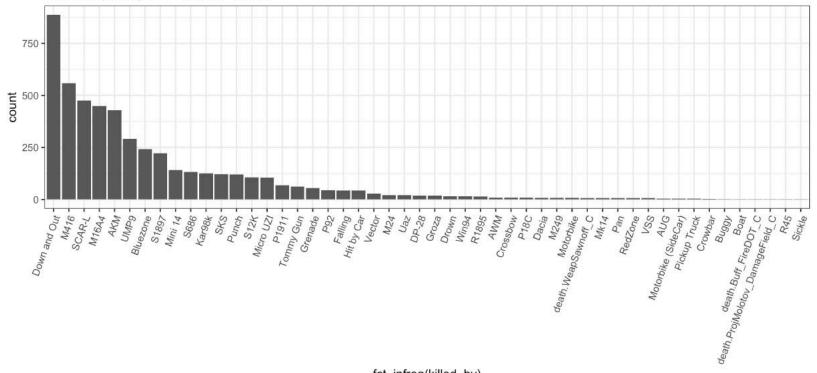
## HYPOTHESES #3

Find the possible distribution of killers' position on the map, and explore the frequency of the causes of death. Additionally, generate the victims' location then visualize the position between killer and victim. Can we find a specific location in which is likely to have more survival chances? Which weapon takes an advantages for players to knockdown others.



### Cause of Death







# Filtering killed by

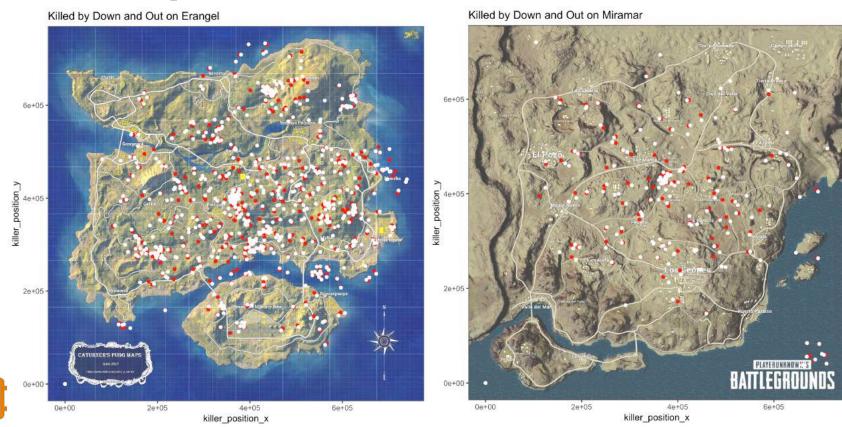
filter(killed\_by == "Down and Out") -> killbydo

death1 %>%

```
death1 %>%
 filter(killed_by == "Down and Out") %>%
 filter(map == "ERANGEL") -> killbydo_ERAN
death1 %>%
 filter(killed_by == "Down and Out") %>%
 filter(map == "MIRAMAR") -> killbydo_MIRA
ggplot(killbydo_ERAN, aes(x = killer_position_x, y = killer_position_y)) +
  annotation_raster(erangel, ymin = -Inf, ymax = Inf, xmin = -Inf, xmax = Inf) +
  geom_point(colour="red") +
  geom_point(aes(x = victim_position_x, y= victim_position_y), colour="white") +
  ggtitle("Killed by Down and Out on Erangel") -> kdbydo_er
ggsave("kdbydo_er.png")
```



# Killed by Down and Out



### Filter 1st killer and 2nd Victim

```
death1 %>%
  filter(killer_placement == 1 & victim_placement == 2) %>%
  filter(map == "MIRAMAR") %>%
  select(killed_by, killer_placement, victim_placement, killer_position_x, killer_position_y,
         victim_position_x, victim_position_y, everything()) ->
  final_pk_MIRA
```

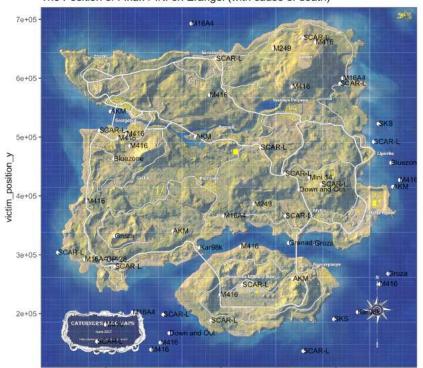
killed_by <fctr></fctr>	killer_placement <fctr></fctr>	victim_placement <fctr></fctr>	killer_position_x <dbl></dbl>	killer_position_y <abl></abl>
SCAR-L	1	2	649557.9	404415.1
Down and Out	1	2	379692.5	379526.5
M416	1	2	323466.8	173065.1
M416	1	2	502435.8	599454.6
Down and Out	1	2	591833.4	374278.9
Kar98k	1	2	288816.6	398158.5
M416	1	2	587723.5	310552.2
SCAR-L	1	2	387953.2	487342.0
M24	1	2	563063.0	421383.8
M416	1	2	653327.8	509258.6



1-10 of 17 rows | 1-5 of 12 columns

# Mapping 1st killer V.S. 2nd Victim





The Position of Finak P.K. on Miramar (with cause of death)





victim\_position\_x victim\_position\_x

# Summary

- Walking has strategy instead of driving
- Killing, Damage, and Knockdown are not crucial
- Launch fire around settlements and villages
- Player's own skills
- Team tactics and Teamwork



### Limitation & Future work

- Deep analysis the relationship between weapon use and the player's location
- Problem solving for the scatterplot on the map
- The pattern of blue zone shrinking is unknown







### References

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