Bryce Harper

Notebook Contents

- Imports
- Data
  - Index DataFrame to Get Pitch Types
- Spray Chart
- Batted Ball Profiles
- Batted Ball Profile - LA
  - Batted Ball Profile - EV
  - Quality Contact by Launch Angle & Exit Velocity
  - EQ Value by Launch Angle & Exit Velocity
  - BABIP Value by Launch Angle & Exit Velocity
  - wOBA Value by Launch Angle & Exit Velocity
  - xwOBA Value by Launch Angle & Exit Velocity
  - xwOBA Value by Launch Angle & Exit Velocity
  - xBA by Launch Angle & Exit Velocity
  - Home Runs by Launch Angle and Exit Velocity
  - xwOBA Against EV
  - xwOBA Value of a hit Against Its Exit Velocity
- Pitch Usage & Counts
  - Counts Breakdown
  - Pitch Usage by Pitcher Handedness
  - Pitch Type by Count
- Heatmaps
  - In Zone Take Heatmaps - All Pitches
  - Out-of-Zone Chase Heatmaps - All Pitches
  - In Zone Take Heatmaps vs. RHP - by Pitch Type

Imports

```
from collections import defaultdict
from matplotlib.patches import Rectangle
from matplotlib.colors import LinearSegmentedColormap
from matplotlib.ticker import FuncFormatter, MaxNLocator
from matplotlib.lines import Line2D
from matplotlib.cm import ScalarMappable
from scipy.stats import gaussian_kde, Normalize
%matplotlib inline
%load_ext autoreload
%autoreload 2
```

Data

```
df = pd.read_csv('./data/statcast-harper.csv')
print('Shape: {}'.format(df.shape)) # Output
df.head(2)
```

```
Shape: (7,818, 118)
   Unnamed: 0 pitch_type  game_date  release_speed  release_pos_x  \
0           0         NaN 2015-04-14            NaN            NaN
1           1         NaN 2015-04-14            NaN            NaN

   release_pos_z  ...  fldz  spin_dir  spin_rate  tfs_deprecated  \
0            NaN  ...   NaN       NaN        NaN             NaN
1            NaN  ...   NaN       NaN        NaN             NaN

   tfs_zulu  umpire  vx0  vy0  vz0  zone
0       NaN     NaN  NaN  NaN  NaN   NaN
1       NaN     NaN  NaN  NaN  NaN   NaN

[2 rows x 118 columns]
```

```
df[['pitch_type', 'game_date', 'release_speed', 'release_pos_x', 'release_pos_z', 'pfx_x', 'pfx_z', 'plate_x', 'plate_z', 'hc_x', 'hc_y', 'vx0', 'vy0', 'vz0', 'ax', 'ay', 'az', 'sz_top', 'sz_bot', 'hit_distance_sc', 'launch_speed', 'launch_angle', 'effective_speed', 'release_spin_rate', 'release_extension', 'game_type', 'stand', 'p_throws', 'balls', 'strikes', 'on_3b', 'on_2b', 'on_1b', 'outs_when_up', 'inning', 'at_bat_number', 'pitch_number', 'pitch_name', 'home_score', 'away_score', 'bat_score', 'fld_score', 'post_away_score', 'post_home_score', 'post_bat_score', 'post_fld_score', 'if_fielding_alignment', 'of_fielding_alignment']].sample(2, random_state=420).T
```

	1,251	5,351
pitch_type	NaN	NaN
game_date	2017-05-23	2018-05-04
release_speed	NaN	NaN
release_pos_x	NaN	NaN
release_pos_z	NaN	NaN
pfx_x	NaN	NaN
pfx_z	NaN	NaN
plate_x	NaN	NaN
plate_z	NaN	NaN
hc_x	NaN	NaN
hc_y	NaN	NaN
vx0	NaN	NaN
vy0	NaN	NaN
vz0	NaN	NaN
ax	NaN	NaN
ay	NaN	NaN
az	NaN	NaN
sz_top	NaN	NaN
sz_bot	NaN	NaN
hit_distance_sc	NaN	NaN
launch_speed	NaN	NaN
launch_angle	NaN	NaN
effective_speed	NaN	NaN
release_spin_rate	NaN	NaN
release_extension	NaN	NaN
game_type	R	R
stand	R	R
p_throws	R	R
balls	0	0
strikes	0	0
on_3b	NaN	NaN
on_2b	NaN	NaN
on_1b	NaN	NaN
outs_when_up	2	2
inning	7	4
at_bat_number	30	13
pitch_number	1	1
pitch_name	NaN	NaN
home_score	2	0
away_score	0	3
bat_score	0	0
fld_score	2	3
post_away_score	0	3
post_home_score	2	0
post_bat_score	0	0
post_fld_score	2	3
if_fielding_alignment	NaN	NaN
of_fielding_alignment	NaN	NaN

Index DataFrame to Get Pitch Types

```
# Index DataFrame to Get Pitch Types
df_index = df[['game_date', 'batter', 'at_bat_number', 'pitch_number', 'pitch_name', 'release_speed', 'release_pos_x', 'release_pos_z', 'pfx_x', 'pfx_z', 'plate_x', 'plate_z', 'vx0', 'vy0', 'vz0', 'ax', 'ay', 'az', 'sz_top', 'sz_bot', 'hit_distance_sc', 'launch_speed', 'launch_angle', 'effective_speed', 'release_spin_rate', 'release_extension', 'game_type', 'stand', 'p_throws', 'balls', 'strikes', 'on_3b', 'on_2b', 'on_1b', 'outs_when_up', 'inning', 'at_bat_number', 'pitch_number', 'pitch_name', 'home_score', 'away_score', 'bat_score', 'fld_score', 'post_away_score', 'post_home_score', 'post_bat_score', 'post_fld_score', 'if_fielding_alignment', 'of_fielding_alignment']]
df_index.head(2)
```

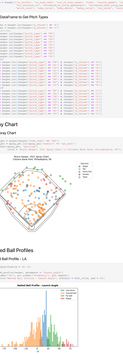
	game_date	batter	at_bat_number	pitch_number	pitch_name	release_speed	release_pos_x	release_pos_z	pfx_x	pfx_z	plate_x	plate_z	vx0	vy0	vz0	ax	ay	az	sz_top	sz_bot	hit_distance_sc	launch_speed	launch_angle	effective_speed	release_spin_rate	release_extension	game_type	stand	p_throws	balls	strikes	on_3b	on_2b	on_1b	outs_when_up	inning	at_bat_number	pitch_number	pitch_name	home_score	away_score	bat_score	fld_score	post_away_score	post_home_score	post_bat_score	post_fld_score	if_fielding_alignment	of_fielding_alignment
0	2015-04-14	460083	1	1	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	R	R	R	0	0	NaN	NaN	NaN	2	7	30	1	NaN	2	0	0	2	0	2	0	2	NaN	NaN
1	2015-04-14	460083	1	2	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	R	R	R	1	0	NaN	NaN	NaN	2	7	30	2	NaN	2	0	0	2	0	2	0	2	NaN	NaN

Spray Chart

PHI Spray Chart

```
# PHI Spray Chart
df[df.stand == 'R'].shape # Output
spray_chart_df = df[df.stand == 'R']
spray_chart = bb.spraychart(spray_chart_df, 'Harper', title='All Balls Hit Toward Home Park, Philadelphia, 9Yr')
plt.legend(loc='upper right')
plt.show()
```

```
(3,424, 118)
```



Batted Ball Profiles

Batted Ball Profile - LA

```
# Batted Ball Profile - LA
fig = bb.bbprofile(spray_chart_df, 'launch_angle')
plt.suptitle('Batted Ball Profile - Launch Angle', fontsize=18, y=1.03)
plt.savefig('./plots/harper_bbprofile_launch_angle.jpg', dpi=150)
```

Batted Ball Profile - EV

```
# Batted Ball Profile - EV
fig = bb.bbprofile(spray_chart_df, 'launch_speed')
plt.suptitle('Batted Ball Profile - Exit Velocity', fontsize=18, y=1.03)
plt.savefig('./plots/harper_bbprofile_launch_speed.jpg', dpi=150)
```

Quality Contact by Launch Angle & Exit Velocity

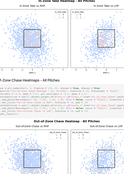
```
# Quality Contact by Launch Angle & Exit Velocity
fig = bb.bbprofile(spray_chart_df, 'quality_contact')
ax = fig.axes[0]
ax.set_title('Quality Contact by Launch Angle & Exit Velocity', fontsize=18, pad=20)
plt.savefig('./plots/harper_bbprofile_quality_contact.jpg', dpi=150)
```

EQ Value by Launch Angle & Exit Velocity

```
# EQ Value by Launch Angle & Exit Velocity
fig = bb.bbprofile(spray_chart_df, 'EQ', kde=True, ncols=2, hspace=.35)
ax = fig.axes[0]
ax.set_title('EQ Value by Launch Angle & Exit Velocity', fontsize=18, pad=20)
plt.savefig('./plots/harper_bbprofile_EQ.jpg', dpi=150)
```

BABIP Value by Launch Angle & Exit Velocity

```
# BABIP Value by Launch Angle & Exit Velocity
fig = bb.bbprofile(spray_chart_df, 'BABIP', kde=True, ncols=2, hspace=.35)
ax = fig.axes[0]
ax.set_title('BABIP Value by Launch Angle & Exit Velocity', fontsize=18, pad=20)
plt.savefig('./plots/harper_bbprofile_BABIP.jpg', dpi=150)
```



wOBA Value by Launch Angle & Exit Velocity

```
# wOBA Value by Launch Angle & Exit Velocity
fig = bb.bbprofile(spray_chart_df, 'wOBA', kde=True, ncols=2, hspace=.35)
ax = fig.axes[0]
ax.set_title('wOBA Value by Launch Angle & Exit Velocity', fontsize=18, pad=20)
plt.savefig('./plots/harper_bbprofile_wOBA.jpg', dpi=150)
```


xwOBA Value by Launch Angle & Exit Velocity

```
# xwOBA Value by Launch Angle & Exit Velocity
fig = bb.bbprofile(spray_chart_df, 'xwOBA', kde=True, ncols=2, hspace=.35)
ax = fig.axes[0]
ax.set_title('xwOBA Value by Launch Angle & Exit Velocity', fontsize=18, pad=20)
plt.savefig('./plots/harper_bbprofile_xwOBA.jpg', dpi=150)
```


xBA by Launch Angle & Exit Velocity

```
# xBA by Launch Angle & Exit Velocity
fig = bb.bbprofile(spray_chart_df, 'xBA', kde=True, ncols=2, hspace=.35)
ax = fig.axes[0]
ax.set_title('xBA by Launch Angle & Exit Velocity', fontsize=18, pad=20)
plt.savefig('./plots/harper_bbprofile_xBA.jpg', dpi=150)
```


Home Runs by Launch Angle and Exit Velocity

```
# Home Runs by Launch Angle and Exit Velocity
fig = bb.bbprofile(spray_chart_df, 'HR', kde=True, ncols=2, hspace=.35)
ax = fig.axes[0]
ax.set_title('Home Runs by Launch Angle and Exit Velocity', fontsize=18, pad=20)
plt.savefig('./plots/harper_bbprofile_HR.jpg', dpi=150)
```


xwOBA Against EV

```
# xwOBA Against EV
fig = bb.bbprofile(spray_chart_df, 'xwOBA', kde=True, ncols=2, hspace=.35)
ax = fig.axes[0]
ax.set_title('xwOBA Against EV', fontsize=18, pad=20)
plt.savefig('./plots/harper_bbprofile_xwOBA.jpg', dpi=150)
```


xwOBA Against EV
Count
Avg
Sum
Stand
Left: 1,000 (29%)
Right: 2,424 (71%)
Pitcher Hand
Left: 1,000 (29%)
Right: 2,424 (71%)
Bat Speed
Mean: 74.9
Std Dev: 17.8
Intercept
Mean: 14.7
Std Dev: 34.1
Slant
Mean: 0.7
Std Dev: 0.7
Spread
Mean: 0.8
Std Dev: 0.4
Swing Path
Mean: 0.3
Std Dev: 0.3
Pull%
Mean: 0.4
Std Dev: 0.5
Cent%
Mean: 0.3
Std Dev: 0.4
Oppo%
Mean: 0.3
Std Dev: 0.4
Launch Angle
Mean: 11.4
Std Dev: 28.4
Launch Speed
Mean: 87.1
Std Dev: 14.9
Hit Distance
Mean: 208.4
Std Dev: 114.7
Hard%
Mean: 0.3
Std Dev: 0.4
Barrel%
Mean: 0.1
Std Dev: 0.3
Solid%
Mean: 0.1
Std Dev: 0.3
Flare%
Mean: 0.2
Std Dev: 0.4
Burner%
Mean: 0.1
Std Dev: 0.3
Poor%
Mean: 0.4
Std Dev: 0.5
Topped%
Mean: 0.2
Std Dev: 0.4
Under%
Mean: 0.2
Std Dev: 0.4
Weak%
Mean: 0.1
Std Dev: 0.3
Pull Air%
Mean: 0.1
Std Dev: 0.3
Sweet Spot%
Mean: 0.3
Std Dev: 0.4
Max Exit Velocity
Mean: 112.8
Std Dev: 7.8
Avg Exit Velocity
Mean: 91.1
Std Dev: 6.4
Avg Launch Angle
Mean: 15.4
Std Dev: 4.1
Avg Hit Distance
Mean: 229.1
Std Dev: 43.1
Avg Hard Hit Distance

```
Freq: [0M-2.5M] [2M-2.5M] [1.5M-2M] [1M-1.5M] [0.5M-1M] [0M-0.5M] Pitch: [Curve] [Slider] [Changeup] [Sinker] [Cutter] [Curveball] [Slow Curve] [Split Finger] [Knuckle Curve] [Slow Curve] Pitch: [Curve] [Slider] [Changeup] [Sinker] [Cutter] [Curveball] [Slow Curve] [Split Finger] [Knuckle Curve] [Slow Curve]
SELECT CS.[PA_Id],[Pitch_Id],[Pitch_Type],[Pitch_Result],[Pitch_Speed],[Pitch_Location_Zone],[Pitch_Location_Side],[Pitch_Location_Height],[Pitch_Location_Depth],[Pitch_Location_Side_Batter],[Pitch_Location_Height_Batter],[Pitch_Location_Depth_Batter],[Pitch_Location_Side_Catcher],[Pitch_Location_Height_Catcher],[Pitch_Location_Depth_Catcher],[Pitch_Location_Side_Batter_Adj],[Pitch_Location_Height_Batter_Adj],[Pitch_Location_Depth_Batter_Adj],[Pitch_Location_Side_Catcher_Adj],[Pitch_Location_Height_Catcher_Adj],[Pitch_Location_Depth_Catcher_Adj],[Pitch_Location_Side_Batter_Adj_Pct],[Pitch_Location_Height_Batter_Adj_Pct],[Pitch_Location_Depth_Batter_Adj_Pct],[Pitch_Location_Side_Catcher_Adj_Pct],[Pitch_Location_Height_Catcher_Adj_Pct],[Pitch_Location_Depth_Catcher_Adj_Pct],[Pitch_Location_Side_Batter_Adj_Pct_Cat],[Pitch_Location_Height_Batter_Adj_Pct_Cat],[Pitch_Location_Depth_Batter_Adj_Pct_Cat],[Pitch_Location_Side_Catcher_Adj_Pct_Cat],[Pitch_Location_Height_Catcher_Adj_Pct_Cat],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat],[Pitch_Location_Side_Batter_Adj_Pct_Cat_Cumulative],[Pitch_Location_Height_Batter_Adj_Pct_Cat_Cumulative],[Pitch_Location_Depth_Batter_Adj_Pct_Cat_Cumulative],[Pitch_Location_Side_Catcher_Adj_Pct_Cat_Cumulative],[Pitch_Location_Height_Catcher_Adj_Pct_Cat_Cumulative],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat_Cumulative],[Pitch_Location_Side_Batter_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Height_Batter_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Depth_Batter_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Side_Catcher_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Height_Catcher_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Side_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Height_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Depth_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Side_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Height_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Side_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Location_Height_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Location_Depth_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Location_Side_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Location_Height_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Result_Cumulative],[Pitch_Result_Cumulative_Pct]
```

In-Zone Take Heatmaps vs RHP

In-Zone Take Heatmaps vs LHP - by Pitch Type

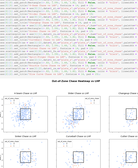
```
Freq: [0M-2.5M] [2M-2.5M] [1.5M-2M] [1M-1.5M] [0.5M-1M] [0M-0.5M] Pitch: [Curve] [Slider] [Changeup] [Sinker] [Cutter] [Curveball] [Slow Curve] [Split Finger] [Knuckle Curve] [Slow Curve] Pitch: [Curve] [Slider] [Changeup] [Sinker] [Cutter] [Curveball] [Slow Curve] [Split Finger] [Knuckle Curve] [Slow Curve]
SELECT CS.[PA_Id],[Pitch_Id],[Pitch_Type],[Pitch_Result],[Pitch_Speed],[Pitch_Location_Zone],[Pitch_Location_Side],[Pitch_Location_Height],[Pitch_Location_Depth],[Pitch_Location_Side_Batter],[Pitch_Location_Height_Batter],[Pitch_Location_Depth_Batter],[Pitch_Location_Side_Catcher],[Pitch_Location_Height_Catcher],[Pitch_Location_Depth_Catcher],[Pitch_Location_Side_Batter_Adj],[Pitch_Location_Height_Batter_Adj],[Pitch_Location_Depth_Batter_Adj],[Pitch_Location_Side_Catcher_Adj],[Pitch_Location_Height_Catcher_Adj],[Pitch_Location_Depth_Catcher_Adj],[Pitch_Location_Side_Batter_Adj_Pct],[Pitch_Location_Height_Batter_Adj_Pct],[Pitch_Location_Depth_Batter_Adj_Pct],[Pitch_Location_Side_Catcher_Adj_Pct],[Pitch_Location_Height_Catcher_Adj_Pct],[Pitch_Location_Depth_Catcher_Adj_Pct],[Pitch_Location_Side_Batter_Adj_Pct_Cat],[Pitch_Location_Height_Batter_Adj_Pct_Cat],[Pitch_Location_Depth_Batter_Adj_Pct_Cat],[Pitch_Location_Side_Catcher_Adj_Pct_Cat],[Pitch_Location_Height_Catcher_Adj_Pct_Cat],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat],[Pitch_Location_Side_Batter_Adj_Pct_Cat_Cumulative],[Pitch_Location_Height_Batter_Adj_Pct_Cat_Cumulative],[Pitch_Location_Depth_Batter_Adj_Pct_Cat_Cumulative],[Pitch_Location_Side_Catcher_Adj_Pct_Cat_Cumulative],[Pitch_Location_Height_Catcher_Adj_Pct_Cat_Cumulative],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat_Cumulative],[Pitch_Location_Side_Batter_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Height_Batter_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Depth_Batter_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Side_Catcher_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Height_Catcher_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Side_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Height_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Depth_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Side_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Height_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Side_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Location_Height_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Location_Depth_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Location_Side_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Location_Height_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Result_Cumulative],[Pitch_Result_Cumulative_Pct]
```

In-Zone Take Heatmaps vs LHP

Out-of-Zone Chase Heatmaps vs RHP - by Pitch Type

```
Freq: [0M-2.5M] [2M-2.5M] [1.5M-2M] [1M-1.5M] [0.5M-1M] [0M-0.5M] Pitch: [Curve] [Slider] [Changeup] [Sinker] [Cutter] [Curveball] [Slow Curve] [Split Finger] [Knuckle Curve] [Slow Curve] Pitch: [Curve] [Slider] [Changeup] [Sinker] [Cutter] [Curveball] [Slow Curve] [Split Finger] [Knuckle Curve] [Slow Curve]
SELECT CS.[PA_Id],[Pitch_Id],[Pitch_Type],[Pitch_Result],[Pitch_Speed],[Pitch_Location_Zone],[Pitch_Location_Side],[Pitch_Location_Height],[Pitch_Location_Depth],[Pitch_Location_Side_Batter],[Pitch_Location_Height_Batter],[Pitch_Location_Depth_Batter],[Pitch_Location_Side_Catcher],[Pitch_Location_Height_Catcher],[Pitch_Location_Depth_Catcher],[Pitch_Location_Side_Batter_Adj],[Pitch_Location_Height_Batter_Adj],[Pitch_Location_Depth_Batter_Adj],[Pitch_Location_Side_Catcher_Adj],[Pitch_Location_Height_Catcher_Adj],[Pitch_Location_Depth_Catcher_Adj],[Pitch_Location_Side_Batter_Adj_Pct],[Pitch_Location_Height_Batter_Adj_Pct],[Pitch_Location_Depth_Batter_Adj_Pct],[Pitch_Location_Side_Catcher_Adj_Pct],[Pitch_Location_Height_Catcher_Adj_Pct],[Pitch_Location_Depth_Catcher_Adj_Pct],[Pitch_Location_Side_Batter_Adj_Pct_Cat],[Pitch_Location_Height_Batter_Adj_Pct_Cat],[Pitch_Location_Depth_Batter_Adj_Pct_Cat],[Pitch_Location_Side_Catcher_Adj_Pct_Cat],[Pitch_Location_Height_Catcher_Adj_Pct_Cat],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat],[Pitch_Location_Side_Batter_Adj_Pct_Cat_Cumulative],[Pitch_Location_Height_Batter_Adj_Pct_Cat_Cumulative],[Pitch_Location_Depth_Batter_Adj_Pct_Cat_Cumulative],[Pitch_Location_Side_Catcher_Adj_Pct_Cat_Cumulative],[Pitch_Location_Height_Catcher_Adj_Pct_Cat_Cumulative],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat_Cumulative],[Pitch_Location_Side_Batter_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Height_Batter_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Depth_Batter_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Side_Catcher_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Height_Catcher_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Side_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Height_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Depth_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Side_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Height_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Side_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Location_Height_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Location_Depth_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Location_Side_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Location_Height_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Result_Cumulative],[Pitch_Result_Cumulative_Pct]
```

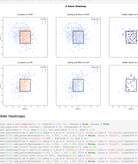
Out-of-Zone Chase Heatmaps vs RHP



Out-of-Zone Chase Heatmaps vs LHP - by Pitch Type

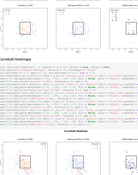
```
Freq: [0M-2.5M] [2M-2.5M] [1.5M-2M] [1M-1.5M] [0.5M-1M] [0M-0.5M] Pitch: [Curve] [Slider] [Changeup] [Sinker] [Cutter] [Curveball] [Slow Curve] [Split Finger] [Knuckle Curve] [Slow Curve] Pitch: [Curve] [Slider] [Changeup] [Sinker] [Cutter] [Curveball] [Slow Curve] [Split Finger] [Knuckle Curve] [Slow Curve]
SELECT CS.[PA_Id],[Pitch_Id],[Pitch_Type],[Pitch_Result],[Pitch_Speed],[Pitch_Location_Zone],[Pitch_Location_Side],[Pitch_Location_Height],[Pitch_Location_Depth],[Pitch_Location_Side_Batter],[Pitch_Location_Height_Batter],[Pitch_Location_Depth_Batter],[Pitch_Location_Side_Catcher],[Pitch_Location_Height_Catcher],[Pitch_Location_Depth_Catcher],[Pitch_Location_Side_Batter_Adj],[Pitch_Location_Height_Batter_Adj],[Pitch_Location_Depth_Batter_Adj],[Pitch_Location_Side_Catcher_Adj],[Pitch_Location_Height_Catcher_Adj],[Pitch_Location_Depth_Catcher_Adj],[Pitch_Location_Side_Batter_Adj_Pct],[Pitch_Location_Height_Batter_Adj_Pct],[Pitch_Location_Depth_Batter_Adj_Pct],[Pitch_Location_Side_Catcher_Adj_Pct],[Pitch_Location_Height_Catcher_Adj_Pct],[Pitch_Location_Depth_Catcher_Adj_Pct],[Pitch_Location_Side_Batter_Adj_Pct_Cat],[Pitch_Location_Height_Batter_Adj_Pct_Cat],[Pitch_Location_Depth_Batter_Adj_Pct_Cat],[Pitch_Location_Side_Catcher_Adj_Pct_Cat],[Pitch_Location_Height_Catcher_Adj_Pct_Cat],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat],[Pitch_Location_Side_Batter_Adj_Pct_Cat_Cumulative],[Pitch_Location_Height_Batter_Adj_Pct_Cat_Cumulative],[Pitch_Location_Depth_Batter_Adj_Pct_Cat_Cumulative],[Pitch_Location_Side_Catcher_Adj_Pct_Cat_Cumulative],[Pitch_Location_Height_Catcher_Adj_Pct_Cat_Cumulative],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat_Cumulative],[Pitch_Location_Side_Batter_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Height_Batter_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Depth_Batter_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Side_Catcher_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Height_Catcher_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Side_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Height_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Depth_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Side_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Height_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Side_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Location_Height_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Location_Depth_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Location_Side_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Location_Height_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Result_Cumulative],[Pitch_Result_Cumulative_Pct]
```

Out-of-Zone Chase Heatmaps vs LHP



4-Seam Heatmaps

```
Freq: [0M-2.5M] [2M-2.5M] [1.5M-2M] [1M-1.5M] [0.5M-1M] [0M-0.5M] Pitch: [Curve] [Slider] [Changeup] [Sinker] [Cutter] [Curveball] [Slow Curve] [Split Finger] [Knuckle Curve] [Slow Curve] Pitch: [Curve] [Slider] [Changeup] [Sinker] [Cutter] [Curveball] [Slow Curve] [Split Finger] [Knuckle Curve] [Slow Curve]
SELECT CS.[PA_Id],[Pitch_Id],[Pitch_Type],[Pitch_Result],[Pitch_Speed],[Pitch_Location_Zone],[Pitch_Location_Side],[Pitch_Location_Height],[Pitch_Location_Depth],[Pitch_Location_Side_Batter],[Pitch_Location_Height_Batter],[Pitch_Location_Depth_Batter],[Pitch_Location_Side_Catcher],[Pitch_Location_Height_Catcher],[Pitch_Location_Depth_Catcher],[Pitch_Location_Side_Batter_Adj],[Pitch_Location_Height_Batter_Adj],[Pitch_Location_Depth_Batter_Adj],[Pitch_Location_Side_Catcher_Adj],[Pitch_Location_Height_Catcher_Adj],[Pitch_Location_Depth_Catcher_Adj],[Pitch_Location_Side_Batter_Adj_Pct],[Pitch_Location_Height_Batter_Adj_Pct],[Pitch_Location_Depth_Batter_Adj_Pct],[Pitch_Location_Side_Catcher_Adj_Pct],[Pitch_Location_Height_Catcher_Adj_Pct],[Pitch_Location_Depth_Catcher_Adj_Pct],[Pitch_Location_Side_Batter_Adj_Pct_Cat],[Pitch_Location_Height_Batter_Adj_Pct_Cat],[Pitch_Location_Depth_Batter_Adj_Pct_Cat],[Pitch_Location_Side_Catcher_Adj_Pct_Cat],[Pitch_Location_Height_Catcher_Adj_Pct_Cat],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat],[Pitch_Location_Side_Batter_Adj_Pct_Cat_Cumulative],[Pitch_Location_Height_Batter_Adj_Pct_Cat_Cumulative],[Pitch_Location_Depth_Batter_Adj_Pct_Cat_Cumulative],[Pitch_Location_Side_Catcher_Adj_Pct_Cat_Cumulative],[Pitch_Location_Height_Catcher_Adj_Pct_Cat_Cumulative],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat_Cumulative],[Pitch_Location_Side_Batter_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Height_Batter_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Depth_Batter_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Side_Catcher_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Height_Catcher_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Side_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Height_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Depth_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Side_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Height_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Side_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Location_Height_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Location_Depth_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Location_Side_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Location_Height_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Result_Cumulative],[Pitch_Result_Cumulative_Pct]
```

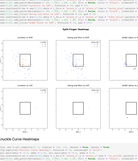


Slider Heatmaps

```
Freq: [0M-2.5M] [2M-2.5M] [1.5M-2M] [1M-1.5M] [0.5M-1M] [0M-0.5M] Pitch: [Curve] [Slider] [Changeup] [Sinker] [Cutter] [Curveball] [Slow Curve] [Split Finger] [Knuckle Curve] [Slow Curve] Pitch: [Curve] [Slider] [Changeup] [Sinker] [Cutter] [Curveball] [Slow Curve] [Split Finger] [Knuckle Curve] [Slow Curve]
SELECT CS.[PA_Id],[Pitch_Id],[Pitch_Type],[Pitch_Result],[Pitch_Speed],[Pitch_Location_Zone],[Pitch_Location_Side],[Pitch_Location_Height],[Pitch_Location_Depth],[Pitch_Location_Side_Batter],[Pitch_Location_Height_Batter],[Pitch_Location_Depth_Batter],[Pitch_Location_Side_Catcher],[Pitch_Location_Height_Catcher],[Pitch_Location_Depth_Catcher],[Pitch_Location_Side_Batter_Adj],[Pitch_Location_Height_Batter_Adj],[Pitch_Location_Depth_Batter_Adj],[Pitch_Location_Side_Catcher_Adj],[Pitch_Location_Height_Catcher_Adj],[Pitch_Location_Depth_Catcher_Adj],[Pitch_Location_Side_Batter_Adj_Pct],[Pitch_Location_Height_Batter_Adj_Pct],[Pitch_Location_Depth_Batter_Adj_Pct],[Pitch_Location_Side_Catcher_Adj_Pct],[Pitch_Location_Height_Catcher_Adj_Pct],[Pitch_Location_Depth_Catcher_Adj_Pct],[Pitch_Location_Side_Batter_Adj_Pct_Cat],[Pitch_Location_Height_Batter_Adj_Pct_Cat],[Pitch_Location_Depth_Batter_Adj_Pct_Cat],[Pitch_Location_Side_Catcher_Adj_Pct_Cat],[Pitch_Location_Height_Catcher_Adj_Pct_Cat],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat],[Pitch_Location_Side_Batter_Adj_Pct_Cat_Cumulative],[Pitch_Location_Height_Batter_Adj_Pct_Cat_Cumulative],[Pitch_Location_Depth_Batter_Adj_Pct_Cat_Cumulative],[Pitch_Location_Side_Catcher_Adj_Pct_Cat_Cumulative],[Pitch_Location_Height_Catcher_Adj_Pct_Cat_Cumulative],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat_Cumulative],[Pitch_Location_Side_Batter_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Height_Batter_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Depth_Batter_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Side_Catcher_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Height_Catcher_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Side_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Height_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Depth_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Side_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Height_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Side_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Location_Height_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Location_Depth_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Location_Side_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Location_Height_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Result_Cumulative],[Pitch_Result_Cumulative_Pct]
```

Changeup Heatmaps

```
Freq: [0M-2.5M] [2M-2.5M] [1.5M-2M] [1M-1.5M] [0.5M-1M] [0M-0.5M] Pitch: [Curve] [Slider] [Changeup] [Sinker] [Cutter] [Curveball] [Slow Curve] [Split Finger] [Knuckle Curve] [Slow Curve] Pitch: [Curve] [Slider] [Changeup] [Sinker] [Cutter] [Curveball] [Slow Curve] [Split Finger] [Knuckle Curve] [Slow Curve]
SELECT CS.[PA_Id],[Pitch_Id],[Pitch_Type],[Pitch_Result],[Pitch_Speed],[Pitch_Location_Zone],[Pitch_Location_Side],[Pitch_Location_Height],[Pitch_Location_Depth],[Pitch_Location_Side_Batter],[Pitch_Location_Height_Batter],[Pitch_Location_Depth_Batter],[Pitch_Location_Side_Catcher],[Pitch_Location_Height_Catcher],[Pitch_Location_Depth_Catcher],[Pitch_Location_Side_Batter_Adj],[Pitch_Location_Height_Batter_Adj],[Pitch_Location_Depth_Batter_Adj],[Pitch_Location_Side_Catcher_Adj],[Pitch_Location_Height_Catcher_Adj],[Pitch_Location_Depth_Catcher_Adj],[Pitch_Location_Side_Batter_Adj_Pct],[Pitch_Location_Height_Batter_Adj_Pct],[Pitch_Location_Depth_Batter_Adj_Pct],[Pitch_Location_Side_Catcher_Adj_Pct],[Pitch_Location_Height_Catcher_Adj_Pct],[Pitch_Location_Depth_Catcher_Adj_Pct],[Pitch_Location_Side_Batter_Adj_Pct_Cat],[Pitch_Location_Height_Batter_Adj_Pct_Cat],[Pitch_Location_Depth_Batter_Adj_Pct_Cat],[Pitch_Location_Side_Catcher_Adj_Pct_Cat],[Pitch_Location_Height_Catcher_Adj_Pct_Cat],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat],[Pitch_Location_Side_Batter_Adj_Pct_Cat_Cumulative],[Pitch_Location_Height_Batter_Adj_Pct_Cat_Cumulative],[Pitch_Location_Depth_Batter_Adj_Pct_Cat_Cumulative],[Pitch_Location_Side_Catcher_Adj_Pct_Cat_Cumulative],[Pitch_Location_Height_Catcher_Adj_Pct_Cat_Cumulative],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat_Cumulative],[Pitch_Location_Side_Batter_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Height_Batter_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Depth_Batter_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Side_Catcher_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Height_Catcher_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Side_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Height_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Depth_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Side_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Height_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Side_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Location_Height_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Location_Depth_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Location_Side_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Location_Height_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat_Cumulative_Pct_Cat_Cumulative],[Pitch_Result_Cumulative],[Pitch_Result_Cumulative_Pct]
```



Sinker Heatmaps

```
Freq: [0M-2.5M] [2M-2.5M] [1.5M-2M] [1M-1.5M] [0.5M-1M] [0M-0.5M] Pitch: [Curve] [Slider] [Changeup] [Sinker] [Cutter] [Curveball] [Slow Curve] [Split Finger] [Knuckle Curve] [Slow Curve] Pitch: [Curve] [Slider] [Changeup] [Sinker] [Cutter] [Curveball] [Slow Curve] [Split Finger] [Knuckle Curve] [Slow Curve]
SELECT CS.[PA_Id],[Pitch_Id],[Pitch_Type],[Pitch_Result],[Pitch_Speed],[Pitch_Location_Zone],[Pitch_Location_Side],[Pitch_Location_Height],[Pitch_Location_Depth],[Pitch_Location_Side_Batter],[Pitch_Location_Height_Batter],[Pitch_Location_Depth_Batter],[Pitch_Location_Side_Catcher],[Pitch_Location_Height_Catcher],[Pitch_Location_Depth_Catcher],[Pitch_Location_Side_Batter_Adj],[Pitch_Location_Height_Batter_Adj],[Pitch_Location_Depth_Batter_Adj],[Pitch_Location_Side_Catcher_Adj],[Pitch_Location_Height_Catcher_Adj],[Pitch_Location_Depth_Catcher_Adj],[Pitch_Location_Side_Batter_Adj_Pct],[Pitch_Location_Height_Batter_Adj_Pct],[Pitch_Location_Depth_Batter_Adj_Pct],[Pitch_Location_Side_Catcher_Adj_Pct],[Pitch_Location_Height_Catcher_Adj_Pct],[Pitch_Location_Depth_Catcher_Adj_Pct],[Pitch_Location_Side_Batter_Adj_Pct_Cat],[Pitch_Location_Height_Batter_Adj_Pct_Cat],[Pitch_Location_Depth_Batter_Adj_Pct_Cat],[Pitch_Location_Side_Catcher_Adj_Pct_Cat],[Pitch_Location_Height_Catcher_Adj_Pct_Cat],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat],[Pitch_Location_Side_Batter_Adj_Pct_Cat_Cumulative],[Pitch_Location_Height_Batter_Adj_Pct_Cat_Cumulative],[Pitch_Location_Depth_Batter_Adj_Pct_Cat_Cumulative],[Pitch_Location_Side_Catcher_Adj_Pct_Cat_Cumulative],[Pitch_Location_Height_Catcher_Adj_Pct_Cat_Cumulative],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat_Cumulative],[Pitch_Location_Side_Batter_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Height_Batter_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Depth_Batter_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Side_Catcher_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Height_Catcher_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Depth_Catcher_Adj_Pct_Cat_Cumulative_Pct],[Pitch_Location_Side_Batter_Adj_Pct_Cat_Cumulative_Pct_Cat],[Pitch_Location_Height_Batter_
```