Notebook Contents

- Imports
- Data
- Pitcher Overview
  - General Pitch Data
  - Pitch Usage
  - Pitch Usage by Batter Handedness
  - Velocity by Pitch Type
  - Pitch Velocity by Pitch Number
- Pitcher Stuff
  - Spin Rate by Pitch Type
  - Spin Efficiency
  - Spin Axis
  - Horizontal & Vertical Break
  - Release Position
  - Release Extension
  - Velocity & Spin Rate
  - Bauer Units
- Count Breakdown
  - Pitch Usage by Count
- Heatmaps
  - Pitch Location by Pitch Type
  - Heatmap Comparison Across Count
  - 3-Count Heatmap
  - Strike Zone Heatmap
  - Changeup Heatmap
  - Fastball Heatmap
  - Curve Heatmap

Imports

```
import numpy as np
import matplotlib.pyplot as plt
from matplotlib import cm, colors, gridspec
from matplotlib.patches import Ellipse
from scipy.stats import gaussian_kde

%matplotlib inline
%matplotlib notebook
%matplotlib widget
```

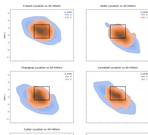
Data

```
df = pd.read_csv('./data/2021_Cleveland.csv')
df['game_date'] = pd.to_datetime(df['game_date'], infer_datetime_format=True)
df.sample(5)
```

```
C:\Users\Ryan\Anaconda3\lib\site-packages\IPykernel\__init__.py:0:
FutureWarning: Pandas will always parse ISO8601 dates when infer_datetime_format is True
C:\Users\Ryan\Anaconda3\lib\site-packages\numpy\lib\function_base.py:2854:
RuntimeWarning: invalid value encountered in ravel
  keepdims=keepdims, initial=initial, where=where)
C:\Users\Ryan\Anaconda3\lib\site-packages\numpy\lib\function_base.py:3118:
RuntimeWarning: invalid value encountered in delete
  arr = asanyarray(arr)
C:\Users\Ryan\Anaconda3\lib\site-packages\numpy\lib\function_base.py:4389:
RuntimeWarning: invalid value encountered in delete
  arrorder = kwargs.get('order', None)
C:\Users\Ryan\Anaconda3\lib\site-packages\numpy\lib\function_base.py:4390:
RuntimeWarning: invalid value encountered in delete
  return asarray(a[tuple(slobj)], order=arrorder)
```

| | pitch_type | game_date | release_speed | release_pos_x | release_pos_z | pfx_x | pfx_z | plate_x | plate_z | pfx_x_adj | pfx_z_adj | vx0 | vy0 | vz0 | ax | ay | az | sz_top | sz_bot | hc_x | hc_y | tfs_zulu | umpire | spin_axis | release_spin_rate | spin_dir | zone | stand | p_throws | type | pitch_name | description | des | hit_location | bb_type | on_3b | on_2b | on_1b | hit_distance_sc | launch_speed | launch_angle | estimated_ba_using_speedangle | estimated_woba_using_speedangle | woba_value | woba_denom | babip_value | iso_value | launch_speed_angle | at_bat_number | pitch_number | pitch_name_abbr | game_type | home_team | away_team | batter | pitcher | events | description | spin_dir_3d_hr | spin_rate_deep | spin_rate_abbrev | on_3b_name | on_2b_name | on_1b_name | batter_name | pitcher_name | inning | inning_topbot |
|---|---|---

Pitch Location by Pitch Type



Hard Hit Summary by Pitch Type

```
1 0.00(0) 0.00(0) 0.00(0) 0.00(0) 0.00(0) 0.00(0) 0.00(0)
```

```
Fig. set 2.07: ggplot(data=d1, X_Plate_loc_ft, Y_Plate_loc_ft, shape = Throw, alpha = Throw)
ggplot(data=d1, X_Plate_loc_ft, Y_Plate_loc_ft, shape = Throw, alpha = Throw)
geom_point(size=2.5, fill=NA, color=NA)
geom_rect(data=Strike Zone, Left, Bottom, Right, Top, fill=NA, color="black", parameter="strike")
geom_rect(data=Strike Zone, Left, Bottom, Right, Top, fill=NA, color="black", parameter="strike")
geom_rect(data=Strike Zone, Left, Bottom, Right, Top, fill=NA, color="black", parameter="strike")
geom_rect(data=Hard Hit Summary
```