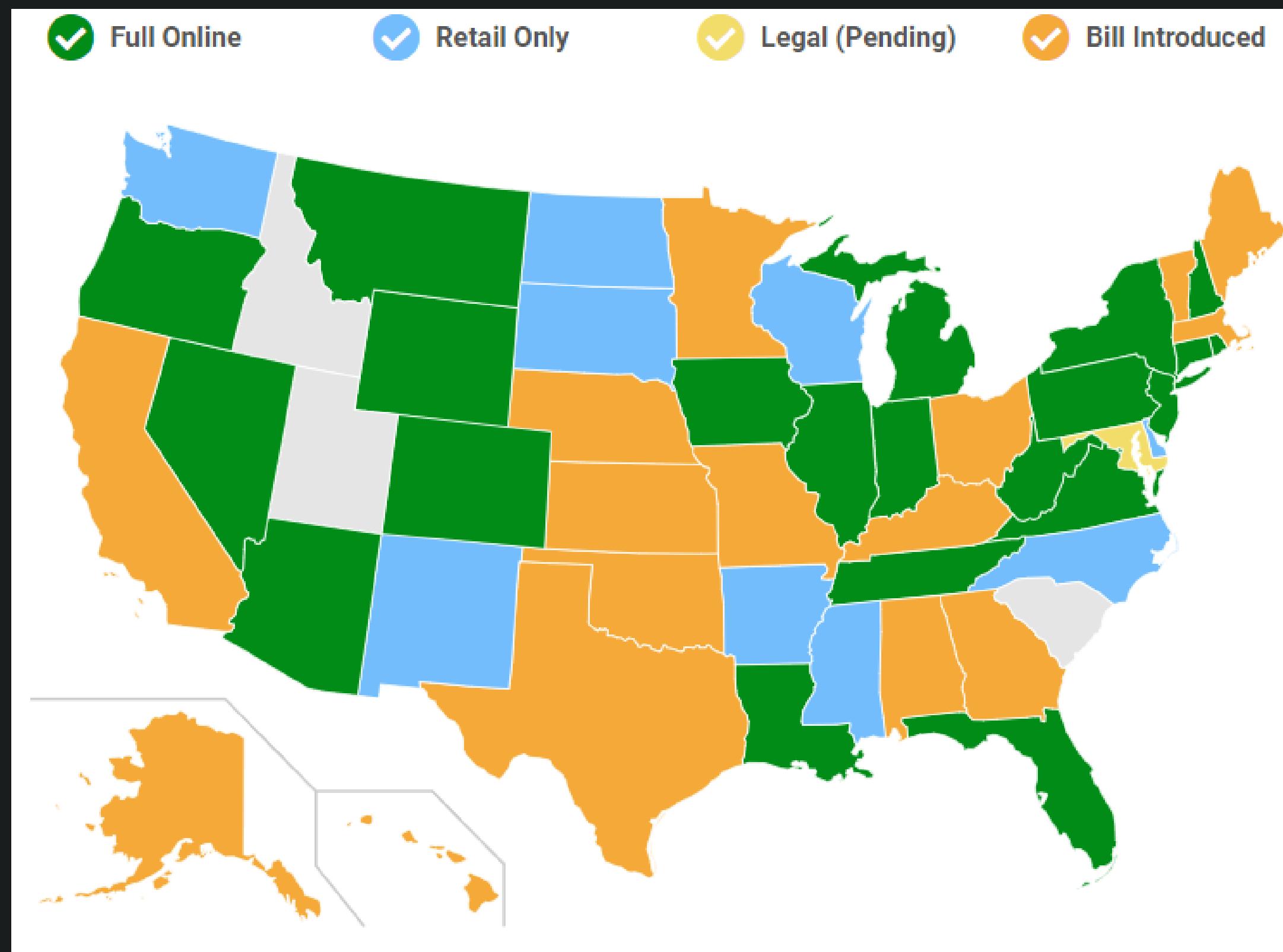


Sports Book Manager

By: Ross Friscia



Sports Betting Legality in the United States





An advertisement for Safer Gambling Week (Nov 19-25, 2020). It features a hand holding a smartphone displaying a blue screen with a dollar bill icon and the text "SET DEPOSIT LIMITS". The background is dark blue. Text on the left reads "SAFER GAMBLING WEEK 19-25 NOV 20" and "Take control. Gamble responsibly.".



How can we, as
Data Scientists,
sports bet
responsibly?

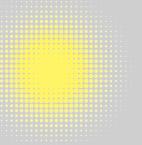
Don't gamble on sports :)

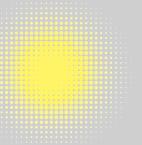
Build a model to predict the
outcome of games and act when
there is a discrepancy with the
market

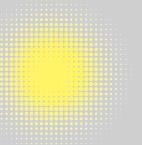
The Problem:

Sports books make it intentionally difficult to extract information from their websites, and to interpret the lines for each event

 **Requiring login to view wagers**

 **Creating custom attributes to distinguish different data**

 **Storing different information within the same class name**

 **Presenting their expected probability in cryptic terms**

 **Providing spreads, so you wager on the margin of the outcome not just the result**

The solution:
Sports Book Manager

What is the package built on?

- pandas
- SciPy
- Selenium
- Chromedriver

How does Sports Book Manager help?

- Makes web scraping sports books easier
- Allows users to use the sports book of their choice
- Calculate the market's implied probability
- Compare your model's output to the market

Example

Extracting hockey wagers from PointsBet

Step 1: Creating an instance of BookScraper and storing relevant information

```
PointsBet = BookScraper(r'https://nj.pointsbet.com/sports',
                        {'NHL':r'/ice-hockey/NHL', 'NBA':r'/basketball/NBA'})
```

Step 2: Retrieving the Odds

```
df = PointsBet.retrieve_sports_book('NHL')
```

	Teams	Lines	Odds
0	Colorado Avalanche	-1.5	120
1	New Jersey Devils	1.5	-140
2	Florida Panthers	-1.5	195
3	Pittsburgh Penguins	1.5	-245
4	Vegas Golden Knights	-1.5	145
5	Philadelphia Flyers	1.5	-176
6	Arizona Coyotes	1.5	-176
7	Detroit Red Wings	-1.5	145
8	Seattle Kraken	1.5	-110
9	Toronto Maple Leafs	-1.5	-110
10	Ottawa Senators	1.5	-110
11	St. Louis Blues	-1.5	-110
12	New York Rangers	1.5	-180
13	Minnesota Wild	-1.5	150
14	Dallas Stars	1.5	-236
15	Nashville Predators	-1.5	190
16	Tampa Bay Lightning	-1.5	145
17	Winnipeg Jets	1.5	-176
18	Anaheim Ducks	1.5	-245
19	Chicago Blackhawks	-1.5	195
20	Washington Capitals	1.5	-221
21	Calgary Flames	-1.5	180

Step 3: Converting Odds to Probability

```
df['Odds'] = pd.to_numeric(df['Odds'])
df['Lines'] = pd.to_numeric(df['Lines'])
```

```
import sports_book_manager.implied_probability_calculator as ipc
df['implied_probability'] = df.apply(lambda x: ipc.implied_probability_calculator(x['Odds']), axis = 1)
df
```

	Teams	Lines	Odds	implied_probability
0	Colorado Avalanche	-1.5	120	45.45
1	New Jersey Devils	1.5	-140	58.33
2	Florida Panthers	-1.5	195	33.90
3	Pittsburgh Penguins	1.5	-245	71.01
4	Vegas Golden Knights	-1.5	145	40.82
5	Philadelphia Flyers	1.5	-176	63.77
6	Arizona Coyotes	1.5	-176	63.77
7	Detroit Red Wings	-1.5	145	40.82
8	Seattle Kraken	1.5	-110	52.38
9	Toronto Maple Leafs	-1.5	-110	52.38
10	Ottawa Senators	1.5	-110	52.38
11	St. Louis Blues	-1.5	-110	52.38
12	New York Rangers	1.5	-180	64.29
13	Minnesota Wild	-1.5	150	40.00
14	Dallas Stars	1.5	-236	70.24
15	Nashville Predators	-1.5	190	34.48
16	Tampa Bay Lightning	-1.5	145	40.82
17	Winnipeg Jets	1.5	-176	63.77
18	Anaheim Ducks	1.5	-245	71.01
19	Chicago Blackhawks	-1.5	195	33.90
20	Washington Capitals	1.5	-221	68.85
21	Calgary Flames	-1.5	180	35.71

Step 4: Using Model Values to Calculate its Expected Probability

```
df_join['model_probability'] = df_join.apply(lambda x: mp.model_probability(x['mean_win_margin'],
                                                               x['sd'], x['Lines']), axis = 1)
```

	Teams	Lines	Odds	implied_probability	mean_win_margin	sd	model_probability
0	Colorado Avalanche	-1.5	120	45.45	1.80	0.56	0.703922
1	New Jersey Devils	1.5	-140	58.33	-1.80	0.56	0.296078
2	Florida Panthers	-1.5	195	33.90	1.68	0.86	0.582894
3	Pittsburgh Penguins	1.5	-245	71.01	-1.68	0.86	0.417106
4	Vegas Golden Knights	-1.5	145	40.82	1.72	0.43	0.695544
5	Philadelphia Flyers	1.5	-176	63.77	-1.72	0.43	0.304456
6	Arizona Coyotes	1.5	-176	63.77	-1.21	0.38	0.777315
7	Detroit Red Wings	-1.5	145	40.82	1.21	0.38	0.222685
8	Seattle Kraken	1.5	-110	52.38	-1.65	0.51	0.384334
9	Toronto Maple Leafs	-1.5	-110	52.38	1.65	0.51	0.615666
10	Ottawa Senators	1.5	-110	52.38	-2.04	0.48	0.130295
11	St. Louis Blues	-1.5	-110	52.38	2.04	0.48	0.869705
12	New York Rangers	1.5	-180	64.29	-1.20	0.56	0.703922
13	Minnesota Wild	-1.5	150	40.00	1.20	0.56	0.296078
14	Dallas Stars	1.5	-236	70.24	-0.57	0.68	0.914289
15	Nashville Predators	-1.5	190	34.48	0.57	0.68	0.085711
16	Tampa Bay Lightning	-1.5	145	40.82	1.68	0.33	0.707280
17	Winnipeg Jets	1.5	-176	63.77	-1.68	0.33	0.292720
18	Anaheim Ducks	1.5	-245	71.01	-0.57	0.41	0.988344
19	Chicago Blackhawks	-1.5	195	33.90	0.57	0.41	0.011656
20	Washington Capitals	1.5	-221	68.85	-1.23	0.42	0.739842
21	Calgary Flames	-1.5	180	35.71	1.23	0.42	0.260158

Step 5: Find the Best Bets

```
df_join['difference'] = df_join.apply(lambda x: (x['model_probability'])*100 - x['implied_probability'], axis=1)
df_join = df_join.sort_values(by=['difference'], ascending=False)
```

		Teams	Lines	Odds	implied_probability	mean_win_margin	sd	model_probability	difference
11		St. Louis Blues	-1.5	-110	52.38	2.04	0.48	0.869705	34.590548
16		Tampa Bay Lightning	-1.5	145	40.82	1.68	0.33	0.707280	29.907953
4		Vegas Golden Knights	-1.5	145	40.82	1.72	0.43	0.695544	28.734427
18		Anaheim Ducks	1.5	-245	71.01	-0.57	0.41	0.988344	27.824431
0		Colorado Avalanche	-1.5	120	45.45	1.80	0.56	0.703922	24.942199
2		Florida Panthers	-1.5	195	33.90	1.68	0.86	0.582894	24.389388
14		Dallas Stars	1.5	-236	70.24	-0.57	0.68	0.914289	21.188871
6		Arizona Coyotes	1.5	-176	63.77	-1.21	0.38	0.777315	13.961538
9		Toronto Maple Leafs	-1.5	-110	52.38	1.65	0.51	0.615666	9.186600
12		New York Rangers	1.5	-180	64.29	-1.20	0.56	0.703922	6.102199
20		Washington Capitals	1.5	-221	68.85	-1.23	0.42	0.739842	5.134160
21		Calgary Flames	-1.5	180	35.71	1.23	0.42	0.260158	-9.694160
13		Minnesota Wild	-1.5	150	40.00	1.20	0.56	0.296078	-10.392199
8		Seattle Kraken	1.5	-110	52.38	-1.65	0.51	0.384334	-13.946600
7		Detroit Red Wings	-1.5	145	40.82	1.21	0.38	0.222685	-18.551538
15		Nashville Predators	-1.5	190	34.48	0.57	0.68	0.085711	-25.908871
1		New Jersey Devils	1.5	-140	58.33	-1.80	0.56	0.296078	-28.722199
3		Pittsburgh Penguins	1.5	-245	71.01	-1.68	0.86	0.417106	-29.299388
19		Chicago Blackhawks	-1.5	195	33.90	0.57	0.41	0.011656	-32.734431
5		Philadelphia Flyers	1.5	-176	63.77	-1.72	0.43	0.304456	-33.324427
17		Winnipeg Jets	1.5	-176	63.77	-1.68	0.33	0.292720	-34.497953
10		Ottawa Senators	1.5	-110	52.38	-2.04	0.48	0.130295	-39.350548

Git Repo Structure

```
sports-book-manager/
| - sports_book_manager/
|   | - __init__.py
|   | - book_scrape_class.py
|   | - implied_probability_calculator.py
|   | - model_probability.py
|   | - tests/
|   |   | - __init__.py
|   |   | - test_book_scrape.py
|   |   | - test_ipc_outputs.py
|   |   | - test_mp_outputs.py
|   | - data/
|   |   | - hockey_odds.csv
|   |   | - model_output_example.csv
| - examples/
|   | - example.ipynb
| - docs/
|   | - written_report.pdf
|   | - presentation.pdf
| - setup.py
| - requirements.txt
| - README.md
| - LICENSE
```

Lessons Learned

- Utilizing classes
- Creating more flexible and extensible software
- Reduce the interface
- Include ability to enter username/password

Future Work

Thank You

