

Python Project, May 2020

# Random Walk: Monte Carlo Simulation Case Study

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#100DaysofCode



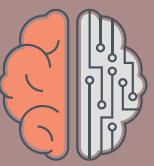
#100DaysofLearning

About  
ME



# Summary

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CLASSIC RANDOM WALK PROBLEM  
SOLVED BY USING MONTE CARLO  
SIMULATION



VISUALIZATIONS OF RANDOM  
WALK PROCESSES AND RESULTS  
ARE PROVIDED



PROBABILITY RATE OF WINNING  
THE BET IS CALCULATED



THE PROGRAM IS WRITTEN IN  
PYTHON VIA JUPITER NOTEBOOK



THE CODE RUNS 10,000  
SIMULATIONS

# RANDOM WALK PROBLEM



You are walking up the Empire State Building and playing a game with your friend.

For 100 times, you roll a dice:

- If it is 1 or 2, you go one step down
- If it is 3, 4, or 5, you go one step up
- If it is 6, you roll the dice again, and walk the resulting number of steps up
- You can not go below step 0
- You have a 0.1% chance of falling down the stairs when you make a move - falling down means you have to start again from step 0



You bet your friend that you will reach 60 steps high. What is the probability that you will win this bet?



# ⟨/⟩ SAMPLE CODE



```
import numpy as np
import matplotlib.pyplot as plt

# Simulate random walk 10,000 times
all_walks = []
for i in range(10000) :
    random_walk = [0]
    for x in range(100) :
        step = random_walk[-1]
        dice = np.random.randint(1,7)
        if dice <= 2:
            step = max(0, step - 1)
        elif dice <= 5:
            step = step + 1
        else:
            step = step + np.random.randint(1,7)
        if np.random.rand( ) <= 0.001 :
            step = 0
        random_walk.append(step)
    all_walks.append(random_walk)
```

# Solution



NumPy



matplotlib



jupyter



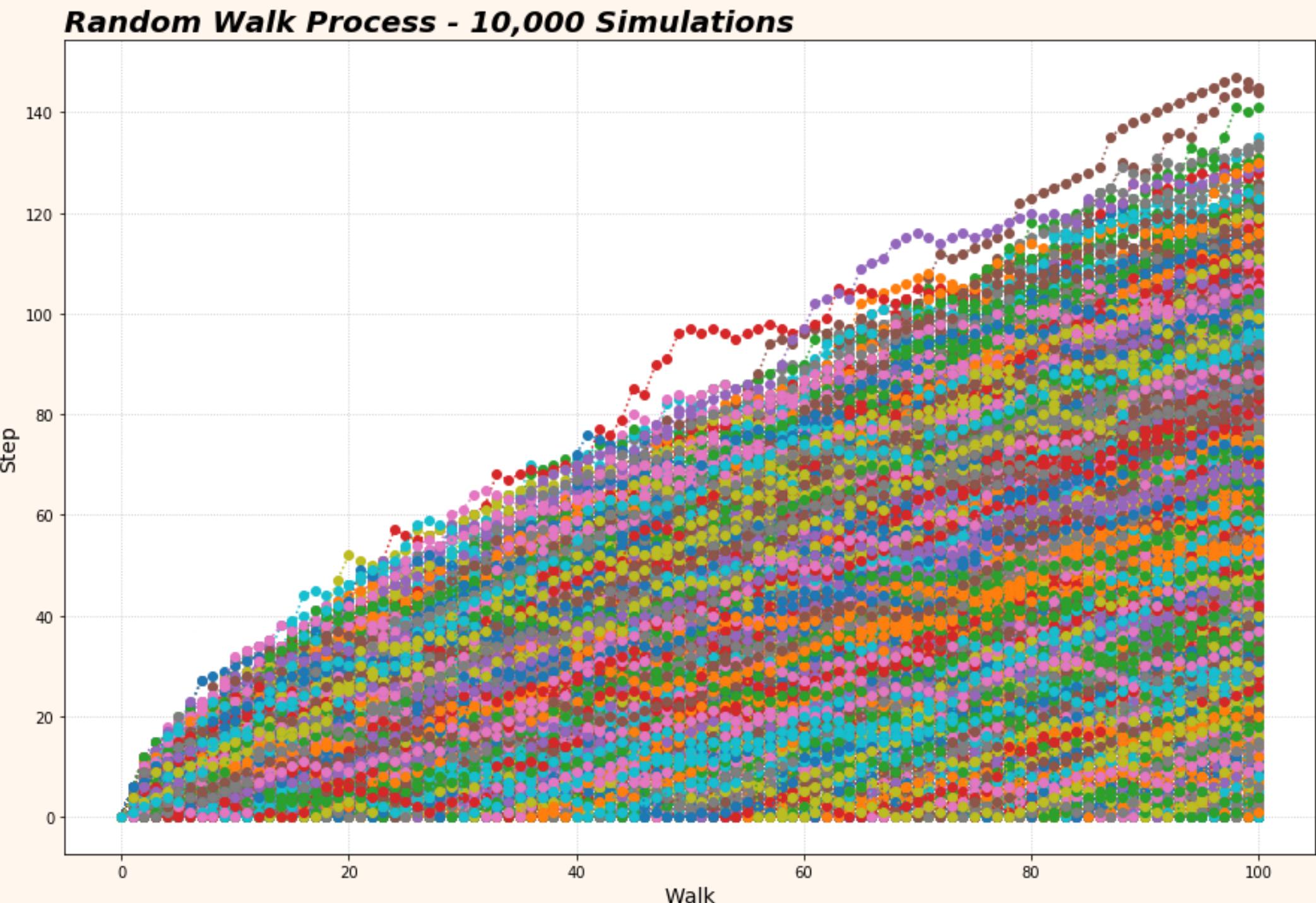
DataCamp

# Visualization & Results

## PLOT: RANDOM WALK PROCESS

CUSTOMIZED:

- FIG SIZE
- MARKER
- GRID
- ALPHA
- LINE STYLE
- FONT SIZE
- TITLES
- STYLE
- FONT WEIGHT
- COLOR

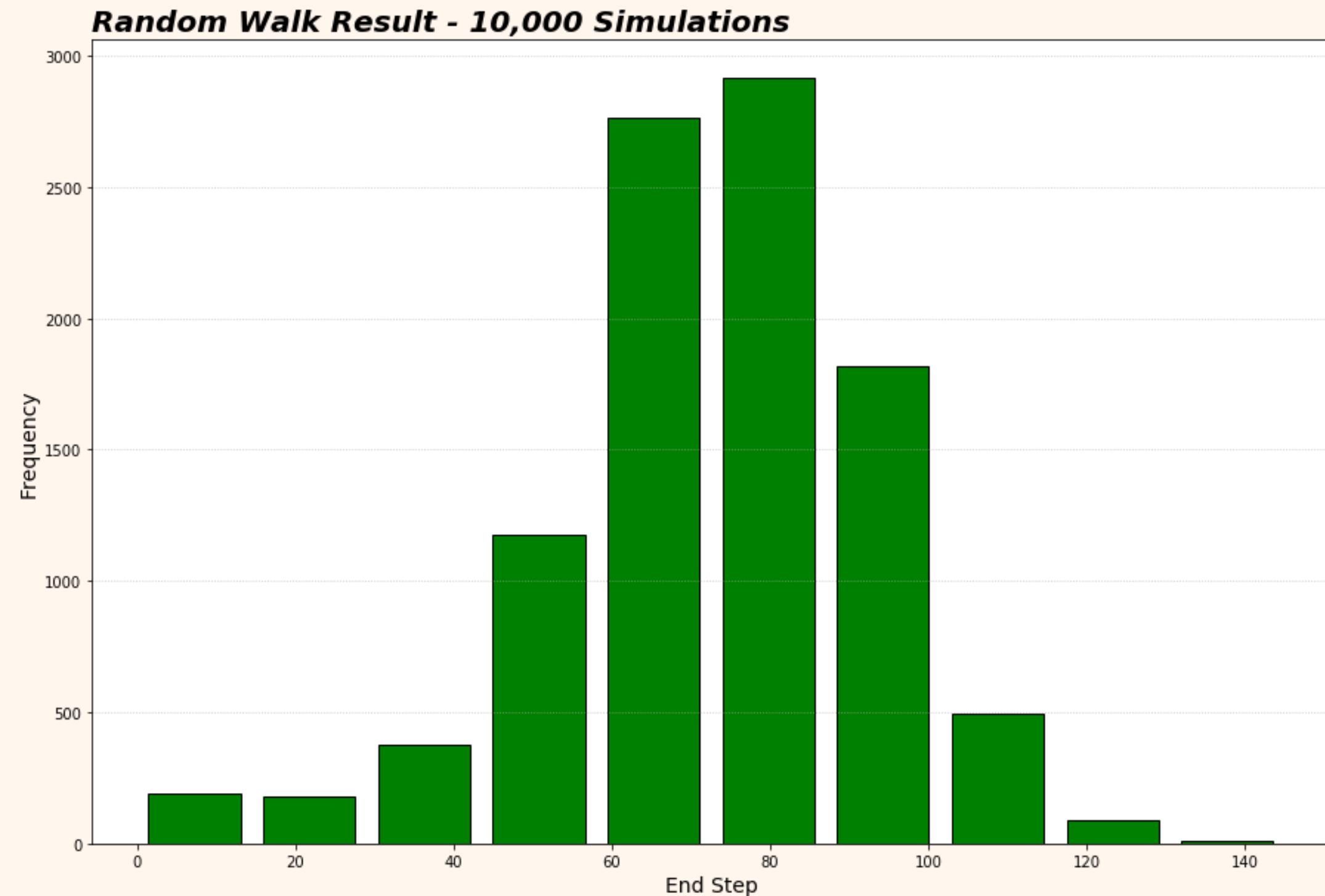


# Visualization & Results

## HISTOGRAM: RANDOM WALK RESULTS

CUSTOMIZED:

- FIG SIZE
- BINS
- COLOR
- EDGE COLOR
- R WIDTH
- GRID
- ALPHA
- LINE STYLE
- FONT SIZE
- TITLES
- FONT WEIGHT



# Conclusion

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## WINNING THE BET?

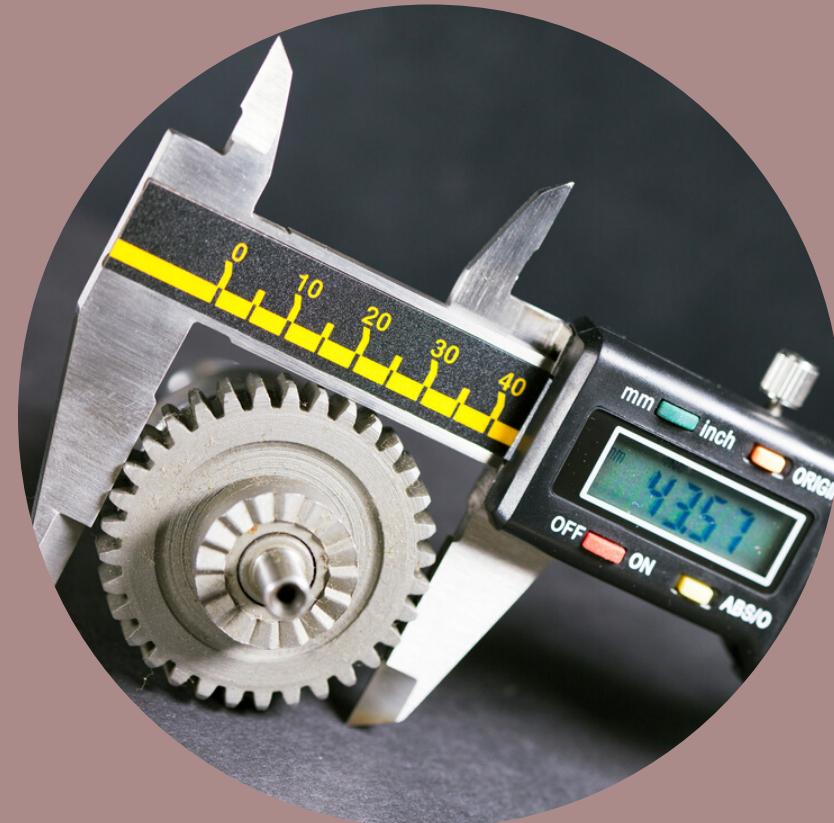
There is a high probability of 78.11% you will win this bet based on 10,000 simulations



## INSTALLATION

Download and run randomwalk.py

**USAGE**  
Parameters can be customized





Have a  
Great  
Day!