Investment Forecasting (Monte Carlo Simulation)

BY TEAM 2:
FARIDA, DIEGO,
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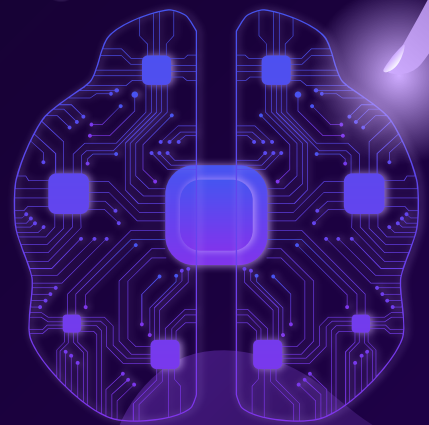

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02 Methodology

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INTRODUCTION & PROBLEM STATEMENT

Project background & context

Investing is uncertain, and returns vary with market conditions and volatility.

Using **Finnhub/Yahoo Finance** data, our project runs **10,000+ Monte Carlo simulations on a $250K portfolio comparing the long-term performance of stocks vs Index fund**s to estimate returns and risk probabilities.

Our goal is to **develop a simulation tool that helps investors and analysts make informed, data-driven portfolio decisions.**

Problems you want to find answers

How can we estimate future investment performance under market uncertainty?

What is the probability of gains or losses over time?

Which assets (SPY, QQQ, AGG) show the most stable risk-adjusted growth?

METHODOLOGY

Data Collection: Fetch current & historical data from Finnhub API & Yahoo Finance for **SPY**, **QQQ**, **AGG**, & select stocks.

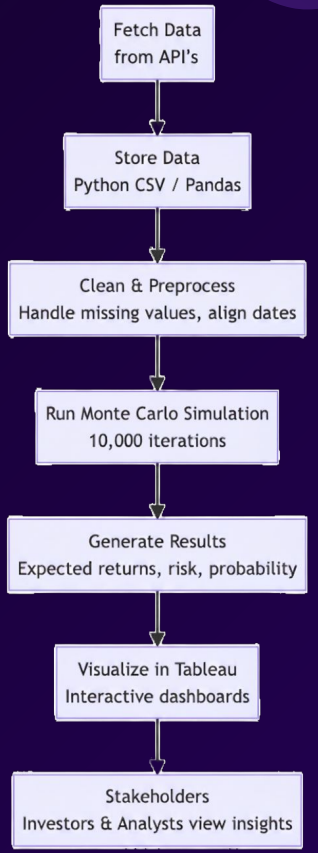
Storage: Save data in CSV or Pandas DataFrames.

Processing: Clean data, align dates, and calculate returns in Python.

Simulation: Run 10,000+ Monte Carlo simulations for 10–20 years.

Visualization: Use Tableau to display risk, return, and probability outcomes.

Stakeholders: Investors and analysts view interactive dashboards to compare results.



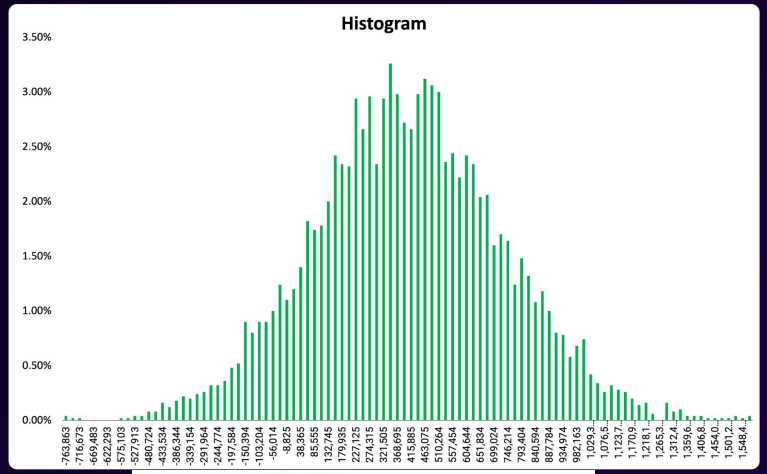
Data Collection

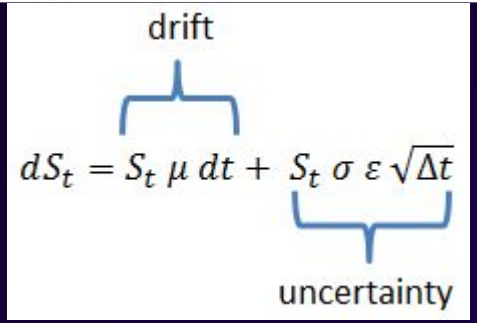
- For our stock datasets we utilized Finnhub and yFinance
- We used get requests to obtain the data we required in order to build our dataframes for our monte carlo simulations.
- We cleaned the data by changing formatting, such as converting the 't' row to datetime.
- yFinance seems better for historical data

```
#present day calls
for sym in symbols:
  url = f"https://finnhub.io/api/v1/quote?symbol={sym}&token={API_KEY}"
  pData = requests.get(url).json()
  pData['symbol'] = sym
  rowsP.append(pData)

  #init dataframe 1
  df1 = pd.DataFrame(rowsP)
#changing t from timestamp into datetime for ease of use/understanding
df1['datetime'] = pd.to_datetime(df1['t'], unit='s')
df1 = df1.drop(columns=['t'])

#c = current price, d = change from prev close, dp = percent change from prev close
#h = high, l = low, o = open price, pc = previous close, symbol = stock symbol
print(df1.columns, "\n")
```

Monte Carlo Method

Example





- Monte Carlo is a method of running a large amount of random trials.
- Gives insight to future trends, while accounting for uncertain probabilities.
- We can use historical data in order to create a basis for simulations
- After 10,000 simulations we can gather data describing worst/best/average case.
- Our monte carlo method will utilize the Geometric Brownian Motion model

Monte Carlo Simulation

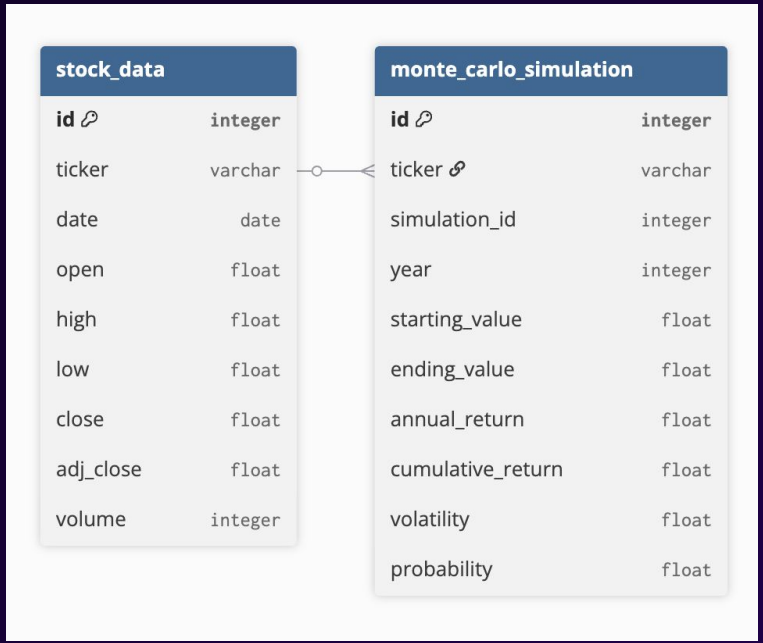
```
port_mean #mean of portfolio
port_stdev #standard deviation of portfolio
dt = 1/days #time step to account for everyday in the year

for i in range(num_simulations):

    #An array representing the daily random shocks that occur
    spikes = np.random.normal(0, 1, days)

    #GBM formula, stimulates change of returns
    daily_returns = np.exp((port_mean - 0.5 * port_stdev**2) * dt +
port_stdev * spikes * np.sqrt(dt))

    #Computing our portfolio's cumulative value
    price_path = initial_investment * np.cumprod(daily_returns)

    #simulation results array
    simulation_results[:, i] = price_path
```

- We will use our previously calculated mean and stdev from our portfolio as part of our simulations
- We will simulate controlled market randomness by inducing spikes into our data
- Using the GBM formula we can calculate the price path for our simulation.
- Insert our results from the simulation into our result array.

Data Model

The stock_data table stores historical market data for each ticker from the api.

The monte_carlo_simulation table contains thousands of simulated future outcomes generated from that stock data.



Each stock record in stock_data is linked to many simulation results in monte_carlo_simulation, representing different possible investment scenarios.
(1 to many relationship)

VISUALIZATION: TABLEAU IDEAS

Extract Data

API CONNECTION ; Stream data to source (mysql) tableau can connect directly to Push data into SQL database , connect to server and click refresh to see new Updates

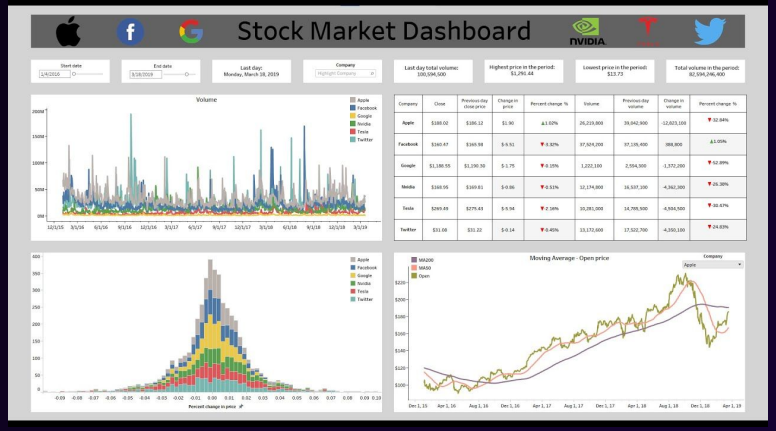
DATABASE : Create connector script (python flask) that calls API finnhub. Tableau connects directly to the Web data connector and this provides live feed without refresh (BUT COMPLEX)

Build Dashboard

- PROBABILITY DISTRIBUTIONS
- GROWTH OVER TIME
- BEST WORST CASE SCENARIOS
- COMPARISON BETWEEN INDEX FUNDS AND Portfolio

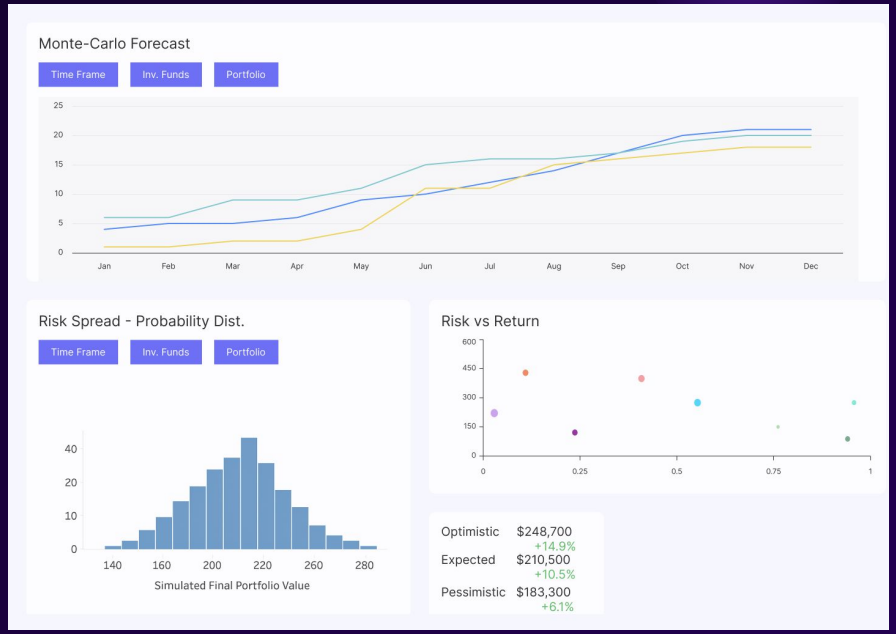
ANSWER QUESTIONS LIKE

- What is the value of my investment over time
- Can i filter for different stocks or ETFs
- Can i see the live feed/updates of the the stocks

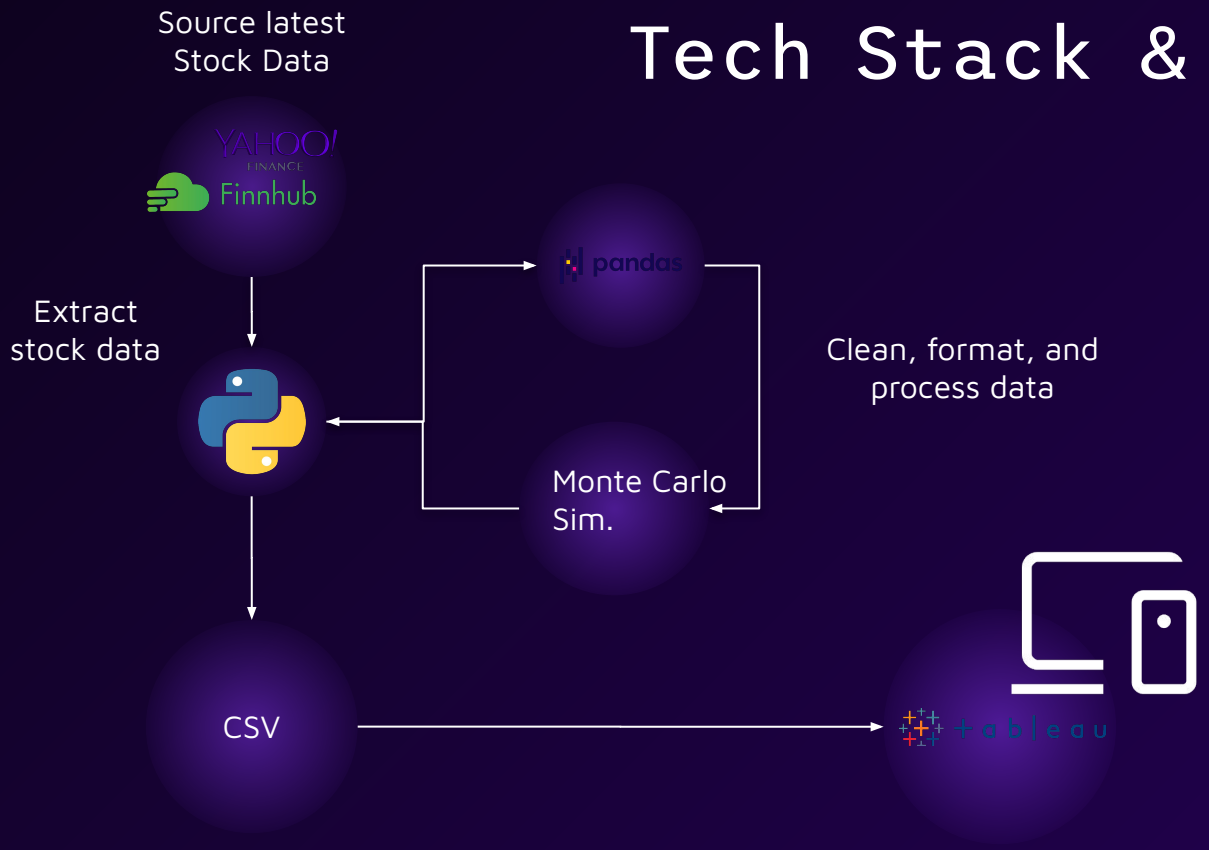


WHAT YOU MIGHT SEE

- Text Tables
- Density Curve
- Line Charts
- Trend lines
- Box plot,Etc



Tech Stack & Flow



Roles

Data Engineer

Ahmed

Data Analyst

Farida

Data Engineer

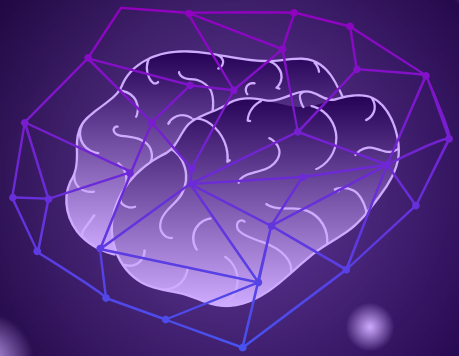
Diego

Data Analyst

Brandon

Thank You!

Q&A?



Investment Simulation & Forecasting

We are trying to 250k over 10 and 20 years and predict the outcome of the investment showing the effect moderate low and high risk investments using visualizations. The basic idea is to

- Explore financial API's (in our case Finnhub)
- Fetch historical prices using our code written in Python
- Provide live feed and Trends over time using Tableau
- Predict and Show correlations between sets based on out outcomes

The goal is to use Monte Carlo Simulations to generate random scenarios, Model over 10 to 20 years and then for each simulation calculate different aggregations like mean, median, best case, worst case scenarios etc

Key ideas in market opportunity_

Research new markets

Analyze existing customer needs and identify gaps in the market to find new opportunities

Innovative solutions

Utilize technology and customer feedback to come up with novel solutions that meet your customer’s demands or needs

Stay ahead of trends

Monitor changes in the marketplace, such as shifts in consumer behavior or emerging technologies, to stay competitive and capitalize on new opportunities and trends

Seasonal spikes

Identify times of year when demand for certain products may spike, such as holidays or special occasions, and use these times to target customers or maximize sales

Six recommendations_

Keep it simple

Structure your pitch deck clearly and make sure all the important points are easy to understand

Use visuals

Incorporate visuals or graphics to illustrate your message and keep the audience engaged

Keep it short

A good pitch deck should be concise and clear; avoid trying to cram in information in excess

Make it memorable

Include impactful stories, statistics, or facts that will help your audience remember your message after the presentation

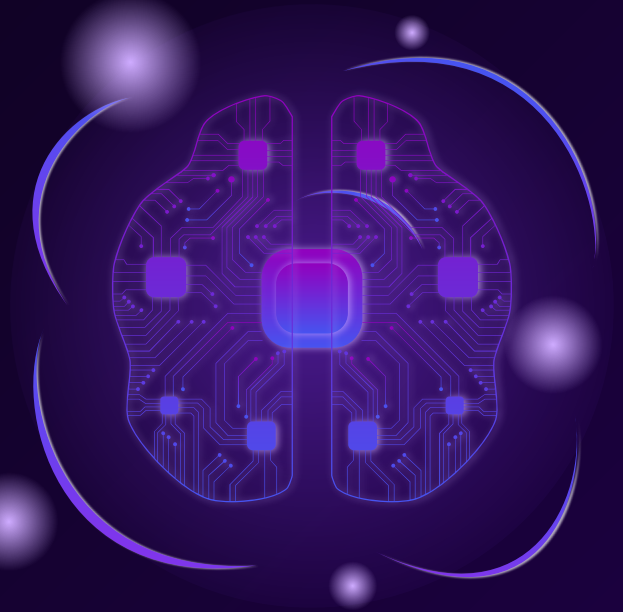
Test & iterate

Practice presenting your deck beforehand with friends or colleagues for feedback, then use this input to refine it further

Main points

A pitch deck is an overview of your business; focus on key points that get the most important ideas across


333,000_
Users bought our product
9h 55m 23s_
Estimated delivery time per unit
386,000 km_
Avg. Distance travelled by logistics team



4,498,300,000_

Number of users analyzed in
our market research

Competition comparison_

	Team A	Team B	Team C	Team D	Team E
Mercury	Yes	Yes	No	Yes	Yes
Mars	Yes	No	Yes	Yes	No
Saturn	No	Yes	Yes	No	No
Venus	Yes	Yes	Yes	Yes	Yes
Jupiter	No	No	Yes	Yes	Yes
Earth	Yes	Yes	No	No	Yes

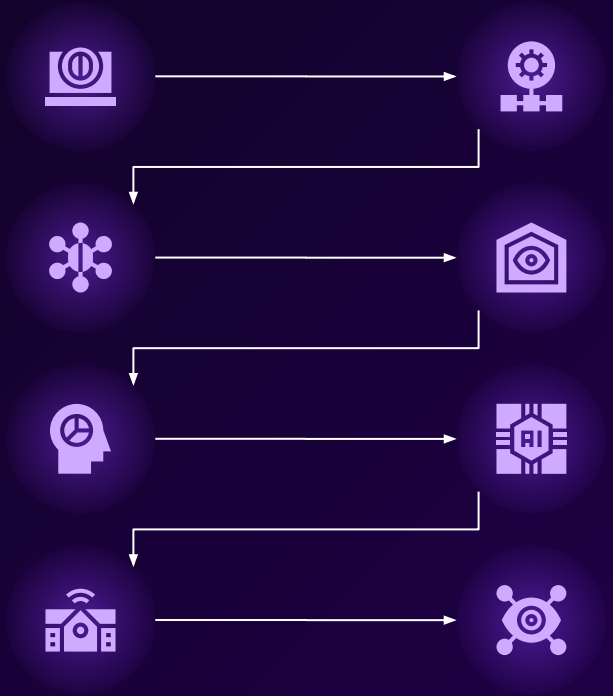
Timeline of your presentation_

Provide a brief overview of the pitch deck content

Identify the target customer pain points and challenges in a brief manner

Highlight the unique value proposition and benefits of your solution

Explain your financial needs and briefly outline your funding allocation



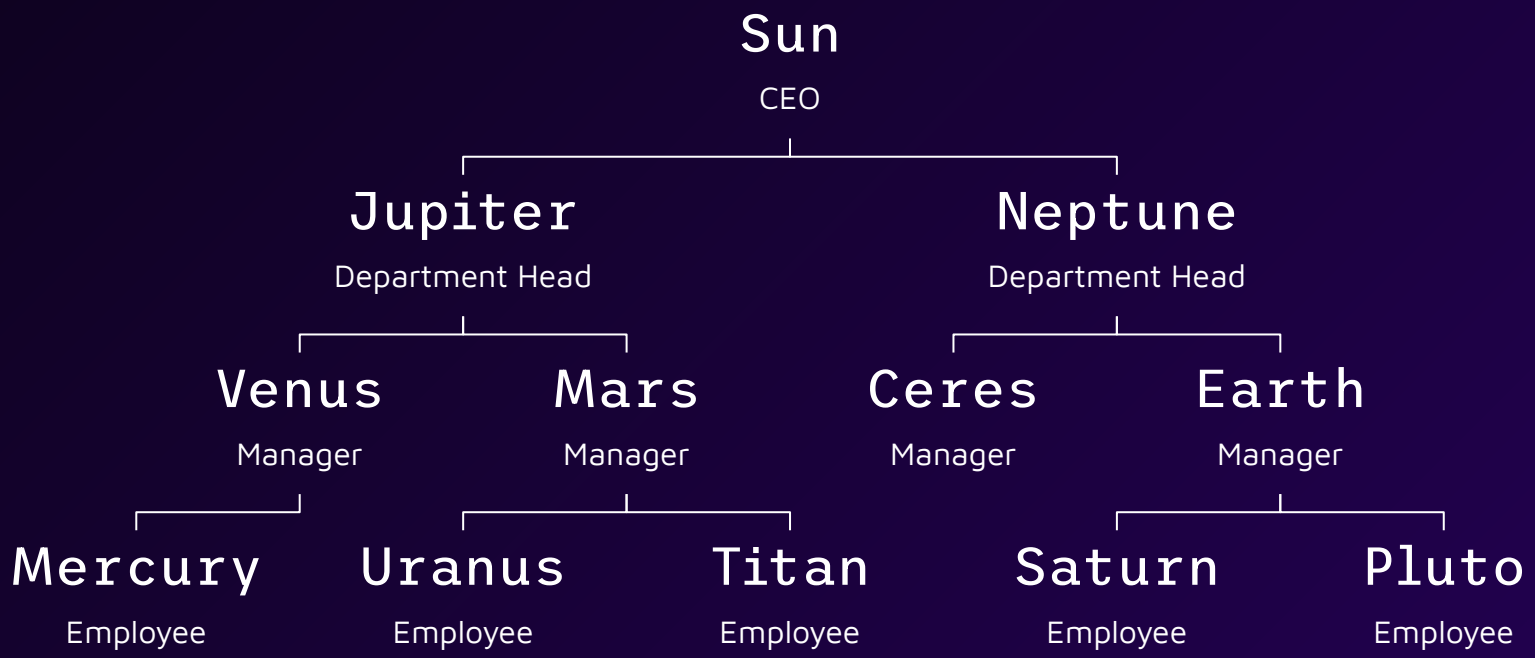
Engage the audience with a concise and compelling company introduction

Describe how your product or service can solve the problem

Analyze the target market size, growth potential, and competition briefly.

End with a clear and concise call to action

Organizational chart_



Market size overview_

Include the total size of the market, which represents the entire potential customer base for the product or service

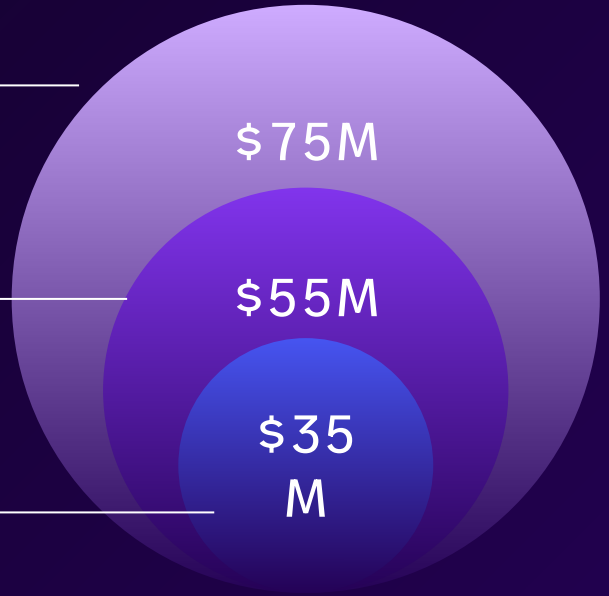
Outer circle

Identify the target market for the product or service, which may be a subset of the total market. This could be based on factors such as demographics, geography, or specific needs

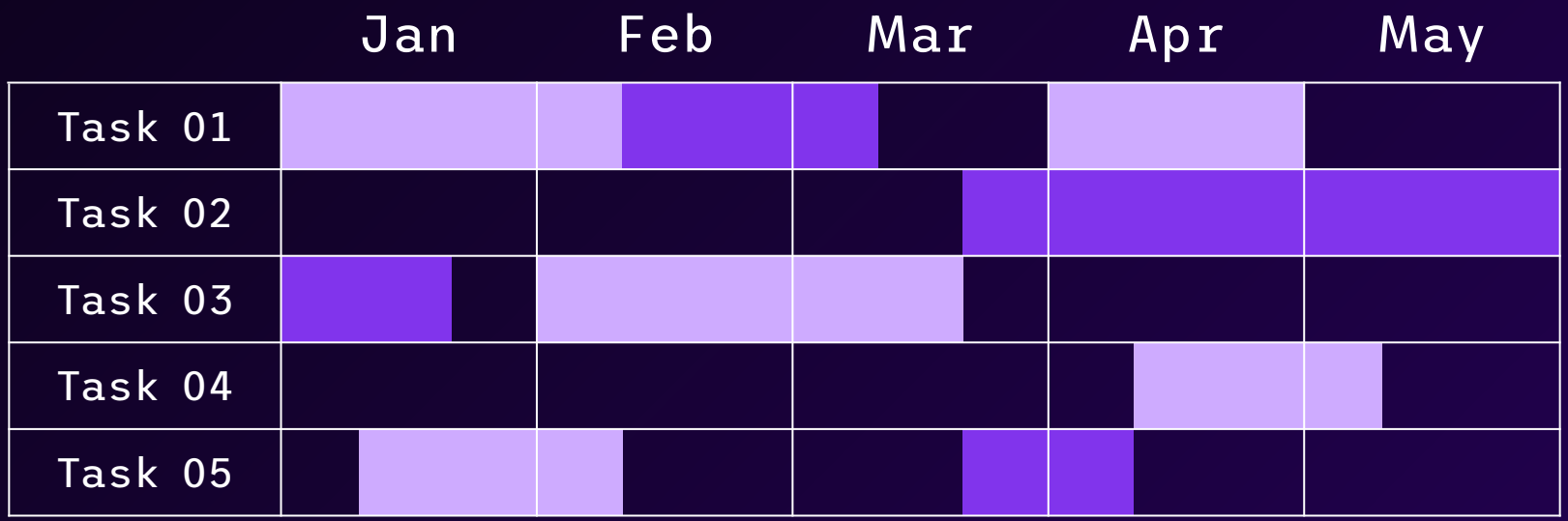
Middle circle

Indicate the current market size, which represents the portion of the target market that the company has successfully captured

Inner circle



Roadmap infographics_



Team 01

Give a brief description of this team and their responsibilities

Team 02

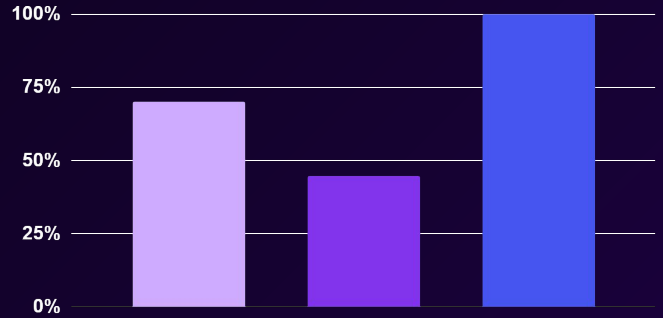
Give a brief description of this team and their responsibilities

KPI dashboard_

70%
Development was mostly good in the beginning

45%
The company faced some difficulties halfway

100%
Bugs were fixed and the final product is ready



Product	Column 1	Column 2
Jupiter	50%	2,000,000
Saturn	20%	50,000
Mercury	100%	1,500,000

Follow the link in the graph to modify its data and then paste the new one here. **For more info, click here**

Icon pack_

Alternative resources_

Here’s an assortment of alternative resources whose style fits that of this template:

Vectors

- Landing page template artificial intelligence
- Landing page neon with smartphone

Resources_

Did you like the resources on this template? Get them at our other websites:

Photos

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- Side view woman working on digital monitors

Vectors

- Artificial intelligence template landing page
- Artificial intelligence landing page
- Artificial intelligence landing page template

Icons

- Icon Pack: Artificial intelligence | Filled

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Trispace

Maven Pro

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All the colors used in this presentation

#ffffff	#0b0218	#ceabff	
#8134ec	#240155	#9101be	#4654f0

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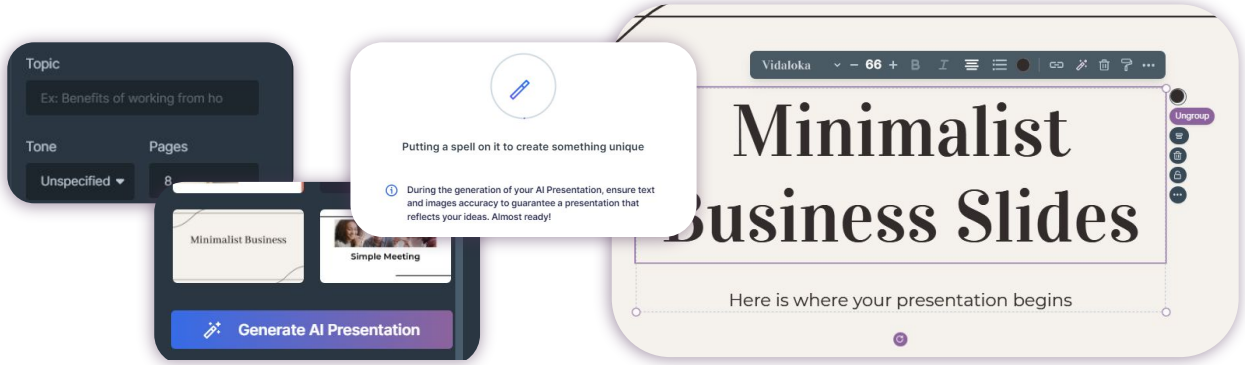

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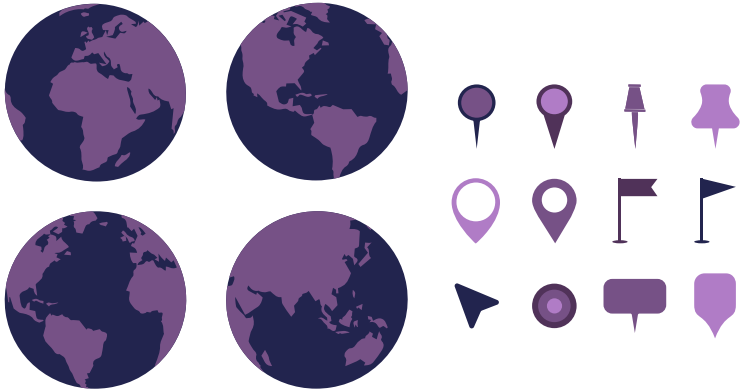

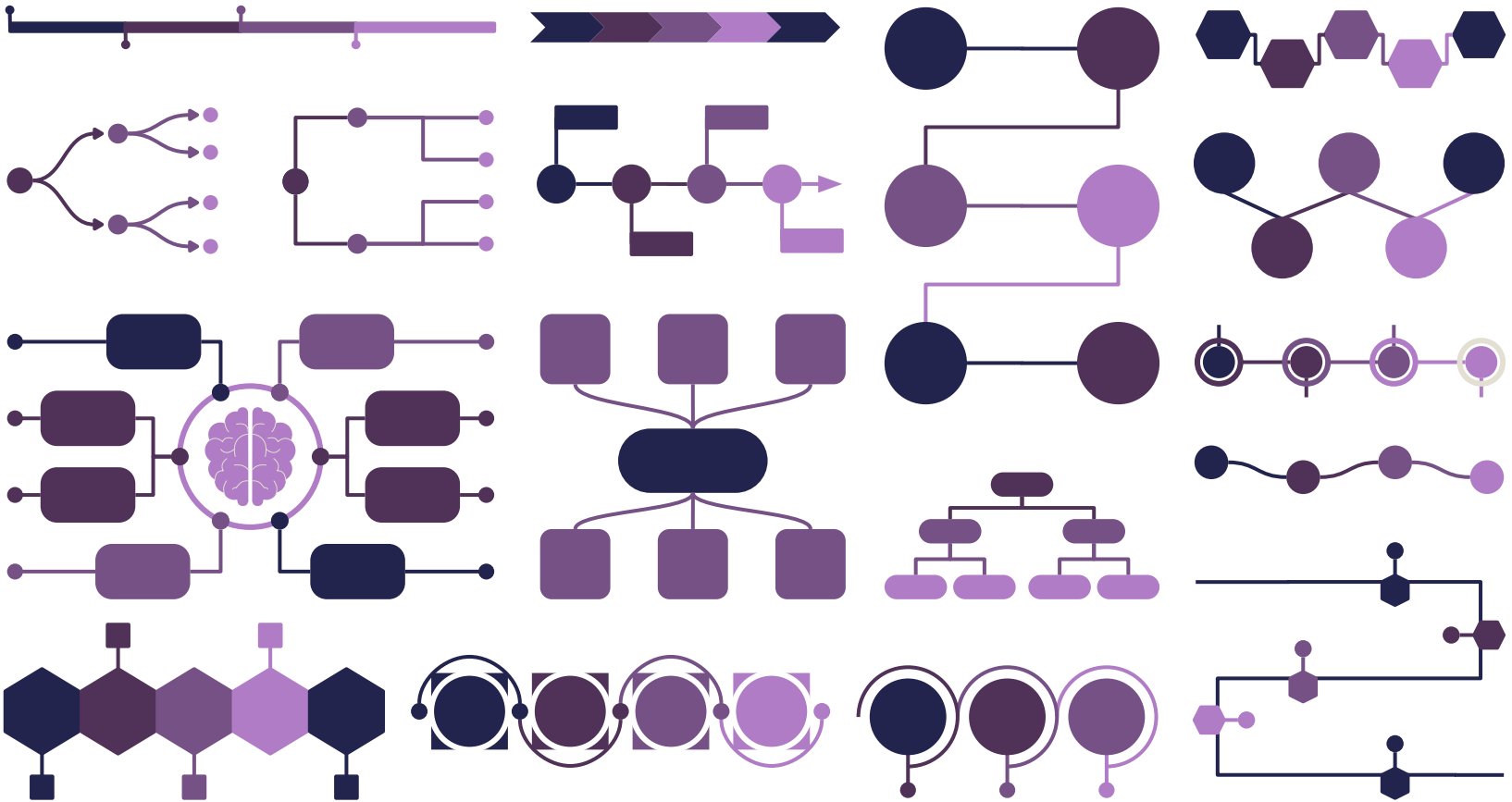

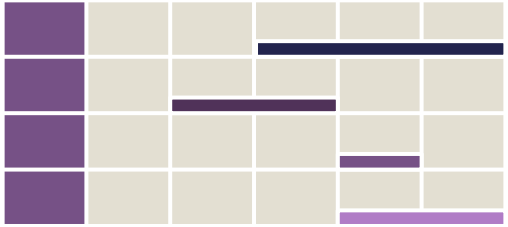

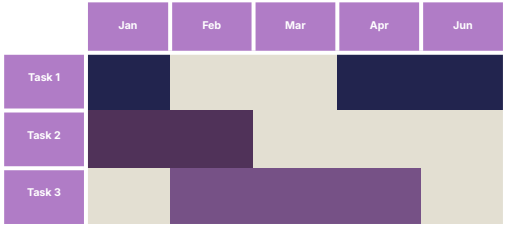
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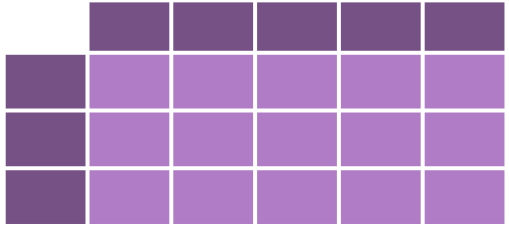

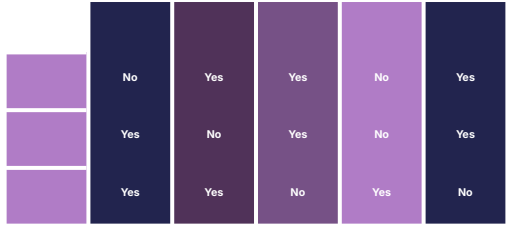
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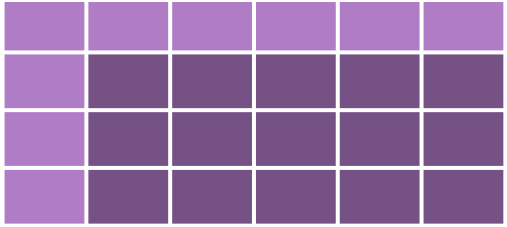

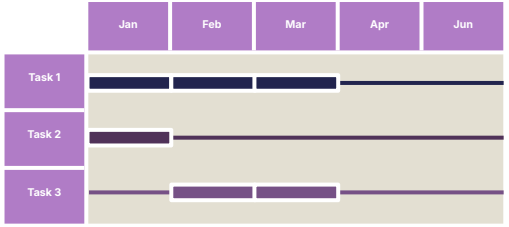
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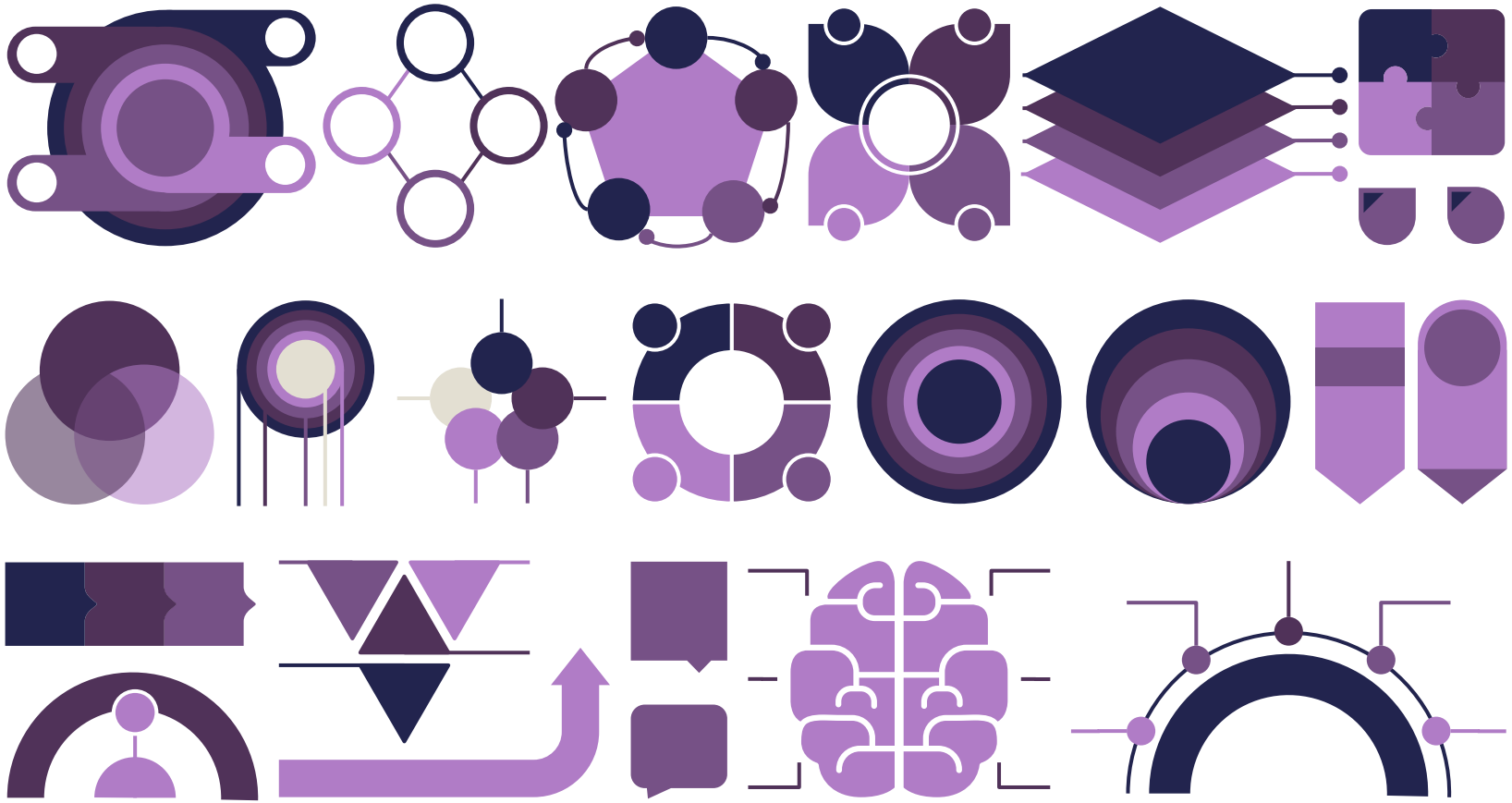


6/10
8/10
7/10
4/10

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