Welcome to FinTech!

FinTech

Lesson 1.1


WELCOME

Class Objectives

By the end of today's class, you will:

- Get to know the instructional team as well as each other.
- Become familiar with the course format and requirements for certification.
- Review the course topics and agenda.
- Be able to explain what FinTech is.
- Review the completion and submission guidelines for the Unit 1 homework assignment.

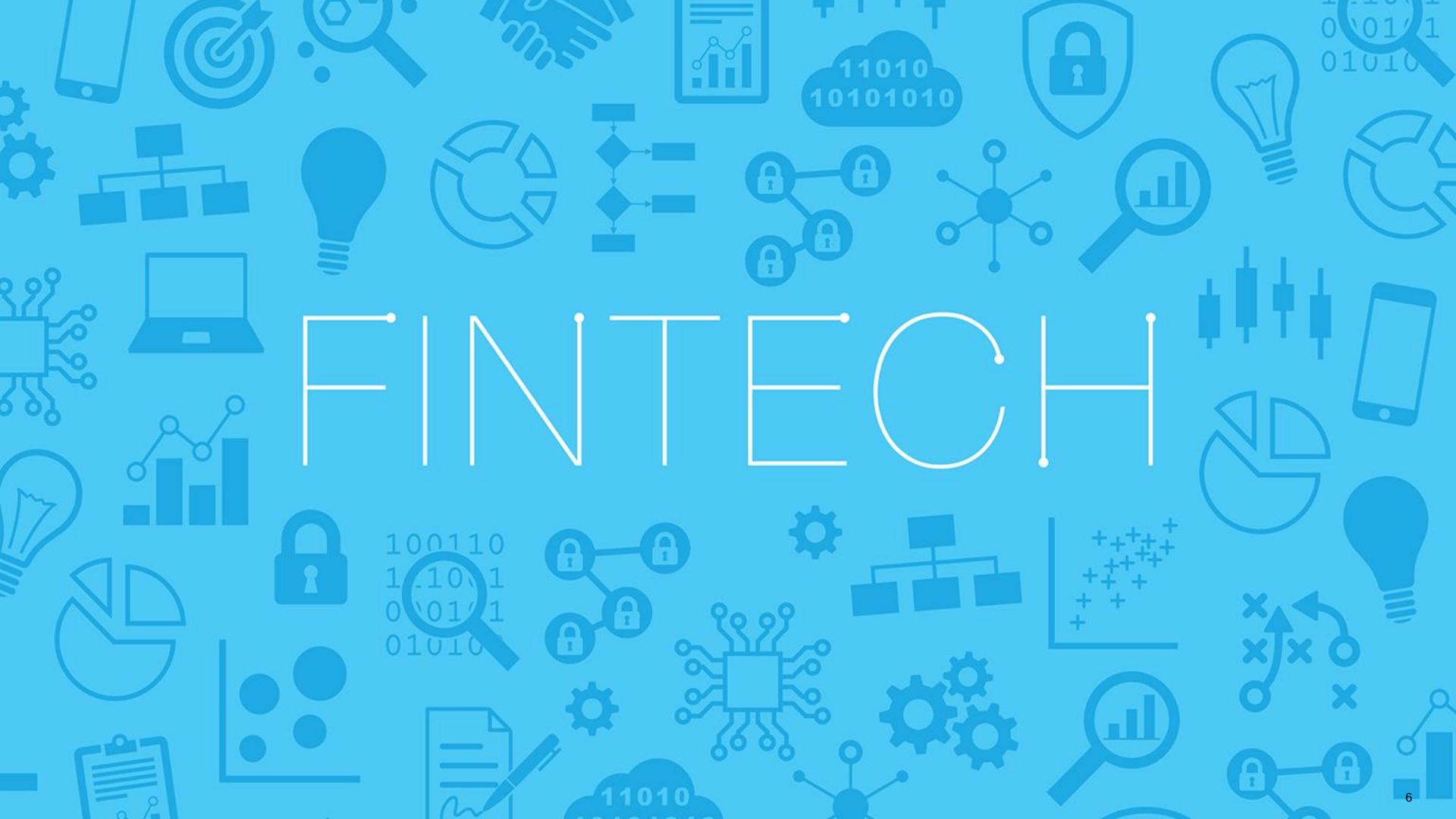
Expectations

1. We are Professional hungry to learn new skills. “Stay hungry”!!!
2. Camera On and wear appropriate clothes
3. Mute your “mic” during class and turn it on when asking question. This eliminates unnecessary background noise. Feel free to have family members to know your classmates.
4. Attendance notification. See policy and notify both TA and Instructor
5. I encourage to actively participate, otherwise the computer will call your name randomly
6. Work on the activities during class because I will select a student randomly to present it with the group
7. Follow the HW policy.
8. Come prepare to office hours
9. Use the career services resources!!!!

“There are naive questions, tedious questions, ill-phrased questions, questions put after inadequate self-criticism. But every question is a cry to understand the world. ***There is no such thing as a dumb question.”***

Carl Sagan, The Demon-Haunted World: Science as a Candle in the Dark

Defining FinTech


FINTECH

The Financial Sector Today

Why Big Banks Are Losing to Tech Giants Over Open Banking

How Technology Is Impacting the Finance and Banking Sector

Blockchain Technology Is Helping Small Businesses Create Their Legal Agreements

Worldwide Financial Services External and Internal IT Spending to Reach $500 Billion in 2021, According to IDC Financial Insights

The Future of Banking Is Rapidly Becoming a Digital Domain. How Will Community Banks Respond to the Tide of Technology?

Tech Firms Could Pose Major Threat to Banks

Banks Unveil Network to Digitize Trade Finance

Why Top Tech Talent May Be Coming to Finance

"Banks Are Technology Firms"

What Is FinTech?

The broader FinTech category can be segmented into four variants.

Origin		Low (small scale)	High (large scale)
	Technology	**Infrastructure providers** seeking to help financial institutions digitize and modernize their technology stacks. Examples: FNZ, Marqeta, Onfido	**Large technology ecosystems** using financial services to strengthen relationships with users. Examples: Apple, Ant Financial, Tencent
	Financial Services	**New entrants, start-ups, and attackers** seeking to enter financial services using new technologies. Examples: SoFi, TransferWise, LendingClub	**Incumbent financial institutions** making significant investments in technology to lift their game. Examples: Wells Fargo, Ping An
		Scale	

Source: McKinsey analysis

But what exactly *is* FinTech?

FinTech is the combination of finance and technology. More specifically, it describes a **financial services industry** that has been disrupted by **technological innovation** that competes with traditional **financial methods** and **improves activities and inefficiencies** in finance.

Activity: FinTech Group Discussion

In this activity, you will reflect on what FinTech means to you.

(Instructions sent via Slack.)

Suggested Time:
5 Minutes

Time’s Up! Let’s Review.

Course Overview

Curriculum Overview

Intro to FinTech
First, you'll learn about the fundamental priorities of investment banks, traders, insurance agencies, and other players in the financial industry. You will also learn about the command line and GitHub to prepare for future programming assignments.

Python and Financial Programming
Next, you'll learn Python programming, focusing in depth on the core libraries relevant to finance work. You will use APIs like Quandl to add live financial data feeds to your software projects. You'll also use a variety of analytic tools to extract insights and create reports.

Curriculum Overview

Algorithms, Statistics, and Machine Learning
You will learn a variety of core algorithms, models, and forecasting tools, including Monte Carlo simulations, risk-data aggregation, portfolio theory, and regression. You'll draw on this background as you apply machine learning concepts to financial challenges.

Advanced Topics: Big Data and Blockchain
The course will end with deep coverage of the big data and blockchain toolchains. You will use Python to complete challenges that involve building and using these toolchains for financial and regulatory benefit.

Curriculum Breakdown by Week

Unit 1: Intro to FinTech
1. Intro to FinTech and Finance

Units 2–7: Python for Finance Deep Dive
2. Python Basics
3. Python and Pandas + Review Day
4. Pandas + Review Day
5. APIs
6. Data Visualization
7. SQL

Units 8–9: Project Work
8. Project 1
9. Project 1 continued

Units 10–15: Applied Machine Learning
10. Time Series Analysis
11. Classification
12. Natural Language Processing
13. AWS and Cloud ML
14. Deep Learning and Robo Advisors
15. Algorithmic Trading

Units 16–17: Project Work
16. Project 2
17. Project 2 continued

Units 18–22: Blockchain Deep Dive
18. Intro to Blockchain
19. Interacting with Blockchains in Python
20. Intro to Solidity & Smart Contracts
21. Advanced Solidity & Smart Contracts
22. Blockchain Application Development

Units 23–24: Project Work
23. Project 3
24. Project 3 continued

Core Program Modules

Python

Applied ML and AI

Blockchain / Cryptocurrency

Curriculum at a Glance

Week 1: You will be introduced to the world of FinTech and discuss the current financial landscape.

Weeks 2–7: You will learn the basics of Python and how to use additional libraries and tools such as Pandas, APIs, Plotly, and SQL databases, in the context of financial analysis.

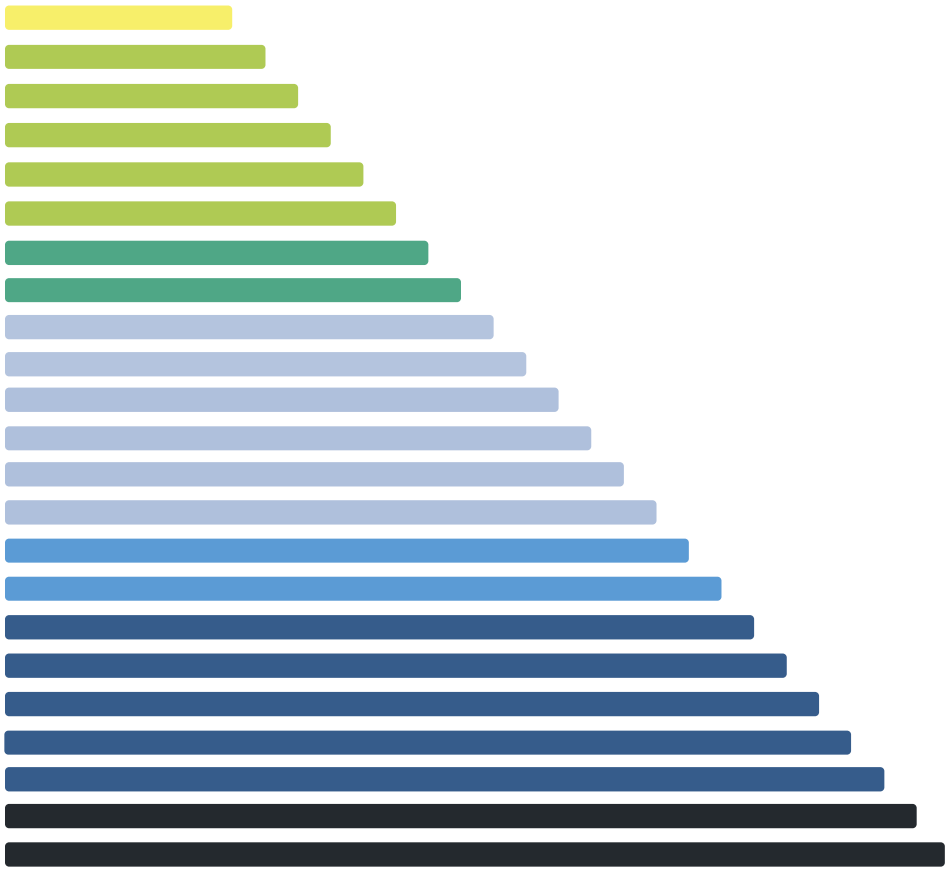
Weeks 8–9: You are tasked with your first project.

Weeks 10–15: Companies are becoming more and more data-driven in their decision making. Therefore, through machine learning, you will need to learn how to not only interpret and create financial models, but also how to automate the execution of such models. Topics include algorithmic trading, robo-advisory, time series analysis, risk management, and Cloud ML technologies.

Weeks 16–17: You are tasked with your second project.

Weeks 18–22: With its benefits of security, speed, and decentralized peer-to-peer validation, blockchain technology has already become more efficient than traditional finance in the context of transactions and third-party validation. You will learn blockchain fundamentals, smart contracts using Solidity, and how to develop blockchain applications on the popular Ethereum blockchain network.

Weeks 23–24: You are tasked with your final project.



Hard Skills + Core Knowledge = *Real Jobs*

Skills/Technologies Covered

- Time Series Analysis
- Financial Ratios / Analysis
- Python Programming
- API Interactions
- Pandas
- NumPy / SciPy
- Pyfin
- Quant DSL
- SQL
- Monte Carlo Simulations
- Forecasting
- Modern Portfolio Theory
- Machine Learning
- Big Data
- Blockchain / Cryptocurrency

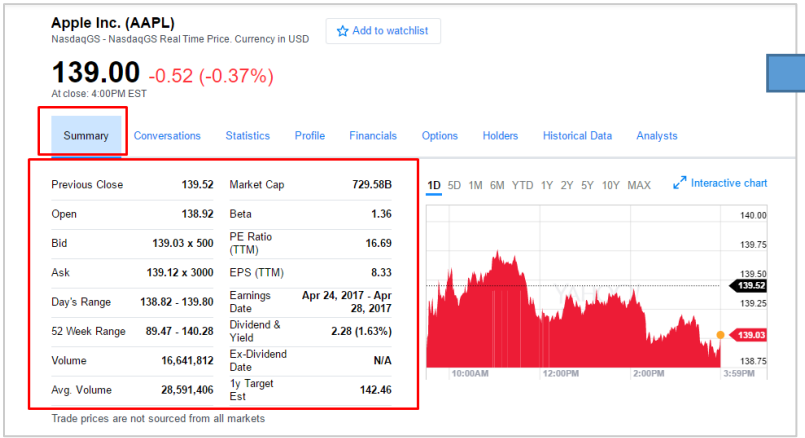
Relevant Jobs

- Business Analyst
- Financial Analyst
- Data Analyst
- Data Scientist
- Quantitative Trader
- Systems Business Analyst
- FinTech Regulatory Associate
- Software Developer
- Financial Manager
- Business Intelligence Analyst
- Cryptocurrency Expert
- Blockchain Developer

Sample Homework Assignments

Sample Assignment: Risky Business (APIs and Statistics)

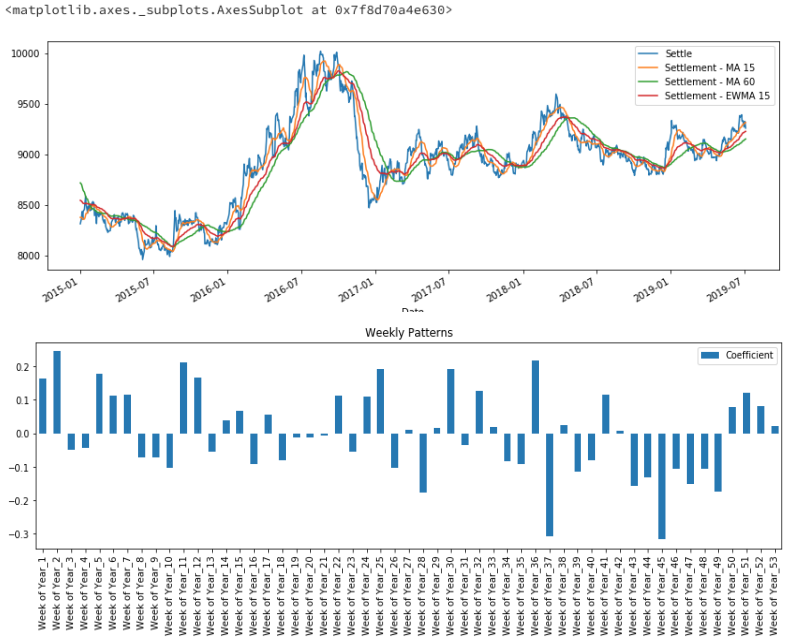
You will learn to create *live* applications that draw stock data using the **financial APIs** to power **Jupyter** notebooks to analyze stock movement.



Sample Assignment: Stock Forecasting (Python & Time Series Analysis)

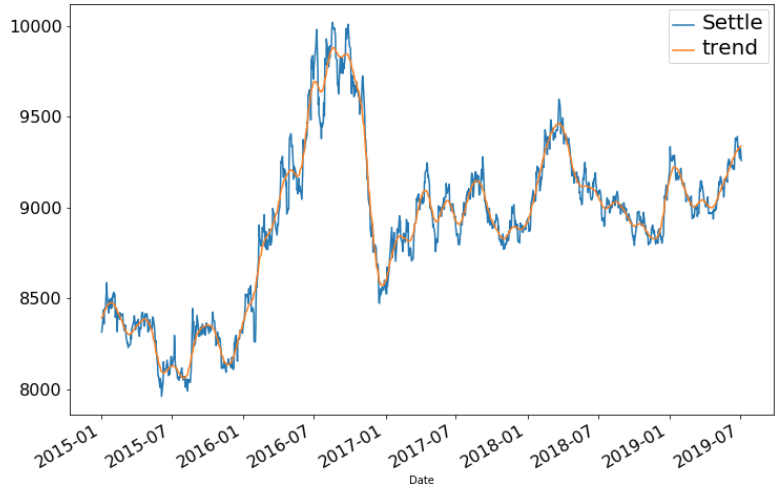
You will learn to create **predictive models** for stock prices using time series analysis and disparate variables.

Return Forecasting: MA/EWMA Smoothing of Futures Prices



Return Forecasting: Decomposition Using a Hodrick-Prescott Filter

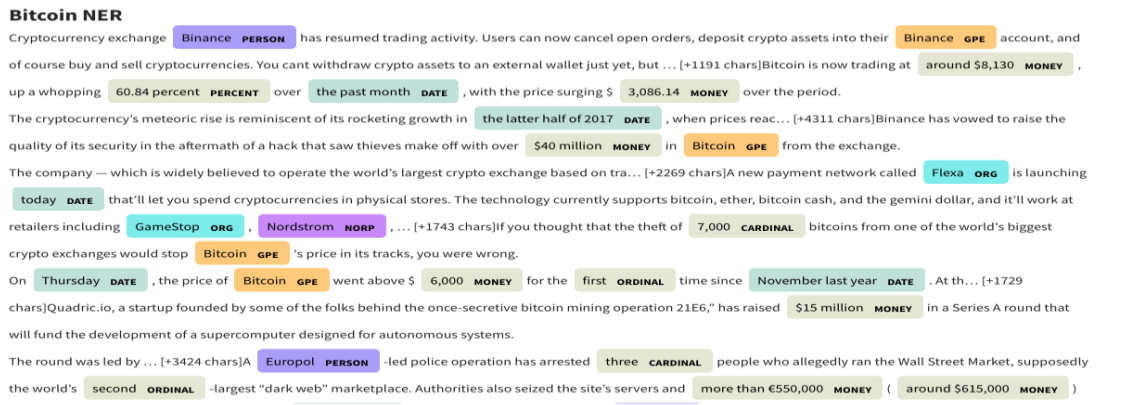
Using a Hodrick-Prescott Filter, decompose the Settle price into a trend and noise.



Sample Assignment: Crypto Sentiment (Machine Learning)

Throughout the course, you will learn the basics behind the most common **machine learning techniques** (linear regression, logistic regression, KNN, k-means clustering, etc.) and how to apply these algorithms to classic challenges in the financial services sector, e.g., applying natural language processing to analyze sentiment scores for cryptocurrency news.

	Compound	Negative	Neutral	Positive	text
0	0.0516	0.900	0.036	0.064	Cryptocurrency exchange Binance has resumed tr...
1	0.3818	0.943	0.000	0.057	Bitcoin is now trading at around $8,130, up a ...
2	-0.2263	0.888	0.065	0.047	Binance has vowed to raise the quality of its ...
3	0.3612	0.937	0.000	0.063	A new payment network called Flexa is launchin...
4	-0.6486	0.897	0.103	0.000	If you thought that the theft of 7,000 bitcoin...

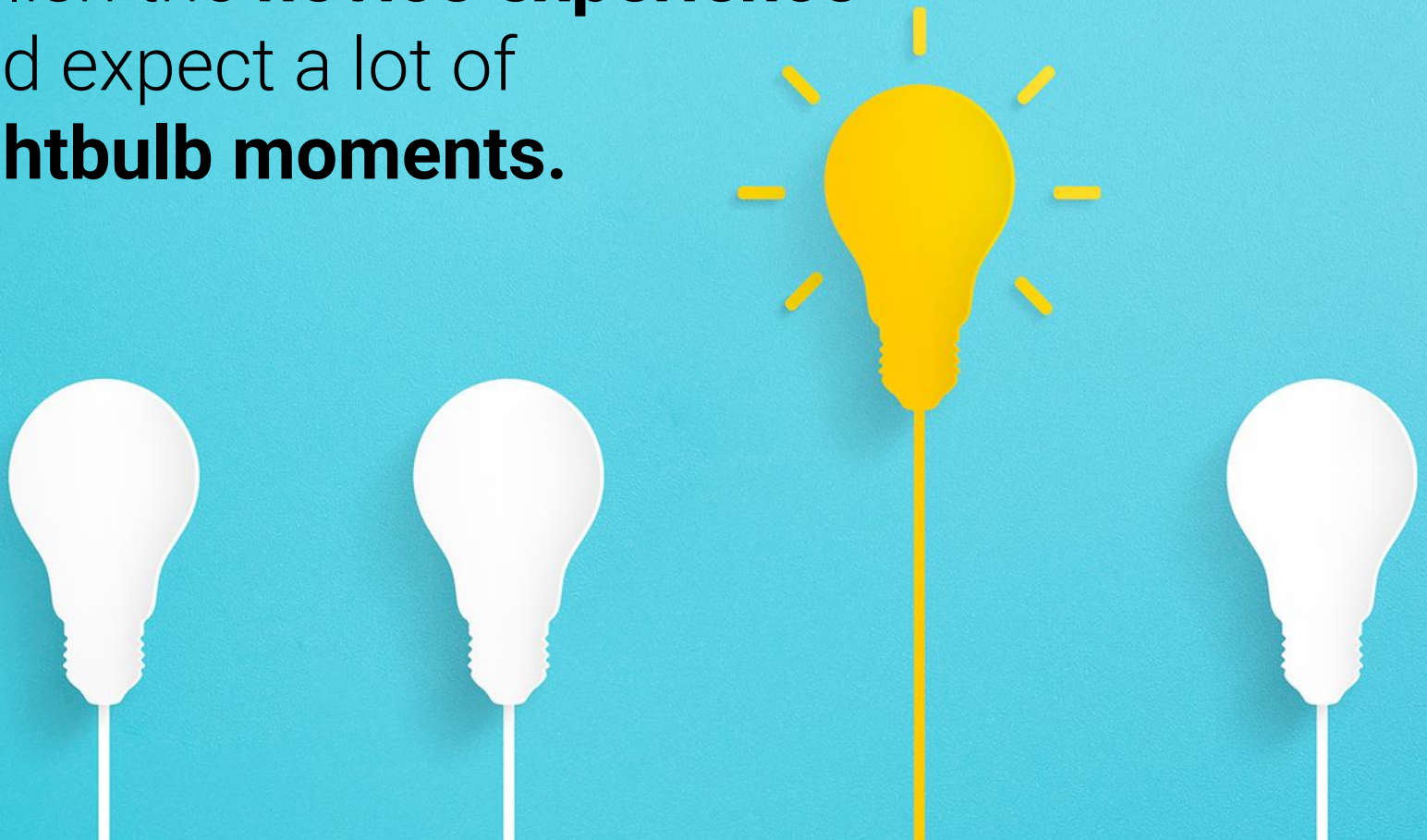


Tips


Embrace your
inner toddler.

Brace yourself for **doubt**, **challenge**, and **confusion**.

Relish the **novice experience** and expect a lot of **lightbulb moments.**



Form a **community** with your classmates.

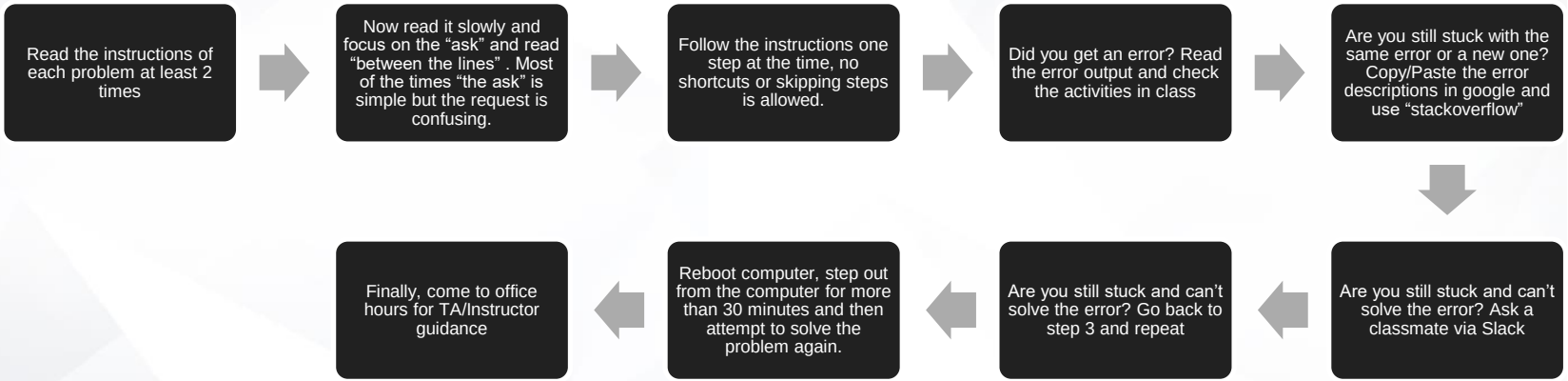
You and your classmates are in this process together. Use each other for help!

You all bring value to the table.
Don’t be afraid to speak up!

There is no shortcut.
You've got to **put in the hours!**


Celebrate
your successes!

Personal troubleshooting roadmap



Bonus:

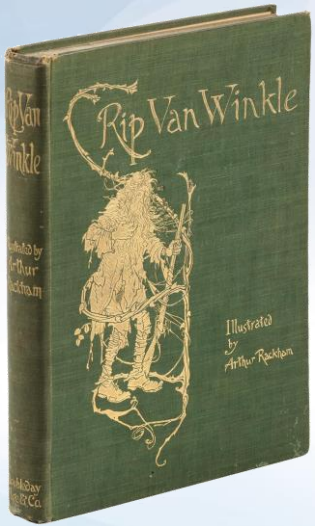
a. Do HWS after Lesson 2 or Day 2
b. Keep in mind that there is a solution for every error that you get, you just need to tell the computer the right way to solve the error.

Countdown timer

15:00

(with alarm)

What was the finance world like in 1999?



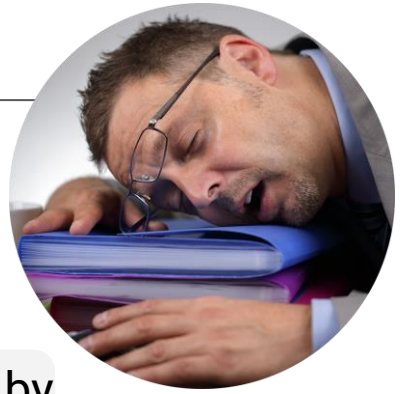
Activity: Rip Van Winkle

Rip Van Winkle is the story of a man who fell asleep right before the events of the American Revolution. He woke up 20 years later to find the world completely changed.

In this thought experiment, you will imagine what it would be like if Rip Van Winkle was a financial analyst who fell asleep in 1999 and woke up 20 years later.

Suggested Time:
10 Minutes

Activity Instructions: Rip Van Winkle



Apply the Rip Van Winkle story to FinTech by imagining if a financial analyst fell asleep in the year 1999 and woke up today. What would he or she find most surprising about the current finance world?

- Define areas of finance that have been deeply affected by technology.
- Name specific companies, products, or innovations that would be surprising to a financial analyst from 1999.

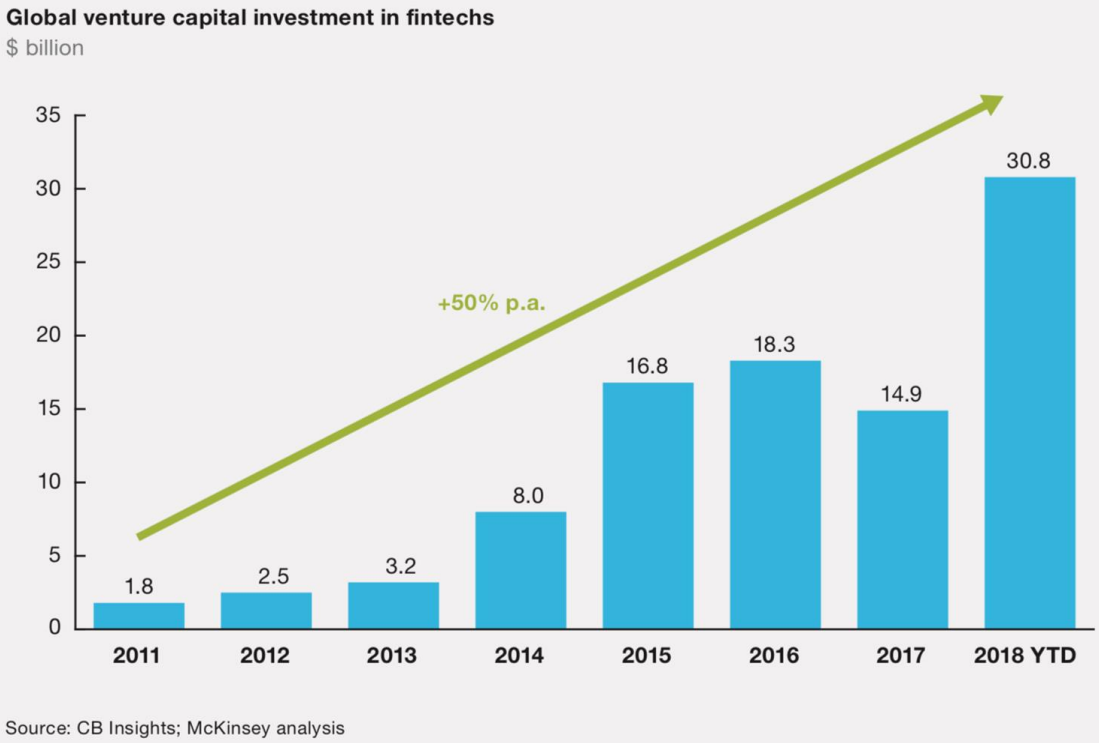
Suggested Time: 10 Minutes

Time’s Up! Let’s Review.

The Rise of FinTech

Global FinTech Investment Growth

FinTech investment has shown dramatic growth in recent years.



Source: CB Insights; McKinsey analysis

Why is FinTech such a hot field of study these days?

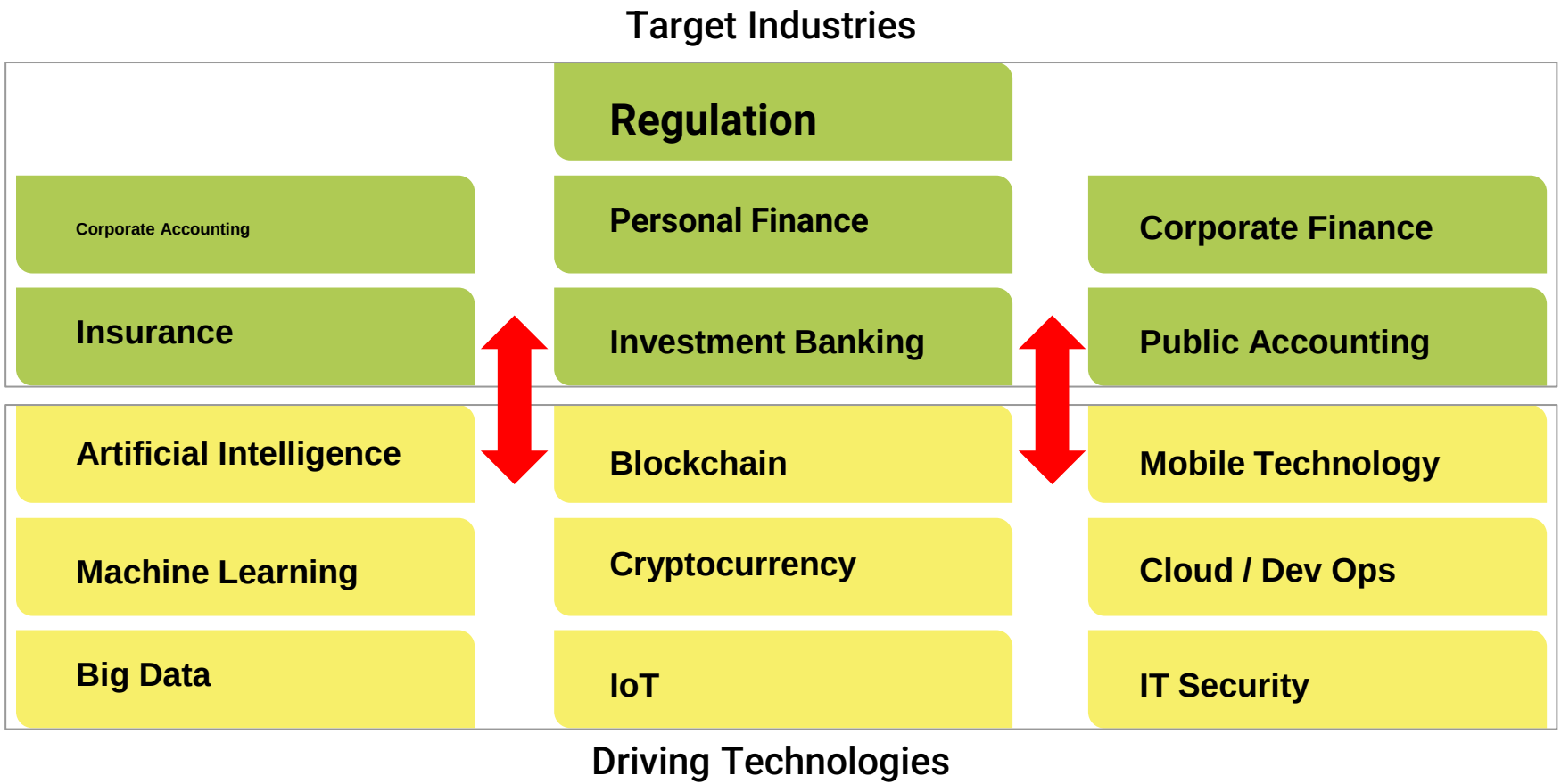
The Driving Forces of FinTech

FinTech is driven by the same trends that dominate software and consumer technology.

Driving Technologies

- **Artificial Intelligence**
- **Blockchain**
- **Mobile Technology**
- **Machine Learning**
- **Cryptocurrency**
- **Cloud / Dev Ops**
- **Big Data**
- **IoT**
- **IT Security**

The Driving Forces of FinTech

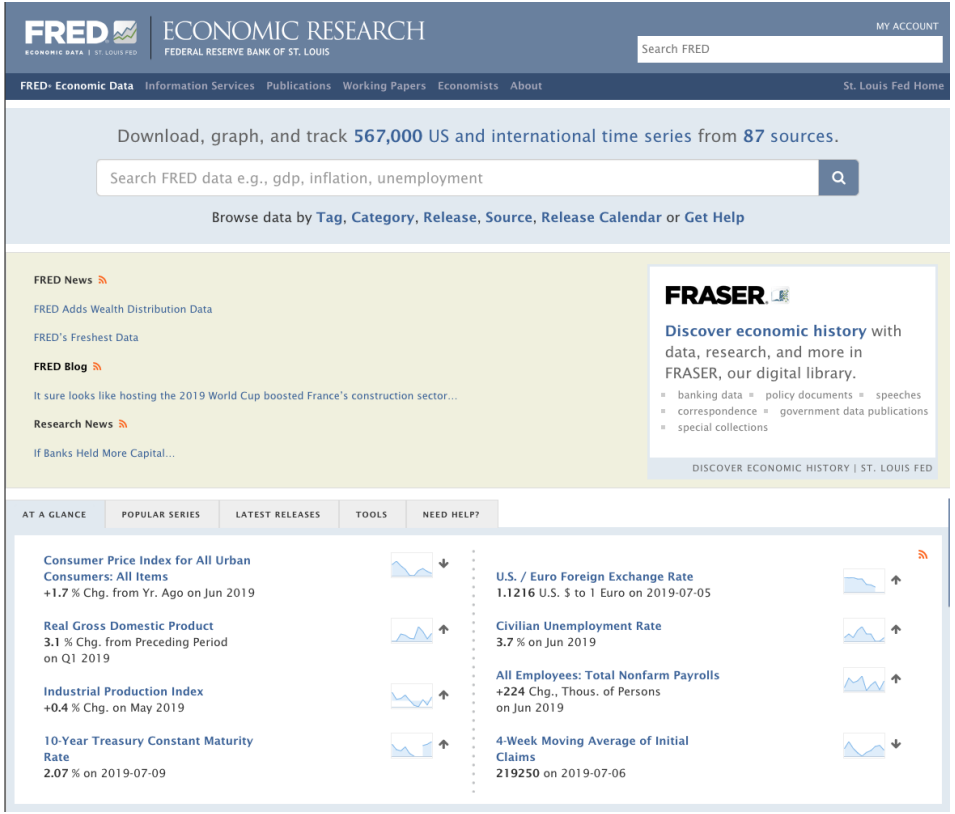


FinTech Thought Experiments

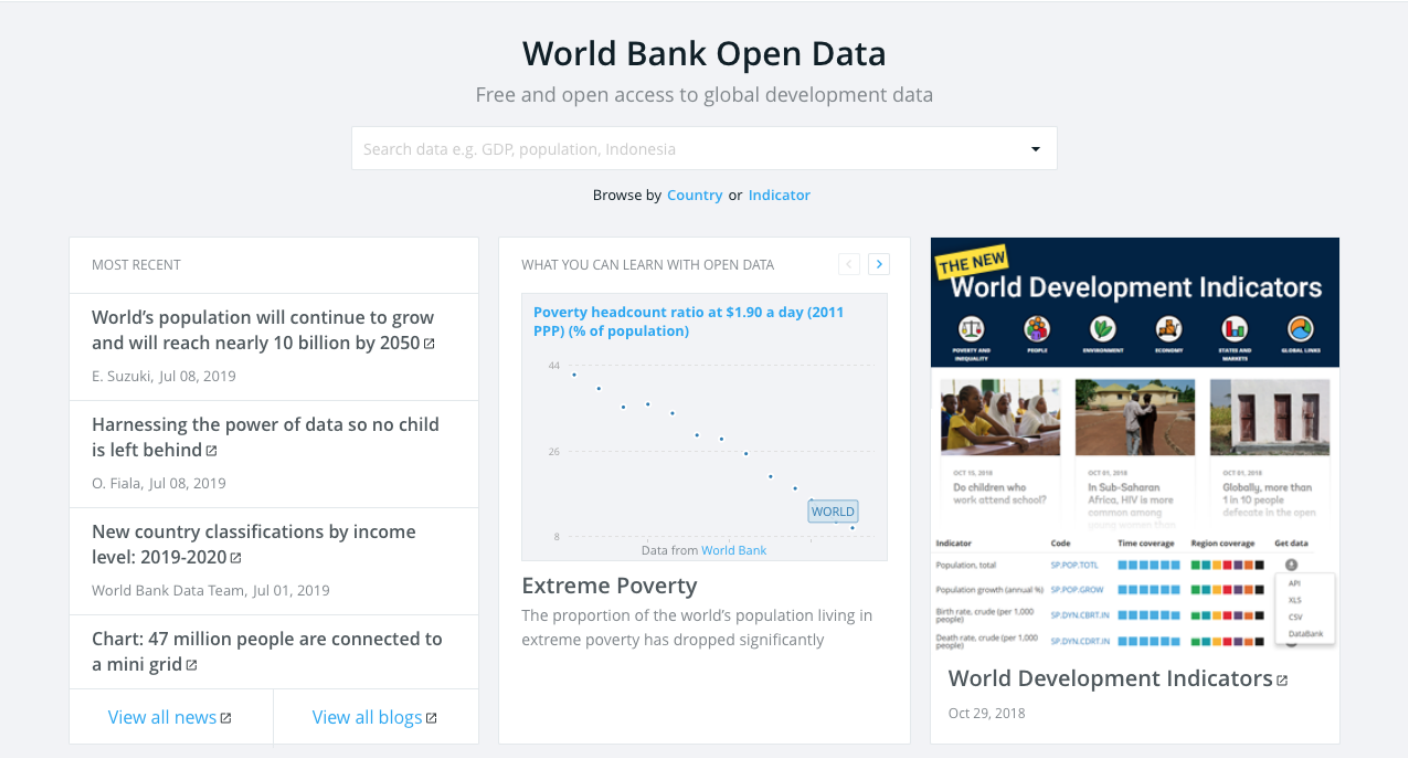
Analyze the Need

Step 1: Identify Data Sources

Web services like FRED (Federal Reserve Bank of St. Louis) provide economic data and indicators that cover banking, business, consumer price indexes, employment, population, GDP, and more.



Step 1: Identify Data Sources

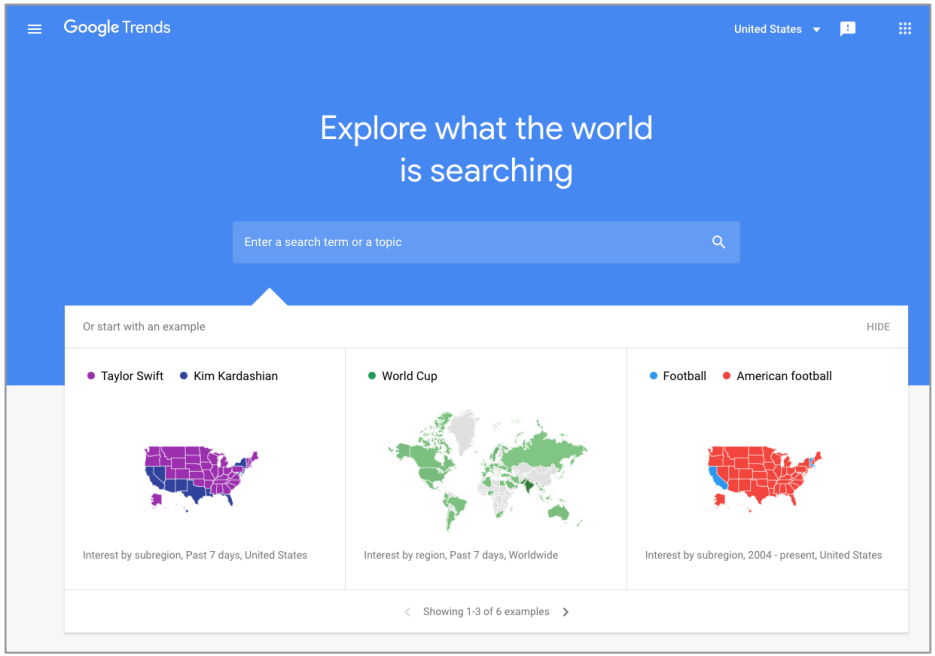


Lots of Data!

Step 2: Build a Data Retrieval Plan

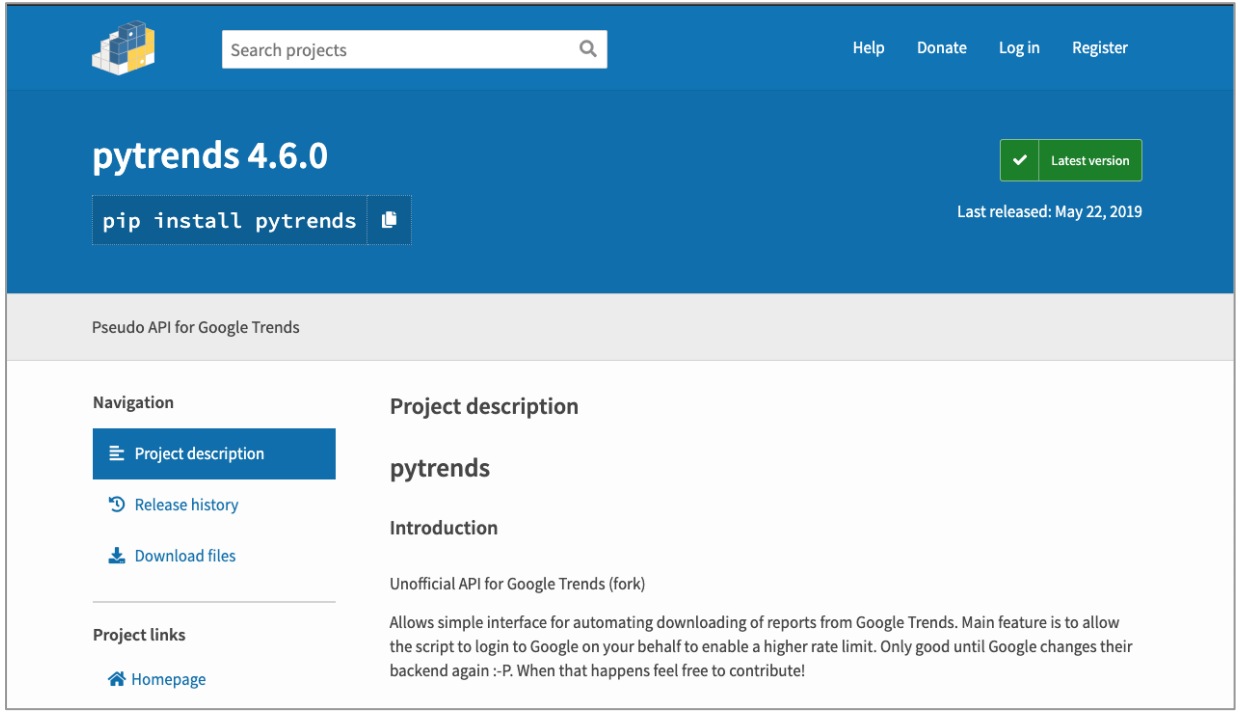
We could retrieve this data by brute force, but it would be:

- Extremely time consuming
- Skewed by our city familiarity
- Labor intensive



Step 2: Build a Data Retrieval Plan

Thankfully, we can take advantage of the pytrends API to programmatically run our queries. (#ThankGoodnessForProgramming)



Step 3: Retrieve the Data with Python

In [3]:
```
# Create payload and capture API tokens. Only needed for interest_over_time(), interest_by_region() & related_queries()
pytrends.build_payload(kw_list=['alpaca'])
```

In [4]:
```
# Interest Over Time
interest_over_time_df = pytrends.interest_over_time()
interest_over_time_df.head()
```

Out[4]:

date	alpaca	isPartial
2014-07-13	50	False
2014-07-20	53	False
2014-07-27	49	False
2014-08-03	52	False
2014-08-10	52	False

This funky code will search Google trends for “alpacas” and return the data...

Step 4: Assemble and Clean the Data

In [7]:
```
# Interest by Region
interest_by_region_df = pytrends.interest_by_region(resolution='COUNTRY', inc_low_vol=True, inc_geo_code=False)
print(interest_by_region_df.head())
```

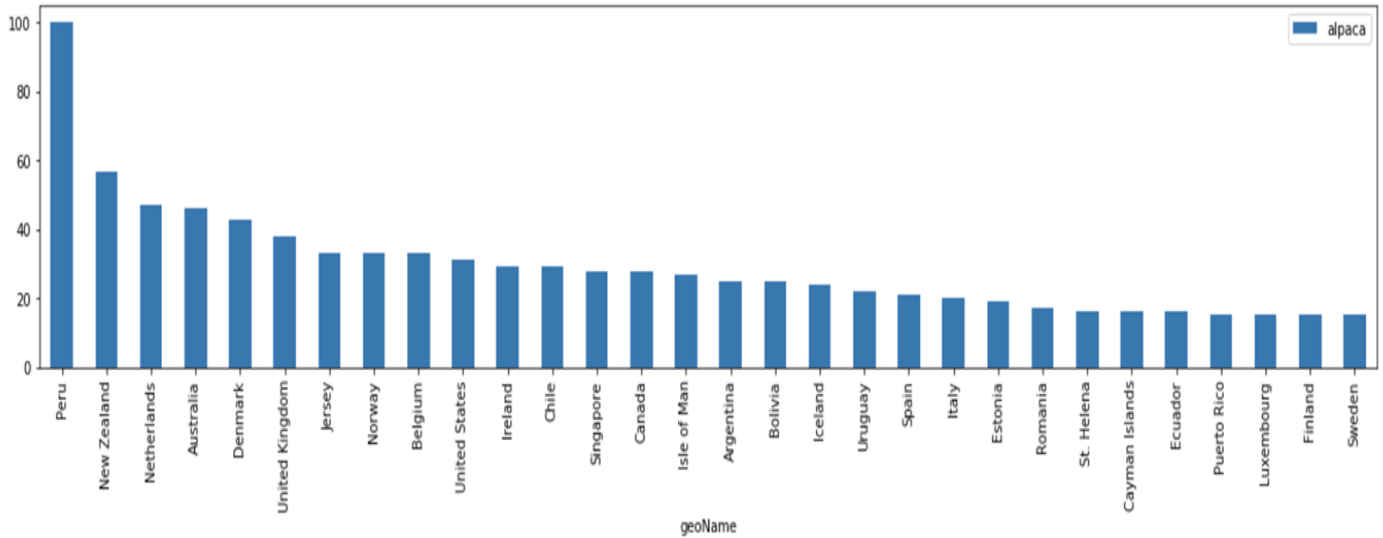
```
                alpaca
geoName
Afghanistan          0
Albania              4
Algeria              1
American Samoa       0
Andorra              0
```

...which we can clean up, and then group results by country...

Step 5: Analyze for Trends

```
In [20]: interest_by_region_df.sort_values(by='alpaca',ascending=False)[0:30].plot(kind='bar', figsize=(20, 4), sort_columns=Tru
```

```
Out[20]: <matplotlib.axes._subplots.AxesSubplot at 0x122a21240>
```



Finally, we can visualize the trends to see that Peru is the best location based on search trends. Obviously, there are other factors to consider, but we are rolling with this for now!

More Money, More Problems

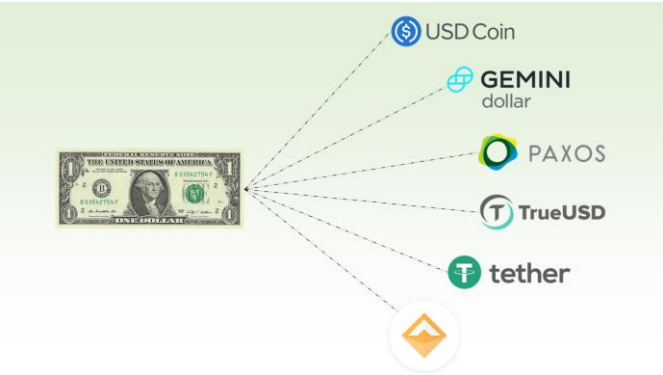
(How do we purchase animals with donation money?)

Cross-Border and Localized Payments

How do we move money easily in places where banking infrastructure is not stable?

Cryptocurrencies have provided a way to easily move value between borders. This is valuable in environments where the financial infrastructure is either unstable or nonexistent.

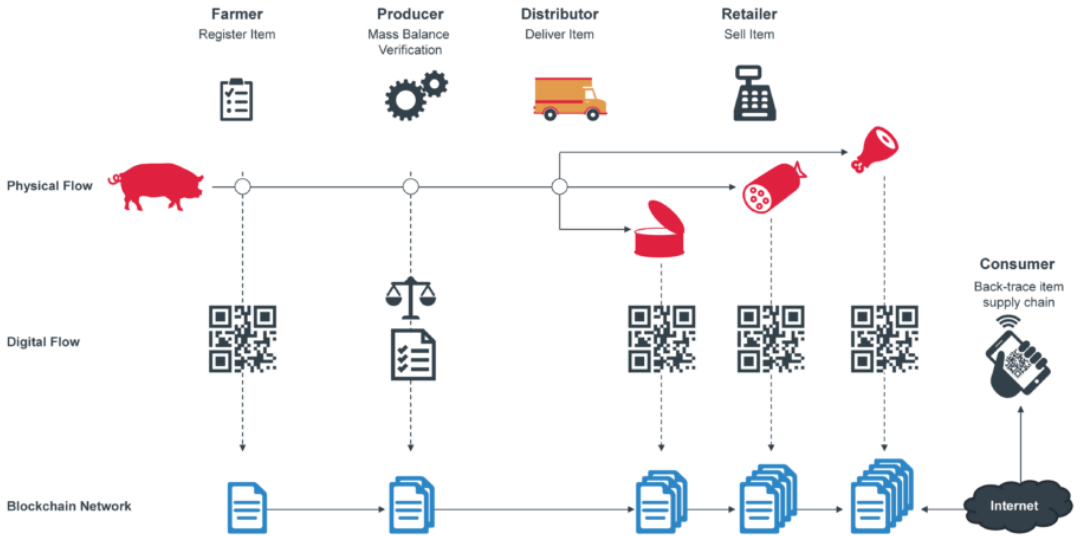
Stablecoins have provided a way to use blockchain technology without volatility.



Blockchain Logistics

We can address accountability, governance, transparency, and efficiency with cutting-edge DeFi technology.

By targeting the supply chain and leveraging blockchain technology, we can trace the impact of the strategy from the initial donation to the event itself.



Analyzing Socioeconomic Impact

We can use similar techniques to examine the effectiveness of the charity.

Analyze Wool Sales in the Region | **Analyze Economic Indicators**

Tracking Transactions

By leveraging DeFi technologies, you can examine blockchain data and analyze the transaction flow.

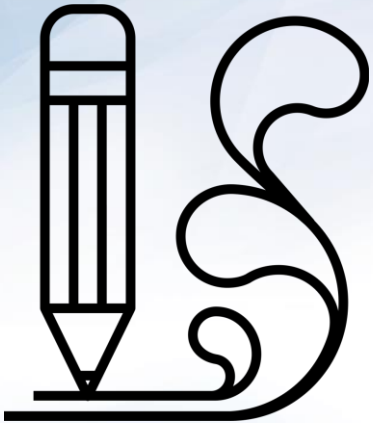
You can analyze volume and transaction flow in the region with the wool purchases from the online and peer-to-peer markets.

Proof can be embedded into the transaction.

Transactions

Tx	0x840bccc19f… 54 secs ago	From 0xf3630c948c8bc62… To 0x68b0db0337d421…	0 Eth
Tx	0xa5ccb87c15… 54 secs ago	From 0xde253c56e3f4fba… To 0x4bcba674eec03d…	0 Eth
Tx	0x3c838d2f67… 54 secs ago	From 0x1d7e1445cd9a30… To 0xe22160dad38907…	0.15 Eth
Tx	0xefdcb0fef1d… 54 secs ago	From 0x761c4412ff0864e… To 0x4dd672e77c7958…	0 Eth
Tx	0xb514a72c51… 54 secs ago	From 0x0e95f8f8ecbd770… To 0x8fdcc30eda7e94f…	0 Eth
Tx	0x96a08f02d6… 54 secs ago	From 0x0e95f8f8ecbd770… To 0x8fdcc30eda7e94f…	0 Eth

View All Transactions



Homework: FinTech Case Study

In this homework assignment, you will develop a case study for a particular FinTech company or technology.

(Instructions sent via Slack.)

Questions?