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## Class Objectives

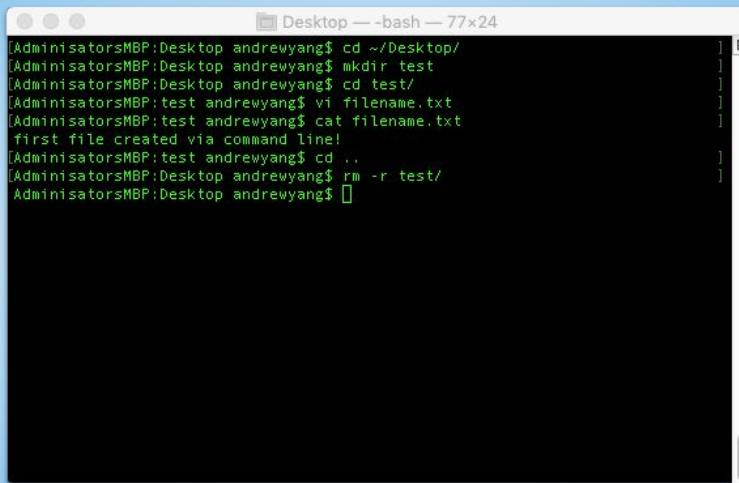
By the end of today's class, you will:

-  Use the command line to execute basic file system operations.
-  Download and upload files to GitHub using the git GUI.
-  Describe the factors that led to the evolution of the FinTech industry.
-  Identify the domains of the FinTech industry that have been disrupted.
-  Make predictions about FinTech domains.

# Introduction to the Command Line

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## What Is the Command Line?



```
[Administrator:MBP:Desktop andrewyang$ cd ~/Desktop/
[Administrator:MBP:Desktop andrewyang$ mkdir test
[Administrator:MBP:Desktop andrewyang$ cd test/
[Administrator:MBP:test andrewyang$ vi filename.txt
[Administrator:MBP:test andrewyang$ cat filename.txt
first file created via command line!
[Administrator:MBP:test andrewyang$ cd ..
[Administrator:MBP:Desktop andrewyang$ rm -r test/
[Administrator:MBP:Desktop andrewyang$ ]
```

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A **command line interface** (CLI), or **terminal**, allows a user to execute and automate commands without the need for a graphical user interface (GUI).

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## The Command Line

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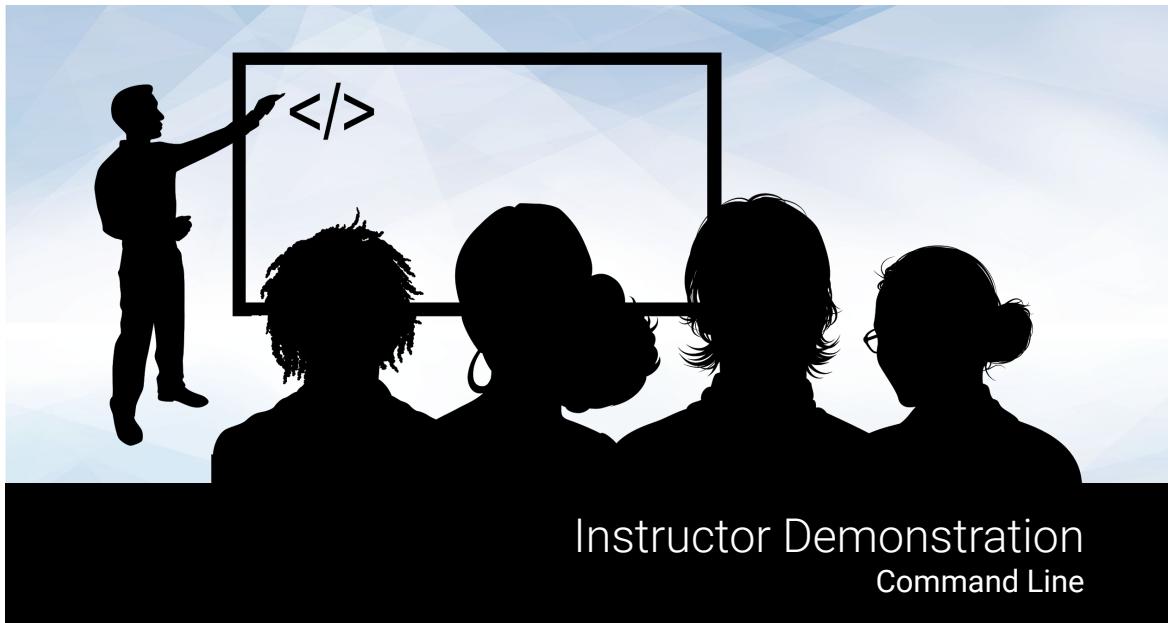
Windows (Git Bash)

```
MINGW64/
Adrian Jones@LAPTOP-4MD59F85 MINGW64 /
$
```

Mac (Terminal)

```
FinTech-Lesson-Plans — -bash — 80x24
AdministratorsMPB:FinTech-Lesson-Plans
andrewyang$
```

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## Instructor Demonstration

### Command Line

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## Activity: Terminal

In this activity, you will perform your own file system operations via the command line.  
(Instructions sent via Slack.)

Suggested Time:  
15 Minutes



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**Time's Up! Let's Review.**

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## File System Operations

mkdir	creates folder directories
cd	navigates into specified folder directories
touch	creates an empty file
cat	reads files and outputs the results to the console
code	open files in VS Code
cd ..	navigates up one level
cp	copies files from source to target
rm -r	recursively deletes all files in a folder (that may have subfolders)
mv	moves files from source to target; can also be used to rename a file
ls	lists the contents of the current directory

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# Version Control and GitHub

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## The Problem: Keeping Track of Work History is Hard!

Especially when you consider that:



People may need to work on something at the same time.



People often work in different locations.



Over the lifetime of a project, it may not always be the same people working on it.

Documents library		
Name	Type	Size
2017 Budget FINAL FINAL v1	Microsoft Excel Macro-E...	
2017 Budget BD Feedback	Microsoft Excel Worksheet	
2017 Budget FINAL FINAL v2a MF - Copy	Microsoft Excel Worksheet	
2017 Budget FINAL v2 (1)	Microsoft Excel Worksheet	
2017 Budget FINAL v2 copy	Microsoft Excel Worksheet	
2017 Budget FINAL v4	Microsoft Excel Worksheet	
2017 Budget v1	Microsoft Excel Worksheet	
2017 Budget v6	Microsoft Excel Worksheet	
2017 Budget v7	Microsoft Excel Worksheet	
2017 Budget	Microsoft Excel Worksheet	
WW 2017 Budget FINAL v5	Microsoft Excel Worksheet	

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Version control systems are software that help you track changes you make in your code over time. As you edit your code, you tell the version control system to take a snapshot of your files. The version control system saves that snapshot permanently so you can recall it later if you need it.

*—Microsoft*

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## GitHub

**Git** is a version control system. For our class, we will be using **GitHub** as the hosting service for our git repositories.

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**GitHub** offers a centralized location where developers can push and pull (upload and download) their code; GitHub always holds the most up-to-date code and files and handles everyone's updates appropriately.

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## Using Git on GitHub

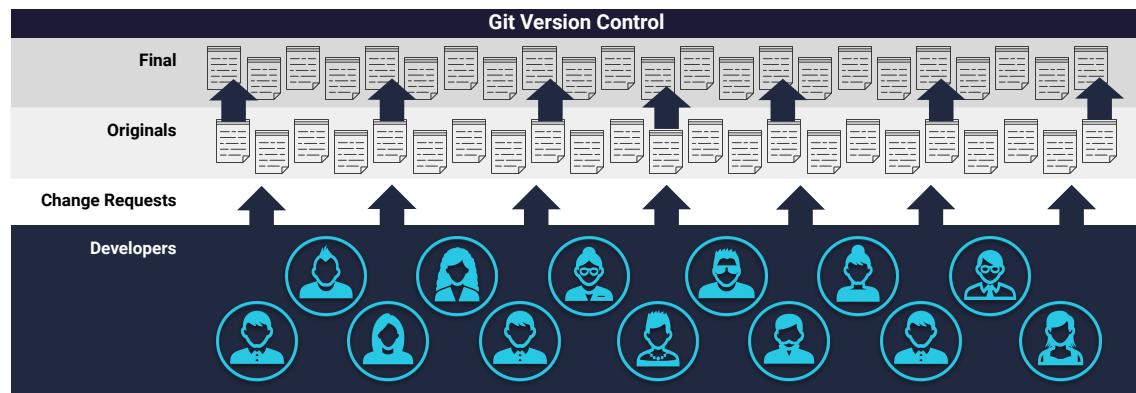
It's not this bad, but git *is* known for having a bit of a learning curve.

A screenshot of a Twitter post from Isaac Wolkerstorfer (@agnoster). The post is a reply to @wilshipley. The text reads: "@wilshipley git gets easier once you get the basic idea that branches are homeomorphic endofunctors mapping submanifolds of a Hilbert space." The post was made at 9:52 PM - 6 Mar 2011. It has 594 Retweets and 425 Likes. Below the tweet are standard Twitter interaction icons for replies, retweets, and likes.

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## GitHub Version Control

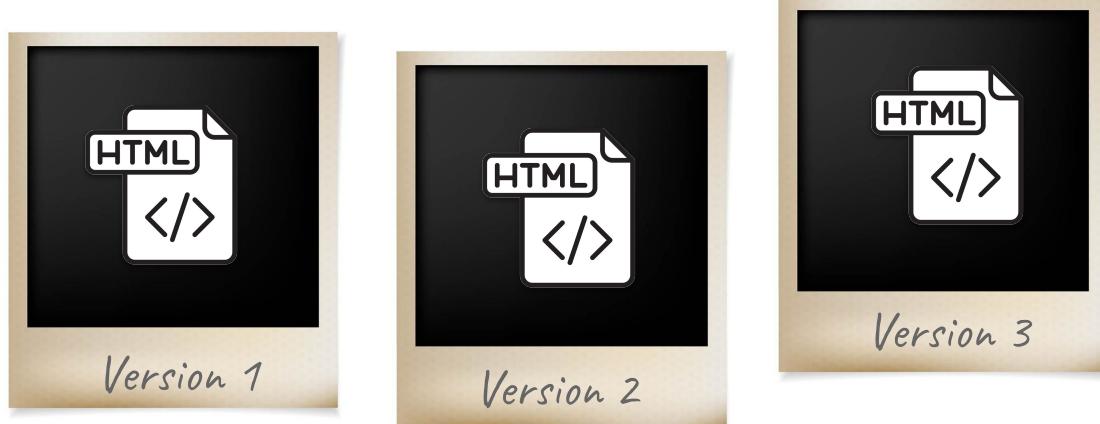
- Modern development is highly collaborative.
- Teams are often extremely large and spread out across the country or world.
- Apps are sometimes made up of hundreds or even thousands of files.



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## GitHub Commits

Git thinks of project history as a series of snapshots or checkpoints. The git term for this is **commits**.



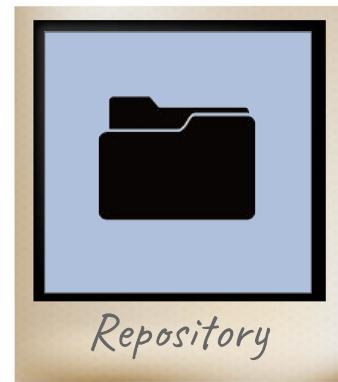
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## GitHub Commits

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When you're ready to save your work, you can "make a commit," "commit your files," or just "commit." These are all terms for the same action.

Think of this as taking a snapshot of your entire project, aka *repository*.



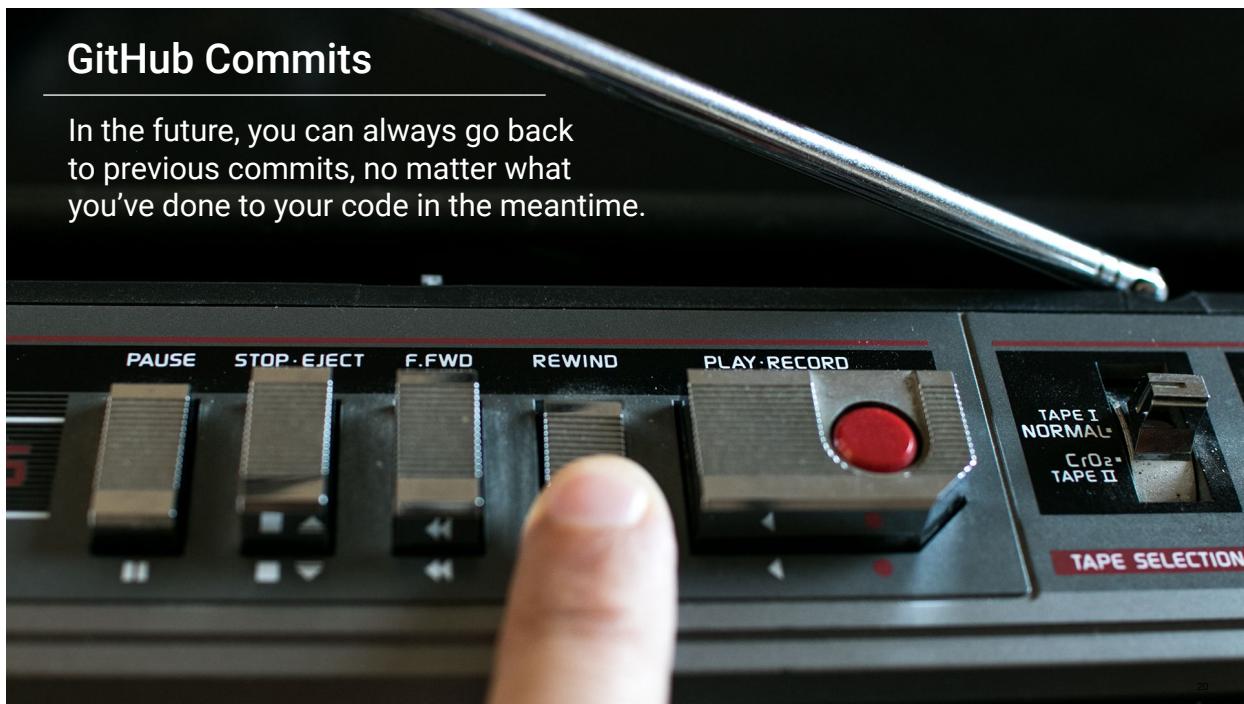
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## GitHub Commits

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In the future, you can always go back to previous commits, no matter what you've done to your code in the meantime.



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## GitHub Commits

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Other metaphors

Reaching a checkpoint in  
a video game



Time Machine on Mac  
(or other backups)

Saving the 37th version  
(but more sophisticated)

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## GitHub Commits

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A project is just a series of commits

Commit 0



Commit 1



Commit 2

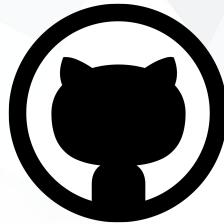
Wrote a README

Wrote most of the code

Added tests

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## Additional Git and GitHub Resources

[Git-scm.com](http://Git-scm.com)

[Recompilermag.com](http://Recompilermag.com)

[A Visual Introduction to Git](http://A Visual Introduction to Git)

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# Evolution of FinTech

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## Mobile Infrastructure & Shifting Consumer Preferences

With the advancements in mobile network infrastructure (2G, 3G, 4G LTE), consumers have become more connected to the internet—as well as each other—than ever before.



## Shifting Consumer Preferences

As a result, consumers not only now have a greater resource pool to cross-check and validate information (e.g., checking prices), but also have become a resource pool themselves, in which companies look to target for business.



## Channels of Engagement

Today, consumers demand quick, reliable, and quality channels of engagement. They are inclined to place their trust in a company that boasts a dynamic and beautiful website, a well-designed and efficient mobile application, and (if possible) a social user platform for connecting with others using the similar product.



## Channels of Engagement

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Companies have been forced to make large investments in technology in order to stay competitive among their industry peers.



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### Technological Channels

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Consumers have more product choices and are loyal to companies they trust.

Thus, the technological channels affecting consumer engagement have a direct impact on a company's ability to market themselves and, ultimately, capitalize on demand.



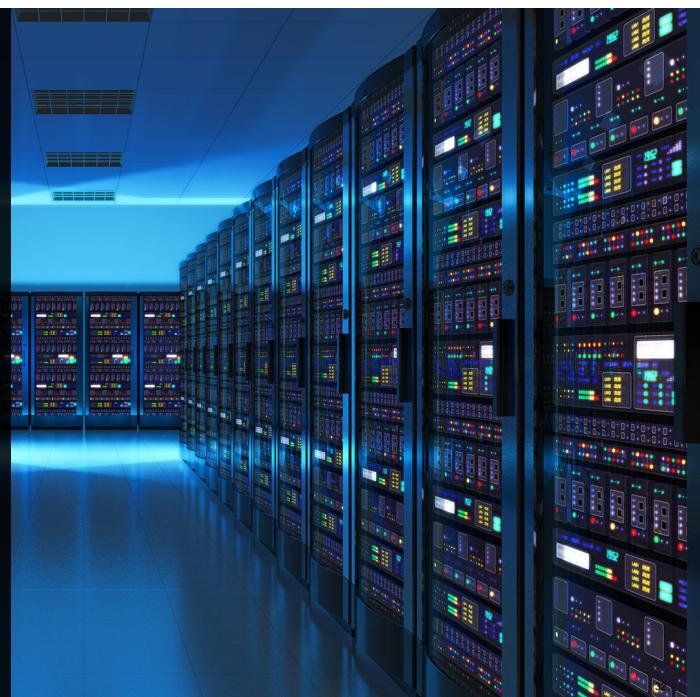
# Big Data

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## Big Data

Over the years, computer processing units (CPUs), random access memory (RAM), and hard drive storage devices have become both more powerful and less expensive.

Therefore, more companies have been able to purchase and utilize large clusters of computers working in parallel.



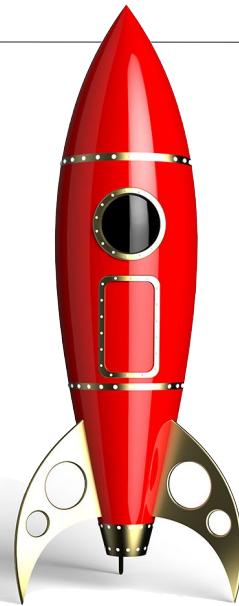
## Big Data

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To enable machines to work in parallel, the concept of MapReduce was born. With MapReduce, data workloads were split among multiple machines for disk-based processing and reaggregated at the end to produce the result.



With the advent of Spark, that same process has been refined for in-memory processing, in which data workloads utilize RAM that is much faster at processing data (though more costly).



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Because big data processing has become more efficient, the **time needed to curate and analyze data has also decreased.**

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## Big Data

Companies have placed an enormous emphasis on technological investment due to the growing feasibility and allure of housing large clusters of machines to drive real-time, data-driven analysis.



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## Cloud Infrastructure

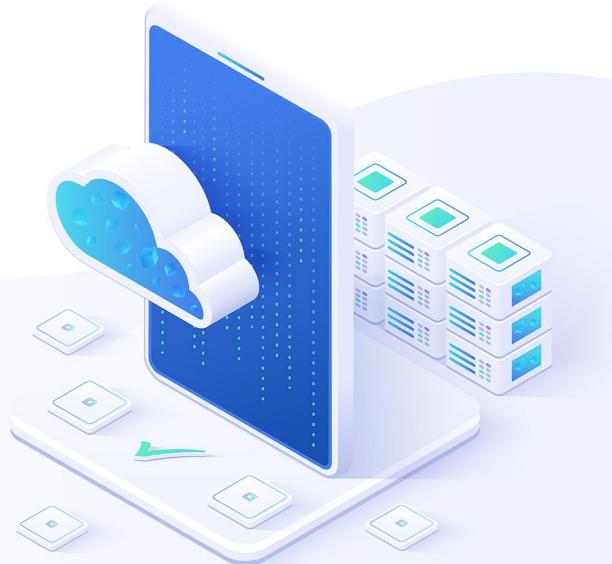


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## Cloud Infrastructure

Traditionally, server farms—large clusters of machines—required large up-front costs and overhead related to server maintenance.

But with the inception of cloud computing, companies no longer had to purchase their own servers for their data processing needs; they instead could "rent" servers from another vendor on an as-needed (and, therefore, much cheaper) basis.



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## Cloud Infrastructure

The business landscape has become increasingly competitive, as smaller companies now have the capabilities to disrupt markets with applications and services that previously would have required large up-front costs.



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**Questions?**

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**FinTech Domains**

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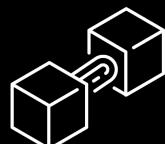


What are some areas in the financial industry in which technology has disrupted traditional finance activities?

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What are some areas in the financial industry in which technology has disrupted traditional finance activities?



**Answer:** Examples include blockchain and financial transactions; robo advisors and investment management; and payment applications and money transfers.

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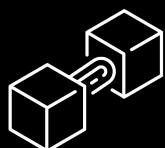


How did these technologies allow for the disruption of traditional finance?

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How did these technologies allow for the disruption of traditional finance?



**Answer:** Blockchain allows for cheaper and more secure transactional validation; robo advisors utilize machine learning algorithms for portfolio management, thereby reducing overhead costs; and payment applications utilize modern infrastructure such as mobile and cloud-based networking.

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How might cloud-based networking contribute to the advent of start-ups and technological innovators?

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How might cloud-based networking contribute to the advent of start-ups and technological innovators?



**Answer:** With cloud-based networking such as AWS, small start-ups and even individuals can quickly spin up servers faster and on an as-needed basis, minimizing time to deployment and reducing up-front costs. This allows smaller companies to compete more efficiently with larger firms that have existing infrastructures.

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Where else might technology disrupt traditional finance?

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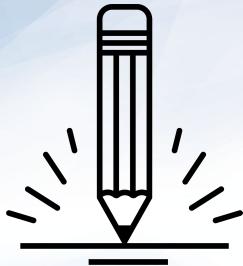


Where else might technology disrupt traditional finance?



**Answer:** Machine learning can be used in lending to more efficiently target customers who have a higher likelihood of paying back their loans, while avoiding those who have a higher likelihood of *not* paying back their loans.

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## Activity: FinTech Domains, Part 1

In this activity, you will work in groups to research and answer questions about various FinTech domains.

Suggested Time:  
25 Minutes

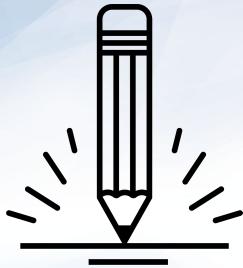


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**Time's Up! Let's Review.**

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## Activity: FinTech Domains, Part 2

In this activity, you will use your research from Part 1 to create news headlines for events that could potentially occur in the next five years.

Suggested Time:  
10 Minutes

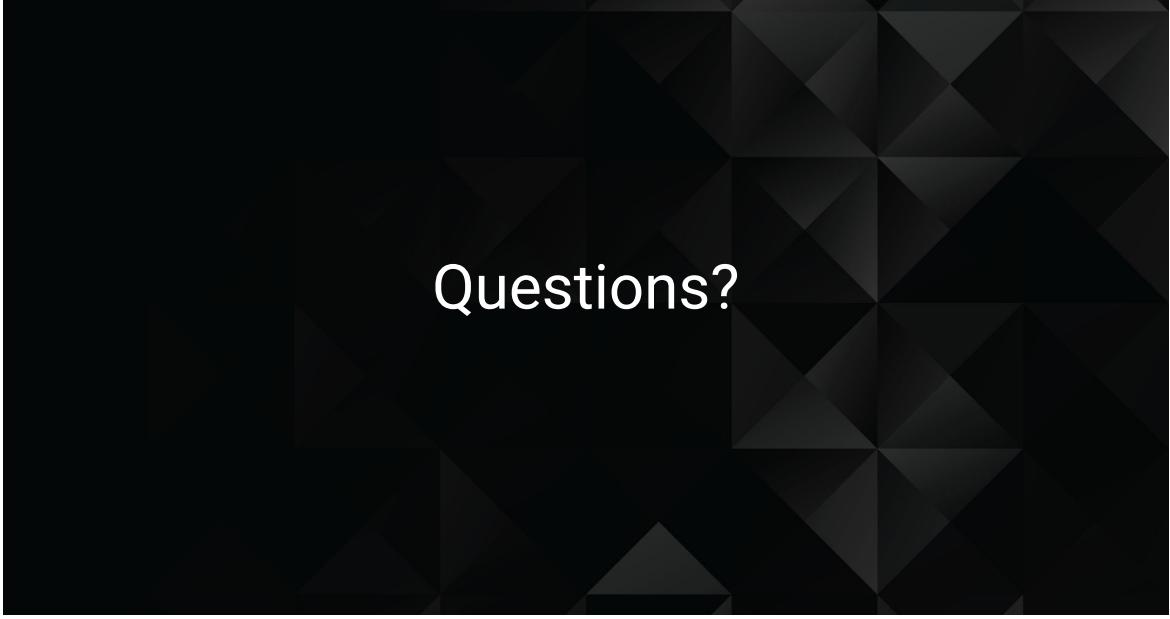


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## PEER REVIEW



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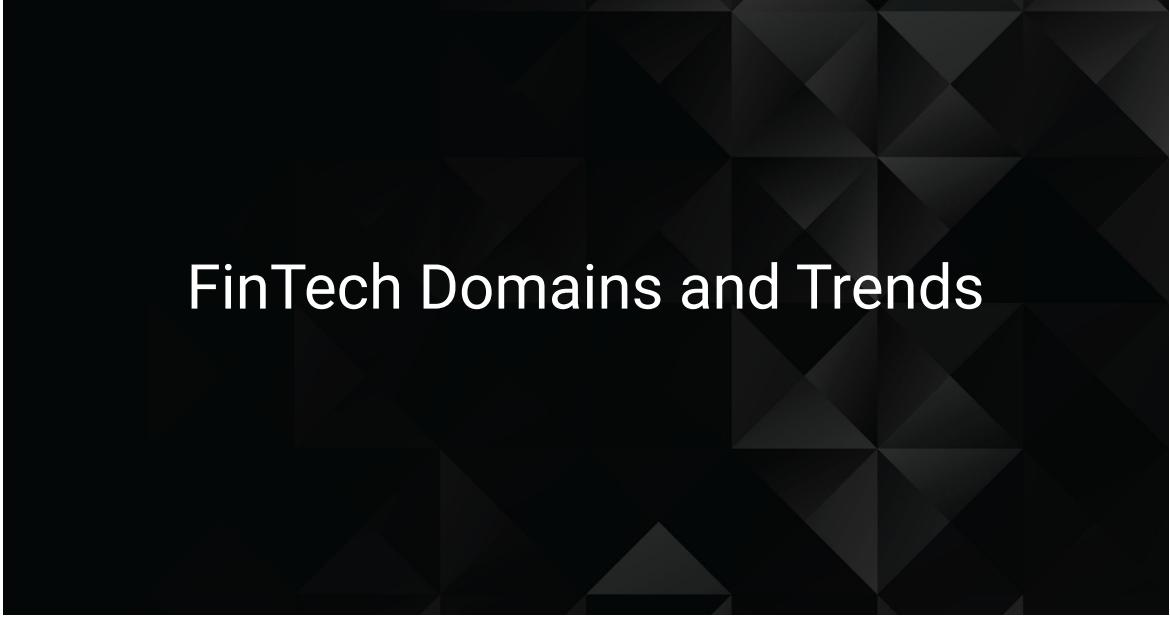
Questions?

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Appendix

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## FinTech Domains and Trends

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## Payments & Remittances

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## Payments & Remittances

Currently representing the largest segment of the FinTech space, digital payments have become increasingly widespread with the growth of e-commerce and mobile device infrastructure.

**Examples:** Venmo, Stripe, PayPal, Square, Apple Pay, Android Pay, Zelle, cryptocurrencies



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## Payments & Remittances

Distributing credit card numbers over the internet proved to be insecure (and costly) in the past. Thus, digital payment technologies were designed for not only security, but overall speed and convenience as well.

PASSWORD

\*\*\*\*\*

USER NAME

\*\*\*\*\*

LOGIN

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# Robo Advisors & Personal Finance

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## Robo Advisors

Robo advisors and personal finance companies provide wealth management, investment, and budgetary services that seek to help customers with their overall capital management and investments.

**Examples:** Betterment, Acorns, Robinhood, Personal Capital



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## Robo Advisors & Personal Finance

Wealth management solutions are often driven by machine learning with automated trading and portfolio rebalancing. Budgetary services utilize machine learning to scan a customer's purchase history and identify buying habits to suggest areas in which they can save.



## RegTech

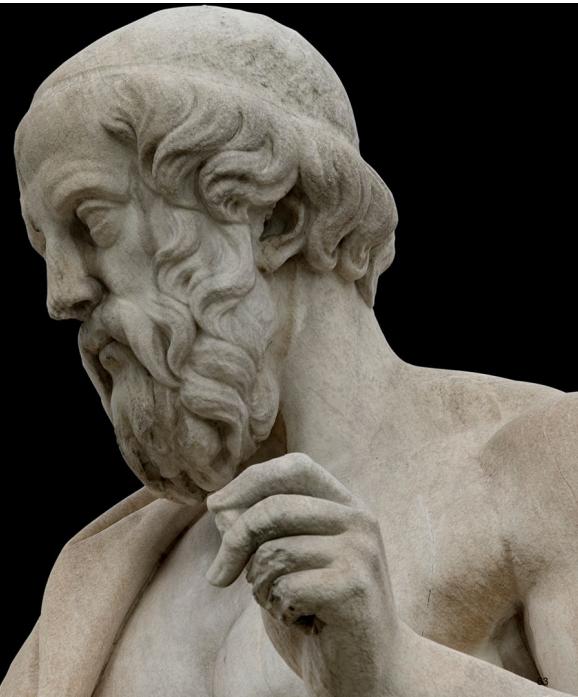
## RegTech

RegTech companies manage the regulatory/compliance processes within the financial industry through technology.



These types of companies use machine learning to identify and prevent instances of fraud, money laundering, and breaches in data.

**Examples:** Apiax, Finform, Trulioo, ClauseMatch



## Digital Banking

## Digital Banking

Digital banking consists of online banks that seek to provide higher account interest rates by reducing the capital overhead associated with physical branches/bank locations.

**Examples:** Ally Bank, ING Direct



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## InsurTech

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## InsurTech

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InsurTechs utilize machine learning to more efficiently group customers into respective risk profiles and, therefore, provide the right type of insurance product.

Fine-tuning the determination of customer risk profiles minimizes costs to those who would have been lumped together in a broader customer risk profile.

**Examples:** Lemonade, Slice, Ladder



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## Alternative Finance



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## Alternative Finance

"Alternative finance" refers to the financial channels outside the realm of traditional finance, such as regulated banks and capital markets, that facilitate capital borrowing and lending.

Popular crowdfunding and peer-to-peer lending channels have emerged in this domain.

**Examples:** Indiegogo, Kiva, LendingClub

