



RICE UNIVERSITY FINTECH

BOOT CAMP

CURRICULUM OVERVIEW

“Banks are technology firms in disguise.”

- Chris Skinner*

The field of finance is evolving. Financial services firms, insurance agencies, and investment banks are all increasingly at the intersection of data and technology, harnessing algorithms, machine learning, big data, and blockchain to conduct business.

The 24-week FinTech Boot Camp is a challenging, part-time program that takes a multidisciplinary approach to attaining proficiency in finance, financial programming, data analysis, and modern tools in cryptocurrency and blockchain.

Throughout the course, you will gain experience with a host of popular tools and methods such as Python programming, financial libraries, machine learning algorithms, Solidity smart contracts, Ethereum, and blockchain. You will also learn how these concepts are leveraged within financial fields from financial planning to hedge funds, as well as best practices for using these skills to add value to your organization.

*Source: <https://thefinanser.com/2008/11/banks-are-techn.html/>

Is This Program Right For **You**?

Are you a creative, curious, and ambitious professional looking to join the FinTech revolution? If so—or if any of the following describes your situation—enrolling in our FinTech Boot Camp could be a smart career move:

A technical professional, such as a developer, help desk technician, or data analyst, who wants to transition into the financial sector and understand how to apply programming to finance

A manager who wants to supercharge his/her skill set to better understand the financial side of their organization

A financial professional who wants to attain a more technical skill set in the wake of their organization's digital transformation

A tech enthusiast looking to get his/her foot in the door in the world of finance

Skills Gained

Students will graduate with a foundation in Financial Technology and Analysis, including*:

Financial Fundamentals

- Advanced Excel
- Time-Series Analysis
- Financial Ratios
- Financial Analysis

Financial Programming

- Python 3
- Pandas
- Matplotlib
- API Interactions
- Amazon Web Services
- NoSQL

Financial Libraries and Tools

- NumPy
- SciPy
- Ffn
- Quantopian

Blockchain and Cryptocurrency

- Solidity
- Ethereum
- Smart Contracts
- Consensus Algorithms
- Transactions
- Validation
- Distributed Ledger
- Cryptocurrency
- Truffle Suite
- Ganache

Machine Learning Applications in Finance

- Algorithmic Trading
- Random Forests
- k-Nearest Neighbors (kNN)
- Support Vector Machines (SVM)
- Linear Regression
- Scikit-learn
- Financial Modeling
- Forecasting
- Logistic Regression

*The material covered in this course is subject to change due to market demand.

A man and a woman are smiling and looking at a laptop screen. The man is leaning over the woman, who is sitting at a desk. There are other laptops and tablets on the desk. The background is a bright, modern office or classroom.

Building On The Basics

Financial institutions are increasingly becoming technology institutions that require not only financial knowledge but deep technical knowledge.

That's why our curriculum is designed to provide you with a deep foundation on the core technical skills needed to succeed in the field. Throughout the program, expect to learn brand new skills and be challenged in completing difficult real-world problems to demonstrate your new abilities. By the program's end, you will have a strong professional portfolio showcasing your work.

Real World Applications, **Real Jobs**

Our graduates will be qualified for a wide range of roles, including:

Financial Analyst

Business Intelligence Analyst

Financial Applications Developer

Cryptocurrency Expert

Quantitative Trader

Blockchain Developer

Systems Business Analyst

Data Analyst

FinTech Regulatory Associate

Data Scientist

Financial Manager

Business Intelligence Analyst

Business Risk Analyst

Research Analyst

Software Engineer

What Students Will Learn

By the time they graduate, students can expect to be able to:

Apply modern financial technologies within the context of working at an investment bank, insurance agency, or any player in the financial industry

Employ financial analysis techniques to model, predict, and forecast trends

Model future financial performance of a company using Python and financial fundamentals

Conduct time-series analysis in conjunction with assumptions and variances to develop financial forecasts, and analyze forecasts for accuracy

Create a custom API with mock bank data and configure the API to allow incoming interactions

Learn to work with databases on the AWS cloud in the service of financial applications

Make API requests to pull financial data, and use a variety of Python packages to run financial analysis on large datasets

Understand both the uses and disadvantages of a variety of machine learning algorithms and their proper application within the field of finance

Leverage machine learning to determine lending preferences and how effectively a cluster of customers would produce interest

Analyze market behavior using machine learning on historical datasets

Design and implement smart contracts with the Solidity programming language

Determine the optimal predictors for market strategy and evaluate models for accuracy

Build an Ethereum blockchain and understand how transactions are validated on a distributed ledger



Course **Structure**

Over the course of 24 weeks, you'll attend informative lectures, participate in a variety of individual and team exercises, and work independently in the classroom and at home. Homework assignments provide an opportunity to apply what you've learned and build on it. The goal is to give you a comprehensive learning experience and true insight into a "day in the life" of a FinTech professional.

DISCUSSION



Instructor-led discussions cover the background, history, and use of new technologies or concepts.

PROJECT WORK



You'll work on timed in-class exercises and projects individually and in teams to put classroom teachings into practice.

PORTFOLIO PROJECTS



Your portfolio signals to employers that you are ready for primetime! You'll build a substantial portfolio of projects that demonstrate your abilities across a wide variety of technologies.



We're Here To **Help**

As they move up the learning curve, students are likely to have questions around some of the concepts covered in class. We're here to help—through in-person and virtual office hours, as well as a dedicated #slack channel where they can get assistance from instructors, support staff, and their fellow students. All work is done via Github, so students can create issues directly on their own projects for instructors to assist them in a truly asynchronous fashion. In addition to learning finance, financial programming, and data analysis, students will have access to career services that will help them prepare for technical roles after graduation through activities such as:

Career Content and Practice Sessions

Database of Customizable Tools and Templates

- Multiple Technical Resume Templates
- Github Best Practices
- Guidelines To Building A Portfolio
- Creating an Elevator Pitch
- Developing a Bio

Online Career Events With Industry Professionals

Soft Skills Training

One-on-One Career Coaching



Meeting **Employer Expectations**

It's a fact: companies care about what a person can do, not what a person says they can do. For that reason, our curriculum teaches students how to apply what they've learned to simulated and lab-based environments.

The curriculum emphasizes in-depth exploratory labs, ranging from building algorithms for detecting fraud to creating applications that interface with the Ethereum network. Students will use personal laptops to practice the skills and abilities included in this course.



Sample Projects

The Interview Question (Python and Time Series Analysis)

Description: Before an interview for your dream job as a Financial Analyst at a storied medical devices company, you are posed a simple request: forecast our stock position over the next 6 months, along with relevant financial measures, and bring your results and method to the interview. You panic, but immediately remember that the skills you have learned should enable you to pull, clean, and manipulate the relevant data so you can present it in an effective manner.

Skills Needed

- Python
- NumPy
- PyFi
- SciPy
- Pandas
- APIs
- JSON
- Time-Series Analysis

Objectives

- Learn to make requests to the Quandl API to pull financial data in JSON format for cleansing, munging, and manipulation.
- Use Python packages like NumPy and SciPy to run financial analysis on the data you retrieve.
- Finally, learn to conduct time-series analysis in conjunction with assumptions and in variances to develop a forecast for a 6 month period.

Risky Business (APIs and Statistical Methods)

Description: One of the most important aspects of financial decisioning is the ability to evaluate and manage risk. For analysts especially, this is a critical part of the job description and requires a strong understanding of finance and statistics. Furthermore, the ability to script in Python is a helpful skill to run bulk analysis efficiently. In this exercise, you will assume the role of an analyst tasked with evaluating risk and return for a diverse portfolio with exposure in numerous sectors.

Skills Needed

- Python
- Pandas
- APIs
- Statistics
- Financial Modeling

Objectives

- Enforce financial and statistical concepts fundamental to evaluating and managing risk.
- Conduct rigorous statistical methods on financial data from a wide variety of industry sectors.
- Understand what constitutes risk, how to forecast risk, and how to hedge against risk within a market portfolio.

Sample **Projects** continued...

Sharpen Your FAANGs (Machine Learning and Trading Algorithms)

Description: You are managing a technology portfolio led by the heavy hitters in the tech world, the FAANG stocks (Facebook, Apple, Amazon, Netflix, Google). After some consideration, you decide you would like to provide a prediction of value for the set of stocks this time next year. While you have a good understanding of machine learning algorithms, you're unsure of which algorithm will do the job most effectively, so you decide to use a small handful to do the job. Of course, without a shred of accuracy clients won't trust your models, so you'll have to evaluate and optimize your models as well.

Skills Needed

- Python
- Pandas
- Machine Learning
- Algorithmic Trading
- APIs
- JSON

Objectives

- Use Python, Pandas, data cleansing, munging, and manipulation, and API requests, to convert an immense amount of data into the proper format for evaluation.
- Use several different machine learning algorithms to form your prediction model, and evaluate and optimize your model.

Trading Bot (Algorithmic Trading)

Description: You've just determined a winning stock market trading strategy. The problem? It requires you to make trades extremely precisely -- with little room for error. Fortunately for you, this class will teach you to program and build your own algorithmic trading bot -- capable of responding to incoming market data in real-time.

Skills Needed

- Python
- Pandas
- Numpy
- Quantopian API
- Machine Learning
- Algorithmic Trading

Objectives

- Utilize Python, Pandas, and a variety of APIs to interpret data streams and market events, and respond with trade activities
- Run analysis to determine the quality of your trading bot's performance

Sample **Projects** continued...

Fraud Watch (Cloud and Machine Learning)

Description: The cost of insurance fraud is estimated to be over \$40 billion a year, and while you aren't going to catch all of it, you have been tasked with developing a complex system for detecting fraud using big data and machine learning. By the end of this activity, you will be making a recommendation for the path forward with a system you devise.

Skills Needed

- Python
- AWS Redshift
- Machine Learning

Objectives

- Harness the power of the cloud to efficiently comb through and manipulate large data sets.
- Use machine learning clustering and classification algorithms on your data to develop a fraud detection application.

The New Cryptocurrency in Town (Blockchain, Object-Oriented Programming, and Cryptocurrency)

Description: Blockchain and its applications within the finance industry are growing fast. In an effort to capitalize on this newfound craze, you decide to develop your own cryptocurrency, YouCoin! In this activity, you will develop your own Ethereum blockchain using Solidity and object-oriented programming.

Skills Needed

- Solidity
- Ganache
- Ethereum Blockchain
- Truffle Suite

Objectives

- Script a Smart Contract using the Solidity programming language.
- Learn how to build a blockchain using nodes and consensus algorithms.
- Develop a cryptocurrency to validate the blockchain.

Course Curriculum By Module

Module	Description	What You'll Learn
Learning Module: Intro to FinTech	Students begin with an introduction to the FinTech landscape before learning to conduct financial statement analysis in Microsoft Excel.	<ul style="list-style-type: none">» FinTech Landscape» Financial Statement Analysis» Advanced Microsoft Excel
Learning Module: Financial Programming	Dive into programming with a popular language in the financial landscape - Python! You'll learn Python and advanced Python-based financial libraries.	<ul style="list-style-type: none">» Command Line Git» Python Programming» Pandas» JSON» NumPy» SciPy» Databases and APIs» Financial Packages» Financial Modeling» Forecasting» Time Series Analysis
Learning Module: Machine Learning Applications in Finance	Students will explore how financial services and FinTech institutions are using machine learning, the cloud, and databases to leverage information.	<ul style="list-style-type: none">» Algorithmic Trading» Scikit-learn» Linear Regression» Logistic Regression» k-Means Clustering» Classification and Regression Tree (CART)» Neural Networks
Learning Module: Blockchain and Cryptocurrency	Students will learn how to create smart contracts with Solidity and how to build their very own cryptocurrency.	<ul style="list-style-type: none">» Solidity» Smart Contracts» Consensus Algorithms» Transactions» Validation» Distributed Ledger» Ethereum Blockchain» Cryptocurrency» Mining» Truffle Suite» Ganache