

algo trading with python

Algo Trading with Python: A Comprehensive Guide

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Introduction to Algo Trading with Python

Algo trading with Python has rapidly become a cornerstone of modern finance. This comprehensive guide delves into the world of algorithmic trading, exploring its intricacies, benefits, challenges, and practical implementation using Python. We'll cover everything from fundamental concepts to advanced techniques, equipping you with the knowledge to embark on your own algorithmic trading journey.

Understanding Algorithmic Trading

Algorithmic trading, or algo trading, involves using computer programs to automate trading decisions. This contrasts with manual trading, where decisions are made by human traders. Algo trading with Python offers several advantages, including speed, precision, and the ability to execute complex strategies unattainable through manual methods. This efficiency is particularly beneficial in high-frequency trading (HFT), where milliseconds can mean the difference between profit and loss.

The core of algo trading with Python lies in its ability to analyze vast quantities of data swiftly and accurately. Python's extensive libraries, including Pandas for data manipulation, NumPy for numerical computation, and Scikit-learn for machine learning, are perfectly suited for this task.

Key Components of Algo Trading with Python

Several key elements constitute a successful algo trading system using Python:

1. **Data Acquisition:** Gathering reliable and timely market data is crucial. Sources can range from free APIs (like Alpha Vantage) to commercial data providers offering high-frequency tick data. Efficiently handling this data within your Python environment is paramount.
1. **Strategy Development:** This involves defining the specific rules and logic that govern trading decisions. This could range from simple moving average crossovers to complex machine learning models predicting price movements. Your strategy's efficacy will directly impact your profitability in algo trading with Python.
1. **Backtesting:** Before deploying any strategy, rigorous backtesting is essential. This involves simulating the strategy's performance on historical data to evaluate its potential profitability and risk. Python offers powerful backtesting frameworks like Zipline and Backtrader, which help automate this crucial step.
1. **Risk Management:** Defining and adhering to risk management rules is crucial for survival in the markets. This includes setting stop-loss orders, position sizing limits, and diversification strategies. Proper risk management protects your capital and mitigates potential losses.
1. **Order Execution:** This involves connecting your Python strategy to a brokerage API to automate the placement and management of trades. Careful consideration needs to be given to latency and order routing to optimize execution efficiency.

Popular Python Libraries for Algo Trading

Several Python libraries greatly simplify the development and implementation of algo trading strategies:

Pandas: For data manipulation and analysis.

NumPy: For numerical computation.

Scikit-learn: For machine learning algorithms.

Statsmodels: For statistical modeling.

Zipline and Backtrader: For backtesting.

TA-Lib: For technical analysis indicators.

Advanced Techniques in Algo Trading with Python

Beyond basic strategies, algo trading with Python opens doors to sophisticated techniques:

Machine Learning: Employing machine learning models to predict price movements or identify trading opportunities. Techniques like Support Vector Machines (SVMs), Random Forests, and Recurrent Neural Networks (RNNs) can be leveraged.

High-Frequency Trading (HFT): Developing strategies that exploit extremely short-term price discrepancies. This demands high-performance computing and low-latency connections.

Sentiment Analysis: Analyzing news articles and social media sentiment to gauge market sentiment and inform trading decisions.

Challenges and Considerations in Algo Trading with Python

While algo trading with Python offers significant benefits, challenges exist:

Data Quality: Inaccurate or incomplete data can lead to flawed strategies and significant losses.

Overfitting: Overfitting a model to historical data can result in poor performance on new data.

Transaction Costs: Transaction costs (commissions, slippage) can significantly impact profitability.

Market Volatility: Unexpected market events can render even well-designed strategies ineffective.

Regulatory Compliance: Adhering to regulatory requirements is critical.

Conclusion

Algo trading with Python is a powerful tool for both novice and experienced traders. By mastering the concepts and techniques discussed in this guide, and leveraging Python's versatile libraries, you can build and deploy your own algorithmic trading strategies. Remember that consistent learning, rigorous testing, and prudent risk management are essential for long-term success in this dynamic field. Continuous improvement and adaptation to market conditions are key to staying ahead in the world of algo trading with Python.

FAQs

1. What is the best Python library for backtesting? There isn't a single "best" library. Zipline and Backtrader are popular choices, each with strengths and weaknesses. The best choice depends on your specific needs and preferences.
1. How can I get started with algo trading with Python? Begin with learning the fundamentals of Python and relevant libraries like Pandas and NumPy. Then, explore simple trading strategies and backtest them thoroughly before live trading.
1. What are the risks associated with algo trading? Risks include data quality issues, overfitting, transaction costs, market volatility, and regulatory compliance. Proper risk management is crucial.
1. Is high-frequency trading (HFT) feasible for beginners? HFT is highly complex and requires significant resources and expertise. It's generally not recommended for beginners.
1. Can I use free data for algo trading with Python? Yes, several free APIs provide market data, though their quality and frequency may be limited.
1. How do I connect my Python strategy to a brokerage? Most brokerages offer APIs that allow programmatic access to your trading account. Consult your brokerage's documentation for details.
1. What is the role of machine learning in algo trading? Machine learning can be used to predict price movements, identify trading opportunities, and optimize trading strategies.

1. How important is backtesting in algo trading with Python? Backtesting is crucial for evaluating the performance of a strategy before deploying it with real money. It allows you to identify potential flaws and refine your approach.
1. What are the ethical considerations in algo trading with Python? Ethical considerations include avoiding market manipulation, adhering to regulatory guidelines, and ensuring fair and transparent trading practices.

Related Articles:

1. "Building a Simple Moving Average Crossover Strategy with Python": A tutorial on implementing a basic algo trading strategy using Python and Pandas.
1. "Backtesting Your Algo Trading Strategies with Zipline": A guide to using the Zipline backtesting framework in Python.
1. "Implementing Machine Learning for Stock Price Prediction in Python": An exploration of applying machine learning models to predict stock prices.
1. "Advanced Technical Indicators in Python for Algo Trading": A deep dive into various technical indicators and their implementation in Python.
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algo trading with python: Python for Algorithmic Trading Yves Hilpisch, 2020-11-12

Algorithmic trading, once the exclusive domain of institutional players, is now open to small organizations and individual traders using online platforms. The tool of choice for many traders today is Python and its ecosystem of powerful packages. In this practical book, author Yves Hilpisch shows students, academics, and practitioners how to use Python in the fascinating field of algorithmic trading. You'll learn several ways to apply Python to different aspects of algorithmic trading, such as backtesting trading strategies and interacting with online trading platforms. Some of the biggest buy- and sell-side institutions make heavy use of Python. By exploring options for systematically building and deploying automated algorithmic trading strategies, this book will help you level the playing field. Set up a proper Python environment for algorithmic trading Learn how to retrieve financial data from public and proprietary data sources Explore vectorization for financial analytics with NumPy and pandas Master vectorized backtesting of different algorithmic trading strategies Generate market predictions by using machine learning and deep learning Tackle real-time processing of streaming data with socket programming tools Implement automated algorithmic trading strategies with the OANDA and FXCM trading platforms

algo trading with python: Python Algorithmic Trading Cookbook Pushpak Dagade, 2020-08-28 Build a solid foundation in algorithmic trading by developing, testing and executing powerful trading strategies with real market data using Python Key FeaturesBuild a strong foundation in algorithmic trading by becoming well-versed with the basics of financial marketsDemystify jargon related to understanding and placing multiple types of trading ordersDevise trading strategies and increase your odds of making a profit without human interventionBook Description If you want to find out how you can build a solid foundation in algorithmic trading using Python, this cookbook is here to help. Starting by setting up the Python environment for trading and connectivity with brokers, you'll then learn the important aspects of

financial markets. As you progress, you'll learn to fetch financial instruments, query and calculate various types of candles and historical data, and finally, compute and plot technical indicators. Next, you'll learn how to place various types of orders, such as regular, bracket, and cover orders, and understand their state transitions. Later chapters will cover backtesting, paper trading, and finally real trading for the algorithmic strategies that you've created. You'll even understand how to automate trading and find the right strategy for making effective decisions that would otherwise be impossible for human traders. By the end of this book, you'll be able to use Python libraries to conduct key tasks in the algorithmic trading ecosystem. Note: For demonstration, we're using Zerodha, an Indian Stock Market broker. If you're not an Indian resident, you won't be able to use Zerodha and therefore will not be able to test the examples directly. However, you can take inspiration from the book and apply the concepts across your preferred stock market broker of choice. What you will learn

- Use Python to set up connectivity with brokers
- Handle and manipulate time series data using Python
- Fetch a list of exchanges, segments, financial instruments, and historical data to interact with the real market
- Understand, fetch, and calculate various types of candles and use them to compute and plot diverse types of technical indicators
- Develop and improve the performance of algorithmic trading strategies
- Perform backtesting and paper trading on algorithmic trading strategies
- Implement real trading in the live hours of stock markets

Who this book is for If you are a financial analyst, financial trader, data analyst, algorithmic trader, trading enthusiast or anyone who wants to learn algorithmic trading with Python and important techniques to address challenges faced in the finance domain, this book is for you. Basic working knowledge of the Python programming language is expected. Although fundamental knowledge of trade-related terminologies will be helpful, it is not mandatory.

algo trading with python: *Algorithmic Trading with Python* Chris Conlan, 2020-04-09

Algorithmic Trading with Python discusses modern quant trading methods in Python with a heavy focus on pandas, numpy, and scikit-learn. After establishing an understanding of technical indicators and performance metrics, readers will walk through the process of developing a trading simulator, strategy optimizer, and financial machine learning pipeline. This book maintains a high standard of reproducibility. All code and data is self-contained in a GitHub repo. The data includes hyper-realistic simulated price data and alternative data based on real securities. Algorithmic Trading with Python (2020) is the spiritual successor to Automated Trading with R (2016). This book covers more content in less time than its predecessor due to advances in open-source technologies for quantitative analysis.

algo trading with python: Machine Learning for Algorithmic Trading Stefan Jansen, 2020-07-31

Leverage machine learning to design and back-test automated trading strategies for real-world markets using pandas, TA-Lib, scikit-learn, LightGBM, SpaCy, Gensim, TensorFlow 2, Zipline, backtrader, Alphalens, and pyfolio. Purchase of the print or Kindle book includes a free eBook in the PDF format. Key Features

- Design, train, and evaluate machine learning algorithms that underpin automated trading strategies
- Create a research and strategy development process to apply predictive modeling to trading decisions
- Leverage NLP and deep learning to extract tradeable signals from market and alternative data

Book Description The explosive growth of digital data has boosted the demand for expertise in trading strategies that use machine learning (ML). This revised and expanded second edition enables you to build and evaluate sophisticated supervised, unsupervised, and reinforcement learning models. This book introduces end-to-end machine learning for the trading workflow, from the idea and feature engineering to model optimization, strategy design, and backtesting. It illustrates this by using examples ranging from linear models and tree-based ensembles to deep-learning techniques from cutting edge research. This edition shows how to work with market, fundamental, and alternative data, such as tick data, minute and daily bars, SEC filings, earnings call transcripts, financial news, or satellite images to generate tradeable signals. It illustrates how to engineer financial features or alpha factors that enable an ML model to predict returns from price data for US and international stocks and ETFs. It also shows how to assess the signal content of new features using Alphalens and SHAP values and includes a new

appendix with over one hundred alpha factor examples. By the end, you will be proficient in translating ML model predictions into a trading strategy that operates at daily or intraday horizons, and in evaluating its performance. What you will learn

- Leverage market, fundamental, and alternative text and image data
- Research and evaluate alpha factors using statistics, Alphalens, and SHAP values
- Implement machine learning techniques to solve investment and trading problems
- Backtest and evaluate trading strategies based on machine learning using Zipline and Backtrader
- Optimize portfolio risk and performance analysis using pandas, NumPy, and pyfolio
- Create a pairs trading strategy based on cointegration for US equities and ETFs
- Train a gradient boosting model to predict intraday returns using AlgoSeek's high-quality trades and quotes data

Who this book is for If you are a data analyst, data scientist, Python developer, investment analyst, or portfolio manager interested in getting hands-on machine learning knowledge for trading, this book is for you. This book is for you if you want to learn how to extract value from a diverse set of data sources using machine learning to design your own systematic trading strategies. Some understanding of Python and machine learning techniques is required.

algo trading with python: *Python for Finance* Yves J. Hilpisch, 2018-12-05 The financial industry has recently adopted Python at a tremendous rate, with some of the largest investment banks and hedge funds using it to build core trading and risk management systems. Updated for Python 3, the second edition of this hands-on book helps you get started with the language, guiding developers and quantitative analysts through Python libraries and tools for building financial applications and interactive financial analytics. Using practical examples throughout the book, author Yves Hilpisch also shows you how to develop a full-fledged framework for Monte Carlo simulation-based derivatives and risk analytics, based on a large, realistic case study. Much of the book uses interactive IPython Notebooks.

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algo trading with python: *Hands-On Machine Learning for Algorithmic Trading* Stefan Jansen, 2018-12-31 Explore effective trading strategies in real-world markets using NumPy, spaCy, pandas, scikit-learn, and Keras

- Key Features
- Implement machine learning algorithms to build, train, and validate algorithmic models
- Create your own algorithmic design process to apply probabilistic machine learning approaches to trading decisions
- Develop neural networks for algorithmic trading to perform time series forecasting and smart analytics

Book Description The explosive growth of digital data has boosted the demand for expertise in trading strategies that use machine learning (ML). This book enables you to use a broad range of supervised and unsupervised algorithms to extract signals from a wide variety of data sources and create powerful investment strategies. This book shows how to access market, fundamental, and alternative data via API or web scraping and offers a framework to evaluate alternative data. You'll practice the ML workflow from model design, loss metric definition, and parameter tuning to performance evaluation in a time series context. You will

understand ML algorithms such as Bayesian and ensemble methods and manifold learning, and will know how to train and tune these models using pandas, statsmodels, sklearn, PyMC3, xgboost, lightgbm, and catboost. This book also teaches you how to extract features from text data using spaCy, classify news and assign sentiment scores, and to use gensim to model topics and learn word embeddings from financial reports. You will also build and evaluate neural networks, including RNNs and CNNs, using Keras and PyTorch to exploit unstructured data for sophisticated strategies. Finally, you will apply transfer learning to satellite images to predict economic activity and use reinforcement learning to build agents that learn to trade in the OpenAI Gym. What you will learn

Implement machine learning techniques to solve investment and trading problemsLeverage market, fundamental, and alternative data to research alpha factorsDesign and fine-tune supervised, unsupervised, and reinforcement learning modelsOptimize portfolio risk and performance using pandas, NumPy, and scikit-learnIntegrate machine learning models into a live trading strategy on QuantopianEvaluate strategies using reliable backtesting methodologies for time seriesDesign and evaluate deep neural networks using Keras, PyTorch, and TensorFlowWork with reinforcement learning for trading strategies in the OpenAI GymWho this book is for Hands-On Machine Learning for Algorithmic Trading is for data analysts, data scientists, and Python developers, as well as investment analysts and portfolio managers working within the finance and investment industry. If you want to perform efficient algorithmic trading by developing smart investigating strategies using machine learning algorithms, this is the book for you. Some understanding of Python and machine learning techniques is mandatory.

algo trading with python: Learn Algorithmic Trading Sourav Ghosh, Sebastien Donadio, 2019-11-07 Understand the fundamentals of algorithmic trading to apply algorithms to real market data and analyze the results of real-world trading strategies Key Features Understand the power of algorithmic trading in financial markets with real-world examples Get up and running with the algorithms used to carry out algorithmic trading Learn to build your own algorithmic trading robots which require no human intervention Book Description It's now harder than ever to get a significant edge over competitors in terms of speed and efficiency when it comes to algorithmic trading. Relying on sophisticated trading signals, predictive models and strategies can make all the difference. This book will guide you through these aspects, giving you insights into how modern electronic trading markets and participants operate. You'll start with an introduction to algorithmic trading, along with setting up the environment required to perform the tasks in the book. You'll explore the key components of an algorithmic trading business and aspects you'll need to take into account before starting an automated trading project. Next, you'll focus on designing, building and operating the components required for developing a practical and profitable algorithmic trading business. Later, you'll learn how quantitative trading signals and strategies are developed, and also implement and analyze sophisticated trading strategies such as volatility strategies, economic release strategies, and statistical arbitrage. Finally, you'll create a trading bot from scratch using the algorithms built in the previous sections. By the end of this book, you'll be well-versed with electronic trading markets and have learned to implement, evaluate and safely operate algorithmic trading strategies in live markets. What you will learn Understand the components of modern algorithmic trading systems and strategies Apply machine learning in algorithmic trading signals and strategies using Python Build, visualize and analyze trading strategies based on mean reversion, trend, economic releases and more Quantify and build a risk management system for Python trading strategies Build a backtester to run simulated trading strategies for improving the performance of your trading bot Deploy and incorporate trading strategies in the live market to maintain and improve profitability Who this book is for This book is for software engineers, financial traders, data analysts, and entrepreneurs. Anyone who wants to get started with algorithmic trading and understand how it works; and learn the components of a trading system, protocols and algorithms required for black box and gray box trading, and techniques for building a completely automated and profitable trading business will also find this book useful.

algo trading with python: Hands-On Financial Trading with Python Jiri Pik, Sourav Ghosh,

2021-04-29 Build and backtest your algorithmic trading strategies to gain a true advantage in the market Key Features Get quality insights from market data, stock analysis, and create your own data visualisations Learn how to navigate the different features in Python's data analysis libraries Start systematically approaching quantitative research and strategy generation/backtesting in algorithmic trading Book Description Creating an effective system to automate your trading can help you achieve two of every trader's key goals; saving time and making money. But to devise a system that will work for you, you need guidance to show you the ropes around building a system and monitoring its performance. This is where Hands-on Financial Trading with Python can give you the advantage. This practical Python book will introduce you to Python and tell you exactly why it's the best platform for developing trading strategies. You'll then cover quantitative analysis using Python, and learn how to build algorithmic trading strategies with Zipline using various market data sources. Using Zipline as the backtesting library allows access to complimentary US historical daily market data until 2018. As you advance, you will gain an in-depth understanding of Python libraries such as NumPy and pandas for analyzing financial datasets, and explore Matplotlib, statsmodels, and scikit-learn libraries for advanced analytics. As you progress, you'll pick up lots of skills like time series forecasting, covering pmdarima and Facebook Prophet. By the end of this trading book, you will be able to build predictive trading signals, adopt basic and advanced algorithmic trading strategies, and perform portfolio optimization to help you get —and stay—ahead of the markets. What you will learn Discover how quantitative analysis works by covering financial statistics and ARIMA Use core Python libraries to perform quantitative research and strategy development using real datasets Understand how to access financial and economic data in Python Implement effective data visualization with Matplotlib Apply scientific computing and data visualization with popular Python libraries Build and deploy backtesting algorithmic trading strategies Who this book is for If you're a financial trader or a data analyst who wants a hands-on introduction to designing algorithmic trading strategies, then this book is for you. You don't have to be a fully-fledged programmer to dive into this book, but knowing how to use Python's core libraries and a solid grasp on statistics will help you get the most out of this book.

algo trading with python: *Algorithmic Short Selling with Python* Laurent Bernut, Michael Covel, 2021-09-30 Leverage Python source code to revolutionize your short selling strategy and to consistently make profits in bull, bear, and sideways markets Key Features Understand techniques such as trend following, mean reversion, position sizing, and risk management in a short-selling context Implement Python source code to explore and develop your own investment strategy Test your trading strategies to limit risk and increase profits Book Description If you are in the long/short business, learning how to sell short is not a choice. Short selling is the key to raising assets under management. This book will help you demystify and hone the short selling craft, providing Python source code to construct a robust long/short portfolio. It discusses fundamental and advanced trading concepts from the perspective of a veteran short seller. This book will take you on a journey from an idea (“buy bullish stocks, sell bearish ones”) to becoming part of the elite club of long/short hedge fund algorithmic traders. You'll explore key concepts such as trading psychology, trading edge, regime definition, signal processing, position sizing, risk management, and asset allocation, one obstacle at a time. Along the way, you'll will discover simple methods to consistently generate investment ideas, and consider variables that impact returns, volatility, and overall attractiveness of returns. By the end of this book, you'll not only become familiar with some of the most sophisticated concepts in capital markets, but also have Python source code to construct a long/short product that investors are bound to find attractive. What you will learn Develop the mindset required to win the infinite, complex, random game called the stock market Demystify short selling in order to generate alpa in bull, bear, and sideways markets Generate ideas consistently on both sides of the portfolio Implement Python source code to engineer a statistically robust trading edge Develop superior risk management habits Build a long/short product that investors will find appealing Who this book is for This is a book by a practitioner for practitioners. It is designed to benefit a wide range of people, including long/short market participants, quantitative participants, proprietary traders, commodity

trading advisors, retail investors (pro retailers, students, and retail quants), and long-only investors. At least 2 years of active trading experience, intermediate-level experience of the Python programming language, and basic mathematical literacy (basic statistics and algebra) are expected.

algo trading with python: Head First Python Paul Barry, 2016-11-21 Want to learn the Python language without slogging your way through how-to manuals? With Head First Python, you'll quickly grasp Python's fundamentals, working with the built-in data structures and functions. Then you'll move on to building your very own webapp, exploring database management, exception handling, and data wrangling. If you're intrigued by what you can do with context managers, decorators, comprehensions, and generators, it's all here. This second edition is a complete learning experience that will help you become a bonafide Python programmer in no time. Why does this book look so different? Based on the latest research in cognitive science and learning theory, Head First Python uses a visually rich format to engage your mind, rather than a text-heavy approach that puts you to sleep. Why waste your time struggling with new concepts? This multi-sensory learning experience is designed for the way your brain really works.

algo trading with python: Algorithmic Trading with Interactive Brokers Matthew Scarpino, 2019-09-03 Through Interactive Brokers, software developers can write applications that read financial data, scan for contracts, and submit orders automatically. Individuals can now take advantage of the same high-speed decision making and order placement that professional trading firms use. This book walks through the process of developing applications based on IB's Trader Workstation (TWS) programming interface. Beginning chapters introduce the fundamental classes and functions, while later chapters show how they can be used to implement full-scale trading systems. With an algorithmic system in place, traders don't have to stare at charts for hours on end. Just launch the trading application and let the TWS API do its work. The material in this book focuses on Python and C++ coding, so readers are presumed to have a basic familiarity with one of these languages. However, no experience in financial trading is assumed. If you're new to the world of stocks, bonds, options, and futures, this book explains what these financial instruments are and how to write applications capable of trading them.

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LEARNING FOR ALGORITHM TRADING will introduce you many selected tips and breaking down the basics of coding applied to finance. You will discover as a beginner the world of data science, machine learning and artificial intelligence with step-by-step guides that will guide you during the code-writing learning process. The following list is just a tiny fraction of what you will learn in this bundle PYTHON FOR BEGINNERS □ Differences among programming languages: Vba, SQL, R, Python □ 3 reasons why Python is fundamental for Data Science □ Introduction to some Python libraries like NumPy, Pandas, Matplotlib, □ 3 step system why Python is fundamental for Data Science □ Describe the steps required to develop and test an ML-driven trading strategy. PYTHON DATA SCIENCE □ A Proven Method to Write your First Program in 7 Days □ 3 Common Mistakes to Avoid when You Start Coding □ Fit Python Data Analysis to your business □ 7 Most effective Machine Learning Algorithms □ Describe the methods used to optimize an ML-driven trading strategy. OPTIONS TRADING FOR BEGINNERS □ Options Trading Strategies that guarantee real results in all market conditions □ Top 7 endorsed indicators of a successful investment □ The Bull & Bear Game □ Learn about the 3 best charts patterns to fluctuations of stock prices DAY AND SWING TRADING □ How Swing trading differs from Day trading in terms of risk-aversion □ How your money should be invested and which trade is more profitable □ Swing and Day trading proven indicators to learn investment timing □ The secret DAY trading strategies leading to a gain of \$ 9,000 per month and more than \$100,000 per year. Even if you have never written a programming code before, you will quickly grasp the basics thanks to visual charts and guidelines for coding. Today is the best day to start programming like a pro. For those trading with leverage, looking for a way to take a controlled approach and manage risk, a properly designed trading system is the answer If you really wish to learn MACHINE LEARNING FOR ALGORITHMIC TRADING and master its language, please click the BUY NOW button.

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Explore the forex market organization and operations
Understand the sources of alpha and the concept of algo trading
Get a grasp on typical risks and ways to mitigate them
Understand fundamental and technical analysis
Connect to data sources and check the integrity of market data
Use API and FIX protocol to send orders
Translate trading ideas into code
Run reliable backtesting emulating real-world market conditions

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