Quantitative Researcher

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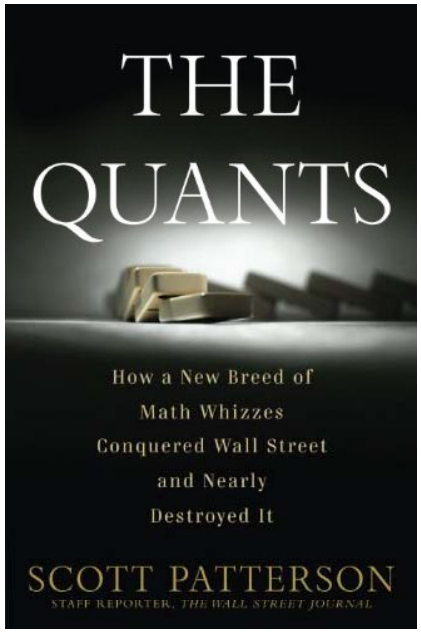
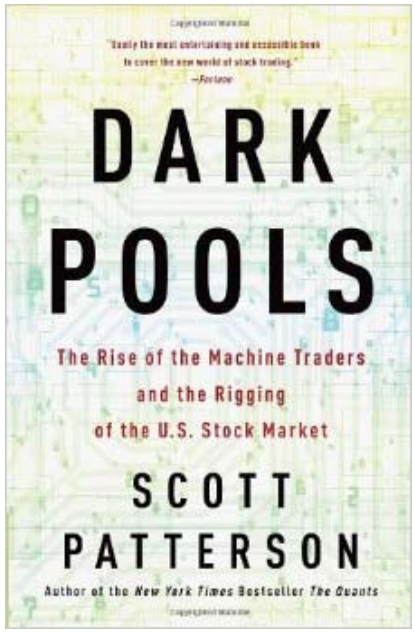
The New York Times Best Sellers





Just take the history and stories, and ignore the analysis and claims.

What does a Quant do?

A quant designs and implements mathematical models for

1. the pricing of derivatives
2. assessment of risk
3. predicting market movements

Types of quant roles:

1. high freq VS long term
2. various asset classes
3. Market Making/Stat Arbitrage/Momentum/Mean Reversion
4. Alpha generation/Optimization/Risk management/Execution

Potential employers:

- Commercial banks: ask less of you, and pay less. Good job security.
- Investment banks: long hours but pay well. Not so good job security.

- Hedge funds: a lot of work but somewhat flexible as long as you produce potential to make a huge amount of money but volatile
- Proprietary trading firms (Prop shops): even higher compensation but very volatile

Resources:

On Becoming a Quant by Mark Joshi
Automated Trading by Max Dama

What starting package are you looking at:

Base + 1st yr bonus (minimum guarantee) + signing bonus

= 1st yr total: 200k-300k and possibly more

Non-compete agreement:

Duration: 1-2 years
Scope: direct competitors
Compensation: $$

投资有风险
入行需谨慎

Required skills:

1. problem solving and reasoning
2. programming
3. basic Maths / linear algebra
4. probability and basic statistics
5. algorithms /data structure
6. familiarity with machine learning
7. minimum finance

Interview process:

Initial contact → early stage → onsite → additional info → make offer

Info session informal chat dinner	coding test campus interview phone interview	full day	references executive assessment

time frame: 2-3 weeks to 5-6 weeks

How to apply:

1. via CareerBridge / Campus interview
2. via Recruiter / Headhunter

When to apply:

1. as early as possible, recruiting season begins in September
2. BUT only when you're ready!!! You won't have a second chance!

How do you know you're ready (or not):

1. try mock interviews
2. the best way: 实战演练
   at least get a few onsites before applying for your dream job

Useful Tips:

Before the interview:

1. Preparation is the key!!!
2. Take advantage of resources you have
3. Experience: internships, projects
4. Write codes on blank paper / whiteboard
5. Make sure you know everything in your resume really really well

During the interview:

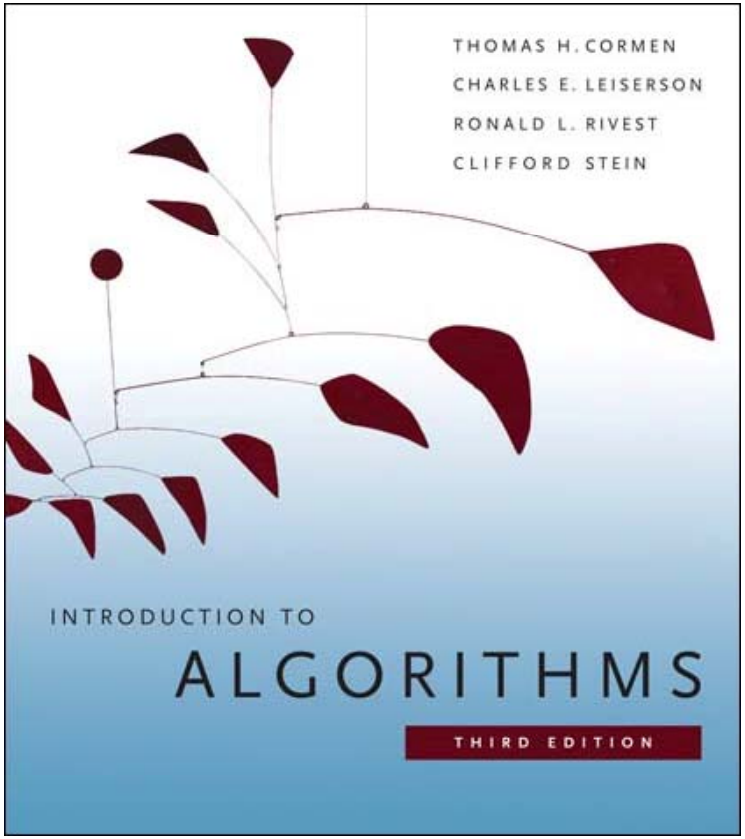
1. You have (some) control over your interviews
2. The interview is not over yet (until you walk out the door)!

After the interview:

1. how to negotiate your offer
2. when to make your decision and accept/turn down offers

Basic algorithms/data structures:

- sorting/order statistics
- greedy
- dynamical programming
- stack/queue/priority queue
- binary tree
- hash table/set and map in C++
- graphs (usually not necessary)



Resources:

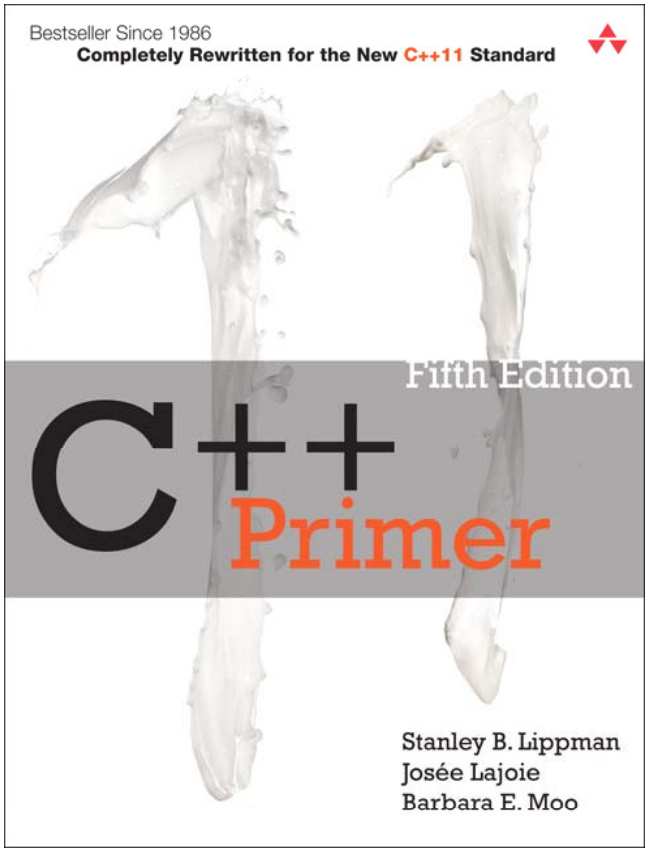
1. CLRS (text and problems)
2. TopCoder
3. GeeksforGeeks

Programming:

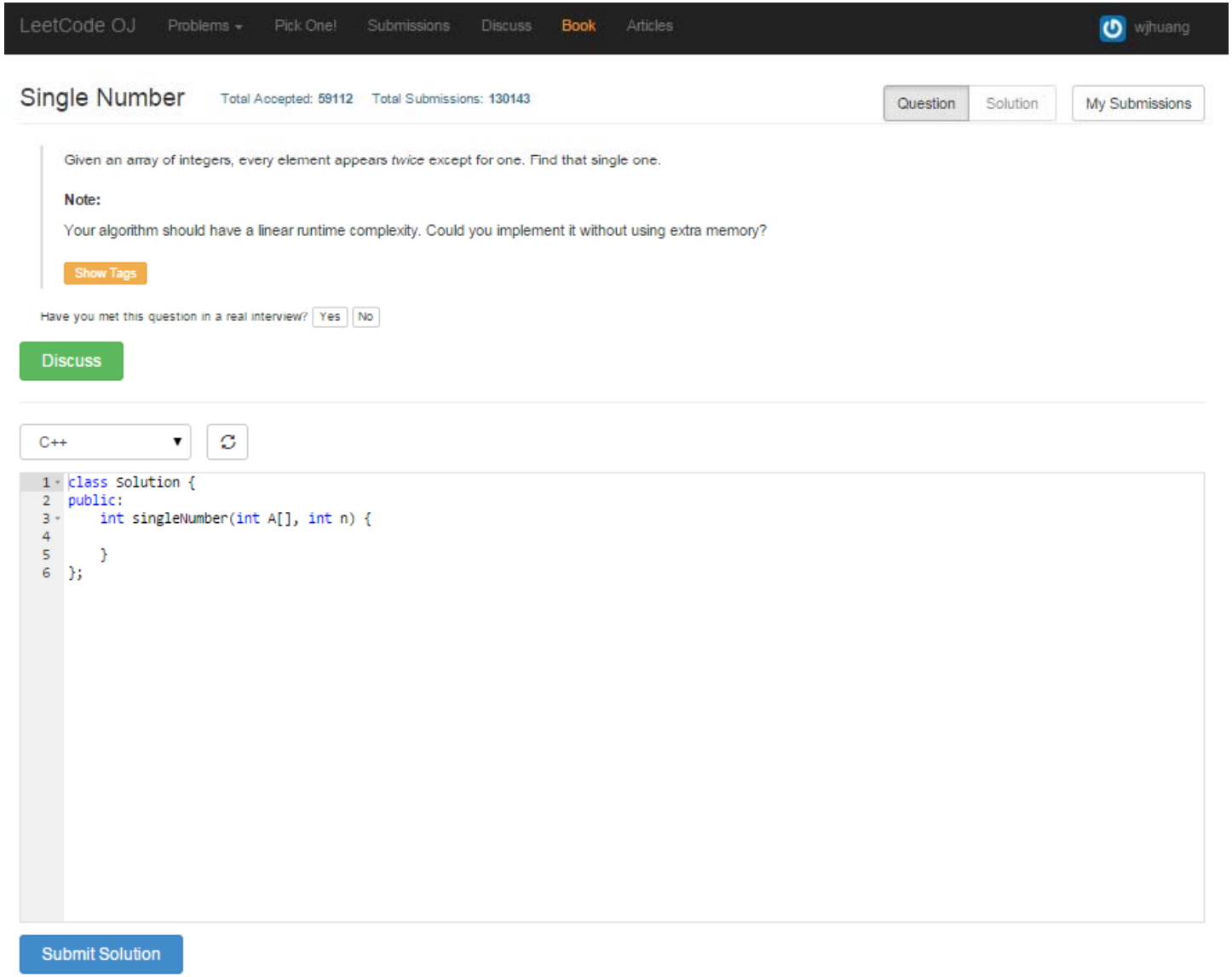
Required: C++/Java
Recommended: Python/R/MATLAB

Resources:

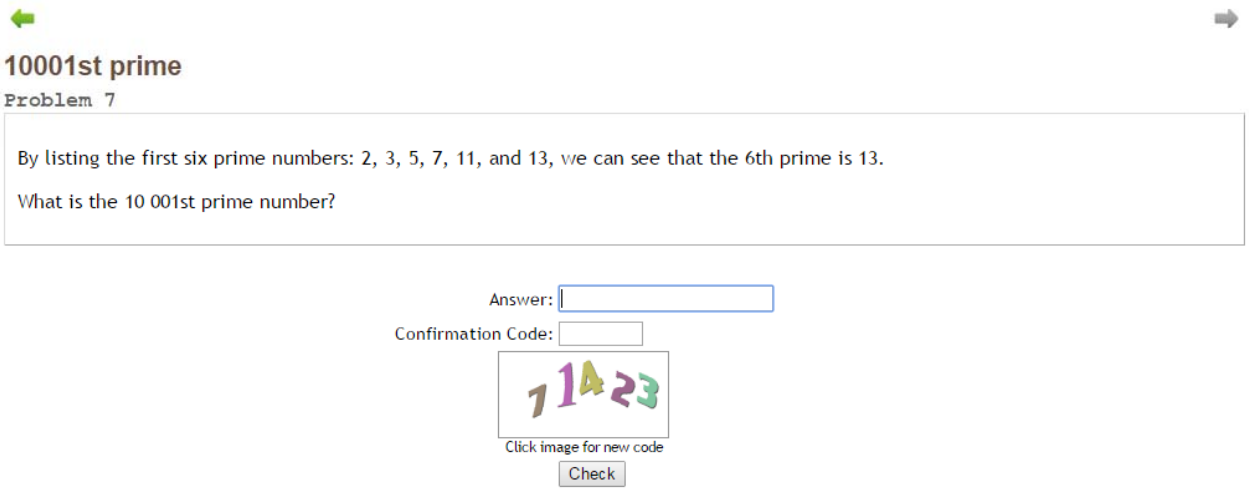
1. Leetcode (real interview questions)
2. Project Euler (more Math problems)
3. TopCoder (coding competition)
4. GeeksforGeeks



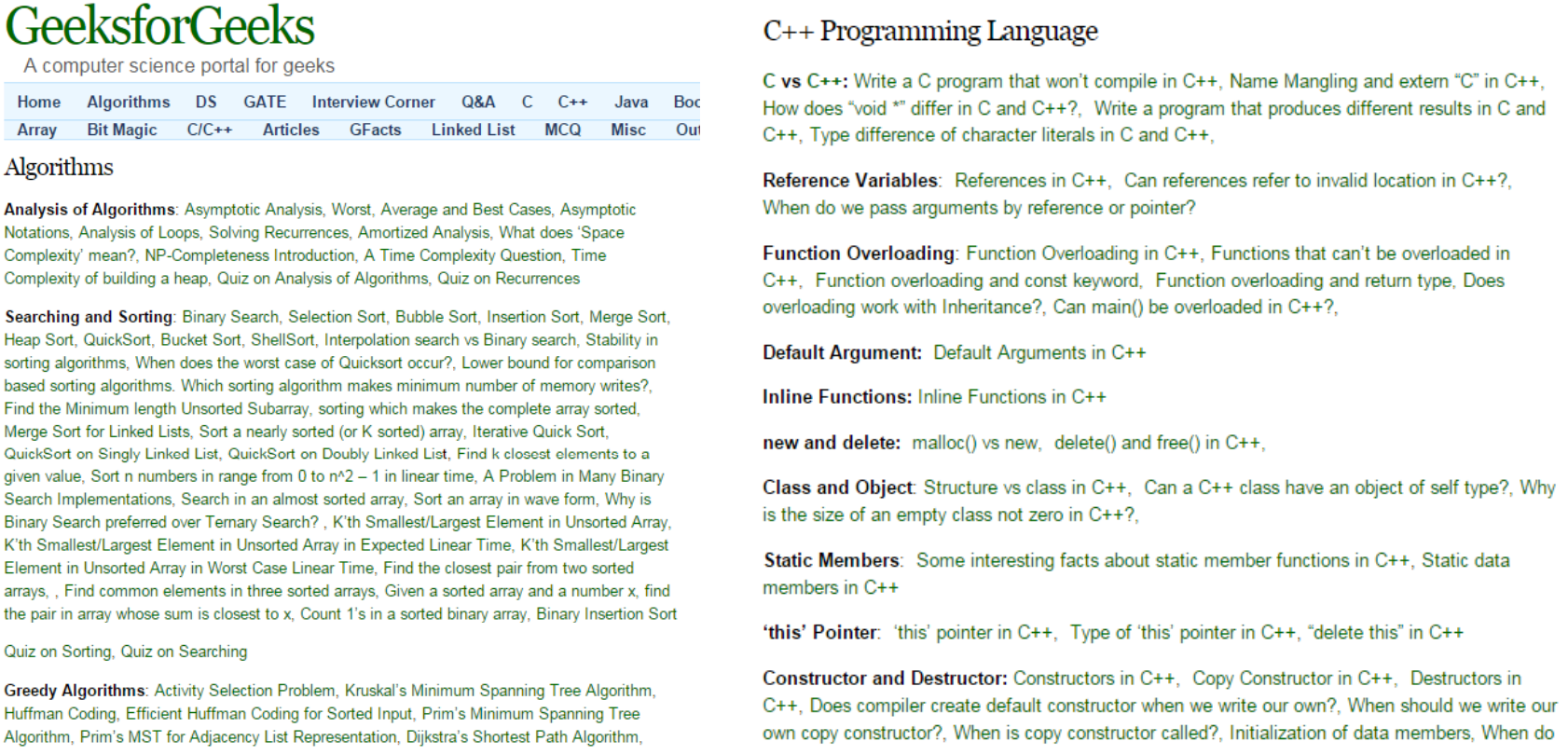
Leetcode online judge (OJ):



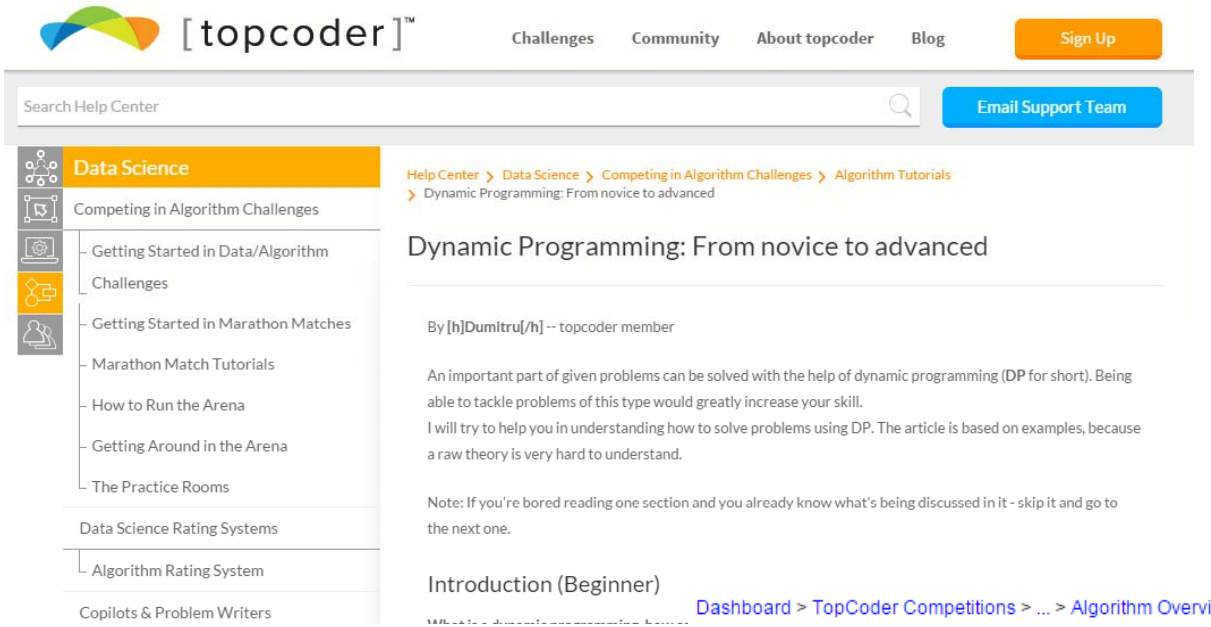
Project Euler



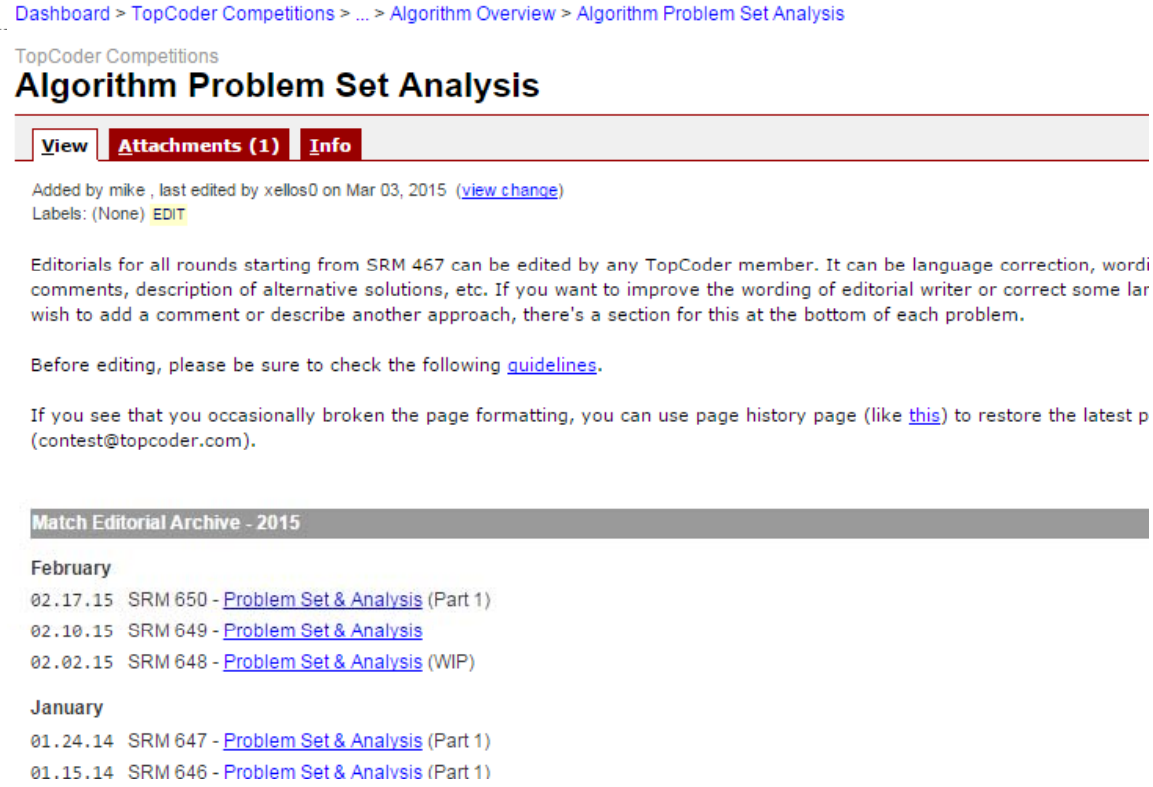
GeeksforGeeks



TopCoder Tutorials

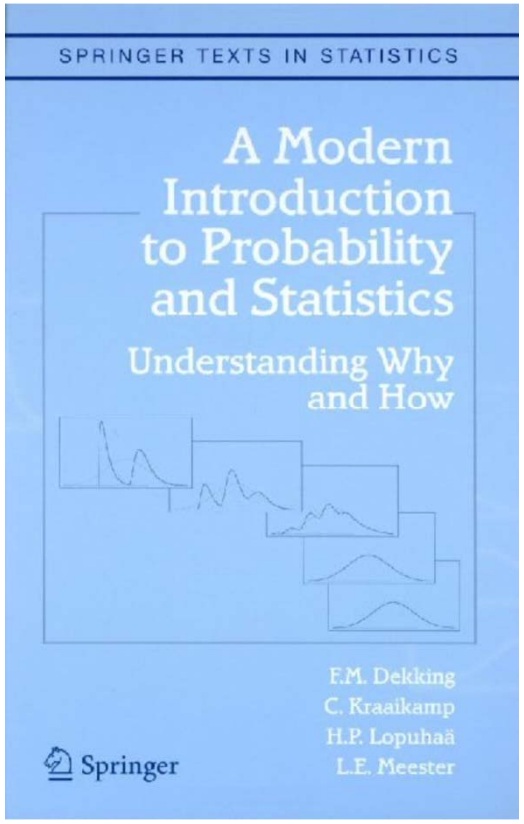


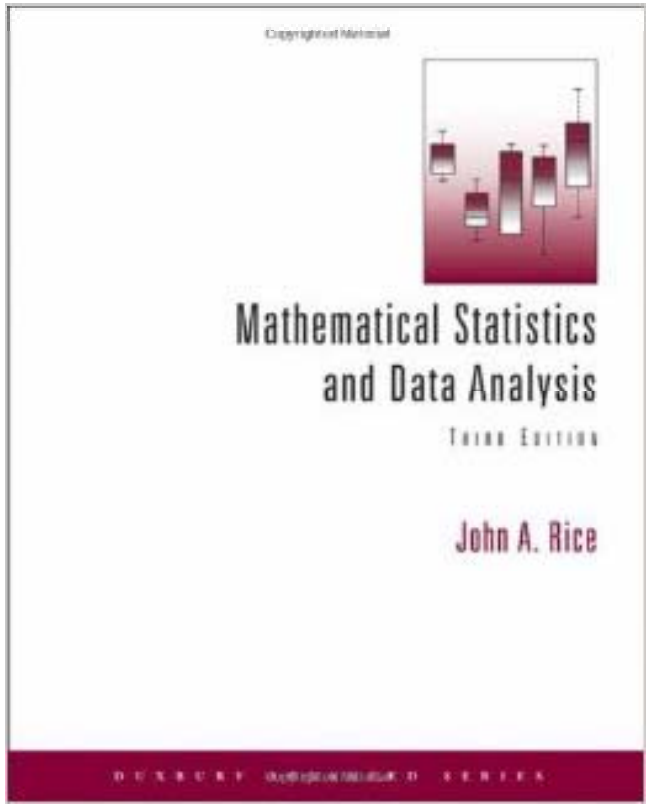
TopCoder Archive



Probability and Statistics

be familiar with standard distributions and their properties
be able to model problems using standard distributions
fitting of probability distribution, assessing goodness of fit
confidence interval, central limit theorem, linear regression, …

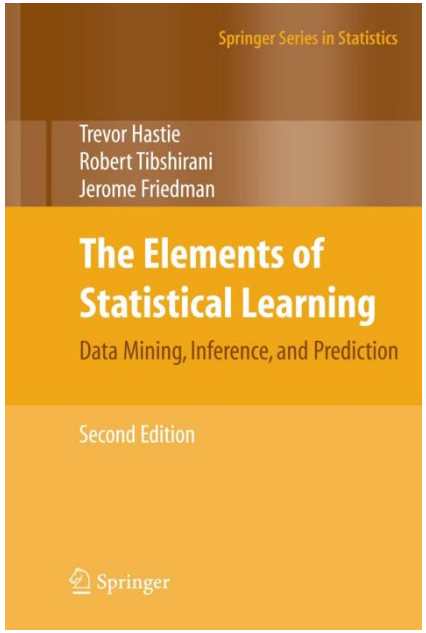


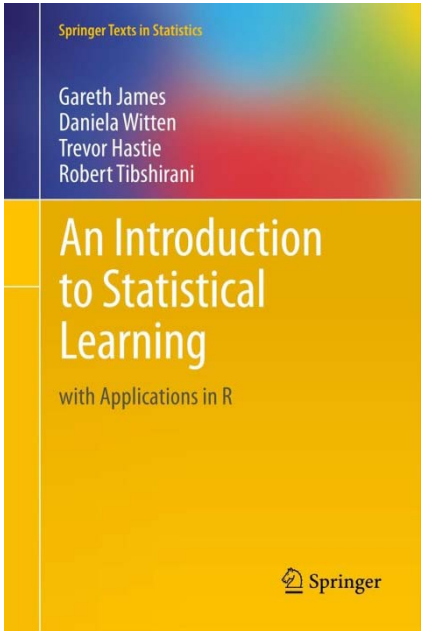


Machine learning

Resources:

1. MIT 6.867 notes
2. Stanford CS229 notes by Andrew Ng
3. CMU Data Mining notes by Ryan Tibshirani
4. The Elements of Statistical Learning
   or An Introduction to Statistical Learning: with Applications in R

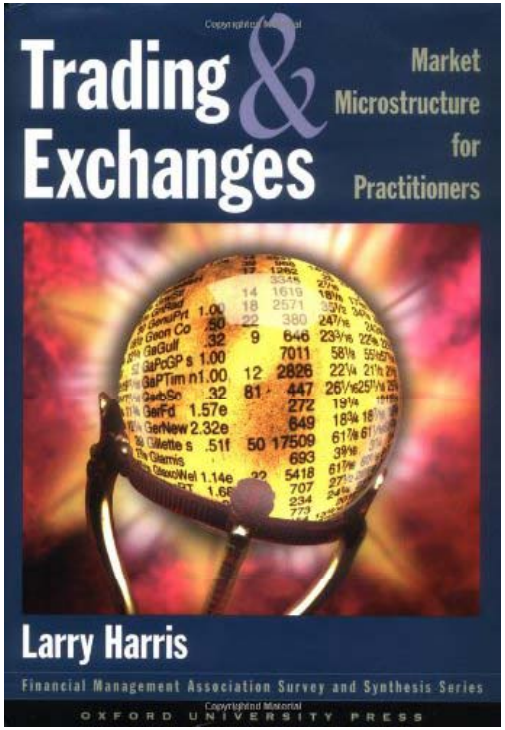




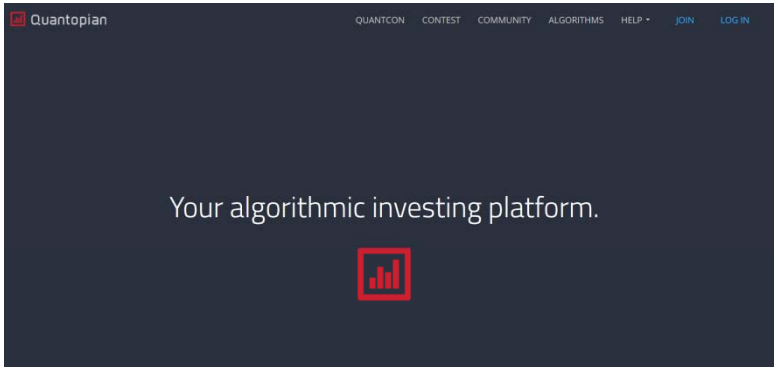
Finance and Trading

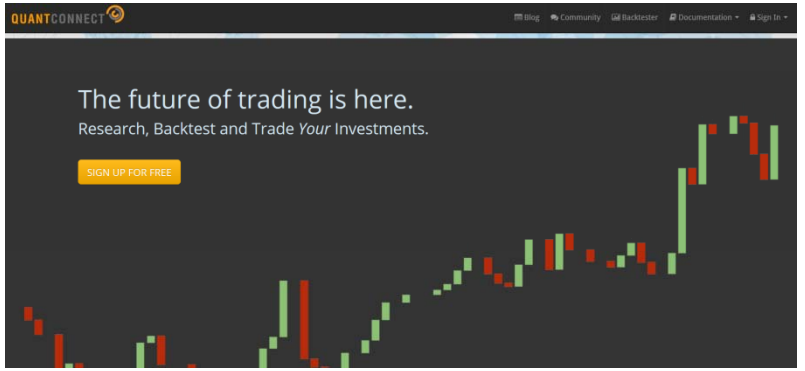
- Finance Theory class notes
- Analytics of Finance class notes

- Trading and Exchanges book
- Traders@MIT Traders @ MIT

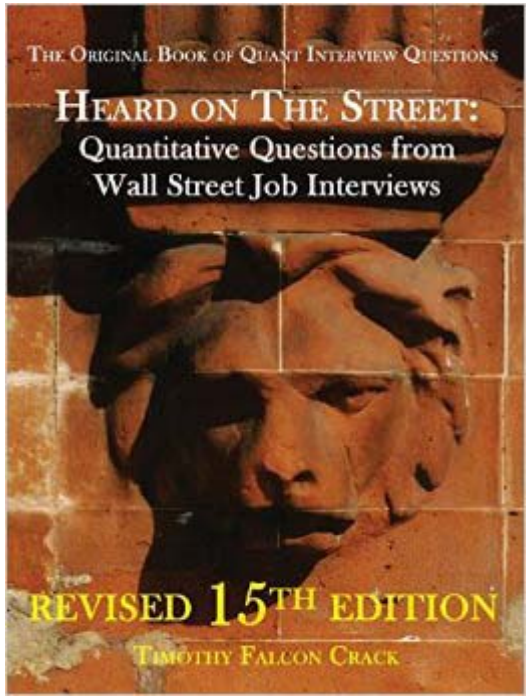


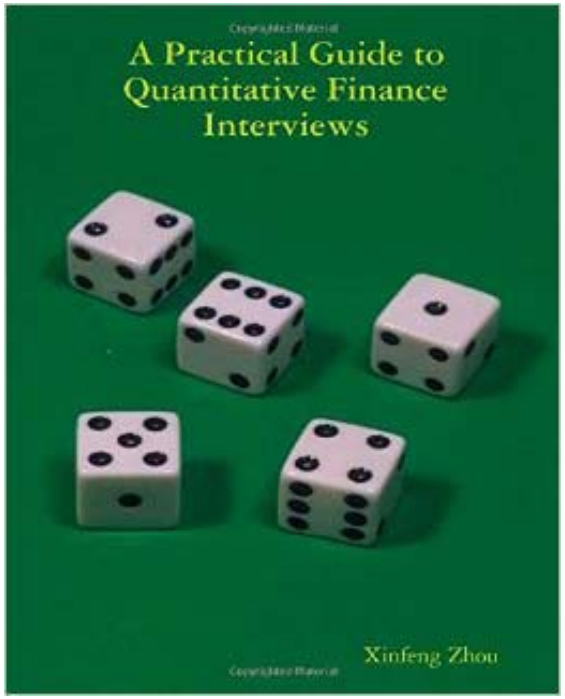
- Open a brokerage account and trade!
- Online algorithmic trading platform:
  Quantopian in python
  Quantconnect in C#

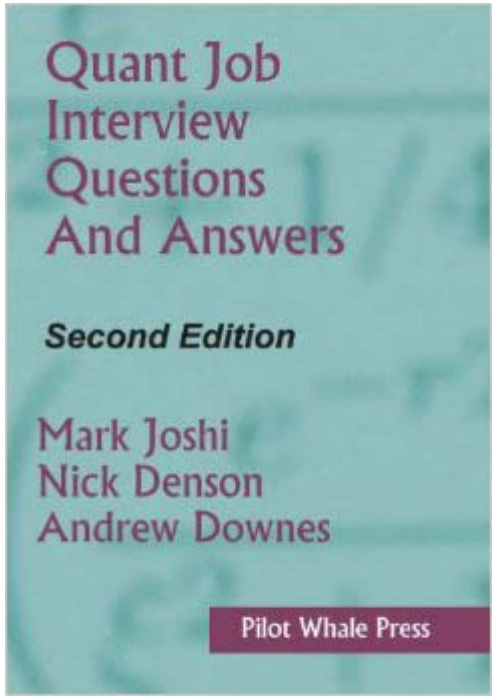




Brain Teasers / Interview books







Classes offered at MIT

Algorithm:

- 6.006: Introduction to Algorithms
- 6.046: Design & Analysis of Algorithms
- 6.231: Dynamic Programming & Stochastic Control

Statistics:

- 6.437: Inference & Information
- 6.438: Algorithm for Inference
- 6.867: Machine Learning
- 14.381: Statistical Methods in Economics

Finance:

- 15.401/15.402: Finance Theory
- 15.450: Analytics of Finance

Other:

- 6.255: Optimization Methods
- 6.337: Introduction to Numerical Methods
- 6.262/6.265: Stochastic Process

Founded in 1990
Headquarters: Chicago
# of employees: 1000+

Citadel Securities: quantitative strategies
250+ people, 50+ quants

Very successful business, especially in recent years
Performance-based rewarding
Great starting package among big firms
Located in Chicago

Recruiting process:
usually 1-2 rounds of campus/phone interviews
full day onsite, usually meet 5-6 pp

Other firms in this category: Two Sigma, D.E. Shaw, …

PDT PARTNERS

Founded by Peter Muller in 1993 in Morgan Stanley
Spin off and became independent in 2013
Headquarters: New York
# of employees: 100+

CEO Peter Muller: “the coolest guy in Wall Street”

Researchers position (quants): top school PhDs only!

label themselves as elite company: highly selective

Recruiting process:

1. campus interviews
2. “Super Saturday”: all entry level candidates come onsite
3. Research presentation + full day interview

Hudson River Trading
Founded in 2002
Headquarters: New York
# of employees: <100

Positions: Algorithm Developer vs Core Developer

Strength and Culture

Recruiting process: usually 2 rounds of campus/phone interviews
full day onsite, meet ~5 pp

Founded by Mark Gorton in 1998
Headquarters: New York

Small research group + shared technology infrastructure

Strength and Culture

Recruiting process: 1-2 rounds of campus/phone interviews
full day onsite, meet 5-6 pp

other firms in this category: Jump Trading, …

Founded in 2013
Headquarters: NYC, SF
# of employees: ~20

Founders: James Chiu, Harr Chen and Pang Chau

Very promising young start-up:

1. all-star core team
2. great culture
3. high compensation

Recruiting process:

1-2 phone interviews
full day onsite, meet almost everyone in the team

Other top firms for quants:

Renaissance
Two Sigma
Jump Trading
D.E. Shaw
Virtu Financial
…

Other opportunities:

Jane Street
Susquehanna International Group (SIG)
DRW
WorldQuant
Point72 Asset Management(formerly SAC)
Teza
….

Firms near Cambridge: Domeyard, Tech Square Trading

There are lots of opportunities out there, not only in finance!

No matter what you do, do your very best!

Help your fellow students when you can!