Developing Financial Thinking in Academia and Industry

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Agenda

Developing Financial Thinking

- Why, What, Where
- Challenges
- How

Call to Action
Why Develop Financial Thinking

The industry that makes up Wall Street (finance, insurance, and real estate) is the biggest contributor to GDP

Source: Bureau of Economic Analysis (BEA); Haver Analytics LP.
What Is Financial Thinking

- Mathematics
  - Statistics
- Business Understanding
- Tools
  - Programming
Traditional Application Areas of Financial Thinking

- Investment Management
- Risk Management
- Algorithmic Trading
- Financial Forecasting & Modeling
- Derivatives Pricing
- Insurance & Actuarial Science
- ... and many more applications
University of Rome Tor Vergata Graduate Students Acquire Marketable Programming and Asset Pricing Skills

Challenge
Teach graduate students in finance and banking the quantitative analysis and coding skills that are in demand in the industry

Solution
Take advantage of campus-wide access to MATLAB, online tutorials, and a certification program to enable students to acquire and demonstrate proficiency in MATLAB programming

Results
- Classroom time optimized
- Complex concepts learned through visualization
- Students graduated with in-demand skills

“In finance, you only truly understand the theory after you implement it in code and run that code on data to see what it produces—all of which our students do in MATLAB. We know this approach is much appreciated by the industry because our graduates find jobs quite easily.”

- Dr. Stefano Herzel, University of Rome Tor Vergata

Link to user story
Trending/Upcoming Application Areas

- AI is maturing
  - Sentiment Analysis
  - Explainable AI
  - Reinforcement Learning
- Climate Risk
- Quantum Computing
State Street Global Advisors Develops Scoring Model to Bring Transparency to ESG Investing

Challenge
Provide ESG scores to enable institutional investors to make sustainable investing decisions

Solution
Work with MathWorks Consulting Services to accelerate the development of an ESG scoring model that incorporates a transparent materiality framework, national corporate governance codes, and metrics from multiple data providers

Results
- Months of development time saved
- Deadline met despite late framework changes
- Changes implemented in days, not weeks

“We were under tremendous time pressure and could not afford to wait around figuring out whether and how R-Factor™ could be built in Python, R, or another language. We needed to move fast, and with MATLAB and support from MathWorks consultants, we were able to deliver.”
- Todd Bridges, Ph.D., State Street Global Advisors

Link to user story
Common Challenges

Industry

- New hires need to learn multiple technology/platforms and mathematical concepts to improve collaboration
- Team members need to use the right tool for the right job to push the quantitative boundaries
- I want to upskill my existing staff rather than recruit experts in specialized domains

Academia

- I want my students to be learn multiple programming tools
- Incoming students lack sufficient programming experience / Curriculum needs to focus on concepts
- I want my curriculum material to prepare students for current industry demands
How To Develop Financial Thinking

Self-Learn & Apply

Integration with Technology

Keep up with Industry Trends
Self-Learn and Apply
UI-based Workflows

Apps (In-product)
UI-based Workflows

App Designer

MATLAB Web App Server
Self-Paced Online Courses

Data Science
- Machine Learning Onramp
- Deep Learning Onramp
- Reinforcement Learning Onramp
- Machine Learning with MATLAB
- Deep Learning with MATLAB

Computational Mathematics
- Introduction to Linear Algebra with MATLAB
- Solving Nonlinear Equations with MATLAB
- Solving Ordinary Differential Equations with MATLAB
- Introduction to Statistical Methods with MATLAB
- Optimization Onramp
- Introduction to Symbolic Math with MATLAB

Programming
- MATLAB Onramp
- MATLAB Fundamentals
- MATLAB for Data Processing and Visualization
- MATLAB Programming Techniques

https://matlabacademy.mathworks.com/
Quantitative Finance Bootcamp

- Developed and updated based on the request of educators in top Financial Engineering programs
- Curriculum modules for instructor-led or self-guided learning
- Familiarize and refresh key concepts in
  - Programming
  - Statistics & Probability
  - Optimization
  - Linear Algebra
- Programming exercises based on real-world case studies

Download Bootcamp
MOOCs

Monetary Policy Analysis and Forecasting
Learn about the macroeconomic motivation of the quarterly projection model (QPM), its key properties, model calibration, data filtration, and how to implement the QPM in MATLAB software in order to learn and understand practical model building and model operation as it is usually done in central banks.

Estimated 6 weeks
0-10 hours per week
Self-paced
Progress at your own speed
Free
Optional upgrade

About the instructors
Mikhail Pranovich
Economist • The International Monetary Fund

https://www.edx.org/course/monetary-policy-analysis-and-forecasting

Practical Data Science with MATLAB Specialization

Browse → Data Science → Data Analysis

5.0 749 ratings

Erin Byrne 11 more instructors

Enroll for Free
Starts Aug 13
Financial aid available

19,322 already enrolled

https://www.coursera.org/specializations/practical-data-science-matlab
Integration with Technology
MATLAB and the Analytics Ecosystem

Data Sources:
- SQL Server
- MongoDB
- Cloudera
- Amazon S3
- Azure Data Lake Store
- Hive
- Neo4j
- Cassandra
- Amazon Athena

Business Systems:
- Excel
- Spark
- Tableau
- Power BI
- Spotfire
- Java
- Kafka
- .NET
- Qlik
- Python
- C
- Amazon Kinesis

Cloud / VM:
- VMware
- Rackspace
- Kubernetes
- Google Cloud
- Amazon Web Services
- Microsoft IIS
- Jenkins
Scale Up Computations

- More /better hardware
- Proximity to cloud data

Even more hardware to meet scaling needs

<table>
<thead>
<tr>
<th>Access requirements</th>
<th>Desktop in the cloud</th>
<th>Cluster in the cloud (Client can be any cloud on on-premise desktop)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any user could set up</td>
<td>NVIDIA GPU Cloud</td>
<td>MathWorks Cloud Center</td>
</tr>
<tr>
<td>Customizable template-based set up</td>
<td></td>
<td>MathWorks Cloud Reference Architecture</td>
</tr>
<tr>
<td>Full set-up in custom environment</td>
<td></td>
<td>Custom installation - DIY</td>
</tr>
</tbody>
</table>

Learn More: Parallel Computing on the Cloud
Interoperability of MATLAB with Other Languages

Calling Libraries Written in Another Language From MATLAB

- Java
- Python
- C
- C++
- Fortran
- COM components and ActiveX® controls
- RESTful, HTTP, and WSDL web services

Calling MATLAB from Another Language

- Java
- Python
- C/C++
- Fortran
- COM Automation server

https://www.mathworks.com/support/requirements/language-interfaces.html
Aberdeen Asset Management Implements Machine Learning–Based Portfolio Allocation Models in the Cloud

Challenge
Improve asset allocation strategies by creating model portfolios with machine learning techniques

Solution
Use MATLAB to develop classification tree, neural network, and support vector machine models, and use MATLAB Distributed Computing Server to run the models in the cloud

Results
- Portfolio performance goals supported
- Processing times cut from 24 hours to 3
- Multiple types of data easily accessed

“The widespread use of MATLAB in the finance community is a real advantage. Many university students learn MATLAB and can contribute right away when they join our team during internship programs. In addition, the strong MATLAB libraries developed by academic researchers help us explore all the possibilities of this programming language.”
- Emilio Llorente-Cano, Aberdeen Asset Management
Keep up with Industry Trends
Industry Workflows

Solutions - Industries

Examples - Documentation
Conferences
Live Events and Videos

Upcoming Events

On-Demand

Recently Added

What’s New in MATLAB for Finance Professionals

MATLAB Integration with Excel

Using MATLAB with Python

Controlling the COVID-19 Epidemic in Italy Using a Network Model

MATLAB and Simulink Events

Overview | Live Events | On-Demand Webinars and Videos | Conferences | Tradeshows | Search

- Signal Analysis and Feature Extraction for AI with Wavelets
  - Building AI models with signal and time-series data has become very popular for advanced applications in monitoring, automated driving systems, financial portfolio management,...
  - Start Date & Time: 22 Sept 2021, 09:00 EDT
  - Format: Online

- Overview of AI Applications in Industrial Automation and Machinery
  - This webinar is Part 1 of the Artificial Intelligence in Industrial Automation and Machinery series. AI is ever more appearing in applications like smart assistants, machine translation, ...
  - Start Date & Time: 22 Sept 2021, 07:00 EDT
  - Format: Online

- Mixed-Signal Circuit Analysis with MATLAB
  - The design and verification of mixed-signal integrated circuits are becoming increasingly more complex, more integrated functionality and algorithms. Circuit designers often...
  - Start Date & Time: 23 Sept 2021, 08:00 EDT
  - Format: Online

MATLAB Computational Finance Conference 2021

Join the MATLAB Computational Finance Conference 2021 to hear how industry and academic practitioners pace of financial modeling and analysis.

Date: 27 Sept 2021 - 30 Sept 2021
Location: United States

What's New in MATLAB

MATLAB has changed significantly over the last five years to address the growing needs of our users. This includes new features. Specific highlights will include: Create...

Date: 27 Sept 2021
Format: Online

Videos and Webinars

FILTERED BY: Computational Finance

Recently Added

What’s New in MATLAB for Finance Professionals

Access the power of MATLAB from Excel with MATLAB calculation spreadsheets from MATLAB. Automate these other processes.

Date: 20 Jul 2021

Using MATLAB with Python

MATLAB provides flexible, two-way integration with many programming languages. This webinar will cover how to call MATLAB from Python and how to call Python from MATLAB.

Date: 15 Jul 2021

Controlling the COVID-19 Epidemic in Italy Using a Network Model

We show that regional heterogeneity is essential to understanding the spread in Italy as a study case and developing a data-driven approach to design effective public health policies.
Example of Live Webinars

<table>
<thead>
<tr>
<th>Date</th>
<th>Webinar Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct 5, 2021</td>
<td>Using MATLAB to Develop &amp; Deploy Financial Models</td>
</tr>
<tr>
<td>Oct 13, 2021</td>
<td>Machine Learning and Credit Risk Analysis with MATLAB</td>
</tr>
<tr>
<td>Oct 26, 2021</td>
<td>Asset Management with MATLAB</td>
</tr>
<tr>
<td>Nov 10, 2021</td>
<td>Sentiment Analysis with MATLAB</td>
</tr>
</tbody>
</table>

Modelling Transition Climate Risk with MATLAB

Overview
The 2015 "Paris Agreement" places a binding obligation on the world's governments to "Make Finance flows consistent with a pathway towards low greenhouse gas emissions and climate resilient development". Financial institutions are being driven by their regulators, customers, investors, and other stakeholders, to do their part towards transitioning to a low carbon economy and managing exposure to climate-related risks.

"This raises many new data and modelling challenges. In this session, learn about the tools that MathWorks are making available for working with data from Integrated Assessment Models (such as the NGFS scenarios), applying climate stress-tests and incorporating temperature alignment goals into investment portfolios."
Call to Action

Take the Self-Paced Courses & Finance Bootcamp

Explore using MATLAB with Python

Consider attending the Finance Webinar Series

Invite MathWorks Subject Matter Experts
  – Guest lectures
  – Seminar series from Industry
  – Staff offsites/Company Meetings

AGupta@MathWorks.com