Developing Financial Thinking in Academia and Industry

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Agenda

Developing Financial Thinking

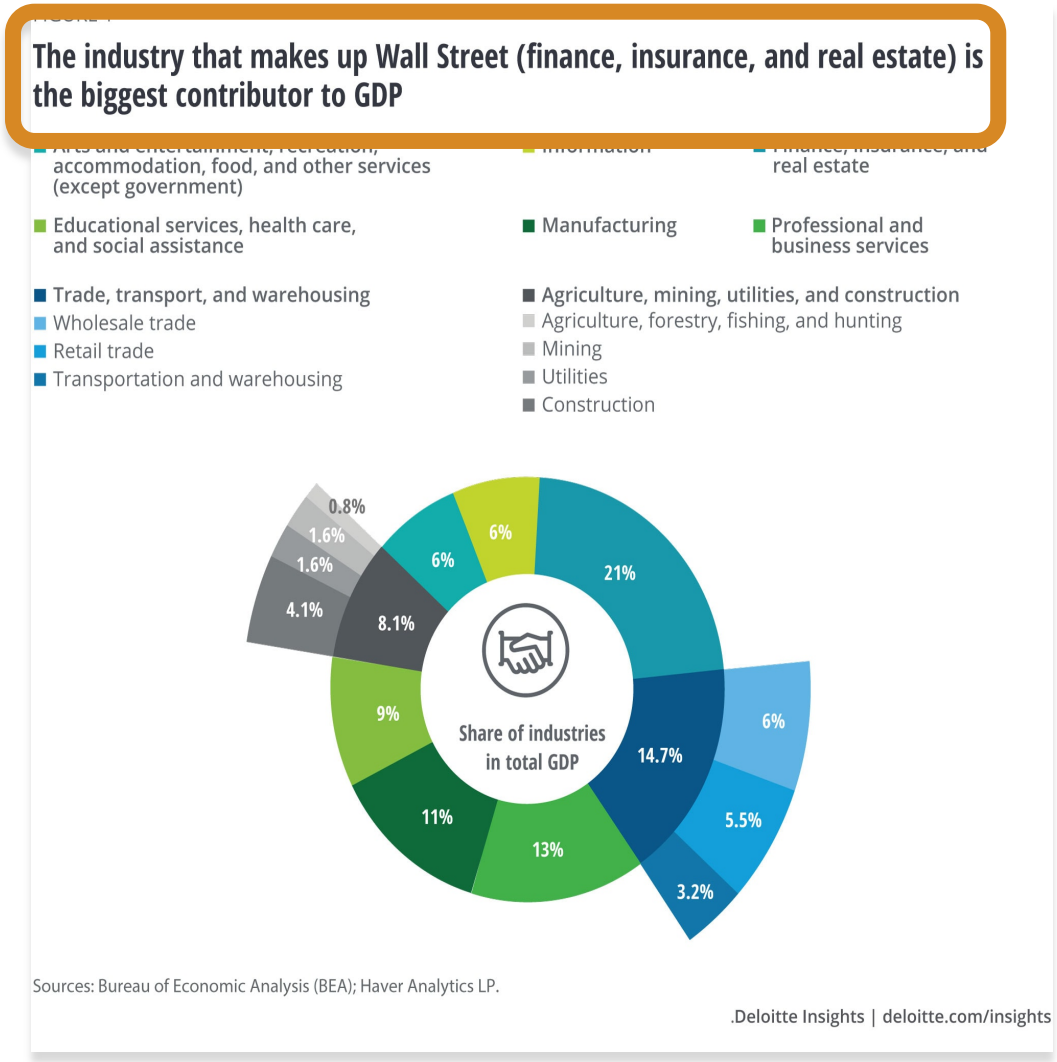
Why, What, Where

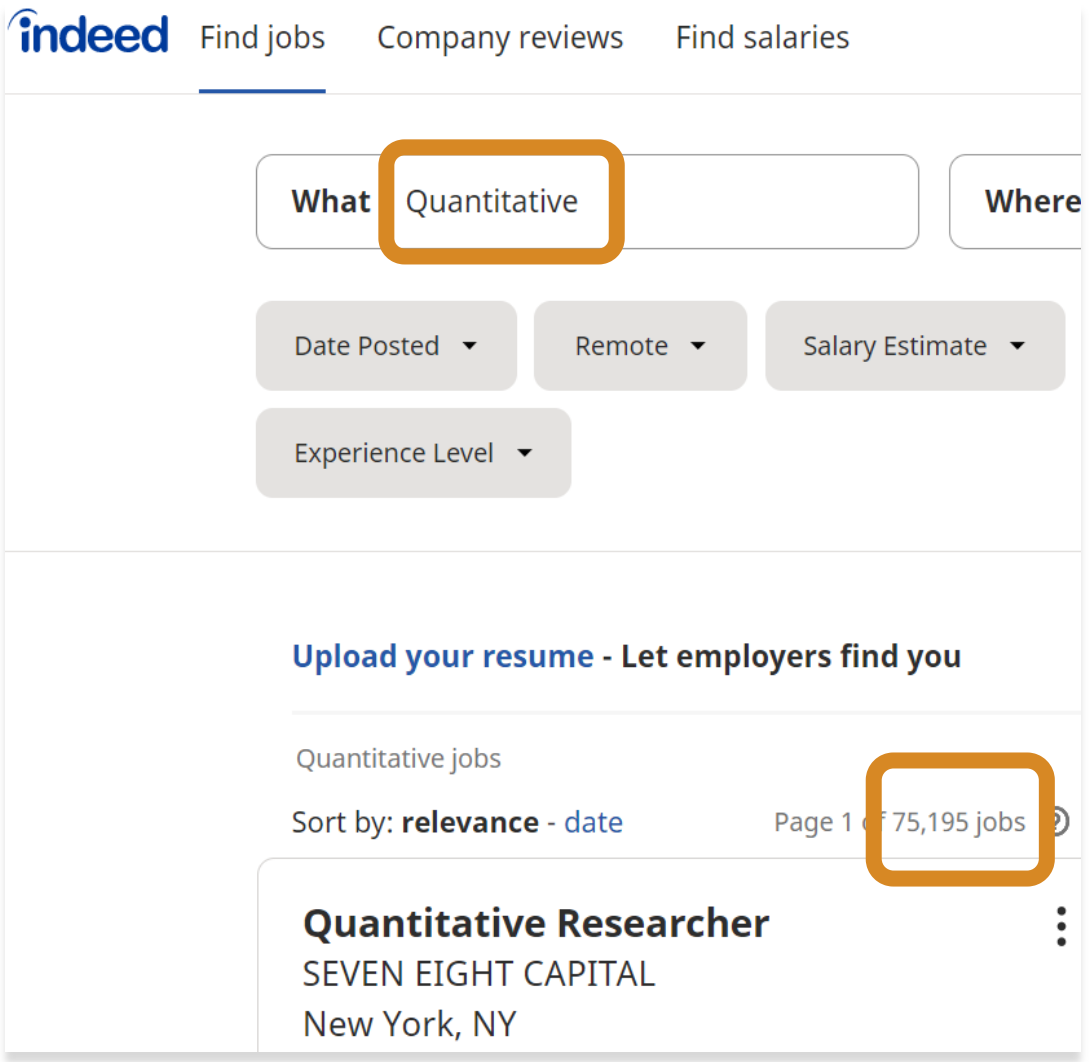
Challenges

How

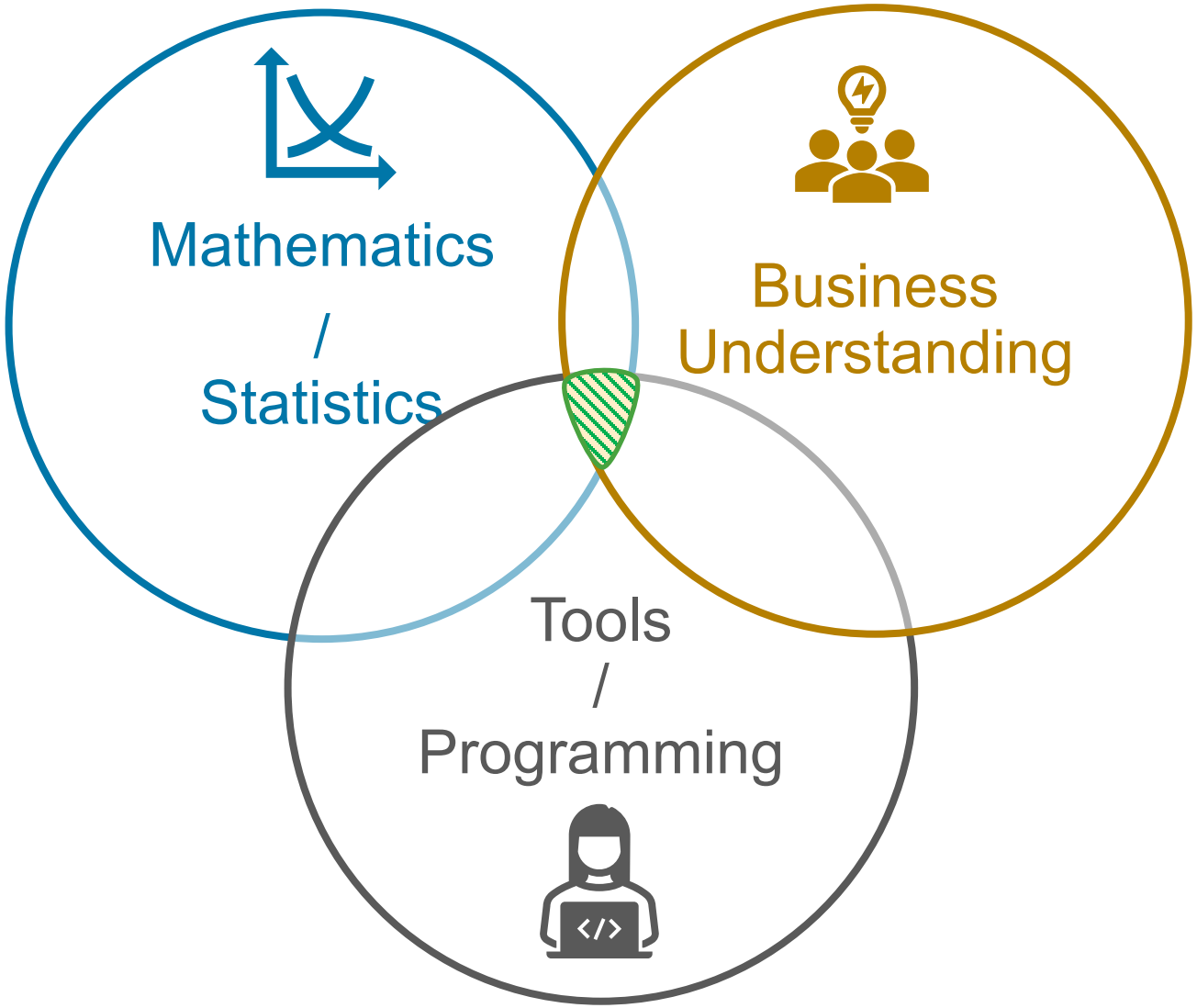
Call to Action

Why Develop Financial Thinking





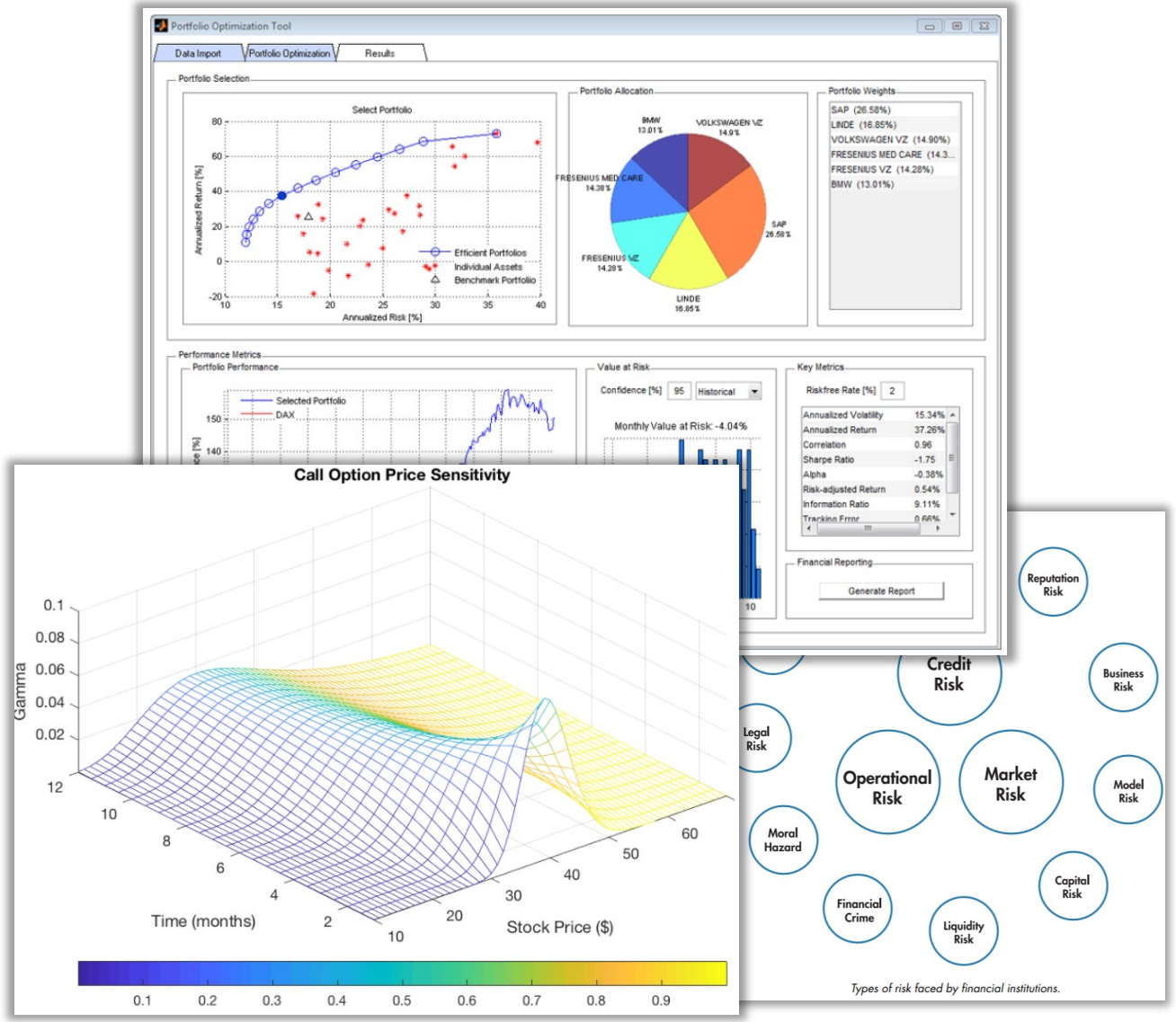
What Is Financial Thinking



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

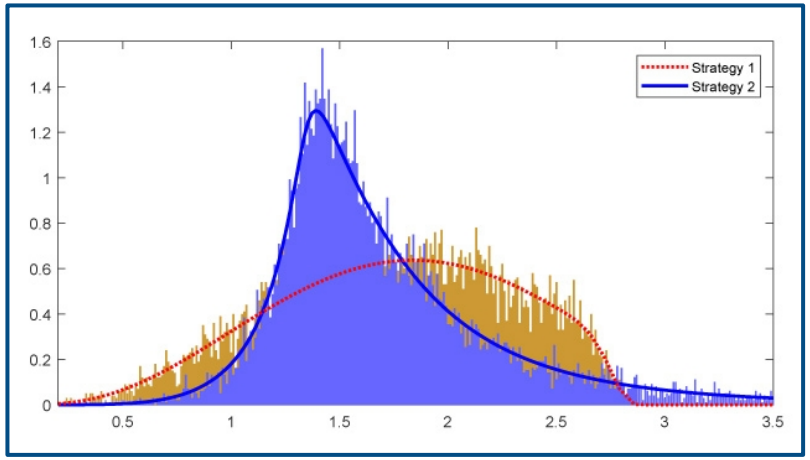
Teach graduate students in finance and banking the quantitative analysis and coding skills that are in demand in the industry

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



Monte Carlo simulation results for empirical densities returns (bars) and theoretical densities returns (lines) for two dynamic strategies.

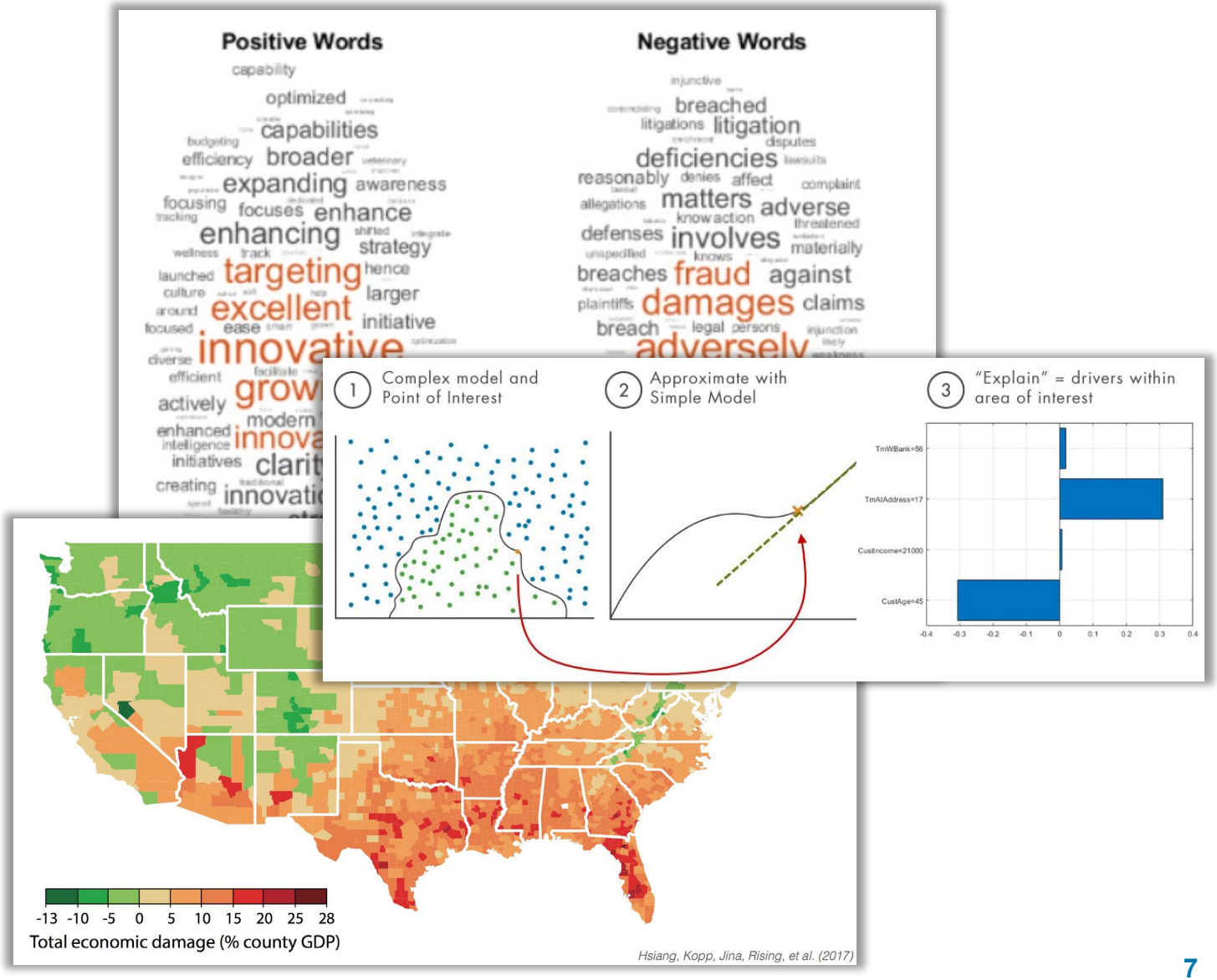
"In finance, you only truly understand the theory after you implement it in code and run that code on data to see what it produces—all of which our students do in MATLAB. We know this approach is much appreciated by the industry because our graduates find jobs quite easily."

- 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

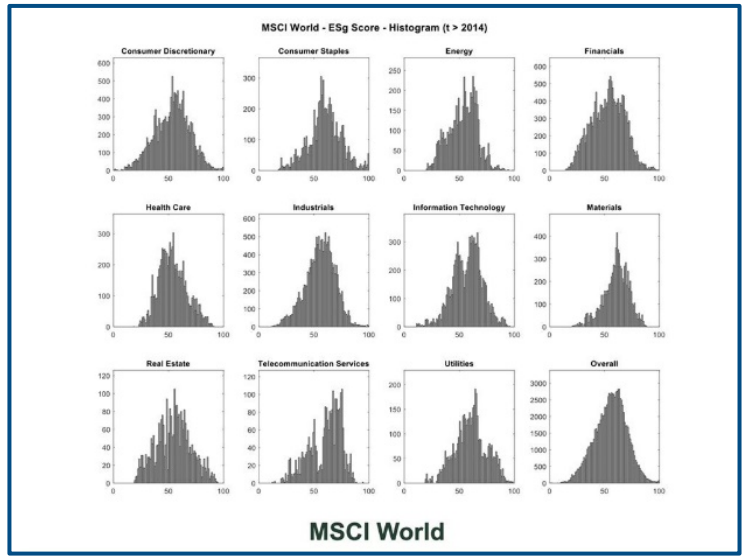
Provide ESG scores to enable institutional investors to make sustainable investing decisions

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



Histogram showing R-Factor™ ESG scores by industry.

"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

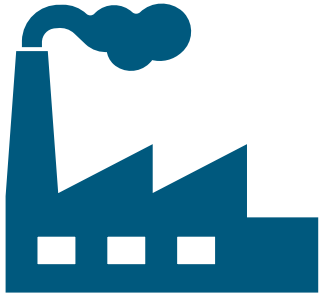
Academia

- 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

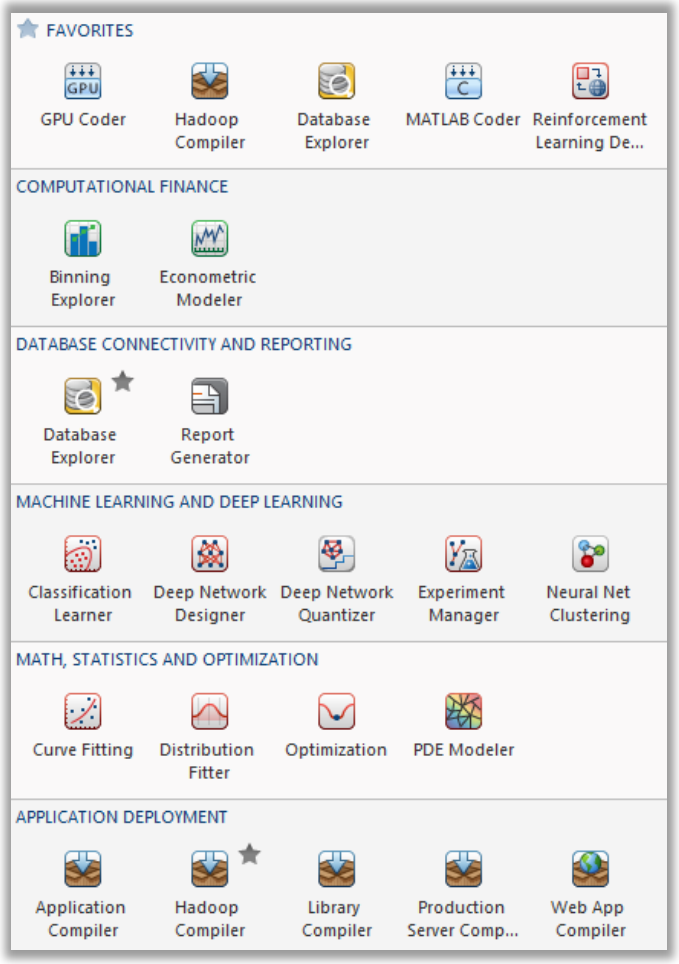
Integration with Technology

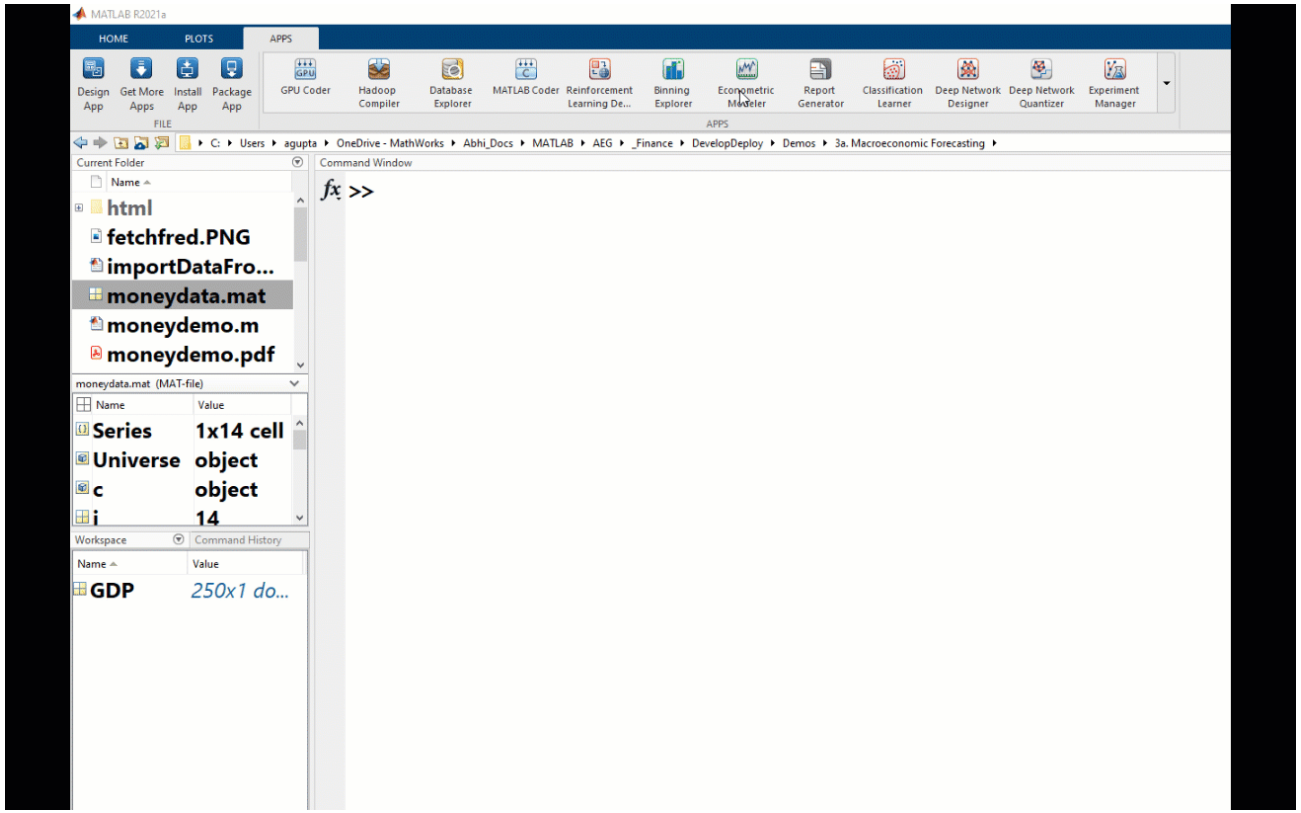


Keep up with Industry Trends

Self-Learn and Apply

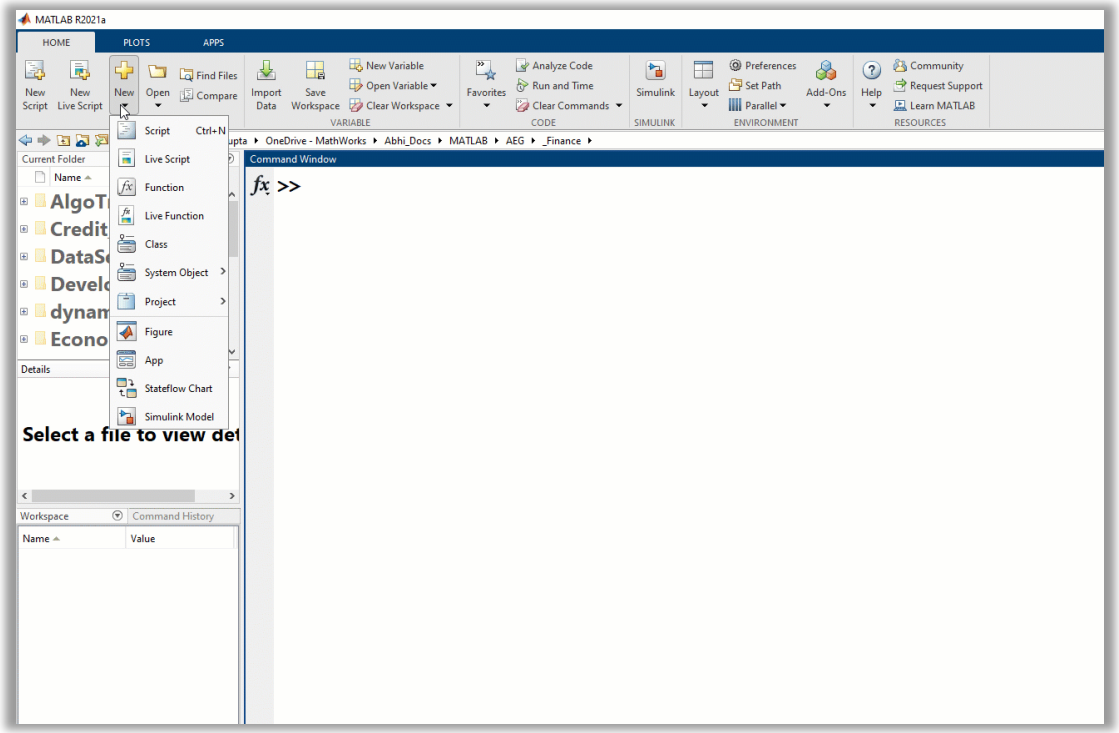
UI-based Workflows



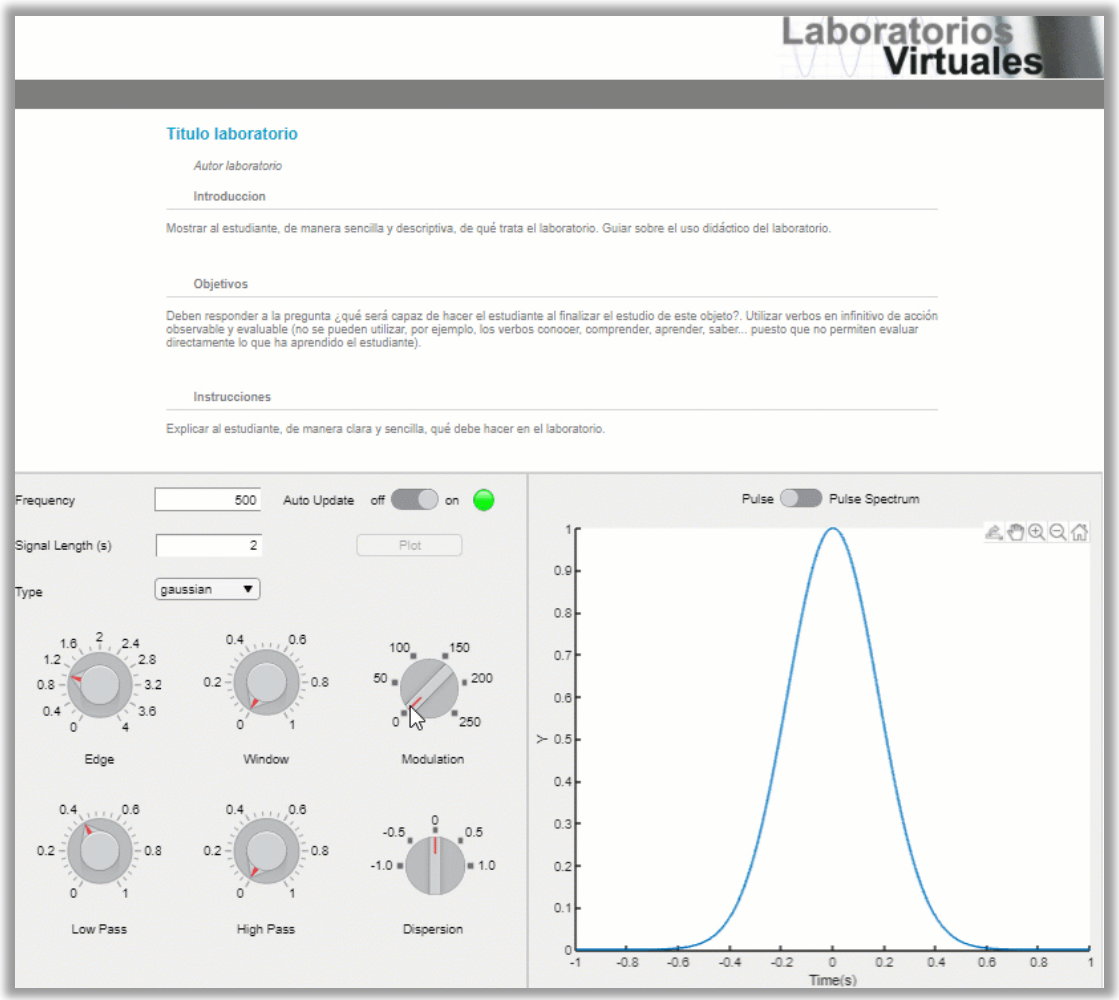


[Apps (In-product)]

UI-based Workflows



App Designer



MATLAB Web App Server

Self-Paced Online Courses

Data Science

Machine Learning Onramp

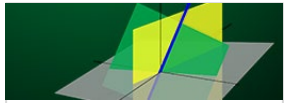
Deep Learning Onramp

Reinforcement Learning Onramp

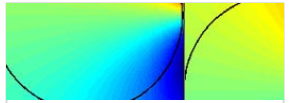
Machine Learning with MATLAB

Deep Learning with MATLAB

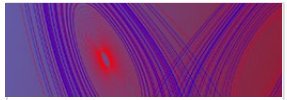
Computational Mathematics



Introduction to Linear Algebra with MATLAB

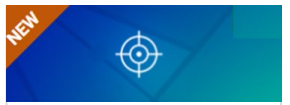


Solving Nonlinear Equations with MATLAB



Solving Ordinary Differential Equations with MATLAB

Introduction to Statistical Methods with MATLAB



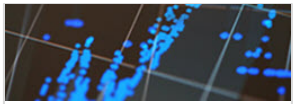
Optimization Onramp

Introduction to Symbolic Math with MATLAB

Programming

MATLAB Onramp

MATLAB Fundamentals



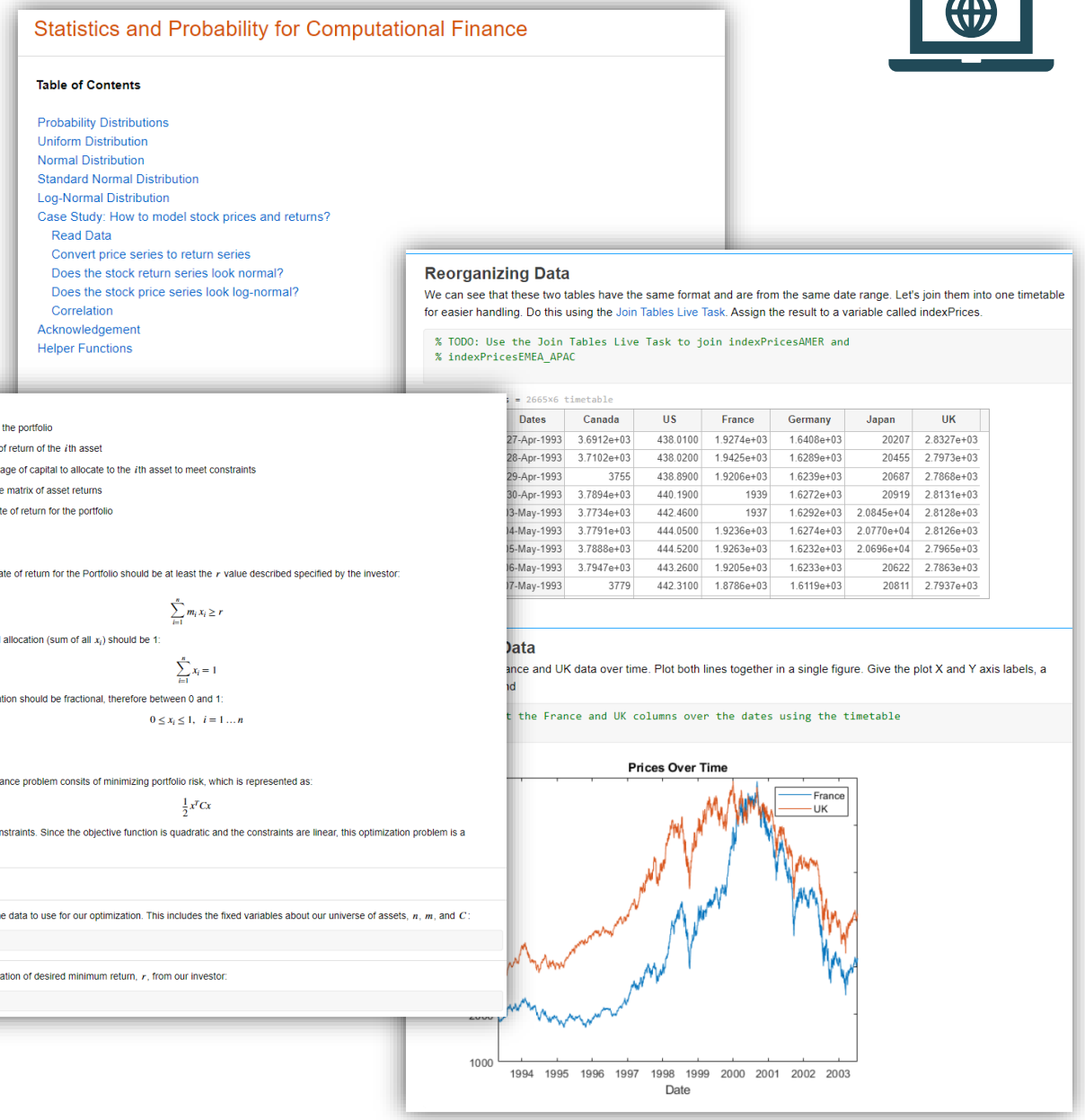
MATLAB for Data Processing and Visualization

MATLAB Programming Techniques

https://matlabacademy.mathworks.com/

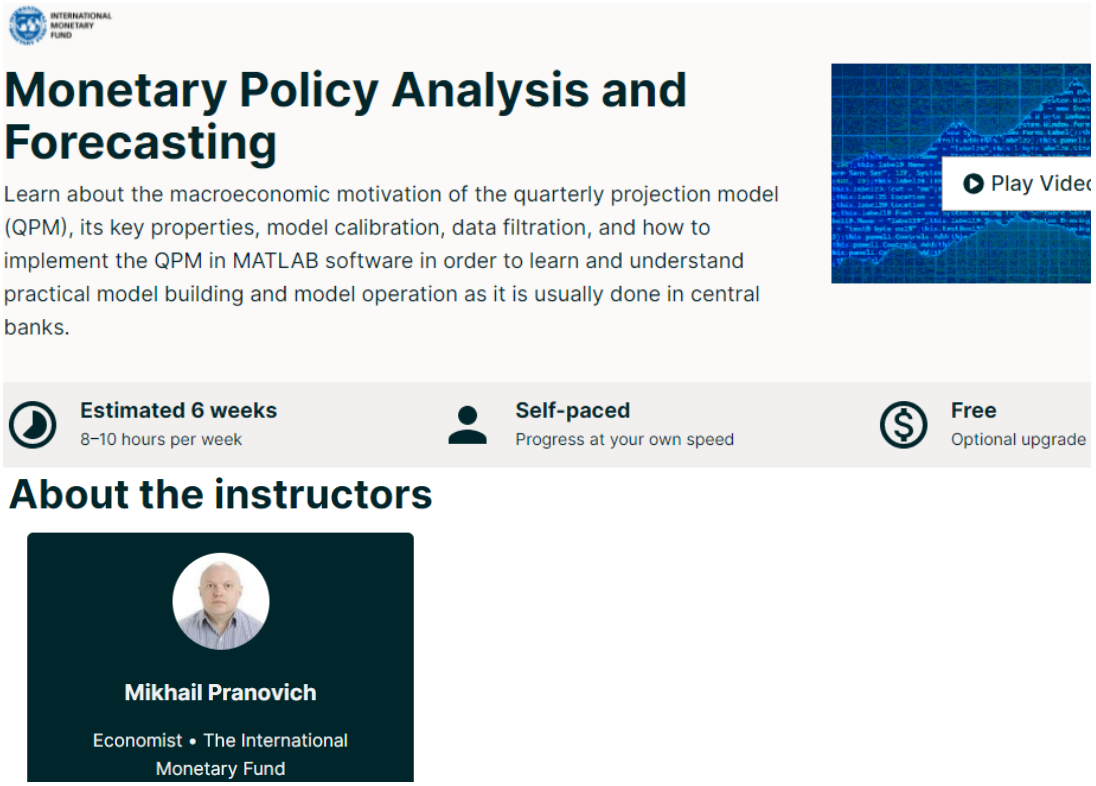
Quantitative Finance Bootcamp

- 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

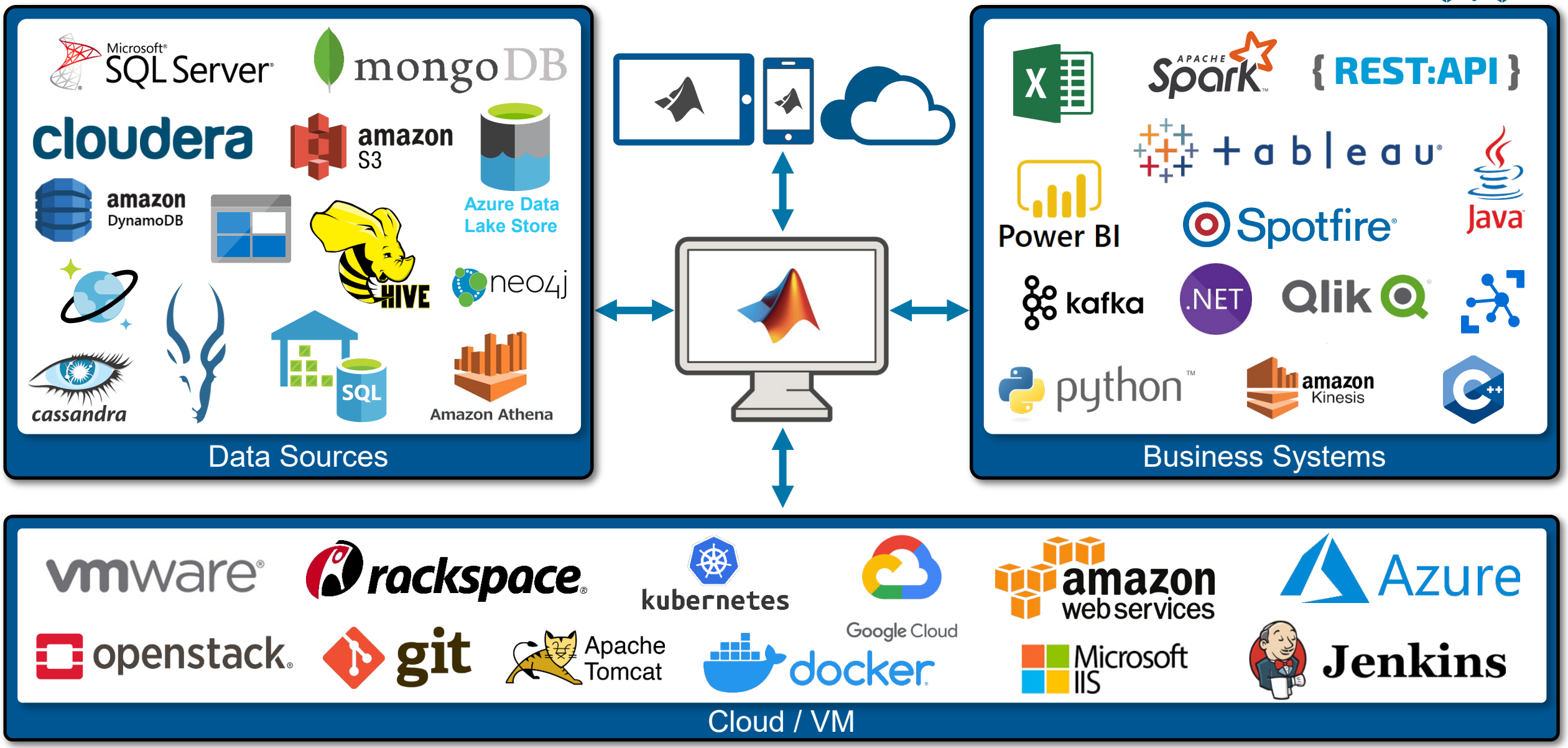


https://www.edx.org/course/monetary-policy-analysis-and-forecasting

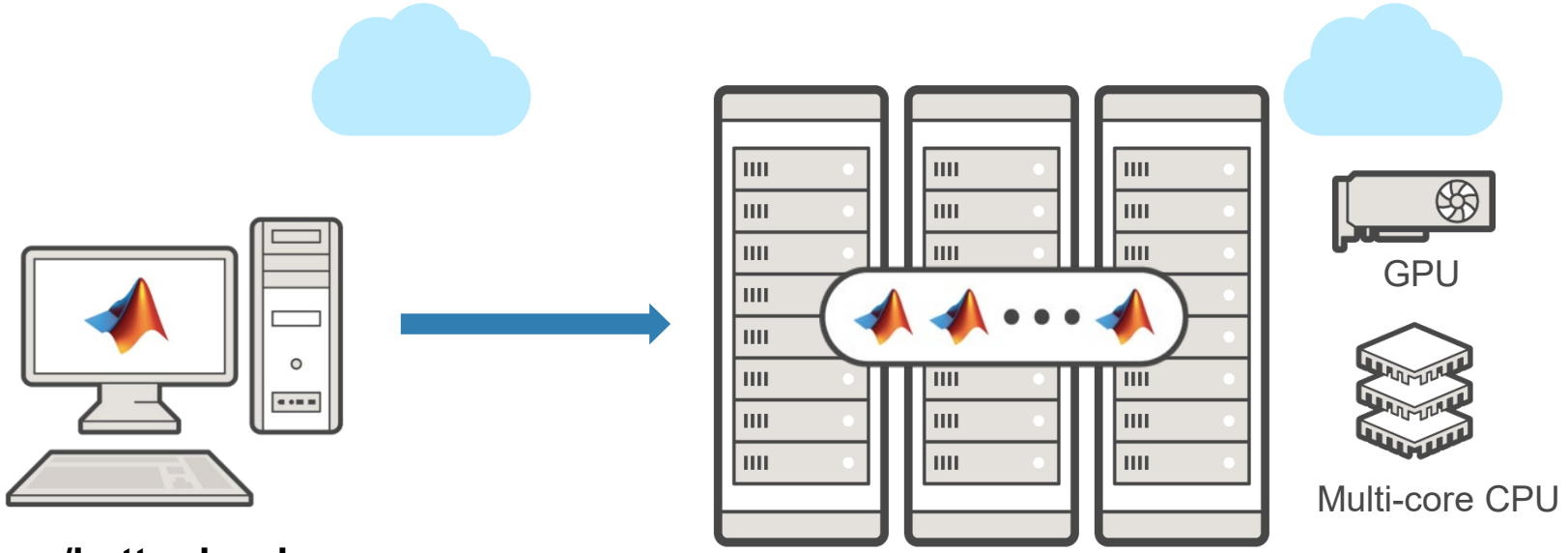
https://www.coursera.org/specializations/practical-data-science-matlab

Integration with Technology

MATLAB and the Analytics Ecosystem



Scale Up Computations



- **More /better hardware**
- **Proximity to cloud data**

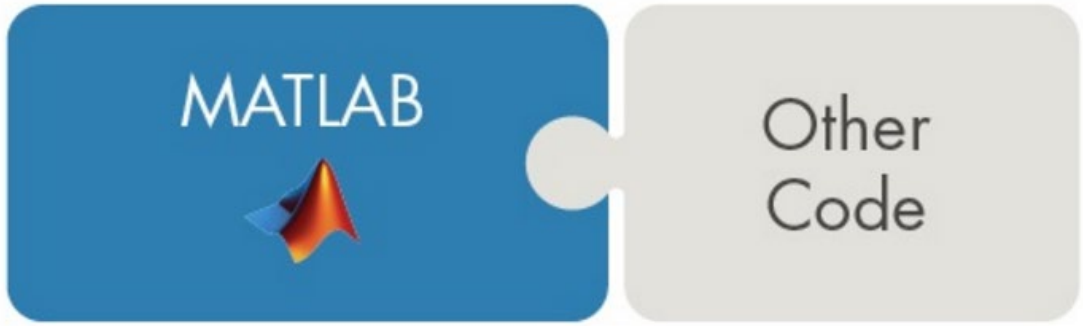
Even more hardware to meet scaling needs

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

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

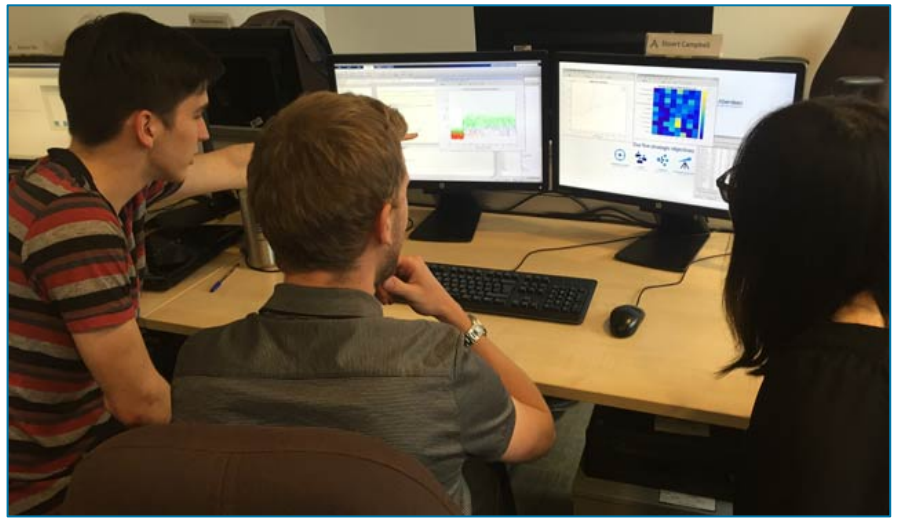
Improve asset allocation strategies by creating model portfolios with machine learning techniques

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



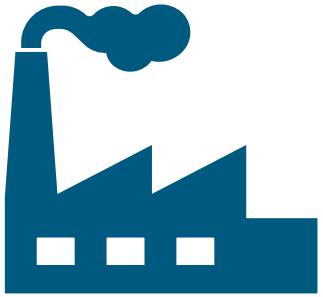
Interns using MATLAB at Aberdeen Asset Management.

"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

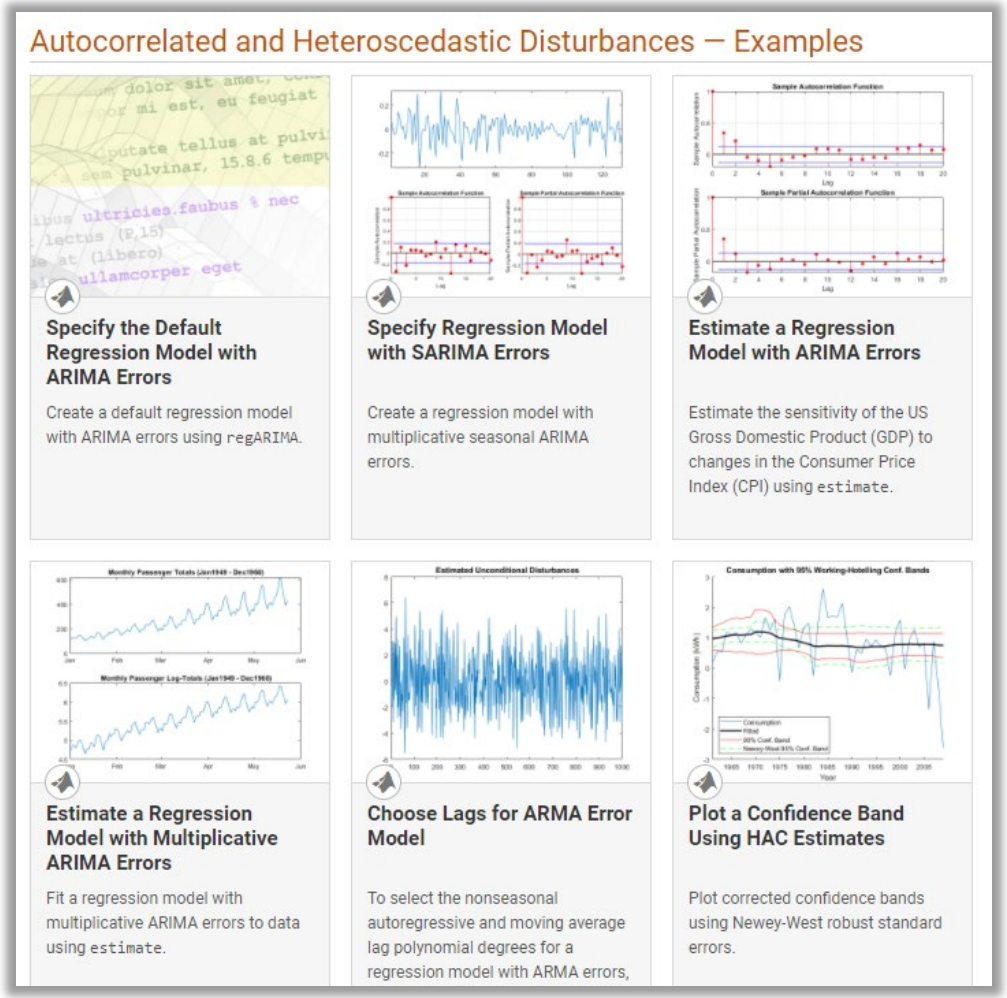
Link to user story

Keep up with Industry Trends



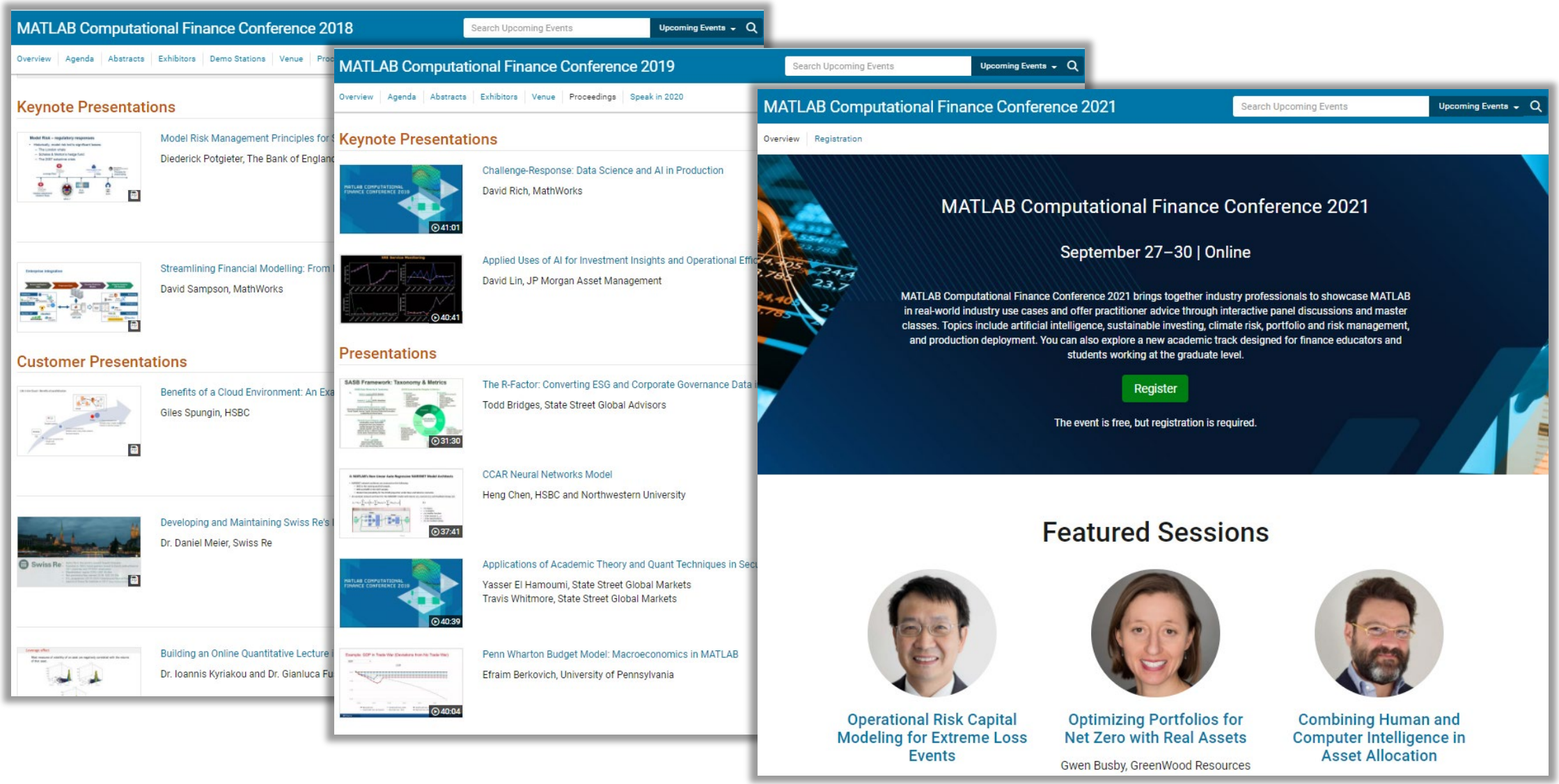
Industry Workflows

[Solutions - Industries]

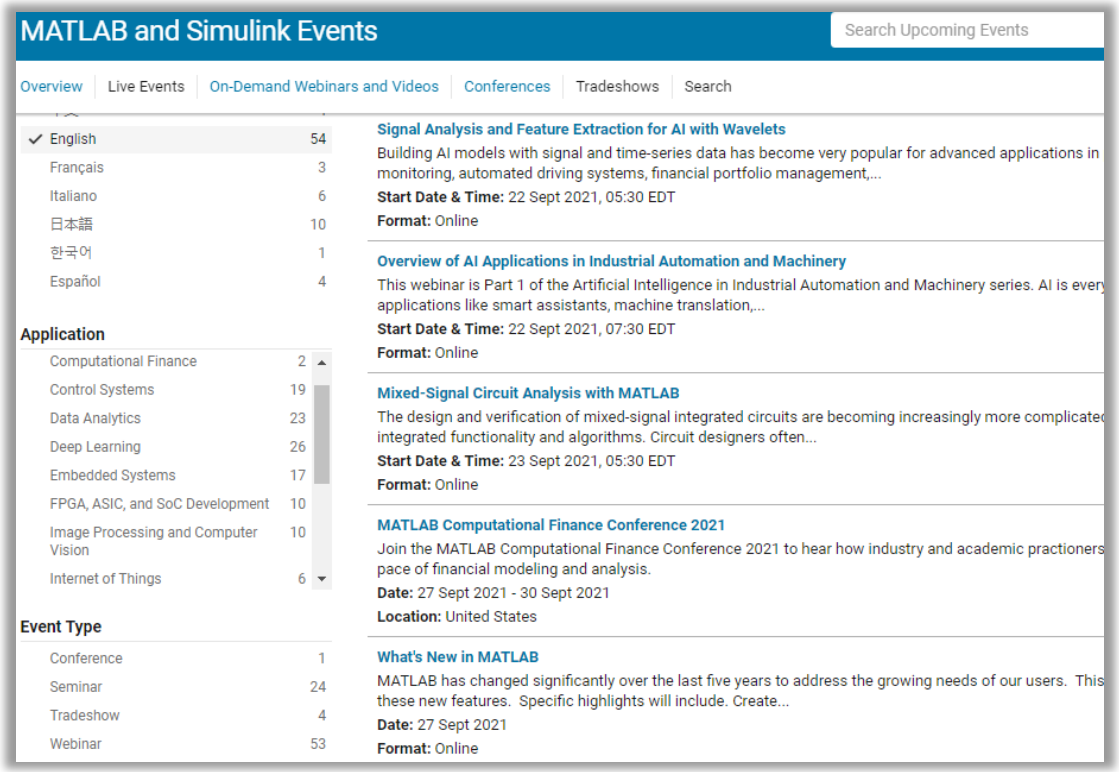


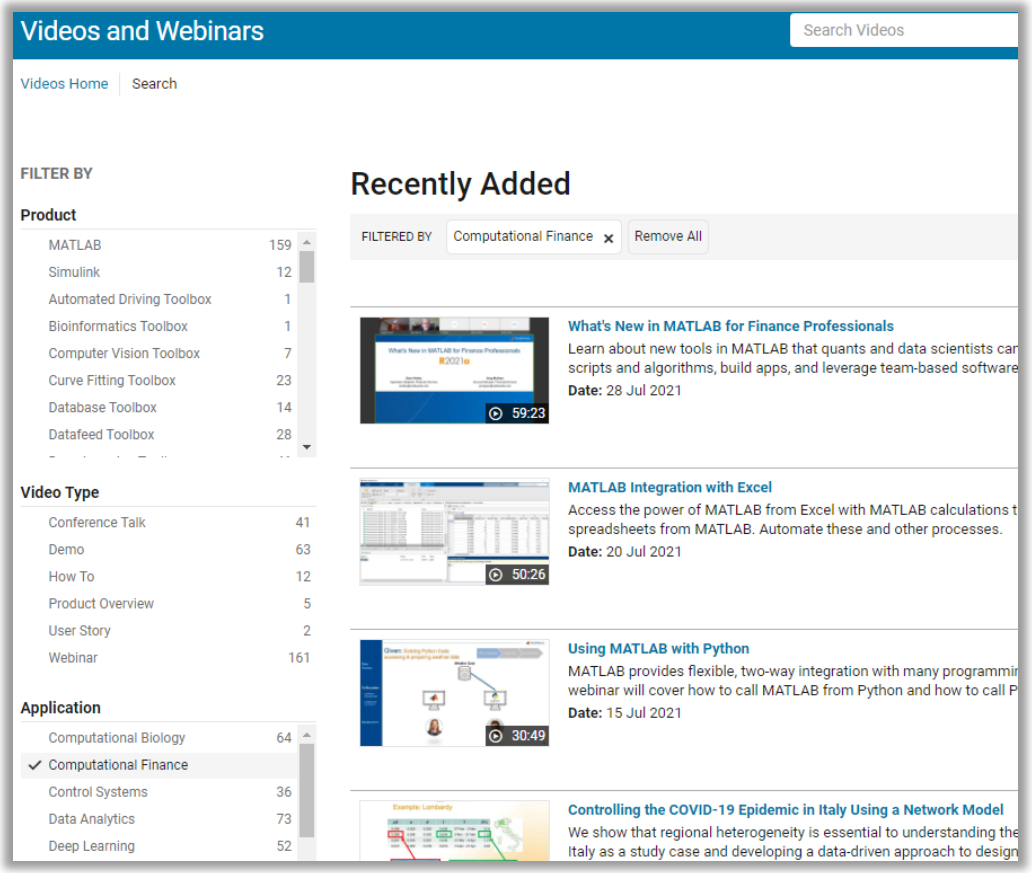
[Examples - Documentation]

Conferences



Live Events and Videos





[Upcoming Events]

[On-Demand]

Example of Live Webinars

Recording

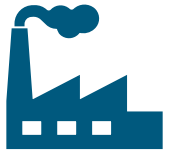
Date	Webinar Topic
Oct 5, 2021	Using MATLAB to Develop & Deploy Financial Models
Oct 13, 2021	Machine Learning and Credit Risk Analysis with MATLAB
Oct 26, 2021	Asset Management with MATLAB
Nov 10, 2021	Sentiment Analysis with MATLAB

Series Registration Link

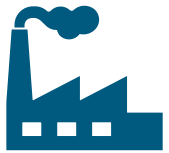
Call to Action

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