

The Secret Life of Models in Banking

Why Financial Services is the Ultimate Playground for Curious Data Scientists — and Why Model Risk Management Underpins It All

WELCOME & INTRODUCTION

Brief personal journey

Engineering to Leadership

From planning a life in academia to finding surprising paths to science application.

Interdisciplinary Data Science

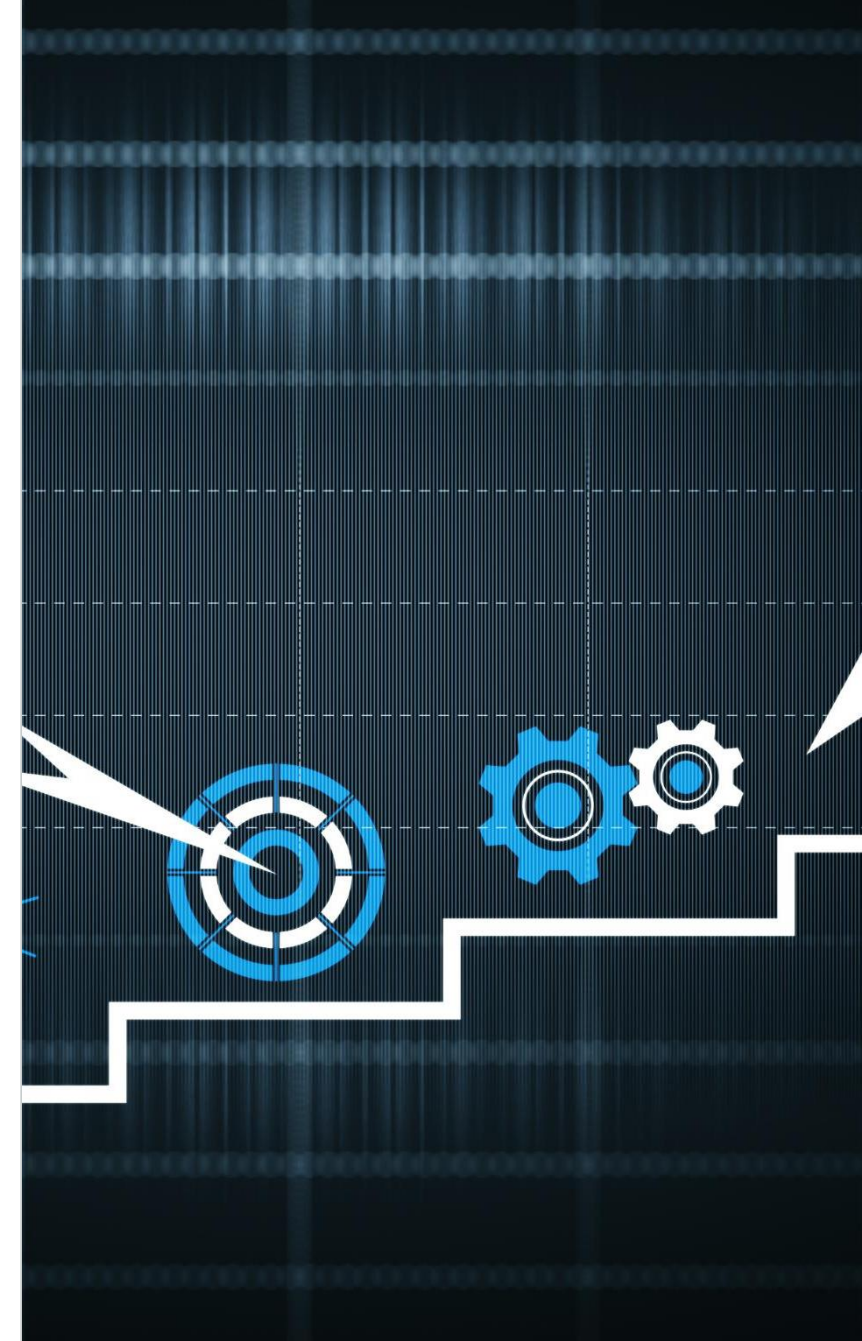
Discovering methodology is crucial, but it's not all that is required.

Leadership in Risk

Critical thinking, deep understanding of the underlying problem and associated risks.

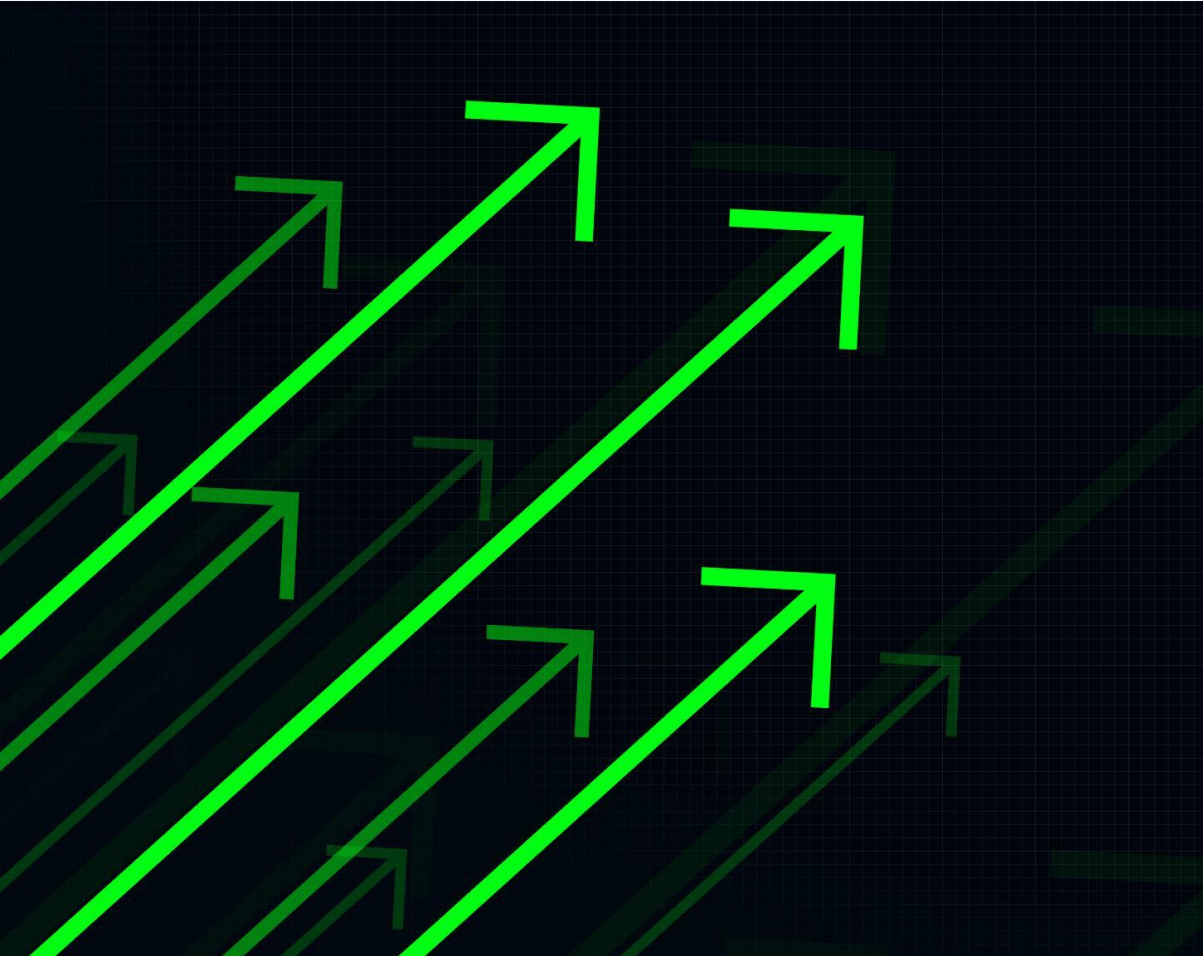
Inspiration for Career Paths

Growth and evolution of the space over 30 years.



THE ROLE OF MODELS IN FINANCIAL SERVICES

Model definition and components



Definition of a Model – yes, it STILL matters.

SR 11-7 definition:

*“a quantitative method, system, or approach that applies statistical, economic, financial, or mathematical theories, techniques, and assumptions to process input data into quantitative estimates. A model consists of three components: an information **input component**, which delivers assumptions and data to the model; a **processing component**, which transforms inputs into estimates; and a **reporting component**, which translates the estimates into useful business information”.*

Why?

Defines the scope of scrutiny

Dictates scope of Model Risk Program

- How about:
 - Models with qualitative/judgmental inputs
 - Chatbots?
 - Other examples?

Some key applications of models

Credit Risk Scoring

Models assess borrower default likelihood to manage credit risks effectively.

Fraud Detection

Detection models identify suspicious financial transactions to prevent fraud.

Customer Segmentation

Models segment customers to optimize targeted marketing strategies and engagement.

Forecasting and Stress Testing

Forecasting models evaluate financial resilience under various economic scenarios.

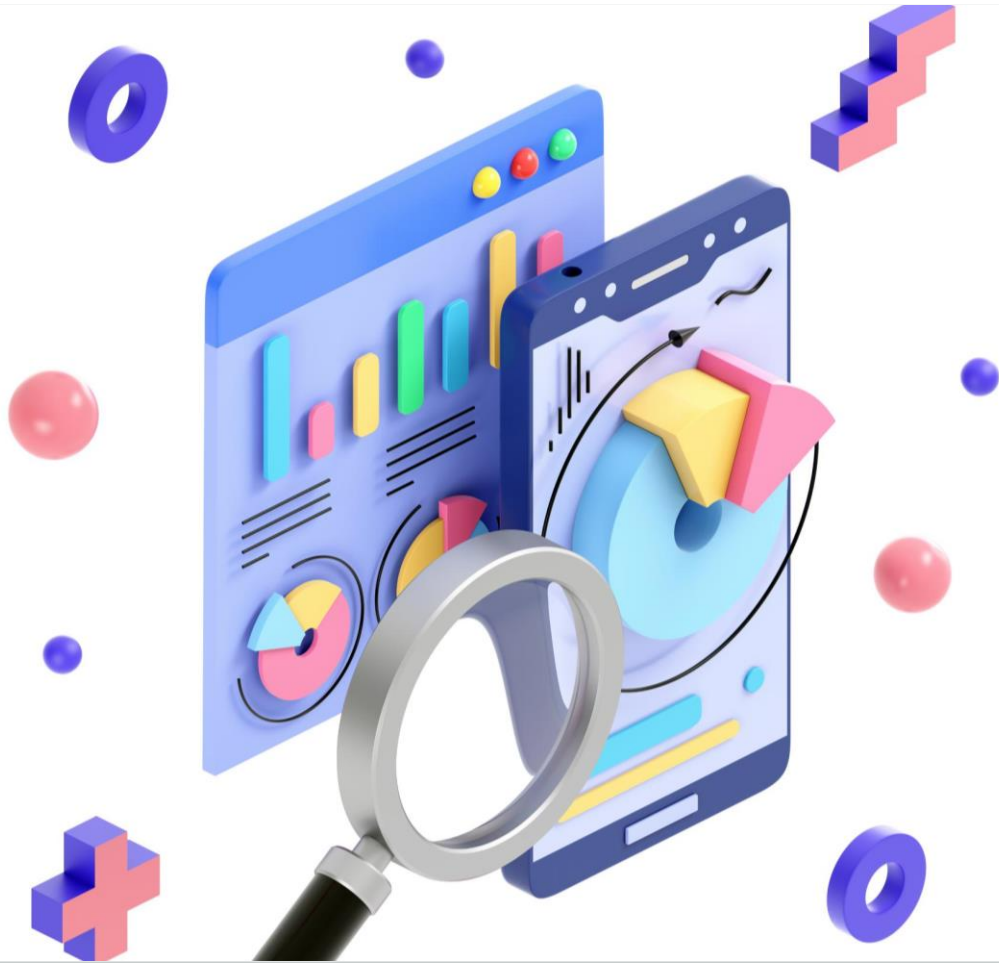
Valuation of Assets

Models determine the monetary value of financial assets for informed decisions.

Operational Planning and Efficiency

Models determine required capacity for key functions like customer service, collections etc

Real-world impact of models – What's at stake?



Lending Decisions

Models assess borrower default probabilities determining access to credit.

Financial Stability

Models are key tools that input into capital and financial planning, helping maintain financial stability and prepare for market or environment fluctuations.

Customer Trust

Models are central to customer trust by enabling reliable and consistent decisions.

Operational Resilience

Models help understand operational bottlenecks; project resource needs to ensure smooth operations.

Regulatory Compliance

Models support regulatory compliance by ensuring adherence to financial standards and reporting requirements.

MODEL RISK MANAGEMENT



Model Risk: understanding how models cause harm

Not all Models are created equal

Model Complexity, reliance on the use and impact all matter.

Independent function

Independence ensures objectivity of evaluation of the model's risks.

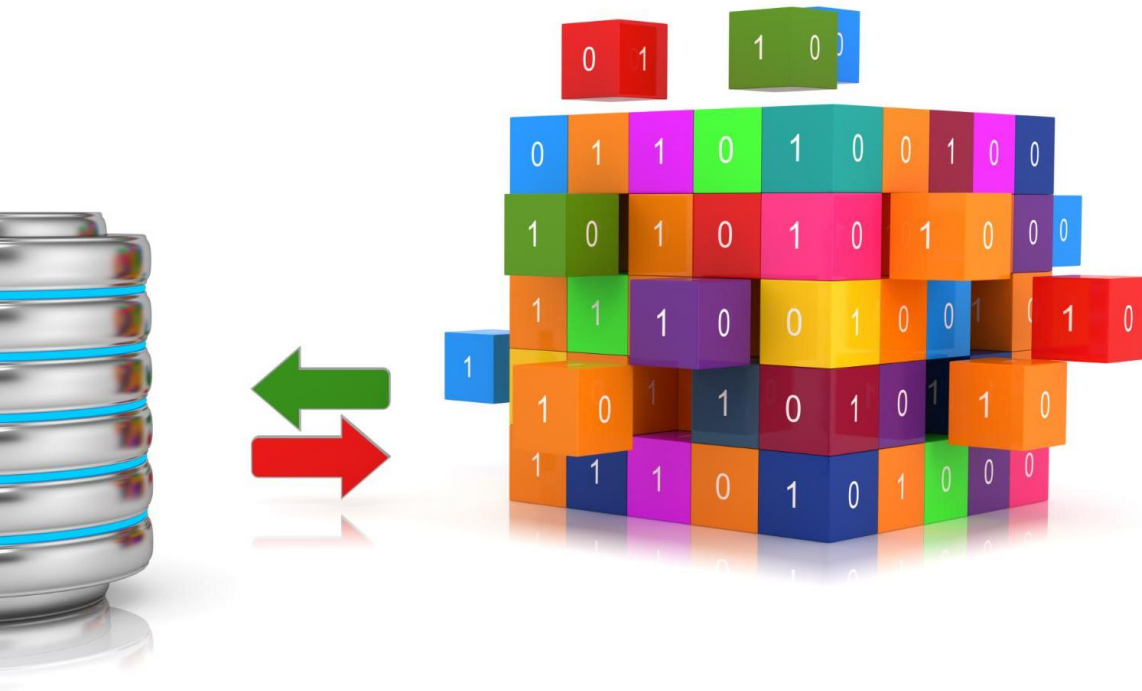
Program Design

Large institutions require programs that provide role clarity, efficient , repeatable and transparent processes, centralized systems and governance

Model Lifecycle Management

Model Development, Implementation, Validation, Monitoring.

How models break



Data Issues

Models can fail due to inaccurate or biased data that compromises their effectiveness and fairness.

Conceptual Flaws

Unsound model assumptions, or faulty application of theory lead to conceptual flaws that undermine model validity.

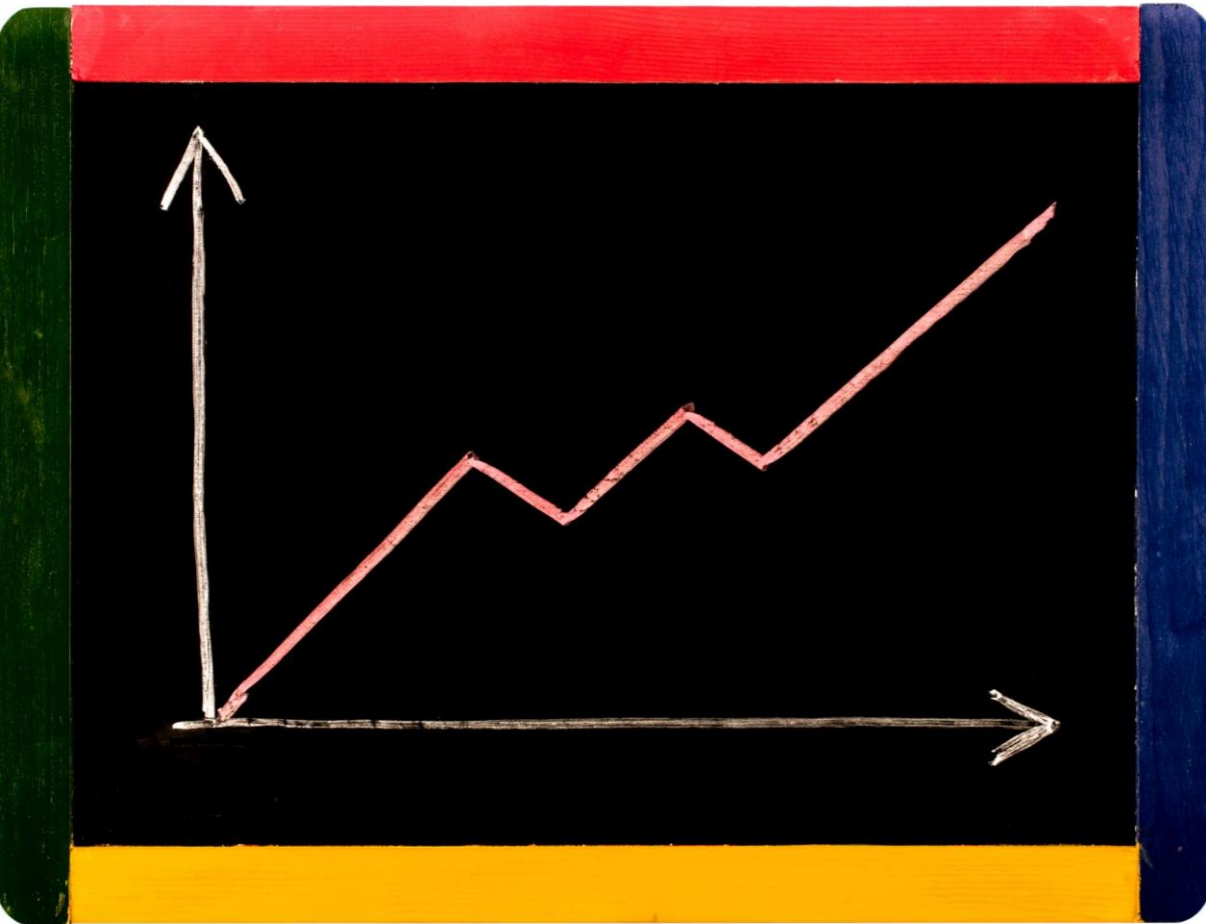
Implementation Errors

Errors during model deployment or coding mistakes cause failures and unreliable results.

Performance

Model performance can deteriorate, even without a changing environment, effective monitoring is one of the most important model controls.

How models are misused



Inappropriate Model Application

Using models in unsuitable segments leads to poor performance or incorrect decisions

Ignoring Limitations

Failure to recognize model limitations increases risk of flawed decisions and errors.

Overlooking Interdependencies

Ignoring relationships between models can lead to undetected changes or impacts on performance

Process changes unaccounted for

Changes in the processes where the model is used may change its inputs, applicable populations: data drift, changed target variables can be particularly harmful

Misunderstood error or variance

Where is the model weak? Models taken as deterministic outputs vs estimates.

Model Validation – one step in Model Risk Management



Validation Process

Model validation independently reviews a model to determine if it is “fit for purpose”:

- Is it conceptually sound?
- Does it perform at an acceptable level for its use
- Does it provide stable/reliable outputs
- Was it correctly implemented
- Is monitoring is adequate

Validation outputs

Validation will provide approval/rejection of a model. If a model is approved, it may also provide:

- Areas where the model needs to be improved
- Model Limitations or restrictions of use

One part of Model Risk Management

Validation is a key component of model risk management; however it is not all that is required for effective risk management.

CURRENT CHALLENGES IN THE INDUSTRY



Obvious challenges

Interpretability vs Complexity

Leveraging more data, more complex algorithms and methods vs parsimonious simpler methods.

Human in the Loop Myths

AI is complex and “human in the loop” can only go so far.

Responsible AI Integration

Ethical, regulatory, and operational factors must be considered to deploy AI responsibly in financial high-stakes environments.

Academic vs. industry challenges

Data Quality and Governance Challenges

Industry faces significant challenges in managing data quality and governance unlike academic environments which often assume these issues are resolved.

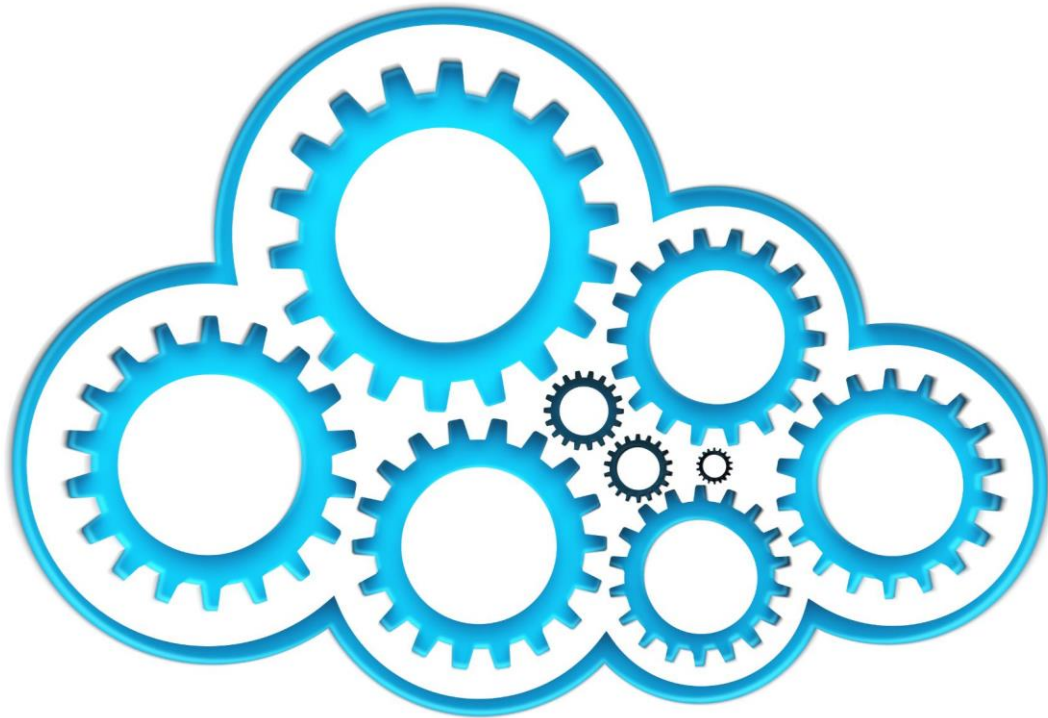
Data Lifecycle Management

Handling the complete data lifecycle in industry requires robust infrastructure to manage data ownership and governance, creation, storage, and archiving effectively.

Bridging Theory and Practice

There tends to be a gap between theoretical models in academia that start from a clean, available data set and their practical implementation in industry's complex real-world settings.

Less obvious (less shiny too!) challenges



Accelerating Development Cycle

Speeding up the transition from model development to deployment is a key industry challenge needing efficient processes.

Adapting to Market Changes

Industries must continuously adapt to macroeconomic shifts and changing consumer behaviors for sustained success.

Models break easier in rapidly changing environments when they are most needed

Infrastructure Limitations

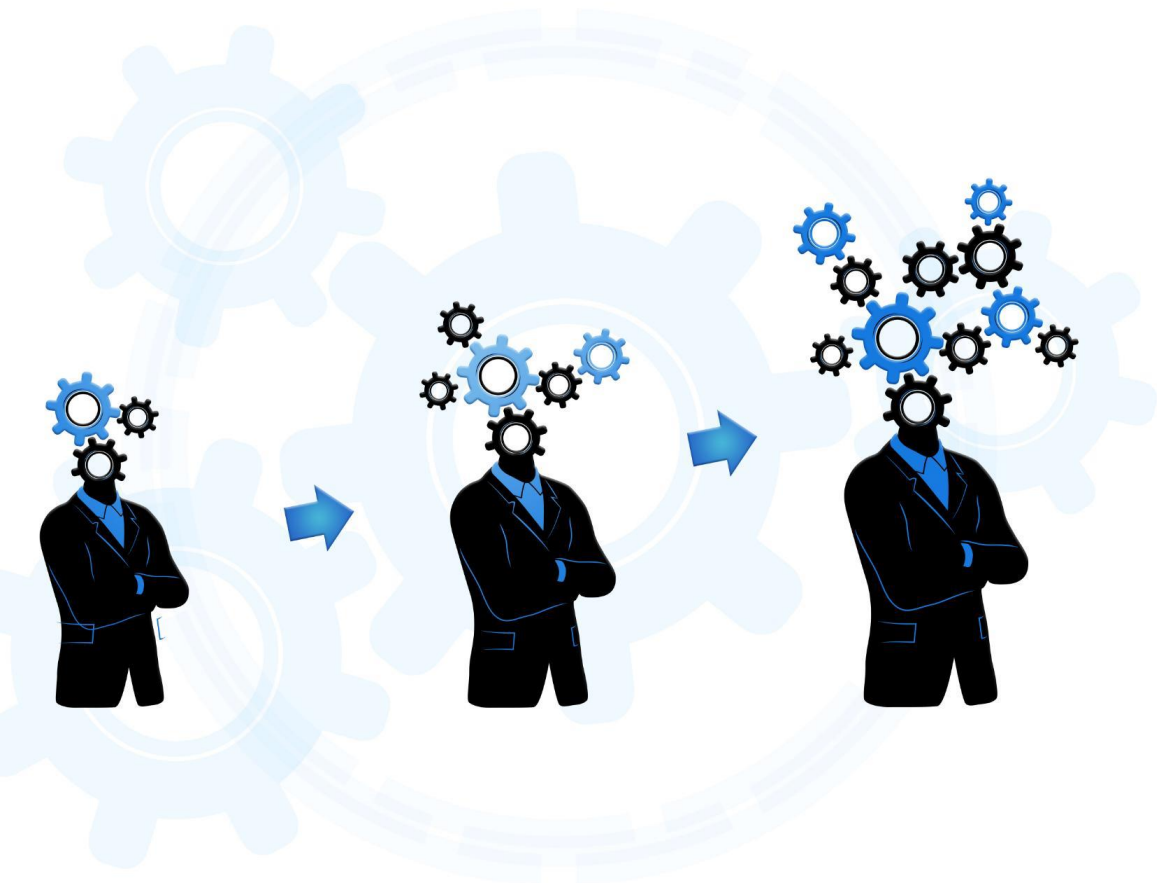
Overcoming constraints in infrastructure is essential for supporting new technologies and scaling operations.

Cost-Performance Balance

Balancing cost-effectiveness with high performance requires strategic investment and innovation.

CAREER OPPORTUNITIES FOR DATA SCIENTISTS IN BANKING

Roles and pathways



Model Development

Model developers create predictive models to support banking decisions and strategies.

Model Validation

Model validators ensure that predictive models perform accurately and reliably.

Analytics Specialists

Analytics specialists extract insights from models and observed data to define strategies across lines of business and model uses.

Data Engineering and Analytics

Data engineers manage data pipelines for efficiency and reliability in delivery

Software/Tool developers

Develop tools that can enable easy access and execution of models and data and build analytical tools that are leveraged by analysts and model developers

Skills in demand



Technical Expertise

Expertise in statistics, machine learning, and programming languages like Python, R, and SQL is crucial for data scientists in banking. Understanding of operating environments, software development and process optimization are a big plus



Communication Skills – Business Acumen

Effective communication enables data scientists to explain complex insights and collaborate across teams in financial services. Ensuring understanding of the underlying businesses and processes that the models are serving differentiates a good analyst from a great one



Creativity and Experimentation

Creativity and willingness to experiment and learn from failure help data scientists innovate and solve complex problems, while effectively managing limitations.

Q&A AND OPEN DISCUSSION

CLOSING THOUGHTS