Welcome to IEOR 4574:
Forecasting: *A Real-World Application*

Bio

- AI Healthcare and Commercial Innovation executive with over 15+ years of experience in AI and Data Science, leading for 10+ years large and diverse teams to deliver enterprise AI and digital solutions using Machine Learning, Deep Learning, and NLP aiming at making people's lives better. Led AI and Data Science at Unilever, Johnson & Johnson, and Philips. Created multi-million-dollar ($MM) impact through innovations, new market insights, growth, and cost savings. Led the development and adoption of Consumer-Centric Healthcare and Marketing AI and Advanced Analytics solutions to create business impact through Insights, Prediction, Personalization, and Automation.

- In leisure time, enjoy Exploring through photography and reading books.

Syed Waseem Haider, Ph.D.

INTRODUCTION TO FORECASTING: IEOR4574

Syed Haider, Ph.D.

AI → Forecast → **Executive Leaders Sponsor** | Change Management | Governance & Ownership | Scenario Analysis →

- Topline Growth
- Cost Avoidance
- Course Correction
- Competitive Advantage

Industry

- Forecasting business financials, market demand, and shipments especially when resources are scarce due to COVID-related disruptions.

- Forecasting in the healthcare impacts on population health, disease progression, the spread of pandemic, provider demand, and Medicare/Medicaid expense growth.

Opportunity Size

- Topline Growth: ~ 3%

- Accuracy Gains (over manual forecasts): 20% – 50%

- Efficiencies in Lost Sales and Product Disruptions: 65%

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Intent: What?
Thought Leadership
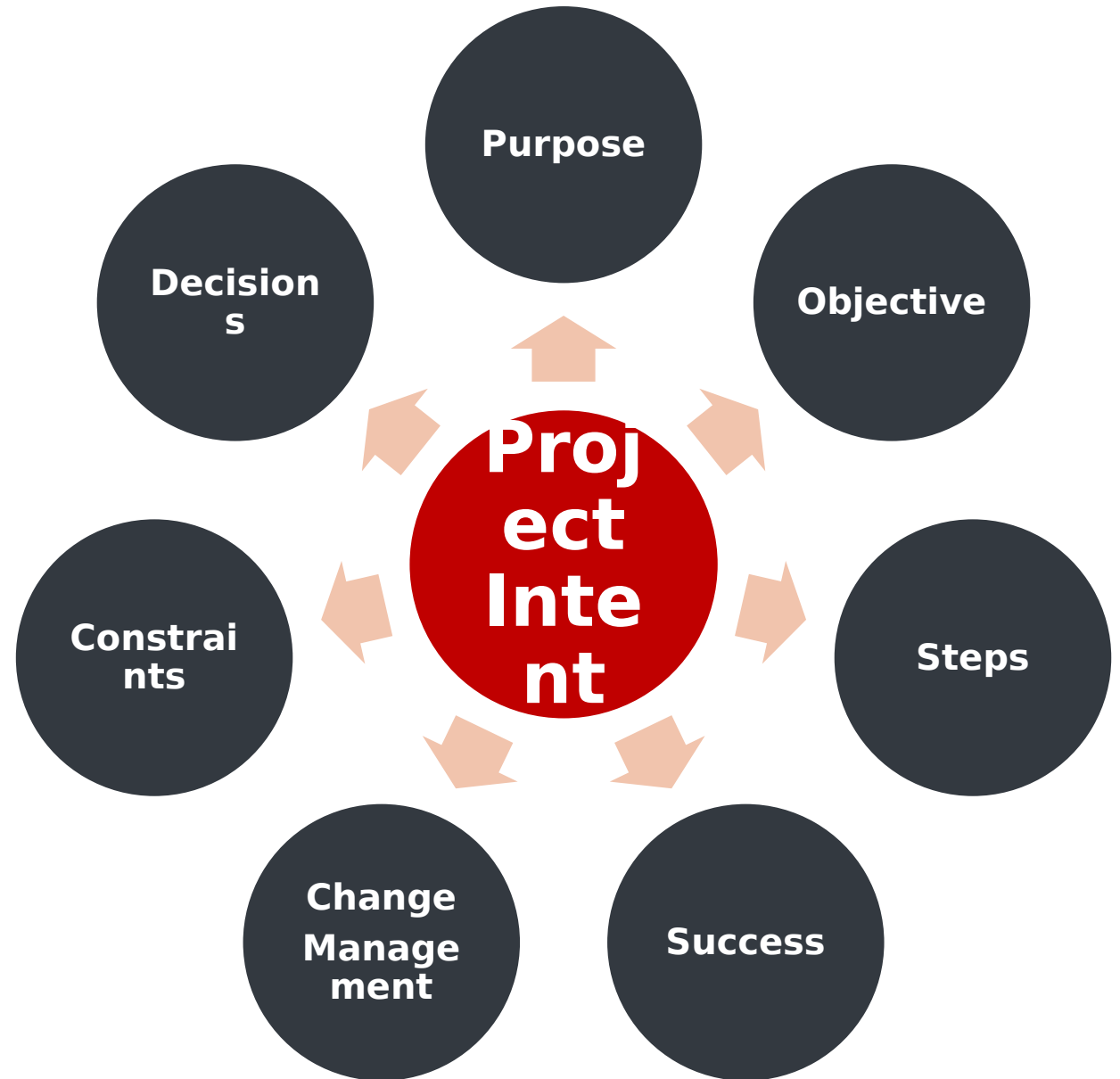
Growth Analysis

■ Drivers of growth

– *Price, gross margin, distribution of products, market penetration, loyalty, productivity, incrementality, material complexity, shipment rate, media investment, coupons, consumer demand, etc.*

– *Exogenous: COVID stringency index, consumer expenditure index, price of commodities, peanut butter price, inflation rate, unemployment rate, crude price, etc.*

– *Seasonality and trends.*

Scenario Analysis and Planning

■ What-if?

  – *Pull the levers*

  – *Eminent scenarios simulations*

  – *Business decisions impact*

Forecast vs. Actuals

- Visualization of actuals and retrospective forecasts, e.g., Q1, Q2, etc.

- Accuracy intervals and forecasting bias.

- Feedback loop to improve forecasts.

- Manual override on the Forecasts for business inputs.

Forecasting Effort Size

- 40 % model development, and 60% stakeholder management and adoption support.

- Maintaining active backlog for improvements and continuous improvement cycles.

- Weekly, monthly, or quarterly refreshes.

- Automation of pipelines through Dev Ops (ML Ops) teams.

Switching Gears – Software Engineering for the Data Scientists

- Principles of Software Engineering for Data Scientists

  - *Clean code – use convention for variables and use a dataframe to organize data.*

  - *Modular code – break down code into functions and modules with clearly defined input and output arguments. Refactor repetitive code.*

  - *Optimal code for time and memory – avoid 'for' loops, use dataframes, vector operations, and lambda. Understand big 'O' notation and algorithms.*

  - *Version control – don't throw away code! Use a self-defined version control or Git repository to check in code. Any code written is the IP of the company.*

  - *Comments and documentation – write code for team members to follow with plentiful comments and detailed documentation.*

Design the Solution for Business

- Don't jump into coding before thinking.

- Think of the end-to-end design of the solution – Architecture.

- Write code to build automated solutions – think beyond the Jupiter notebook.

- Think about object orientation – separate entities from functions.

- Design scalable solutions.

- Prioritize User Experience (UX) – insights for quick decision making.

- Actionable insights for successful adoption.

Q&A