

Scope of the Course

- **How is ISE view of Analytics different from CS Data Science, and Marshall Analytics?**

- CS View of Data Science: Face Recognition, Speech Recognition
- Marshall View: Use Software (e.g. SAS) to make Business Decisions
- ISE View: Models for Transforming Data to Decisions

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- **What kind of Background?**

- Computing: We expect students to have had some programming experience, although we will introduce students to Python and R
- Statistics: Regression, hypothesis testing. We will go over other stat/machine learning concepts such as overfitting, generalizability and others
- Optimization: Linear Programming, but we will introduce some Stochastic Programming models

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- **Interfacing Data and Decisions?**

- Cross-sectional Data
- Time Series Data
- Spatio-Temporal Data

Modern OR APPLICATIONS with Big Data and Big Decisions

Integrative Analytics

- **Coordination** of Sales, Marketing and Production (Cross-Sectional Data)
- Inven



Analytics of Things (AoT)

- **Renewable Energy Integration**



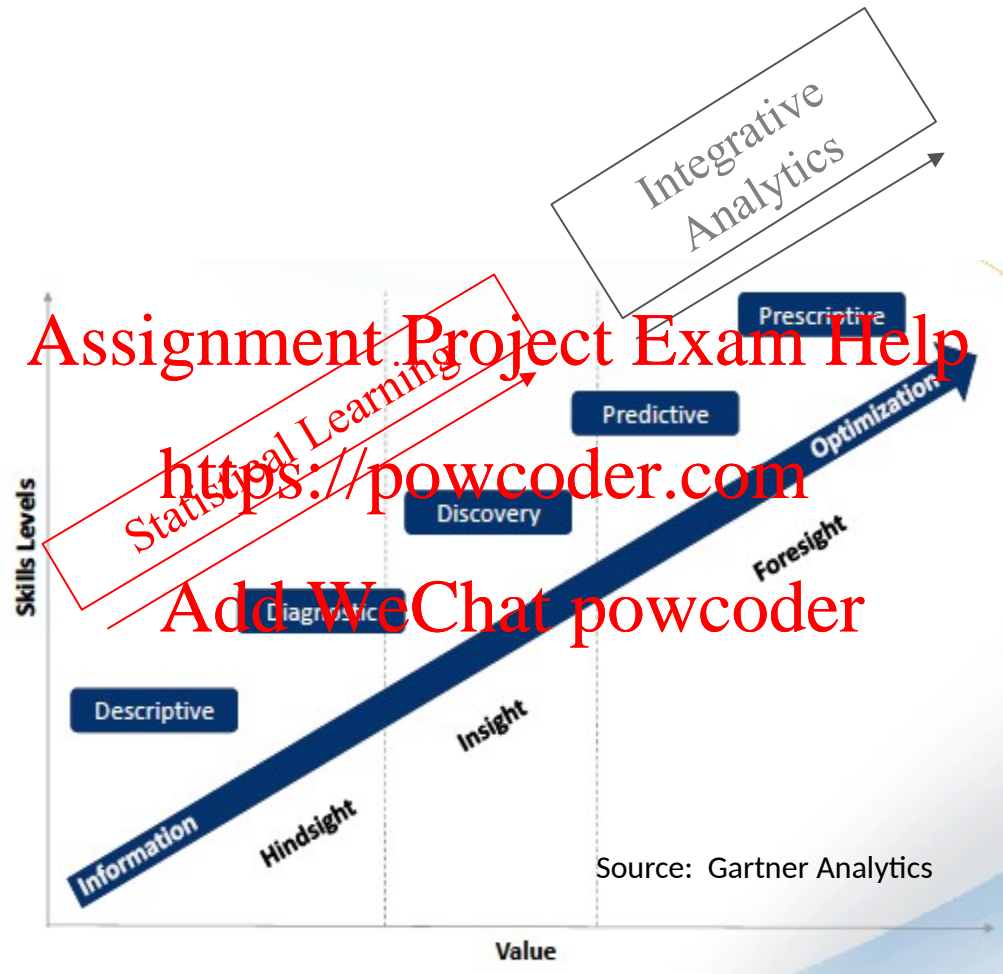
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Modeling Paradigm LEARNING ENABLED OPTIMIZATION

THE SPECTRUM of ANALYTICS



New Generation of Optimization

- Example Application: Advertising+Production Planning
 - Sales Projection based on Regression
 - Use Sales Projections (data) in Production Planning
 - How should one create a production plan when sales are forecast using regression ? (**Cross-sectional data**)
- Example Application: Inventory Models
 - Consider the “R” data set called elecequip
 - 10 years of Time Series Data
 - How should one create an optimal ordering policy when the data is a **time series**
 - **Alternative types of mean-reverting processes**
- Example Application: Renewable Energy
 - Wind data exhibits **spatio-temporal (correlated) data**
 - Validated off-line simulation can be used for simulation as a proxy for data
 - How should one use **simulation wind output** in a unit-commitment cum dispatch model
- Other types of Data:

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Ocean Ship Logbooks (1750...)
122 Scripts · 26 Topics



2013 American Community...
779 Scripts · 49 Topics



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330 Scripts · 18 Topics



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Modern data sets: all kinds of Data

• Healthcare Costs Energy Usage

• Nutrition Content College Debt

What is "Diet Problem into the New Millenium?"

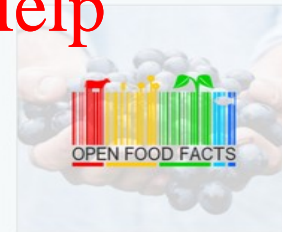
• Transportation Costs etc..

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Health Insurance Market...
1 Script · 0 Topics



World Food Facts
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May 2015 Reddit Comments
771 Scripts · 32 Topics



2013 American Community...
710 Scripts · 47 Topics



NIPS 2015 Papers
135 Scripts · 5 Topics

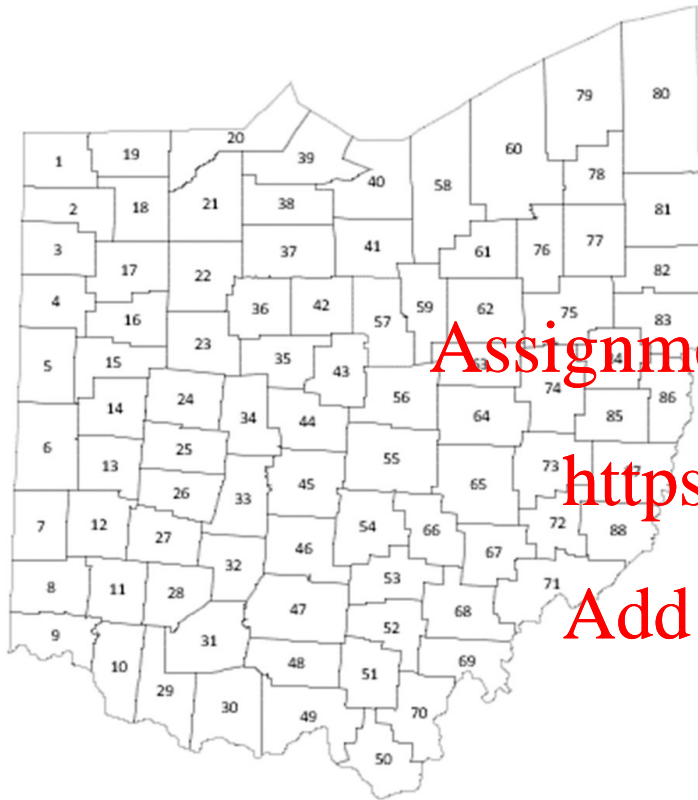


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The Analytics Problems of Today
Ask that We Use Optimization
Methodology which will put a
Strong Foundation for Analytics



Ohio Banking Problem



* New Law (2019) A Bank can put branches in any county where the bank has a principal place of business and in any county adjacent to one in which it has a principal place of business.

*Counties in Ohio (marked by the shapes in the map)

*New Law (1979) ... A Bank can put Branches in any county where the bank has a principal place of business and in any county adjacent to one in which it has a principal place of business.

*What is the minimum number of principal places of business, and in which counties should they be located to enable branches in all eighty-eight counties of Ohio?

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State of Ohio, and Counties

HW 1 (For Teams of Two)

1. Using population data of Ohio counties from the data closest to the year prior to 2011, **instantiate** the **Branch Location formulation** discussed in the Tutorial by Jeff Camm.
2. Using population data for 2020, **instantiate** the **Branch Location formulation**.
3. Compare the solutions, and discuss whether the "glide path" property presented in the paper applies to the decisions which you obtained.
4. Suppose that in 2011 you had a crystal ball into 2020, and wanted to use that population data during the 2011 run. Formulate a model that enforces the glide path property for 2020.

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