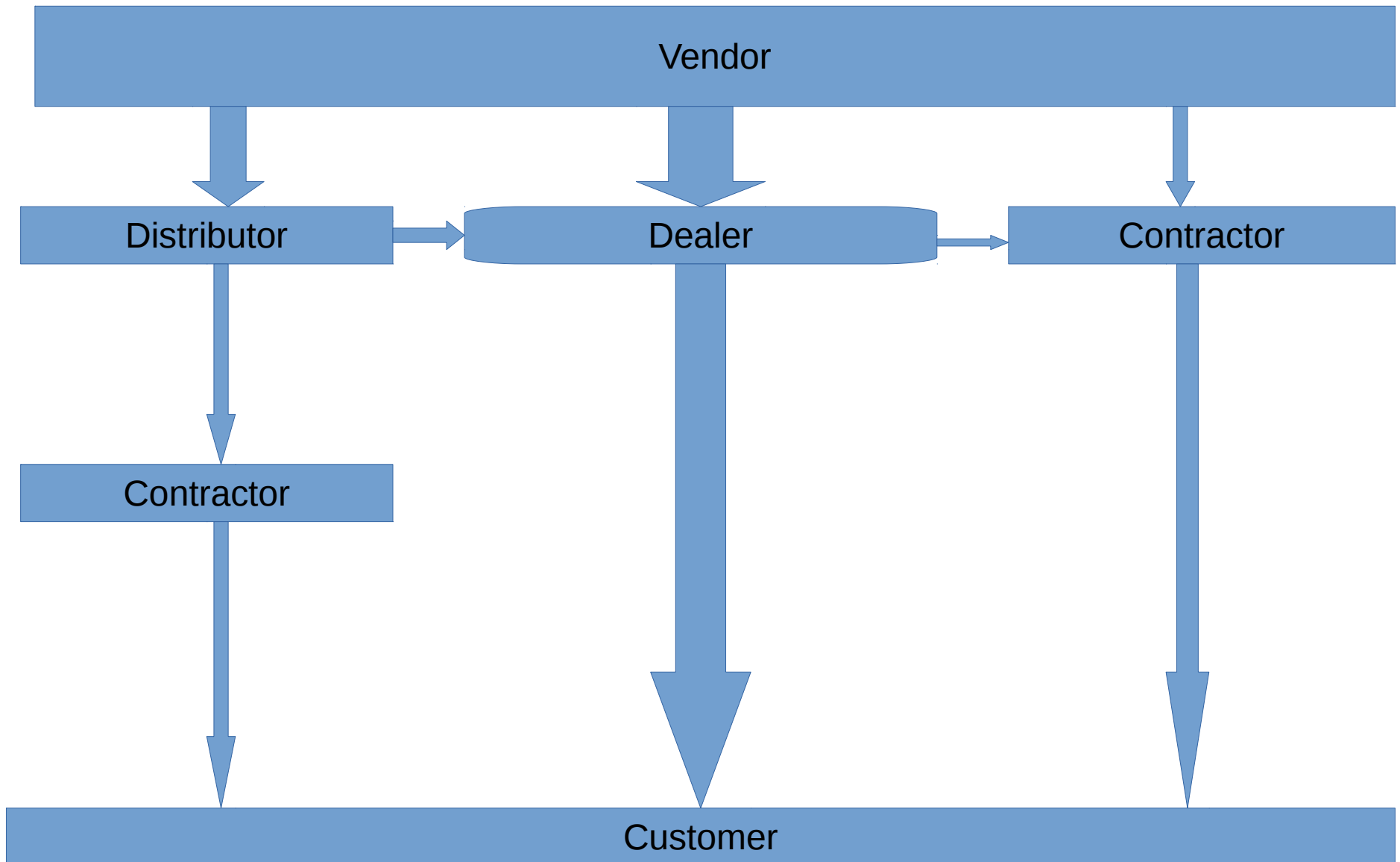# Forecasting Sales In Multi Tiered Distribution Channels

Dennis Graham

BS – Engr Physics    MBA – Finance

Over 30 Years As C level executive or senior staff

# Distribution Channels

Vendor

Distributor → Dealer → Contractor

Contractor

Customer

# Forecasting Sales In Multi Level Distribution Channels

- Forecasting sales in distribution models difficult
- Predicting high and low performers inaccurate
- Time series analysis combined with current belief is state of the art

The purpose is to apply machine learning techniques

to a traditional problem.

# Analytical Flow

- Merge data from multiple sources and formats

- Apply factorization to missing and sparse data

- Apply Random Forests to mixed data types

- Use switchpoint analysis to display and verify

# Actionable Results Required
# By Dealer By Quarter

- Prediction of performance as above or below average

- Identify key causal features

- Sales forecast by dealer

# Summary Data

Number of Dealers:  4048

Dealers With Above Average Performance:  729

Above Average Performance Sales Gain:   5% or more

Dealers With Below Average Performance:  568

Below Average Performance Sales Loss:  -5% or more

Most Common Causes:  Technical support, commitment,
    product capability, payment history

# Summary Statistics

- Sparse Data
  - Pylibfm recommender   MSE .5 on 5
  - 130K empty within 240K total data points
  - Previous technique achieved MSE of 1.1
- Forecast Sales With Random Forest
  - Total Predict Up = 729, Total Predict Down = 568
  - FP Up = 113  FN Up = 20
  - FP Down = 28 FN Down=112
  - Up MSE = .20  Down MSE = .15

# Compact Results Presentation

Enter dealer number:  1006

Dealer Identity:

    Dimension Data, Inc.  New York NY
Forecast
        Performance:  Moving up
        Sales:  $112 Million up from $102 in prior quarter

Causes: Time in business, competitive comparison, support team comparison

Sales Over Time Chart:  y(n)

Estimated Switch Point: (returned by program)

# Next Steps

- Complete time series analysis
- Install on website
- PCA on features
- Cluster causes
- Apply decision trees to categorical data
- Better method of consolidating multiple responses
- Pickling and multi processing

# Contact Information

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Sales Forecasting In Multi Tier Distribution Networks

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