Machine Learning and Analytics in Logistics and Supply Chain

Presented by:

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Agenda

- Supply Chain: Challenges and Trends
- Introduction: Machine Learning and AI
- Case Study – ML and AI in Supply Chain and Logistics
- Getting Started with Machine Learning
- Conclusion
Supply Chain Challenges

- Lower Prices
- Faster Delivery
- Higher customer service expectations
- Demand volatility
- High number of products
- Supply complexities
- More frequent shipments
- Transparency and sustainability

“Companies that continue to utilize traditional supply chain models will struggle to remain competitive and deliver orders that are complete, accurate and on-time.”
Today Amazon sells over 480 million products in the USA. Amazon’s product selection has expanded by 235 million in the past 16 months.

That’s as average addition of 485,00 new products per day.
A Very Long Tail Demand

<table>
<thead>
<tr>
<th>Icon</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Cart]</td>
<td>0.9 million</td>
</tr>
<tr>
<td>![Baby]</td>
<td>1.2 million</td>
</tr>
<tr>
<td>![Cosmetics]</td>
<td>1.7 million</td>
</tr>
<tr>
<td>![Stationery]</td>
<td>6.7 million</td>
</tr>
<tr>
<td>![Shoe]</td>
<td>24 million</td>
</tr>
<tr>
<td>![T-Shirt]</td>
<td>30 million</td>
</tr>
<tr>
<td>![Kitchen]</td>
<td>60 million</td>
</tr>
<tr>
<td>![TV]</td>
<td>96 million</td>
</tr>
</tbody>
</table>
Machine Learning and AI
The Future is Here

• The most innovative companies in the world – that have disrupted their respective industries – rely on Machine Learning to drive their business processes and a great customer experience

• The future of business innovation has Artificial Intelligence (AI) at its very core

• Machine Learning (subfield of AI) is no longer restricted to research labs and is fast becoming the cornerstone of business disruption
What was before Machine Learning?

**Humans** versus Machine

- **Data** → **Program** → **Results**
- **“All knowing programmer”** → **Feedback**

Deterministic Future Outlook
Machine Learning in our Business

Humans versus **Machine**

- **Historic Data** → **Learner** → **Model** → **Predictions**

  - **Decision-Making**
    - Manual (query)
    - Automatic (programmatic)
    - Push decision-making to the edge

**Probabilistic Future Outlook**
Machine Learning Explained

Groundtruth

<table>
<thead>
<tr>
<th>House No.</th>
<th>Square Footage</th>
<th>Bedrooms</th>
<th>Age</th>
<th>School Rating</th>
<th>Final Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>1000</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>$100,000</td>
</tr>
<tr>
<td>H2</td>
<td>800</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>$90,000</td>
</tr>
<tr>
<td>H3</td>
<td>1200</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>$125,000</td>
</tr>
<tr>
<td>H4</td>
<td>600</td>
<td>2</td>
<td>5</td>
<td>1</td>
<td>$60,000</td>
</tr>
<tr>
<td>H5</td>
<td>1500</td>
<td>6</td>
<td>3</td>
<td>3</td>
<td>$150,000</td>
</tr>
</tbody>
</table>

\[
\text{PRICE} (\text{Square Footage, Bedrooms, Age, School Rating}) = w_1 \times sf + w_2 \times br + w_3 \times age + w_4 \times sr
\]
Learning Algorithms

Regression

Classification

Ranking

Supervised

Unsupervised

Reinforcement
Neural Networks

INPUT
- Square footage
- Bedrooms
- Age
- School Rating

HIDDEN
- Hidden 1
- Hidden 2
- Hidden 3
- Hidden 4

OUTPUT
- Price
Deep Learning

INPUT

- Square footage
- Bedrooms
- Age
- School Rating

Hidden layers:

- Hidden 1.1
- Hidden 1.2
- Hidden 1.3
- Hidden 1.4
- Hidden 2.1
- Hidden 2.2
- Hidden 2.3
- Hidden 2.4
- Hidden 3.1
- Hidden 3.2
- Hidden 3.3
- Hidden 3.4

OUTPUT

- Price
Case Study
Transforming Supply Chain and Logistics

Business Challenge:
Develop real-time customer feedback and analysis framework to measure customer satisfaction levels.

Situation:
• Existing process was not capturing valuable customer data

Solution/Approach:
• Collect and aggregate the customer data on areas such as billing, complaints, repairs, contracts, social media and contact center calls.
• Big data analytics model provides real-time feedback and risk flagging for the customers on the verge of churning

Impact:
• Reduction in customer complaints & improved customer satisfaction levels
Getting Started

Start small by leveraging the cloud

- Low hanging fruit: Business problem – “If we just knew…”
- Start Supervised: Historic data with ground truth
- Do not start with Big Data
- Use cloud-based offerings:
  - Microsoft Azure Machine Learning
  - Amazon Machine Learning
  - Google Cloud Machine Learning
  - Big ML
Thank You

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