Data-Driven Demand Learning and Dynamic Pricing Strategies in Competitive Markets

Introduction

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Hasso Plattner Institute (EPIC)

April 18, 2017
Outline

• Motivation: Dynamic Pricing under Competition
• Goals of the Course & Grading
• Introduction: Lecturer & Students
• Structure of the Course
• What will be expected from you?
Motivation

- Opportunities:
  Online markets are transparent
  Prices can be easily adjusted
  Market data (offer prices, sales) can be analyzed
  Existing rule-based pricing strategies are suboptimal

- Challenges:
  Stochastic demand, Unknown customer behavior
  Many competitors, Steadily changing markets
  Derive successful data-driven repricing strategies
Application: Selling Books on Amazon

Data-Driven Demand Learning and Dynamic Pricing Strategies - Introduction
## Suboptimal Response Strategies in a Duopoly

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</table>

Which strategies are applied? Response Times? Relevant factors?

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*Data-Driven Demand Learning and Dynamic Pricing Strategies - Introduction*
How to find Smart Pricing Strategies?

Are there better strategies? Any ideas? Are you interested?

Data-Driven Demand Learning and Dynamic Pricing Strategies - Introduction
Technical Information

• Credits: 4 SWS (V/Ü), 6 ECTS (graded)

• When? Monday/Tuesday 13.30 - 15.00, weekly
  Start: April 18, 2017, End: July 18, 2017

• Where? D-E 9/10

• Who? Rainer Schlosser, rainer.schlosser@hpi.de
  Martin Boissier, martin.boissier@hpi.de

• Slides? HPI, Teaching, Summer 2017
Goals of the Course & Grading

• **Goal:** Build Data-Driven Dynamic Pricing Strategies for Competitive Online Markets

• **Learn:** Demand Estimation + Optimization + Simulation

• **Do:** Apply Approaches, Measure Performance

• **Grading:**
  - 10% Regular Attendance / Personal Engagement
  - 20% Performance / Design of Strategies
  - 30% Presentations
  - 40% Documentation / Paper (End of Semester)
Example: Dynamic Pricing Strategies under Competition

\[ \text{price} \]

\[ \text{time} \]

Data-Driven Demand Learning and Dynamic Pricing Strategies - Introduction
Prerequisites

- Programming
  - Parameters, Data Preparation & Analysis
  - Loops, Recursions

- Basic Mathematical Background
  - Sets, Vectors
  - Probabilities, Random Variables, Expected Values

- More does not harm
  - Regression Analysis
  - Machine Learning Techniques
  - Game Theory
Introduction: Lecturer & Students

- Lecturer: Background / Education
  Interests / Field of Research
  Expectations

- Students: Background / Education?
  Interests / Field of Research?
  Expectations?
Structure of the Course

• **Meetings:** Lectures on „Dynamic Pricing“:
  (i) Customer Behavior
  (ii) Demand Estimation
  (iii) Pricing Strategies
  (iv) Pricing Simulation Platform
  (v) Dynamic Pricing Challenge

• **June/July:** Apply & Improve Data-Driven Strategies
  Input/Support, Questions/Answers, Presentations

• **Aug/Sep:** Documentation of Projects Results
What will be expected from you?

- Use Machine Learning to Estimate Demand / Sales Probabilities
- Implement Algorithms to Compute Optimized Prices
- Simulate the Outcome of Dynamic Pricing Strategies
- Measure the Performance of Strategies
- Document your Results
## Overview

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
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<tbody>
<tr>
<td>2</td>
<td>April 24/25</td>
<td>Customer Behavior</td>
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<td>3</td>
<td>May 1/2</td>
<td>Demand Estimation</td>
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<td>4</td>
<td>May 8/9</td>
<td>Pricing Strategies I</td>
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<td>May 15/16</td>
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<td>6</td>
<td>May 22/23</td>
<td>Pricing Strategies II</td>
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<td>7</td>
<td>May 29/30</td>
<td>Dynamic Pricing Challenge &amp; Price Wars Platform</td>
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<td>8</td>
<td>June 5/6</td>
<td>Workshop / Group Meetings</td>
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<td>9</td>
<td>June 12/13</td>
<td>Presentations (First Results)</td>
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<td>10</td>
<td>June 19/20</td>
<td>Workshop / Group Meetings</td>
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<td>June 26/27</td>
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<td>12</td>
<td>July 3/4</td>
<td>Workshop / Group Meetings</td>
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<tr>
<td>13</td>
<td>July 10/11</td>
<td>Workshop / Group Meetings</td>
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<tr>
<td>14</td>
<td>July 17/18</td>
<td>Presentations (Final Results), Feedback, Documentation (Aug/Sep)</td>
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