

# Introduction

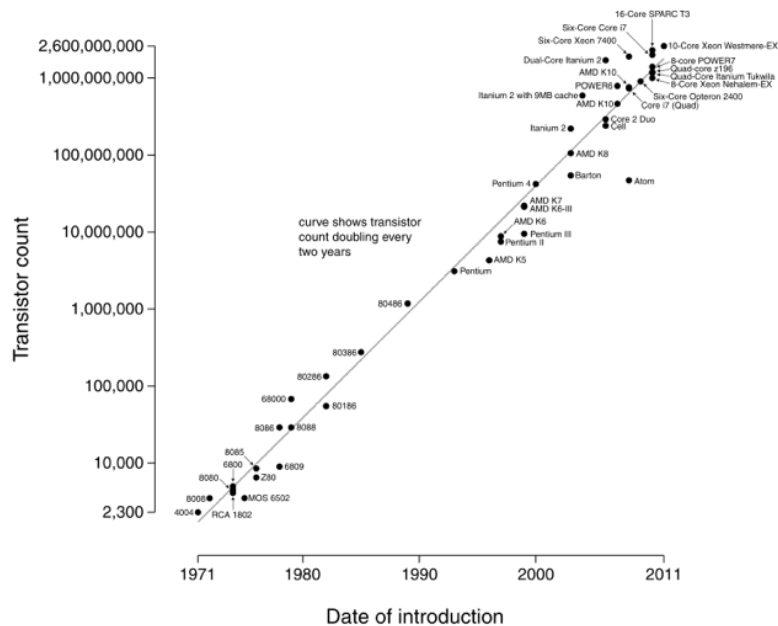
37505 Data Science for Marketing Decision Making  
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The University of Chicago Booth School of Business

2017

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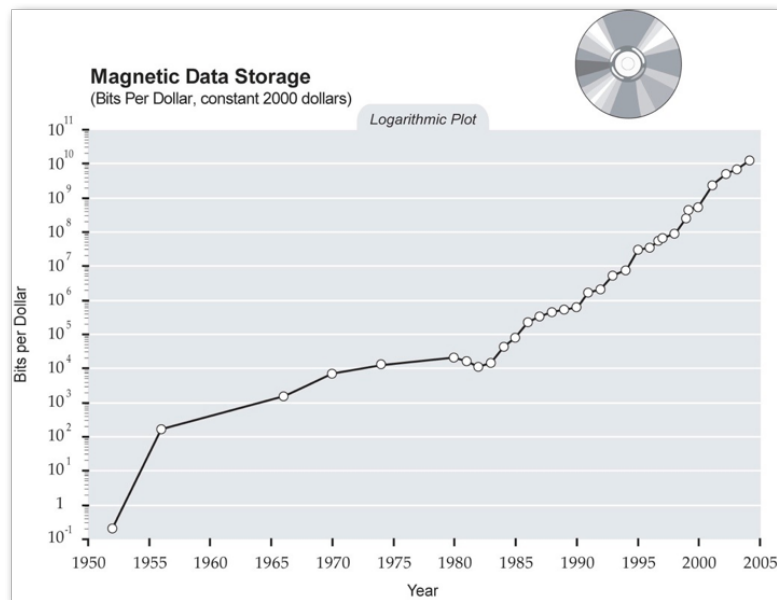
## Rapid advance of computing power

## Microprocessor Transistor Counts 1971-2011 & Moore's Law



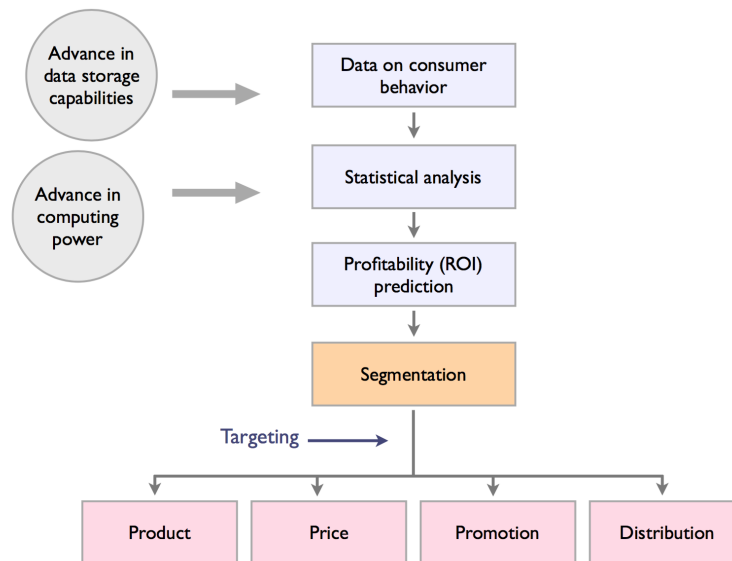
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## The era of Big Data: Rapid advance of storage capabilities



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## Data science and marketing



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## Examples of questions addressed

- ▶ How do own and competitive prices affect demand for our product?
  - ▶ Should we change the pricing structure of the products in our product line?
- ▶ Can we quantify the effects of our advertising campaign? What is the return on our advertising spending?
- ▶ Does targeting customers with catalogs or e-mail yield any incremental value?
- ▶ Can we distinguish between customers who are highly responsive and not responsive to our targeting efforts?
  - ▶ Can modern machine learning methods help us to better segment customers?
- ▶ Is customer churn predictable, and can we design targeted incentives to mitigate churn?
- ▶ What is the return on our online search or display advertising campaigns?

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## Scope of this class

- ▶ Brand management and retailing
- ▶ Consulting
- ▶ Industries that employ customer relationship management (CRM)
  - ▶ Telecom industry
  - ▶ Travel services
  - ▶ Catalog retailing
  - ▶ Online retailing
  - ▶ Financial services
  - ▶ Insurance
  - ▶ Pharmaceutical industry
- ▶ Political campaigns

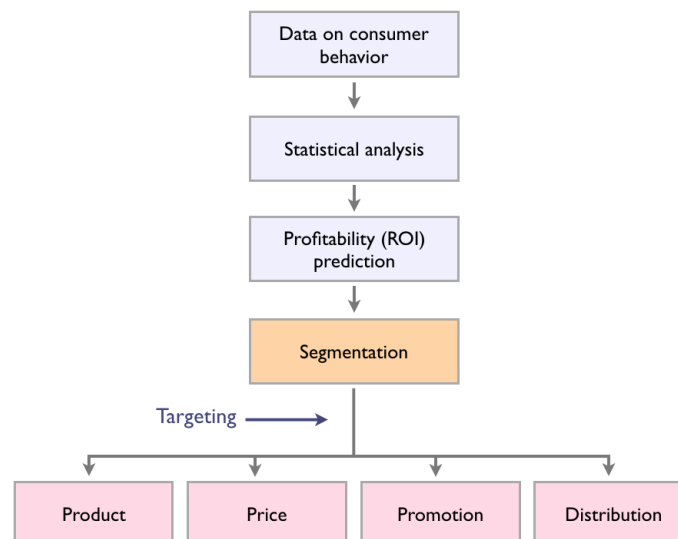
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## Who is this class intended for?

- ▶ Students interested in marketing analytics (in a broad sense)
- ▶ Students who want to acquire professional data science skills
  - ▶ Class introduces key concepts in marketing analytics
  - ▶ Focus on understanding the opportunities and challenges of marketing based on data analytics
  - ▶ Assignments are examples of how to manipulate data, estimate statistical models, and summarize the insights from the analysis
  - ▶ Skills acquired intended to be portable to many business situations

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## Data science and marketing: Example



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## Managing credit card customers

- ▶ Credit card industry is a pioneer in data-driven marketing
  - ▶ Provident (1980's)
- ▶ Questions
  1. What data are used by credit card companies?
  2. What is the goal of the data analysis?
    - ▶ What aspects of customer behavior do credit card companies want to predict?
    - ▶ What marketing decisions do credit card companies make based on the data analysis?

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## Components of credit card customer profitability

- ▶ Net present value of a credit card account
  - ▶ Acquisition cost
  - ▶ Use of card
  - ▶ Balance carried
  - ▶ Interest rate — yield
  - ▶ Retention cost

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## Predicting credit card customer profitability

- ▶ One component of profitability:
  - ▶ Expected revenue from balance carried

$$(1 - \Pr\{\text{default}|\mathbf{x}\}) \cdot i \cdot \mathbb{E}(b|\mathbf{x})$$

- ▶  $i$  = interest rate
    - ▶  $\mathbb{E}(b|\mathbf{x})$  = expected balance
- ▶ Need to predict:
  - ▶ Probability of default
  - ▶ Expected balance
- ▶ How?

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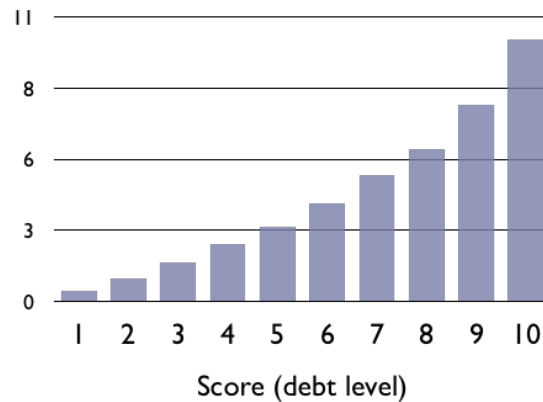
## Predicting default: Data

- ▶ 1970's
  - ▶ Demographics
  - ▶ Zip code
- ▶ 1980's
  - ▶ New customers: Credit bureau data (U.S.)
  - ▶ Existing customers: Account usage behavior recorded in house file

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## Segmentation (scoring) and default predictions

- ▶ Choose a segmentation variable and create customer segments (scores)
- ▶ Predict default probability for each segment using average observed default rate in segment



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## Predicting default for individual customers

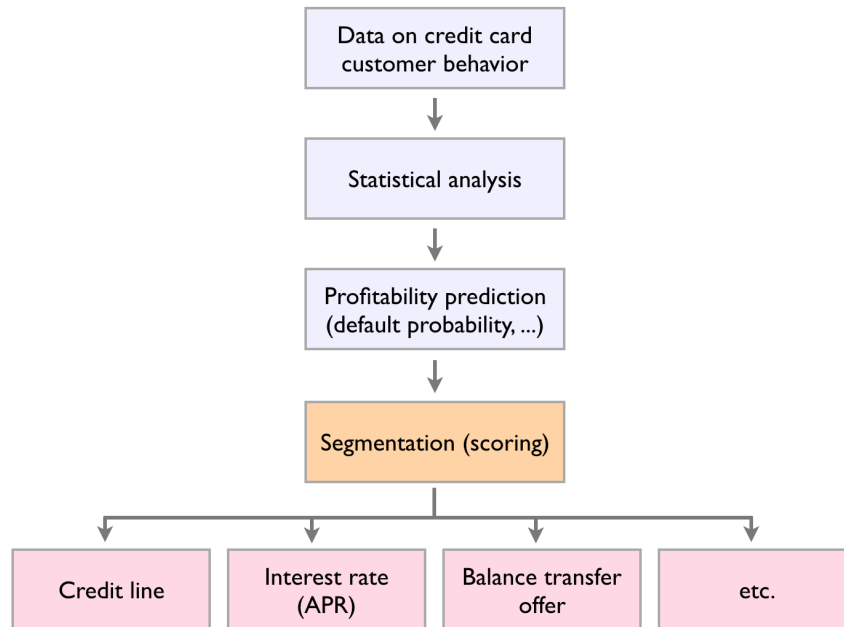
$$\Pr\{\text{default}|x\} \leftarrow f(\text{no. credit cards, mortgage, age, } \dots)$$

- ▶ Based on multiple segmentation variables or inputs,  $x =$  (no. credit cards, mortgage, ...)
- ▶ Statistical tools
  - ▶ Logistic regression
  - ▶ LASSO
  - ▶ Random forest
- ▶ Allows to create segments of one

Customer ID	Year	No. of credit cards	Mortgage	Age	Default
10078421	2008	1	yes	34	0
10079322	2008	4	yes	27	0
10098375	2008	1	no	52	0
10098410	2008	3	yes	40	0
10092452	2008	6	yes	29	1
10108531	2008	2	no	58	0
10104852	2008	8	yes	32	1
10109982	2008	2	yes	27	0
10102399	2008	5	yes	33	0
10128554	2008	5	no	34	0
10121356	2008	8	yes	31	0
10129486	2008	1	no	40	0
10108763	2008	2	no	54	0
10129873	2008	1	no	55	0
10129485	2008	1	yes	30	0

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## Data science and marketing in the credit card industry



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## Data driven marketing vs. traditional marketing research

- ▶ What distinguishes this class from a course on traditional marketing research?
  - ▶ 37107 — Experimental Marketing
- ▶ Traditional marketing research
  - ▶ Design of surveys
  - ▶ Analysis of survey-based data
- ▶ Data driven marketing
  - ▶ Data are already collected
  - ▶ Records of actual customer behavior in the marketplace
    - ▶ Sales
    - ▶ Individual purchases
    - ▶ Marketing mix when product was bought
    - ▶ Advertising messages
    - ▶ Customer characteristics

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## Data driven marketing vs. traditional marketing research

- ▶ Limitations of either approach: Examples
  - ▶ Traditional marketing research
    - ▶ Advertising
      - ▶ How do we learn about incremental sales due to advertising from surveys?
    - ▶ Pricing
      - ▶ How do we learn about the effect of a 5% price cut in a store?
    - ▶ Channels and promotions
      - ▶ How do we learn how pharmaceutical detailing influences prescription decisions?
    - ▶ Segmentation: Is it feasible to implement e-mail marketing using survey data?
  - ▶ Attitudinal data are often valuable to marketers
  - ▶ New products!

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## Course overview (the plan ...)

1. Introduction
2. Tools from Modern Statistics: Review and Roadmap
3. Demand Estimation and Marketing Mix Modeling
4. Demand Models and Pricing Decisions
5. Promotion Planning
6. Causality
7. Advertising Measurement
8. A Primer on Machine Learning
9. CRM: The Customer Targeting Process
10. Targeting Based on Heterogeneous Treatment Effects
11. CRM: Acquisition, Development, and Retention
12. Digital Marketing
13. The Use and Abuse of Data-Driven Marketing

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