Big Data and Marketing

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Agenda

• What is Big Data?
• The Big Deal about Big Data
• Marketing Problems
• Models/Tools
• Applications
• My Research
• Future Outlook
What is Big Data?
What is Big Data?

• Large and complex data with challenges to collect, curate, store, search, transfer, analyze, and visualize
• Requires massively parallel software running on thousands of servers
• Characterized by 4Vs: Volume, Velocity, Variety, and Veracity
• Propelled by the rise of SMACIT (Social, Mobile, Analytics, Cloud, Internet of Things)
• Analysis requires models to accommodate 4Vs
The Big Deal about Big Data
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“In God we trust, all others bring data.”

- William Deming
The Big Deal about Big Data

- Internet data volume: 670 exabytes in 2014; 2.6 exabytes daily
- Business data double every 1.2 years
- 500,000 data centers
- By 2020, 1/3 data through cloud, 35 zettabytes of data
- Market for big data applications
  - $17B 2015; $50B in 2017 (BMO Capital market report)
  - $200B business (McKinsey & Co)
- Companies investing in Big Data will outperform others by 20% (Gartner)
- Volume, Velocity (Walmart: 1M transactions/hr-2.5K terabytes)
- IBM spearheading it
- Emergence of data science/data scientist: 4.4M needed by 2015 (Gartner)
Big Data Social Application

Can my boyfriend come along?

I’m not your boyfriend!

I’m casually dating a number of people.

But you spend twice as much time with me as with anyone else. I’m a clear outlier.

Your math is irrefutable.

Face it—I’m your statistically significant other.
Marketing Problems for Big Data
Marketing Problems

- CLV analysis
- Segmentation and targeting
- Marketing mix allocation
- Promotional planning
- Sales force optimization
- Sales force productivity analysis
- Optimal media allocation
- Retail assortment planning
- Product recommendation system
- Cross-category management
- Business model analysis
- Mobile couponing........
Big Data Application

"Your recent Amazon purchases, Tweet score and location history makes you 23.5% welcome here."
Big Data Models/Tools
Collaborative Filtering
Models: Supervised Learning

• Big data ideal for predictive and prescriptive models
• Linear regression, Logistic regression, Decision trees [CHAID]
• Ensembles (Bagging, Boosting, Random forest)
• Neural networks
  – Backpropagation algorithm, Gradient checking, Random initialization, Autonomous driving
• Support vector machine (SVM)
• Large scale machine learning systems
Models: Unsupervised Learning

- Clustering (BIRCH, Hierarchical, k-means, EM)
- Dimensionality reduction (Factor analysis, PCA)
- Anomaly detection (kNN, Local outlier factor)
- Self organizing maps (SOM)
- Adaptive resonance theory (ARF)
- Latent Dirichlet Allocation (LDA)
- Structured prediction/Graphical/Visualization tools (CRF, HMM, VOS).......
Other Models

- Propensity scoring/matching model
- Stochastic models, MVDP
- Spatial models
- Genetic algorithms
- Agent modeling
- Learning curves
- Recommendation systems
- Social network mapping
Big Data Applications
Applications: Gilt

• Within 1 minute at noon, 3,000 versions of message sent to customers based on analysis of 5-year history
• 65% sales in a 90-minute period = Amazon’s daily sales
• 30% sales from mobile device
• Cloud based data capture
• Big data analysis helped add 1M customers each year
• Helped launch gourmet food, wine
Applications: Linkedin

• Successful data products
  – People you may know
  – Jobs you may be interested in
  – Groups you may like
  – Inmaps
  – Annual network summary

• Marketing decisions
  – Decision-maker targeting using Inmaps
  – Linkedin Services using propensity to buy models
  – Rapid testing of multiple website changes
Other Applications

• Chemical company: Sales force territory alignment
• Business equipment firm: Third party sales force productivity
• GE: Intelligent aircraft engines, turbines, BOPs, MRIs
• Wells Fargo: Path to customer attrition
• Vodafone: Customer churn analysis
• Nationwide: Demand generation: 15-20% for 4 years; 11% fewer headcount; $5M savings; National campaign over high spending in sales agent concentrated MSAs
• PayPal: Identified an overlooked acquisition channel
Amazon: Anticipatory Shipping
My Research in Big Data

- Aisle and display adjacency through spatial modeling (with Bezawada, Balachander, Kannan)
- Third party sales force productivity using MVDP models (with Voleti)
- Multichannel marketing allocation using Bayesian HMM and optimization (with Kushwaha)
- Multichannel targeting using HB conditional probability models
- Market evolution through semi-parametric market response model (with Lin)
- Business model evaluation using Bayesian clustering and graphical models (with Mallick)
- Market basket size forecasting through Bayesian variable selection model (with Johnson)
Future Outlook for Big Data
Future Outlook

• Will big data lead to better/newer models?
• Will big data lead to bigger insights or better judgment?
• Successes: Google translate, Google trends
• Failures: Google flu trends, Award predictions based on tweets
• Machine learning: Science of getting computers to learn without being explicitly programmed. Examples:
  – Google’s page ranking
  – Apple’s iPhoto
  – Spam recognition
• Reducing big data to small relevant data for decision-making
• Marketing expert systems, Marketing machines
• Test and learning built-in models
• Blend of marketing and engineering research cultures