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

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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

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The Big Deal about Big Data

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The Big Deal about Big Data

"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)

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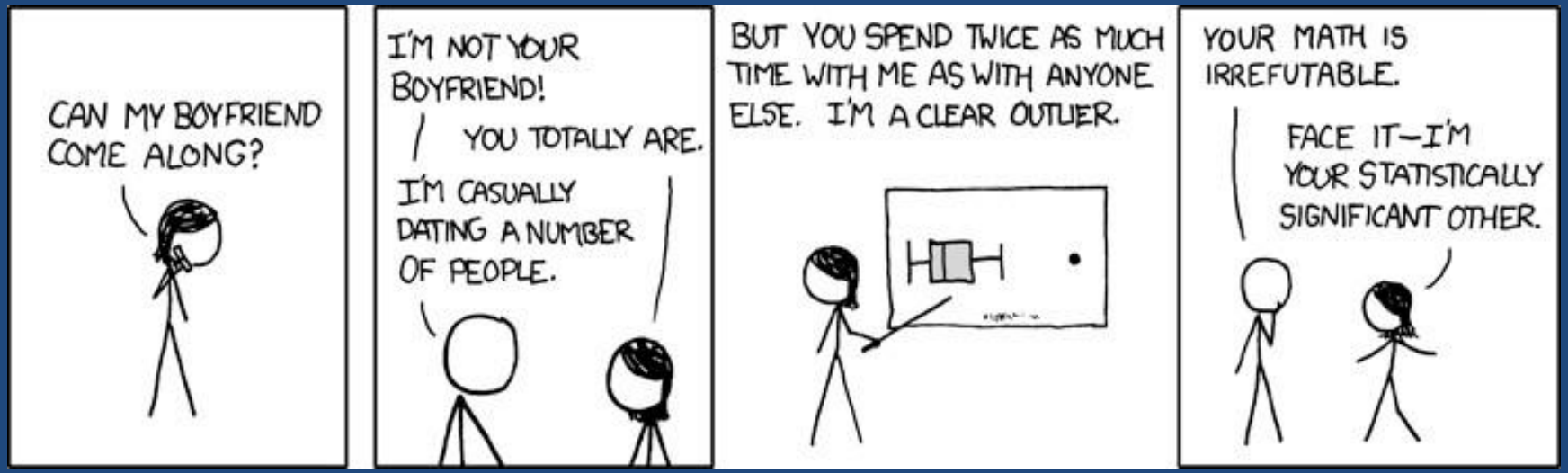
Big Data Social Application



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Marketing Problems for Big Data

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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……

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Big Data Application

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Big Data Models/Tools

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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

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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).....

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Other Models

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

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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

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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

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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
- Tesco: Targeted promotions. Net profits grew 7X (1991-2014)
- PayPal: Identified an overlooked acquisition channel

Amazon: Anticipatory Shipping

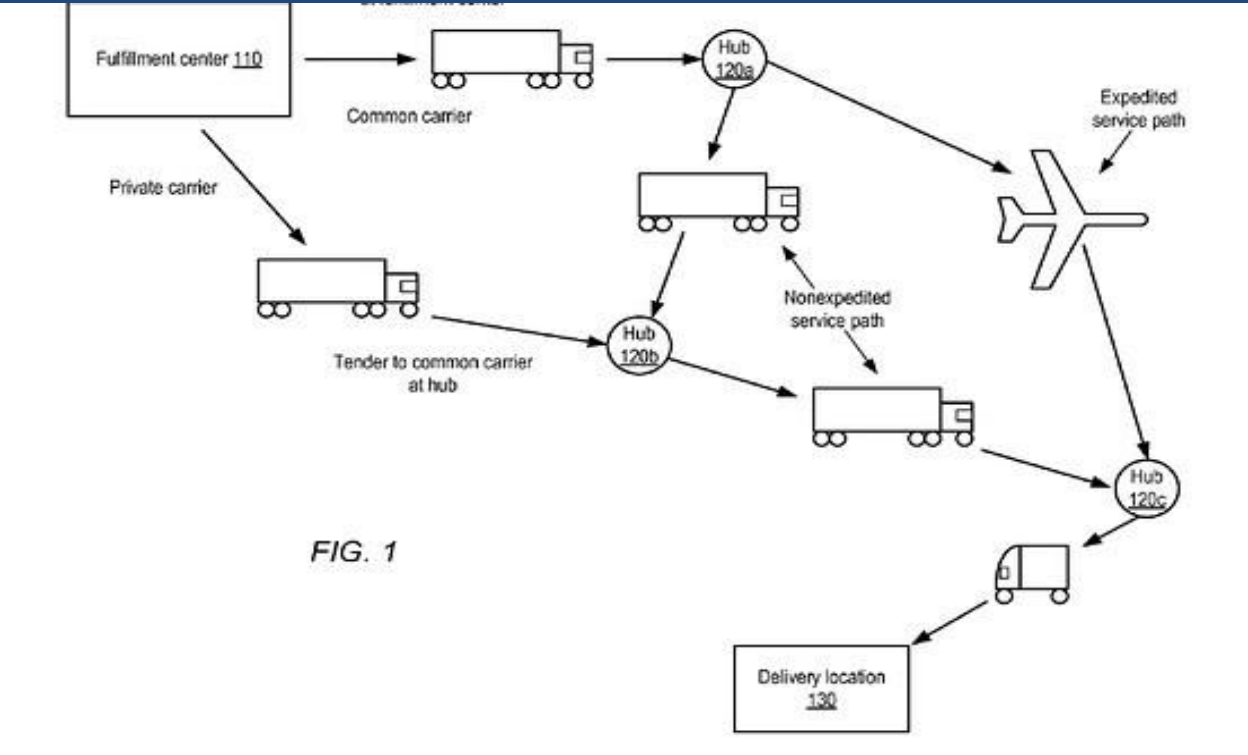

FIG. 1

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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)

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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

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