The Remarkable Transition in Consumer Dynamics and Marketing Analytics – The Last 50 Years and the Future

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1966 - 2016

CONSUMER DYNAMICS

- 1966-76
  - Advertising/Promotion
  - Abundance/Buying power
  - New Products
- 1977-86
  - Brand loyalty
  - UPC Data
  - Brand Power

MARKETING ANALYTICS

- 1966-76
  - Computers in Marketing
  - Marketing Science
  - Brandaid/Assessor/Switching
- 1977-86
  - LOGIT/Conjoint models/ perceptual mapping
  - Decision Support Systems/on line models
  - Econometrics

50 YEAR TRANSITON

CONSUMER DYNAMICS

- 1987-96
  - Internet
  - Consumer Power
  - Trust
- 1997-2006
  - Google
  - Amazon/eBay
  - Big Data

MARKETING ANALYTICS

- 1987-96
  - CRM/Trust Determinants
  - Information Acceleration / Game Theory
  - Dash Boards
- 1997-2006
  - Analytics Tool Kit
  - Targeting Ads
  - Behavioral Economics

LAST DECADE

CONSUMER DYNAMICS

- 2007-2016
  - Social Media
  - Youtube
  - Mobile

MARKETING ANALYTICS

- 2007-2016
  - Market/Behavioral Experimentation
  - Hierarchical Bayesian Models
  - State of the Art -- Morphing Ads/Deep Learning

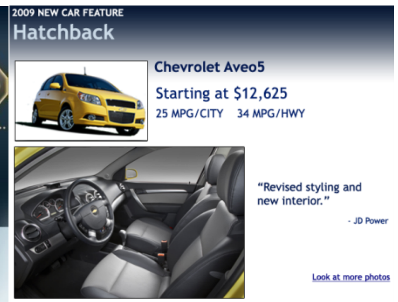
STATE OF THE ART - MORPHING

- Next step after targeting
- **Who** to target to **How** to communicate to them individually
- Cognitive style and communication in ads and web site
- Cognitive Styles: Analytical/Holistic, Impulsive/ Deliberative, Visual/Verbal, Rational/Intuitive

AD MORPHING

Visual-NoDetails-Print

Visual-Details-Web



Verbal-NoDetails-Print

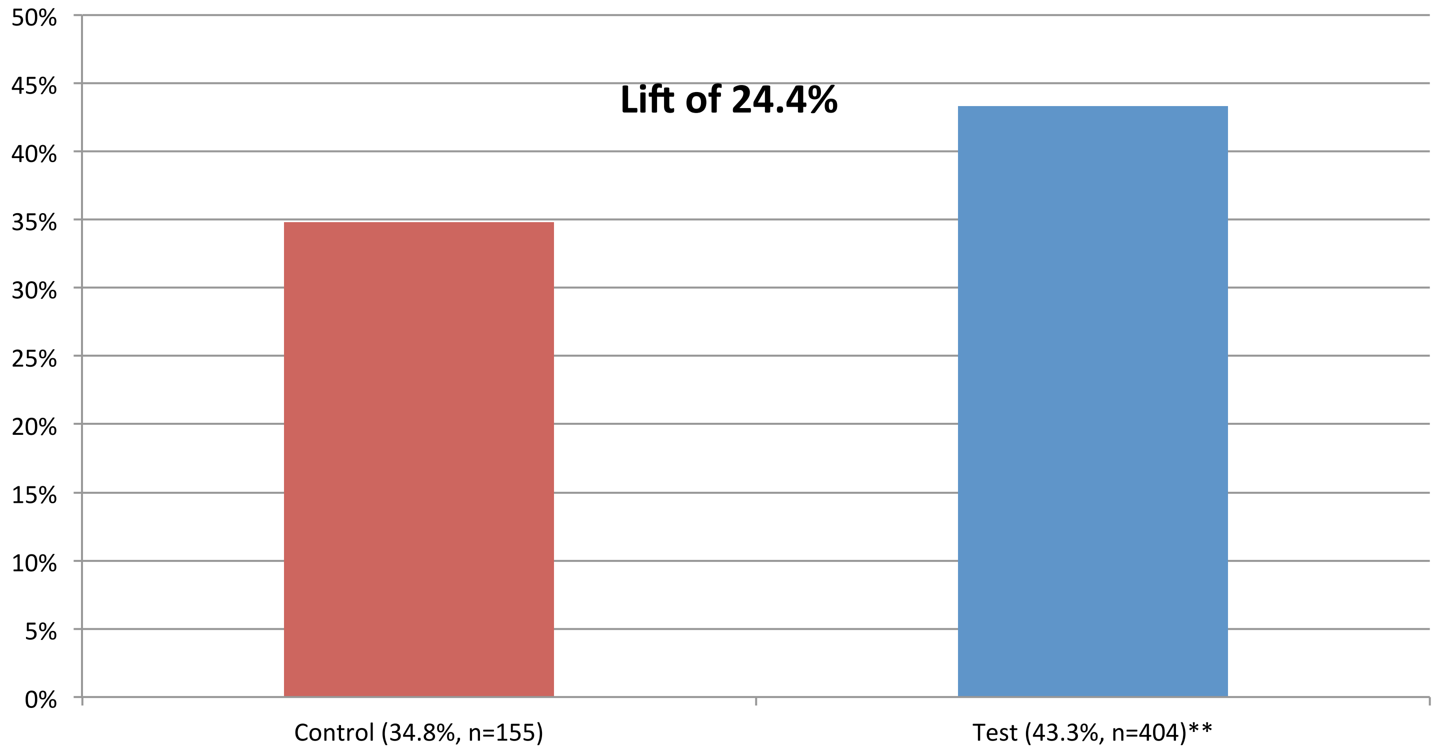
Verbal-Details-Web

Visual-Details-Print

- Estimate cognitive style
- Match ads to cognitive style by continuous experimentation/Machine Learning
- Individual assignment of Messaging
- Matching cognitive style builds trust and consideration and sales

CHEVROLET CONSIDERATION

- Measures consideration of Chevrolet by a participant for his or her next vehicle.



**** Results significant at α = 0.034**

Project – AT&T Cnet Market Experiment

Data Collection

- Track clickstreams on CNET.com
- Survey small segment to determine cognitive style

Consumer Profiling

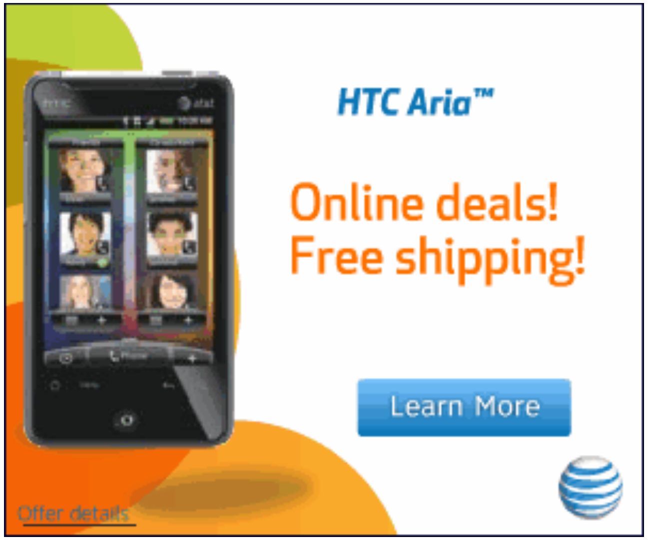
- Using MIT decisioning engine, determine cognitive style of cookies using clickstreams

Targeting by Cognitive Style

- Remessage cookies on CBS ad network
- Morph AT&T banner messaging to cognitive style

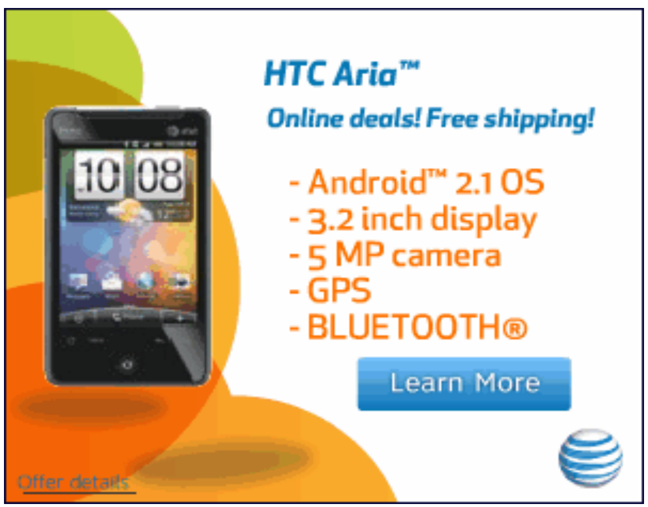
Analysis of Results

- Measure lift in clickthrough rate behavior for morphed vs. unmorphed AT&T ads



Holistic - Deliberative

Holistic - Impulsive



Analytic - Deliberative

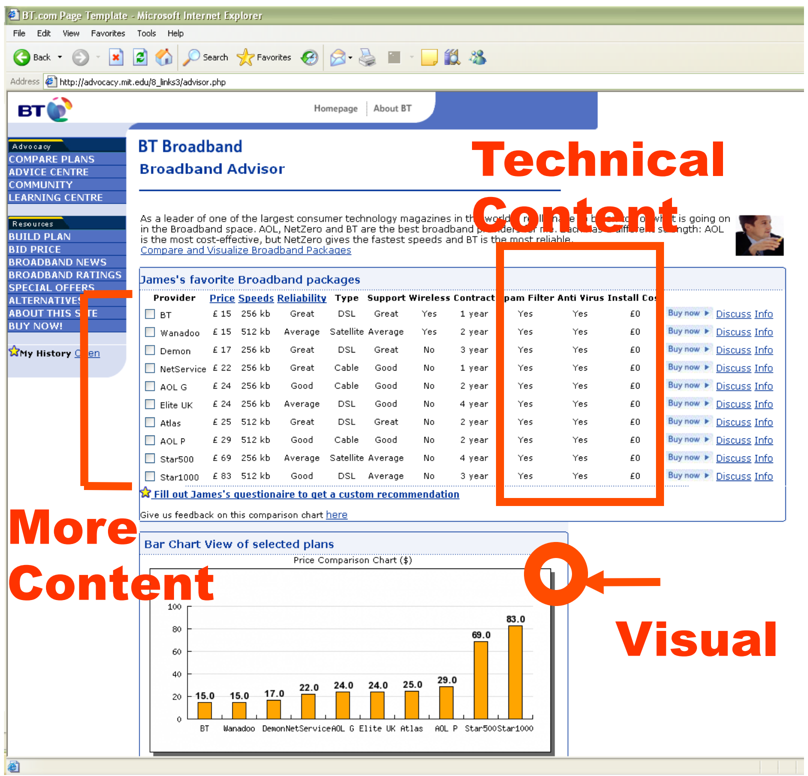
Analytic - Impulsive

CNET MARKET RESULTS

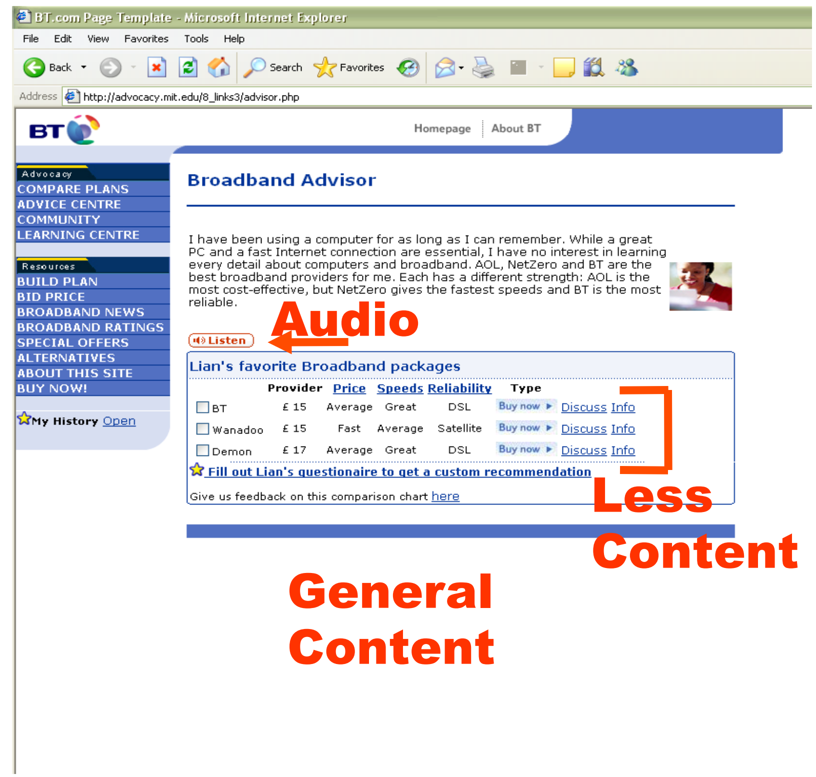
- 27,000 users and
- 63,000 sessions
- CTR .25% TEST VS .13% CONTROL
- Lift of 92% in click rate
- Morphing works

WEBSITE MORPHING

Morph 1



Morph 8



Morph Designed For:
ANALYTIC DELIBERATIVE HIERARCHICAL INDIVIDUALISTIC x0000x

ウェルカムページ
ホーム

データ
アドバイザー
早わかり
基礎知識
レビュー掲示板
カスタマイズページ

モーフィングを止める

Fixed Morphs
000000
111111

データ
詳しいデータを分析する
返済計画を計算する

- カードローン一覧表
- 返済計画ツール

アドバイザー
おすすめカードローンを探して全体像をつかむ

早わかり
時間のない方へ
すぐに分かるカードローン

基礎知識
基礎からじっくり詳しく学ぶカードローンの知識

レビュー掲示板
他の人の意見を見る

カスタマイズページ
あなたのニーズに合わせてサイトをカスタマイズ

Dat

RESULTS

- 1,000+ person panel studies – A/B design
- Increase consideration 25%
- Probability of purchase 20% increase

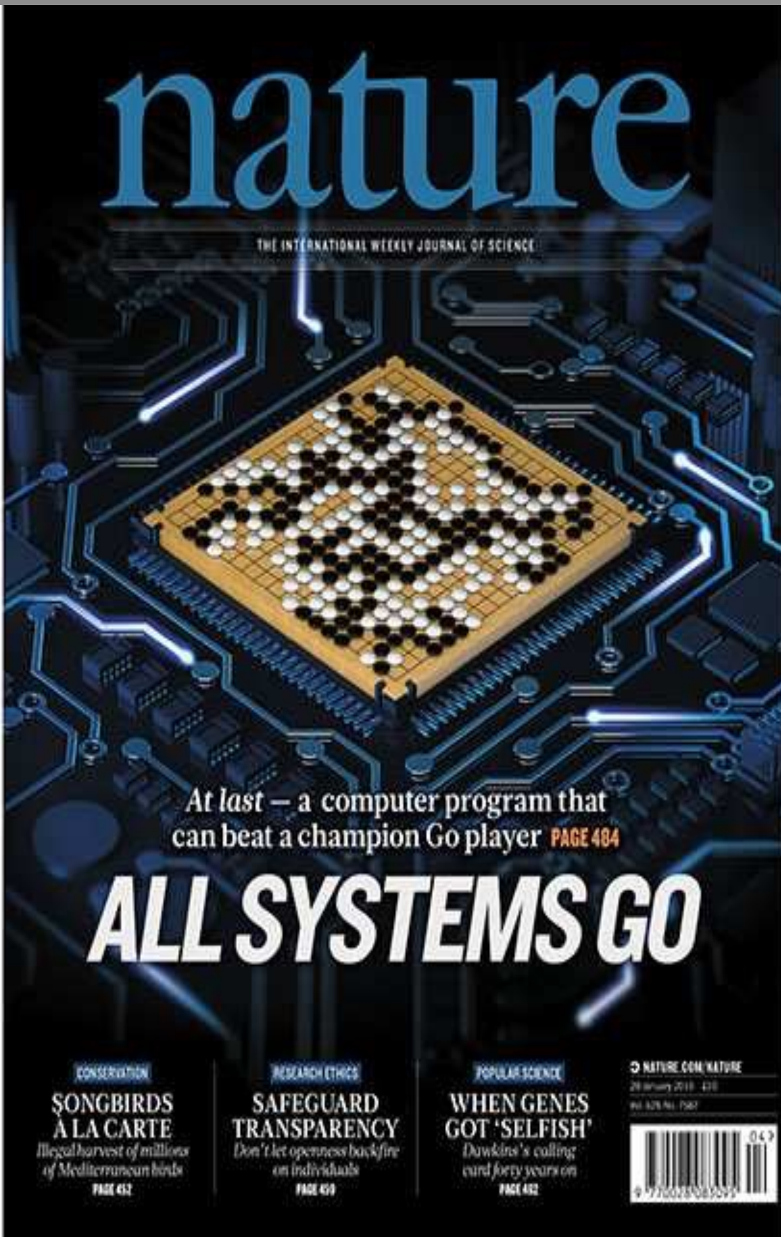
FUTURE OF MORPHING

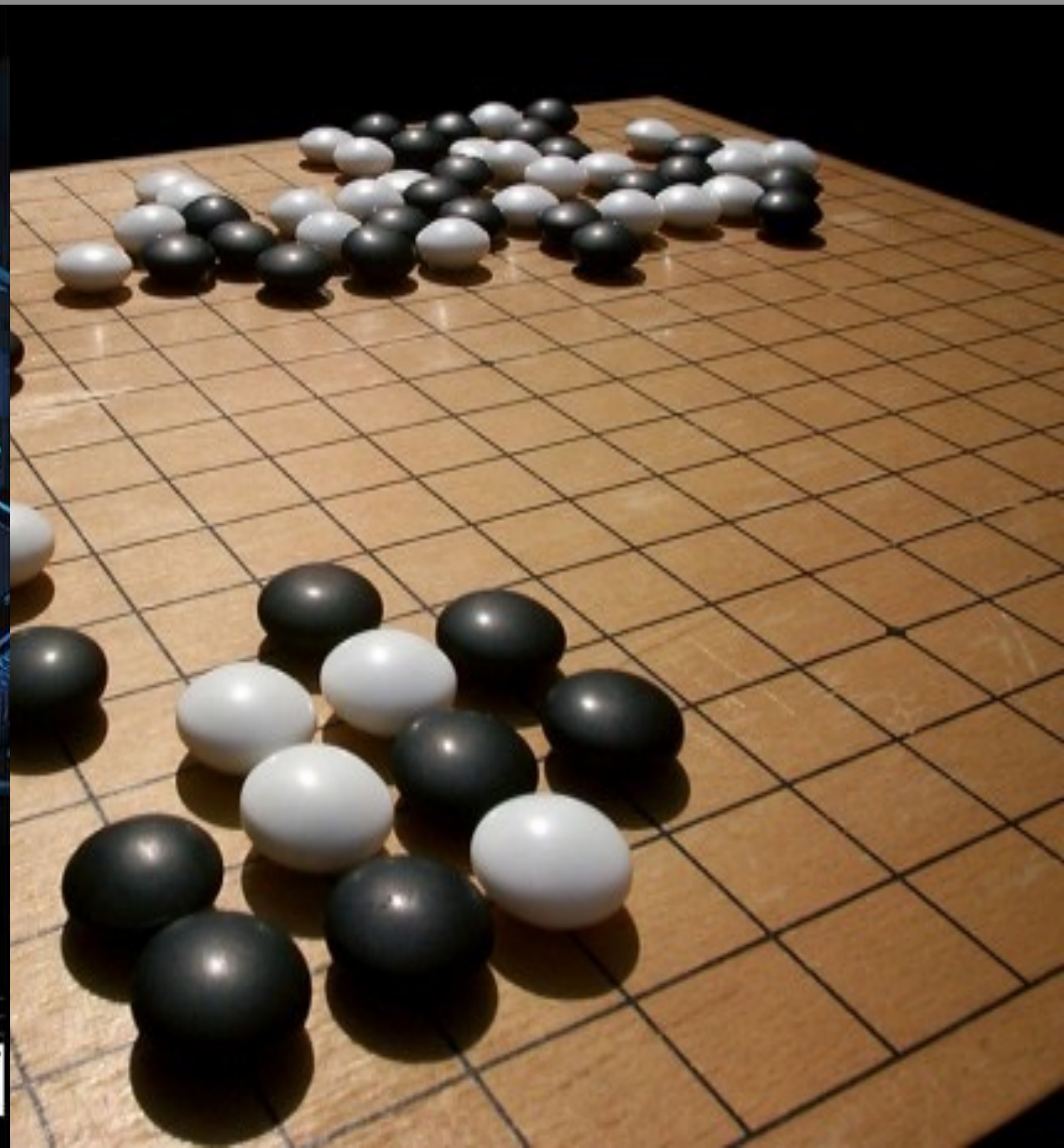
- Easy to use
- Creative links – not just format but strategic
- Cross media morphing
- Opt In or protect privacy
- Next step in building trust

STATE OF THE ART – DEEP LEARNING

- Hot new technique
- Big Data and AI
- Success in Voice, hand writing, visual recognition
- Can be used in Marketing Analytics?
  - Targeting/Morphing
  - New Products
  - Decision Support

Deepmind: The Mystique of Deep Learning



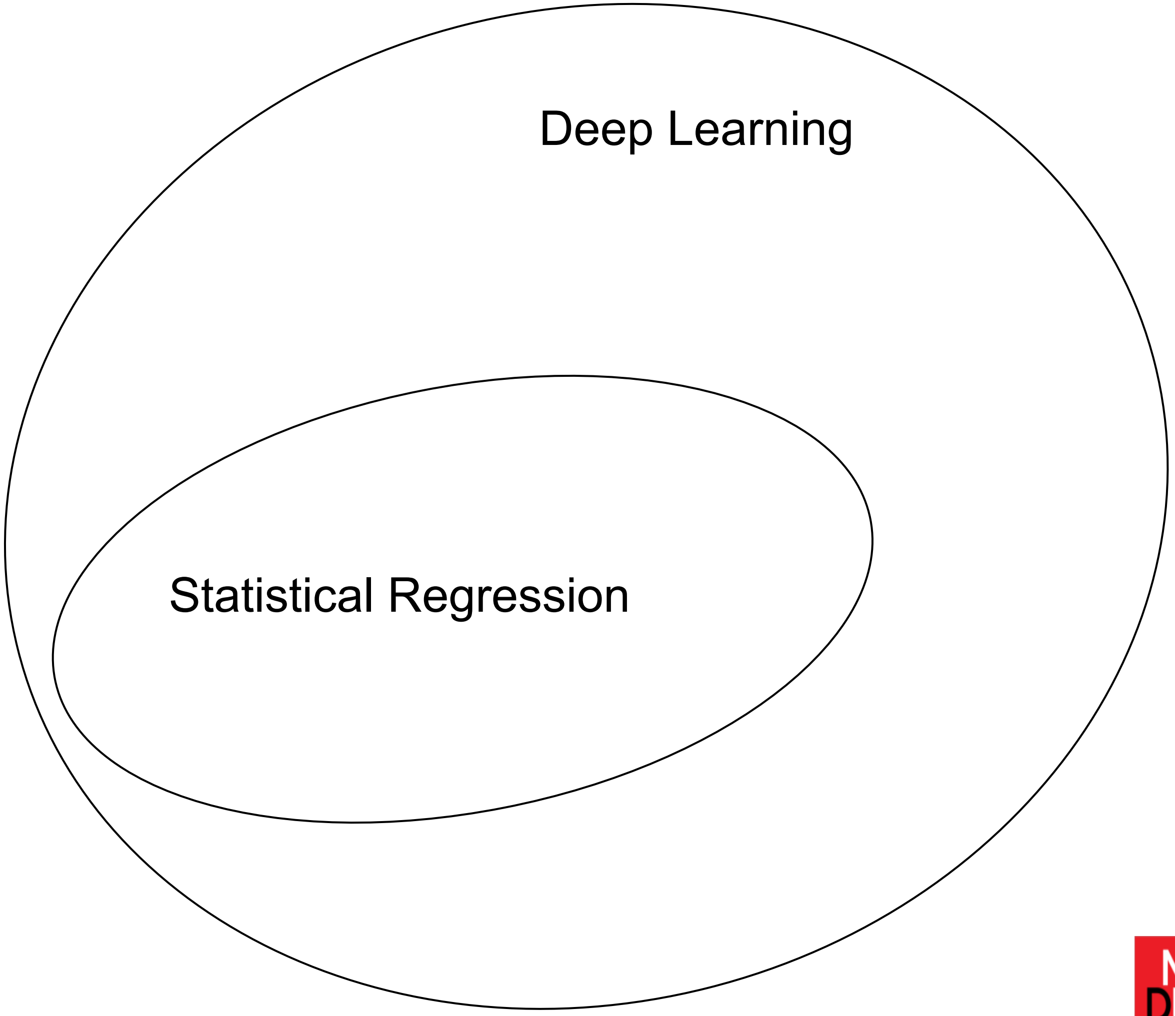


Initiative on the Digital Economy -- IDE

- 4 Program Areas
  - ❖Productivity and Employment
  - ❖Data and Information Privacy
  - ❖New Business Models
  - ❖ Social Dynamics and Market Experimentation Section
- Foundation, Corporation, and Individual support
- Deep Learning in Marketing supported by Suruga Bank

MIT
INITIATIVE ON THE
DIGITAL ECONOMY

Deep Learning in Marketing



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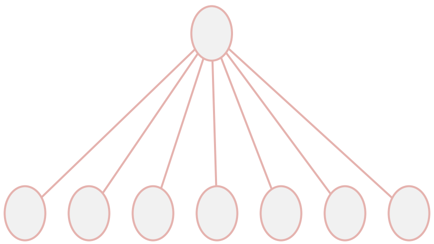
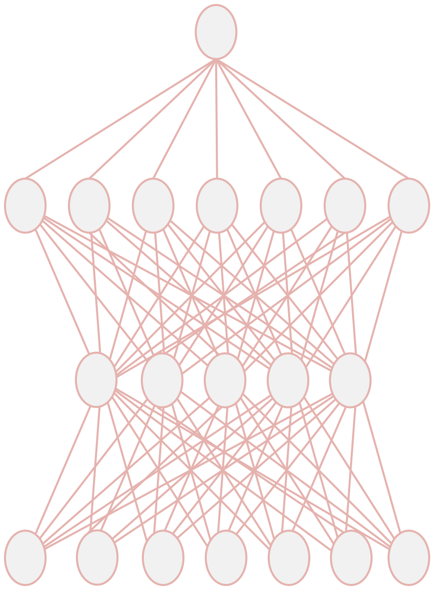
Functional Form

Linear
Regression



Neural
Network

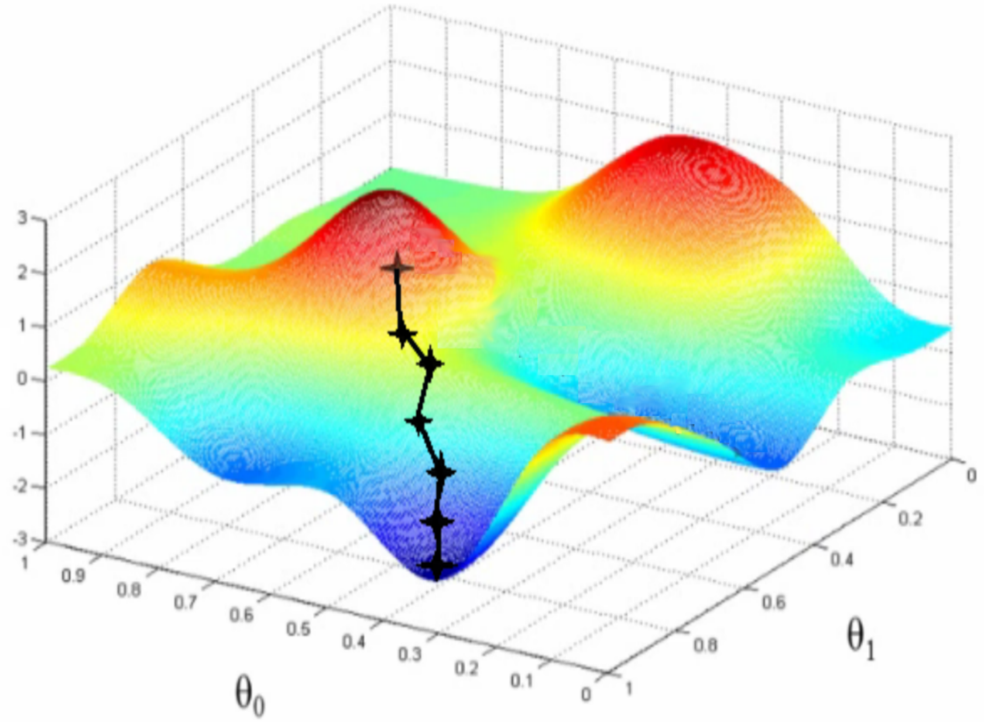


Maximum Likelihood
Interpretable
Linear

Search method required, many suboptimal solutions.
Not easily interpretable
Nonlinear

Stochastic Gradient Descent

Minimize error using gradient descent methods.



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Two Communities with Different Approaches

Classical Statistics	Deep Learning
•High emphasis on error term assumption & statistical properties	•Emphasis on prediction - "It works"
•Simplicity & interpretability - Theory	•Complex neural net
•Use selected data	•Use Big data
•Statistical Heritage	•Artificial Intelligence
•Custom collection of data	•Lower cost Big Data

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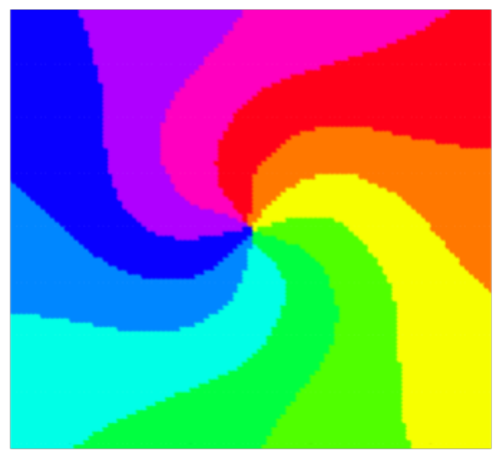
Deep Neural Networks are Non-linear

Multiclass Spiral Dataset

Multinomial Logistic Regression

34% Accuracy

Deep Neural Network



92% Accuracy

Can We Apply Deep Learning to New Products

If we have click data from relevant product selection site can we find new product opportunities?

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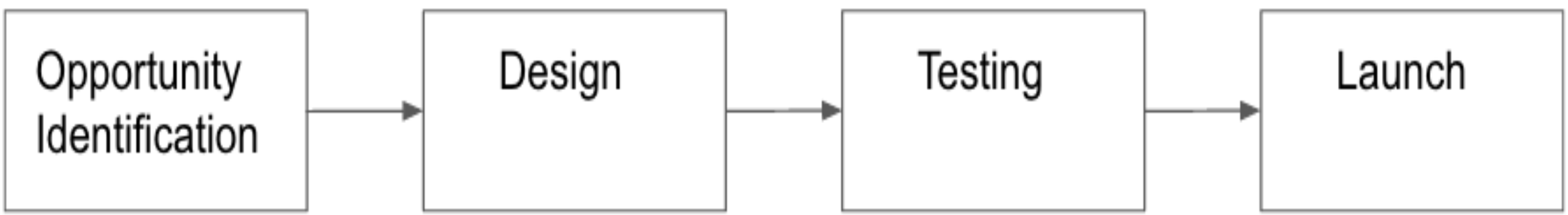
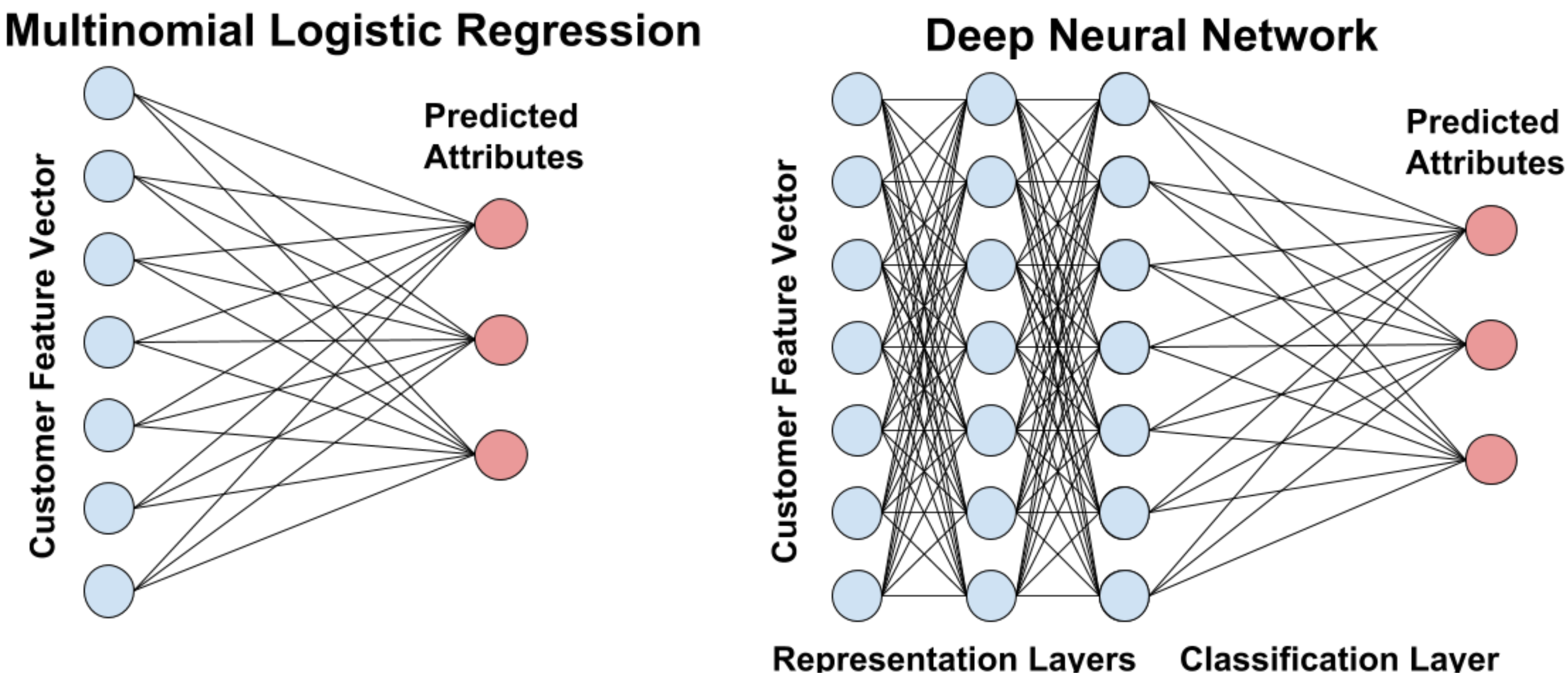
Finding Opportunities for New Products



Approach

- Credit card advisor selection site
- Synthetic click data from "true" customer plus error
- Can we predict card selection (attributes) ?
- Empirical Data for Credit Cards – early results
- What are the implications for new credit cards?

Credit Card Functional Form



Neural Net Model

Realized product interest

Rewards Program		
Travel	Reward	Cashback

Interest rate		
15%	17.5%	20%

Reward rate		
1%	2%	3%

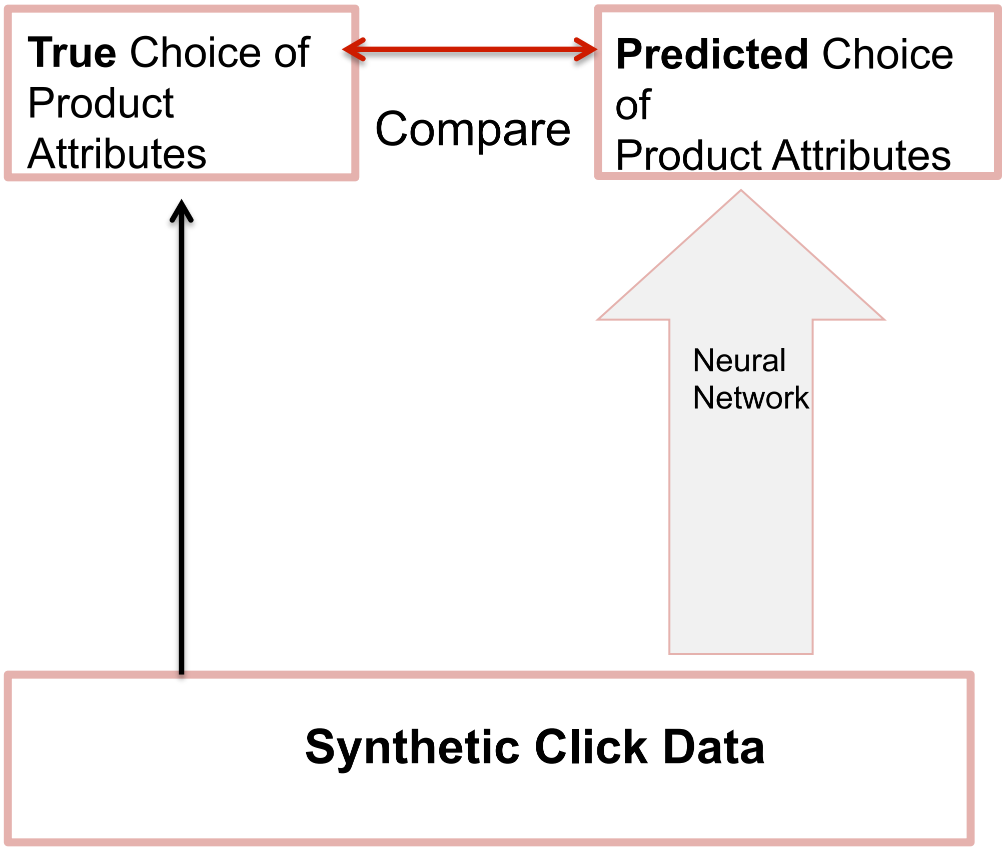
Borrowing limit			
<1,000	5,000	10,000	+20,000

Neural Network

Customer click data

0	1	0	0	1	1	1	0	1	0	0	0

Methodology



Synthetic Data Model

Hypothetical Consumer World

- Expendable income
- Education
- Credit Score
- Risk Tolerance
- Traveler
- Thrill seeking
- Frugal

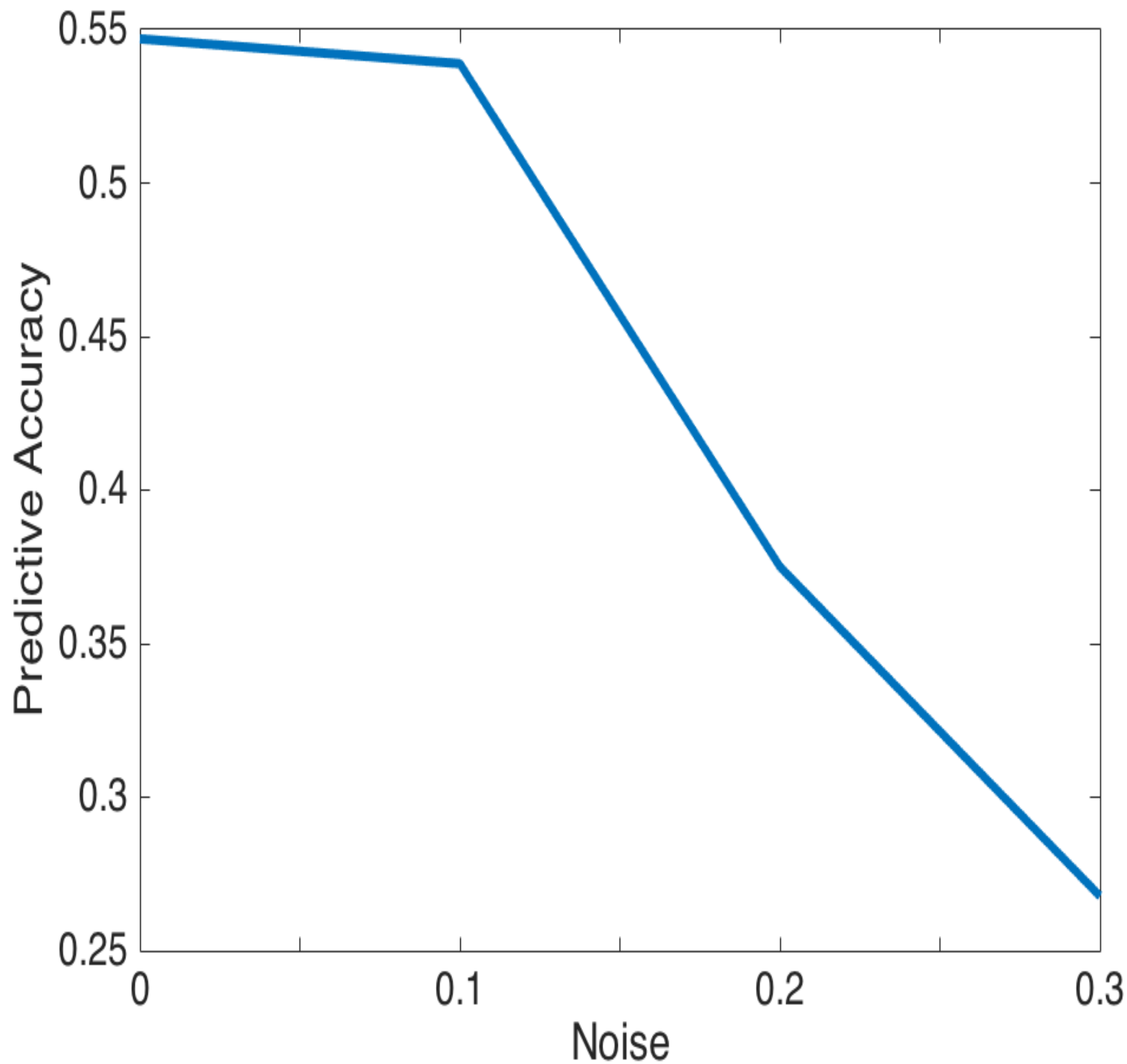
Synthetic Data 10,000 Customers

→ Choices Rules → **Attributes Chosen**

→ Click Rules → **24 Clicks +Noise**

Comparison of True and Predicted

- 10% Noise
- 54% All Four Attributes – No errors
- Good Recovery by Neural Net
- Depends on our noise generation - if 20% noise then only 38% correct



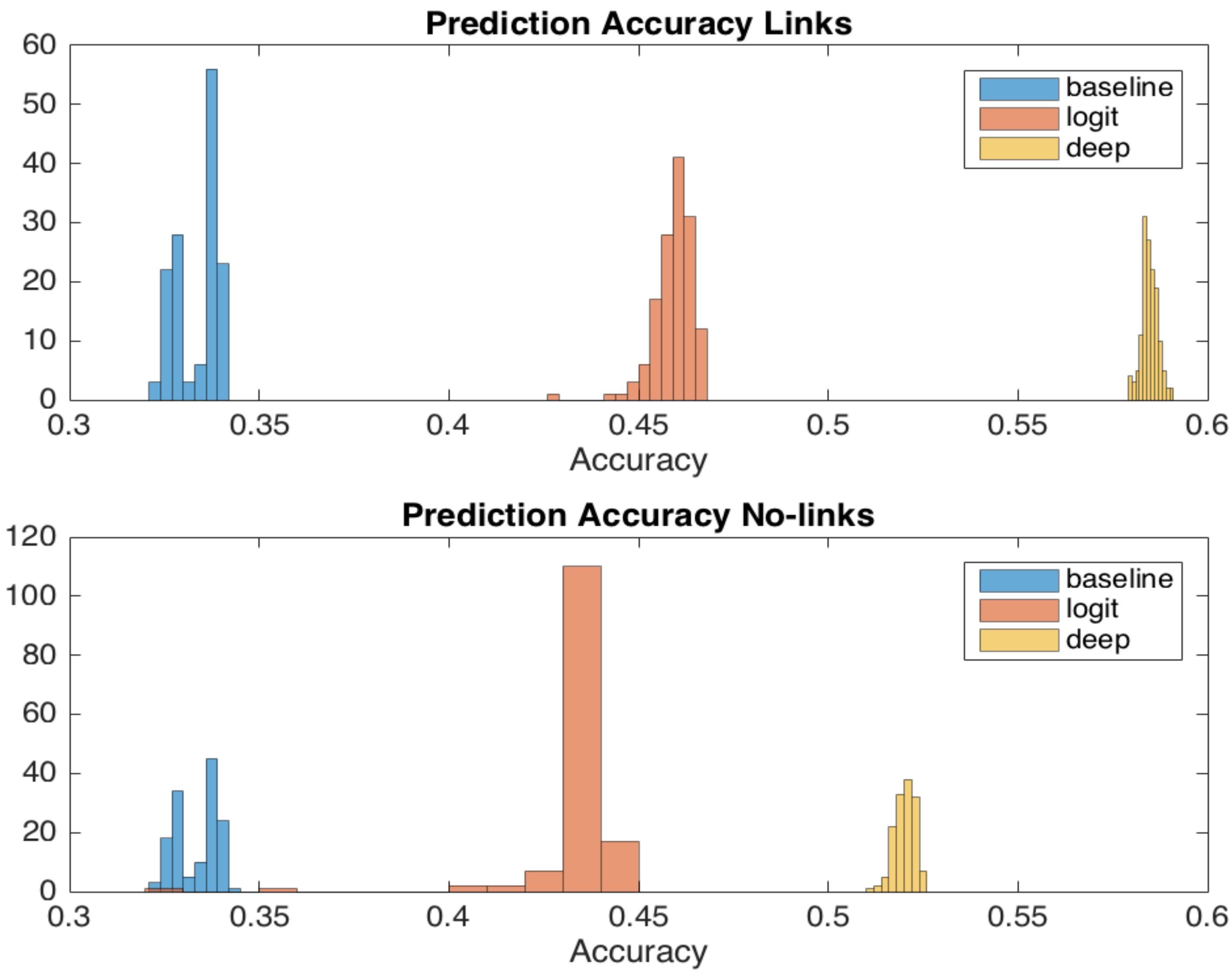
EMPIRICAL DATA – CREDIT CARDS

- Comscore Panel
  - 55,000
  - All clicks
- 15 Bank Credit Card Sites --BOA, CITI, DISCOVER, ETC
  - Average 28 clicks per person
  - 30% visit more than one site
- Variables
  - Annual Percentage Rate (e.g. intro, duration, ongoing)
  - Reward (e.g. amount, miles/cash)
  - Demographics (e.g.age, income, zip, machine id)
  - URLs (across banks)

EMPIRICAL RESULTS

- Deep Learning model
  - Two levels
  - 50% data for fit, 25% validation, 25% test
  - Bootstrap for significance
- Accuracy
  - 52% correct in test data – significant at .1%
  - Significantly better than simple multinomial LOGIT
  - Links significant contributors to accuracy

Empirical Results



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Add a new product

Rewards Program	Rewards Rate	Interest Rate
Cashback	1%	24.99%
Reward Points	2%	22.99%
Miles	1%	16.99%
Miles	1.5%	13.9%

Market Share	Profit ($M)
53.6%	198
17.1%	63
9.4%	35
19.9%	73

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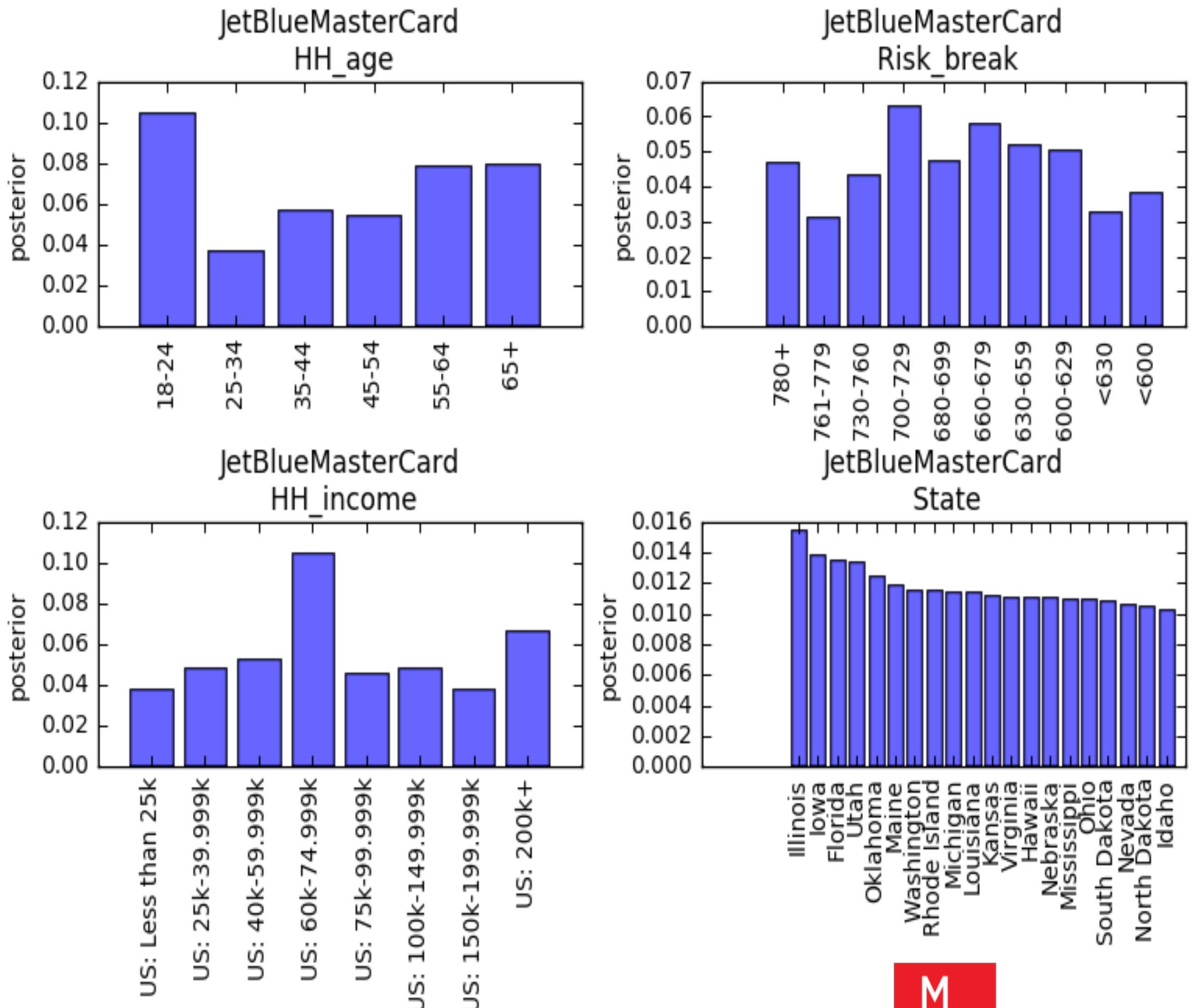
Add a new product

Rewards Program	Rewards Rate	Interest Rate	Market Share	Profit ($M)
Cashback	1.5%	14.99%	14.4%	47
Cashback	1%	24.99%	31.2%	103
Cashback	1%	29.99%	14.8%	49
Cashback	1.5%	12.9%	39.6%	130

What target market do we attract

Rewards Program	Rewards Rate	Interest Rate
Travel	1%	12.24%



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Optimal Card for a Given Customer

US: Less than 25k Delaware 45-54 <630
ProductDetail

Disney Reward Premium Visa
Delta Sky Miles Gold
Venture One Rewards Visa

US: 200k+ California 45-54 780+
ProductDetail

Classic Platinum MasterCard
Barclaycard Rewards Mastercard
Marriot Rewards Premier Business Card

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Deep Learning Research Future Work

Add new click data for advisor/comparison/choice websites (Creditcarma, Nerdwallet, Lending tree)

Technical – Restricted Boltzmann Model
Recurrent neural networks

Other Marketing Problems –
Consumer Brand Loyalty
Media Allocation
Advertising Response
Morphing

Does Deep Learning predict better than classical statistical methods -- conjoint?

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Emerging Conclusions Deep Learning

Can recover synthetic data choice

Early empirical results are encouraging

Identify new product opportunities

Looking for IDE Partners – Financial / Consumer Durables

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Next Ten Years?

CONSUMER DYNAMICS

- Saturation of markets
- Volatility – preferences and economics
- New media – virtual reality
- Technology/data change – block chains/automated driving

Marketing Analytics

- Innovation Support – New Product Needs
- More power in Computers/ networks/data
- New Models/Machine Learning Algorithms
- Managerial Models

SUMMARY

- Exciting 50 years
- More Opportunities to Come – Best Time Ever To Be in Marketing
- Prepare for the unexpected
- This conference is look ahead at future of consumer dynamics and analytics