

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

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December 7, 2016

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 TRANSITION

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

Sporty and Fun

Take a look inside...



THE ALL NEW
CHEVROLET AVEO5

Visual-Details-Web

2009 NEW CAR FEATURE
Hatchback



Chevrolet Aveo5
Starting at \$12,625
25 MPG/CITY 34 MPG/HWY



"Revised styling and new interior."
- J.D. Power

[Look at more photos](#)

Verbal-NoDetails-Print


Sporty, Stylish and Fun

"Rides comfortably and quietly, and offers decent space."
- Chicago Sun-Times

"Freshly revised styling and new interior."
- J.D. Power

"Fun to drive and comfortable."
- Consumer Reports


Read more...



THE ALL NEW
CHEVROLET AVEO5

Verbal-Details-Web

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Chevrolet Aveo5
Starting at \$12,625
25 MPG/CITY 34 MPG/HWY

ACCOLADES
"Rides comfortably and quietly."
- Chicago Sun-Times
"Well tuned for day-to-day driving."
- Edmunds.com
[Read more](#)

QUALITY
"Freshly revised styling and new interior."
- J.D. Power
"Five star crash safety rating."
- Automotive.com
[Read more](#)

Visual-Details-Print

Sporty, Stylish and Fun

27 MPG CITY 34 MPG HWY

Starting at \$12,625

A CLOSER LOOK...

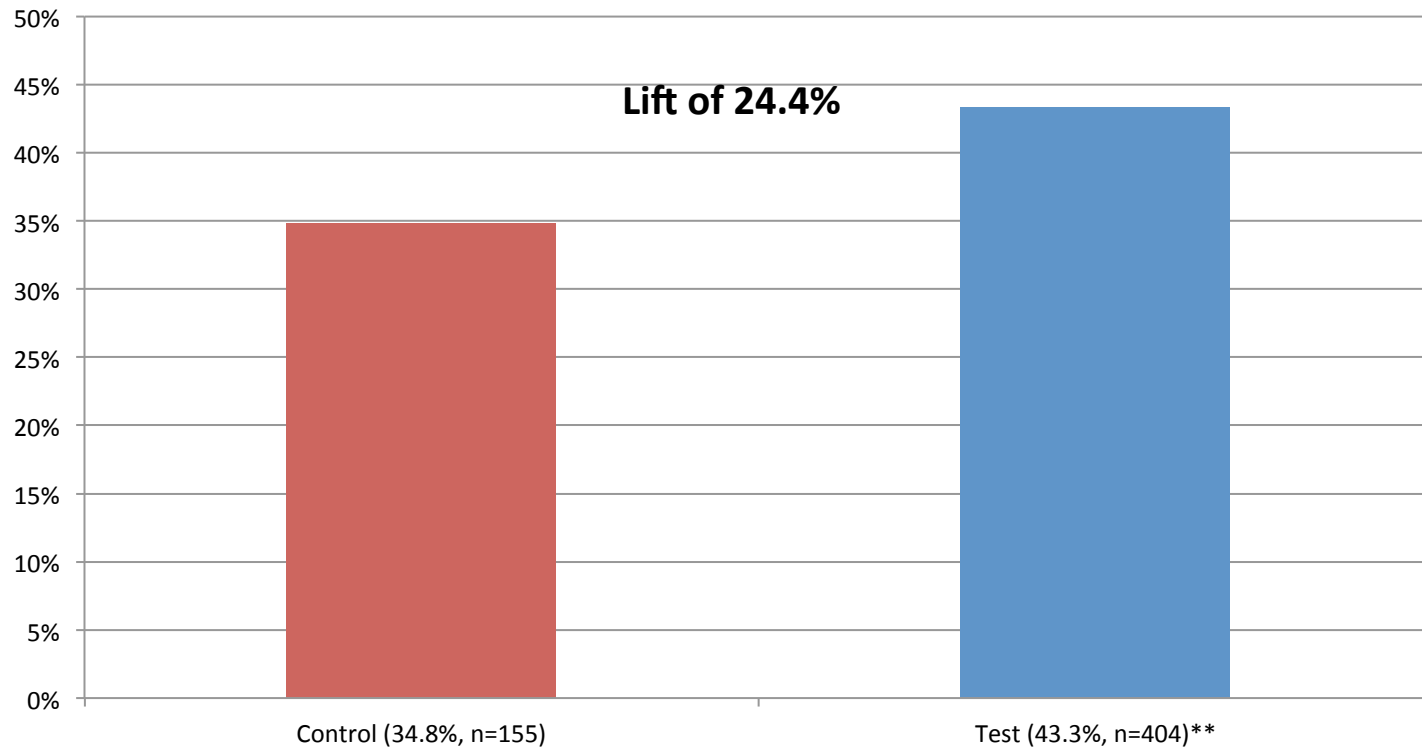


THE ALL NEW
CHEVROLET AVEO5

- 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 $\alpha = 0.034$**

Project – AT&T Cnet Market Experiment



- Track clickstreams on CNET.com


- Survey small segment to determine cognitive style

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

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

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






HTC Aria™

**Online deals!
Free shipping!**

Learn More

[Offer details](#)



Holistic - Deliberative



HTC Aria™

**Online deals!
Free shipping!**

Get It Now

[Offer details](#)



Holistic - Impulsive




HTC Aria™

Online deals! Free shipping!

- Android™ 2.1 OS
- 3.2 inch display
- 5 MP camera
- GPS
- BLUETOOTH®

Learn More

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Analytic - Deliberative



HTC Aria™

Online deals! Free shipping!

- Android™ 2.1 OS
- 3.2 inch HVGA display
- 5 megapixel camera
- GPS and BLUETOOTH®

Get It Now

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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

BT.com Page Template - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://advocacy.mit.edu/8_inlks3/advisor.php

BT.com | [Homepage](#) | [About BT](#)

BT Broadband Broadband Advisor

As a leader of one of the largest consumer technology magazines in the world, we know what is going on in the Broadband space. AOL, NetZero and BT are the best broadband providers for me. Each has a different strength: AOL is the most cost-effective, but NetZero gives the fastest speeds and BT is the most reliable. [Compare and Visualize Broadband Packages](#)

James's favorite Broadband packages

Provider	Price	Speeds	Reliability	Type	Support	Wireless	Contract	Spam Filter	Anti Virus	Install Cost
<input type="checkbox"/> BT	£ 15	256 kb	Great	DSL	Great	Yes	1 year	Yes	Yes	£0
<input type="checkbox"/> Wanadoo	£ 15	512 kb	Average	Satellite	Average	Yes	2 year	Yes	Yes	£0
<input type="checkbox"/> Demon	£ 17	256 kb	Great	DSL	Great	No	3 year	Yes	Yes	£0
<input type="checkbox"/> NetService	£ 22	256 kb	Great	Cable	Good	No	1 year	Yes	Yes	£0
<input type="checkbox"/> AOL G	£ 24	256 kb	Good	Cable	Good	No	2 year	Yes	Yes	£0
<input type="checkbox"/> Elite UK	£ 24	256 kb	Average	DSL	Good	No	4 year	Yes	Yes	£0
<input type="checkbox"/> Atlas	£ 25	512 kb	Great	DSL	Great	No	2 year	Yes	Yes	£0
<input type="checkbox"/> AOL P	£ 29	512 kb	Good	Cable	Good	No	2 year	Yes	Yes	£0
<input type="checkbox"/> Star500	£ 69	256 kb	Average	Satellite	Average	No	4 year	Yes	Yes	£0
<input type="checkbox"/> Star1000	£ 83	512 kb	Good	DSL	Average	No	3 year	Yes	Yes	£0

Bar Chart View of selected plans

Price Comparison Chart (£)

Provider	Price (£)
BT	15.0
Wanadoo	15.0
Demon	17.0
NetService	22.0
AOL G	24.0
Elite UK	24.0
Atlas	25.0
AOL P	29.0
Star500	69.0
Star1000	83.0

Technical Content

More Content

Visual

Morph 8

BT.com Page Template - Microsoft Internet Explorer

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BT.com | [Homepage](#) | [About BT](#)

Broadband Advisor

I have been using a computer for as long as I can remember. While a great PC and a fast Internet connection are essential, I have no interest in learning every detail about computers and broadband. AOL, NetZero and BT are the best broadband providers for me. Each has a different strength: AOL is the most cost-effective, but NetZero gives the fastest speeds and BT is the most reliable.

Audio

[Listen](#)

Lian's favorite Broadband packages

Provider	Price	Speeds	Reliability	Type
<input type="checkbox"/> BT	£ 15	Average	Great	DSL
<input type="checkbox"/> Wanadoo	£ 15	Fast	Average	Satellite
<input type="checkbox"/> Demon	£ 17	Average	Great	DSL

[Fill out Lian's questionnaire to get a custom recommendation](#)

Give us feedback on this comparison chart [here](#)

Less Content

General Content

Card Loan Support System

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



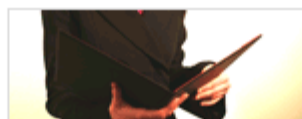
データ

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

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



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



レビュー掲示板

他の人の意見を見る



早わかり

時間のない方へ
すぐに分かるカードロ
ーン



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



RESULTS

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

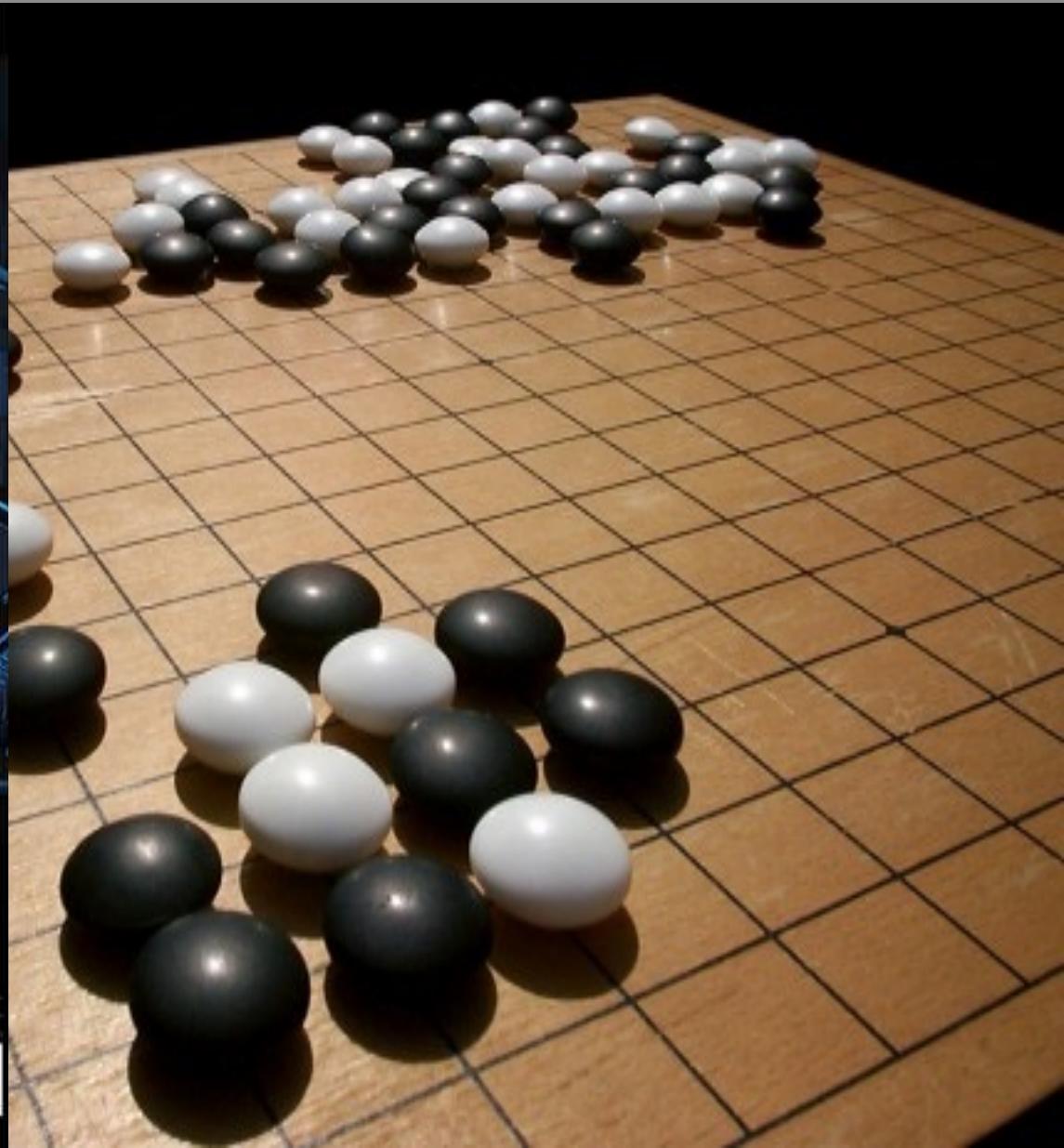
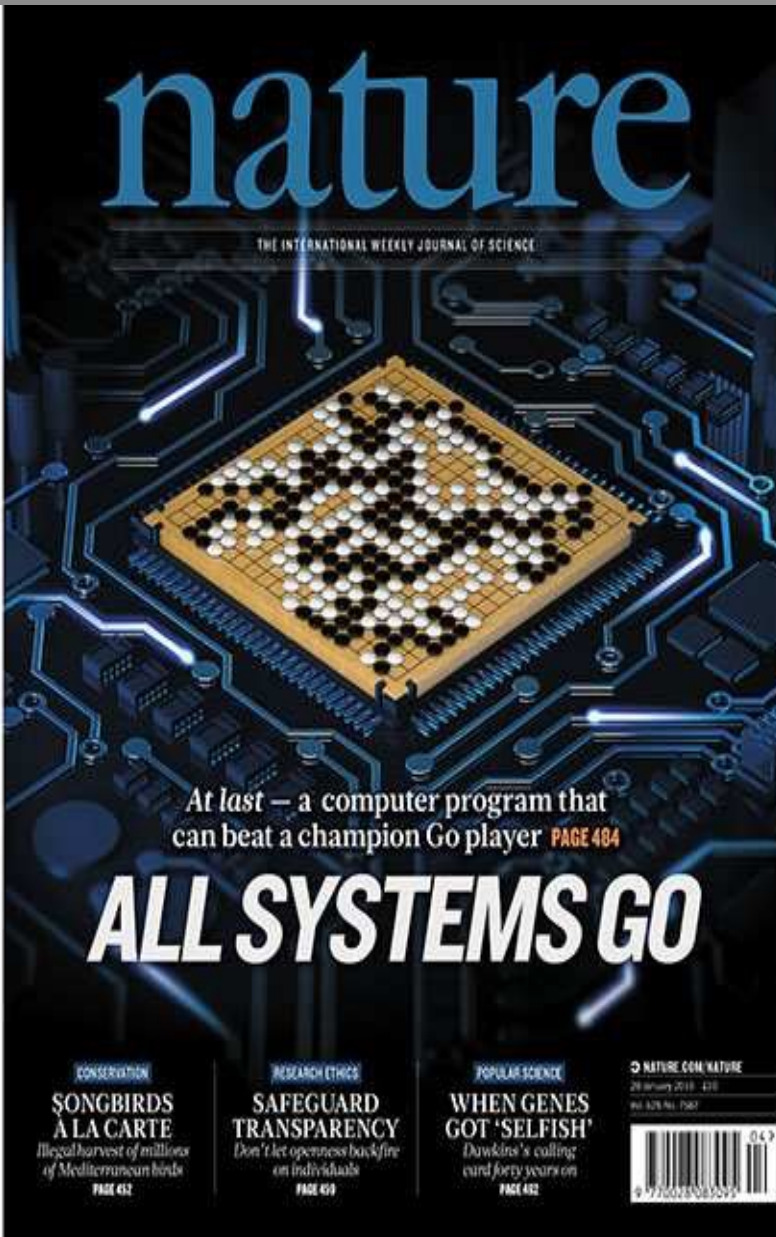
FUTURE OF MORPHING

- 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

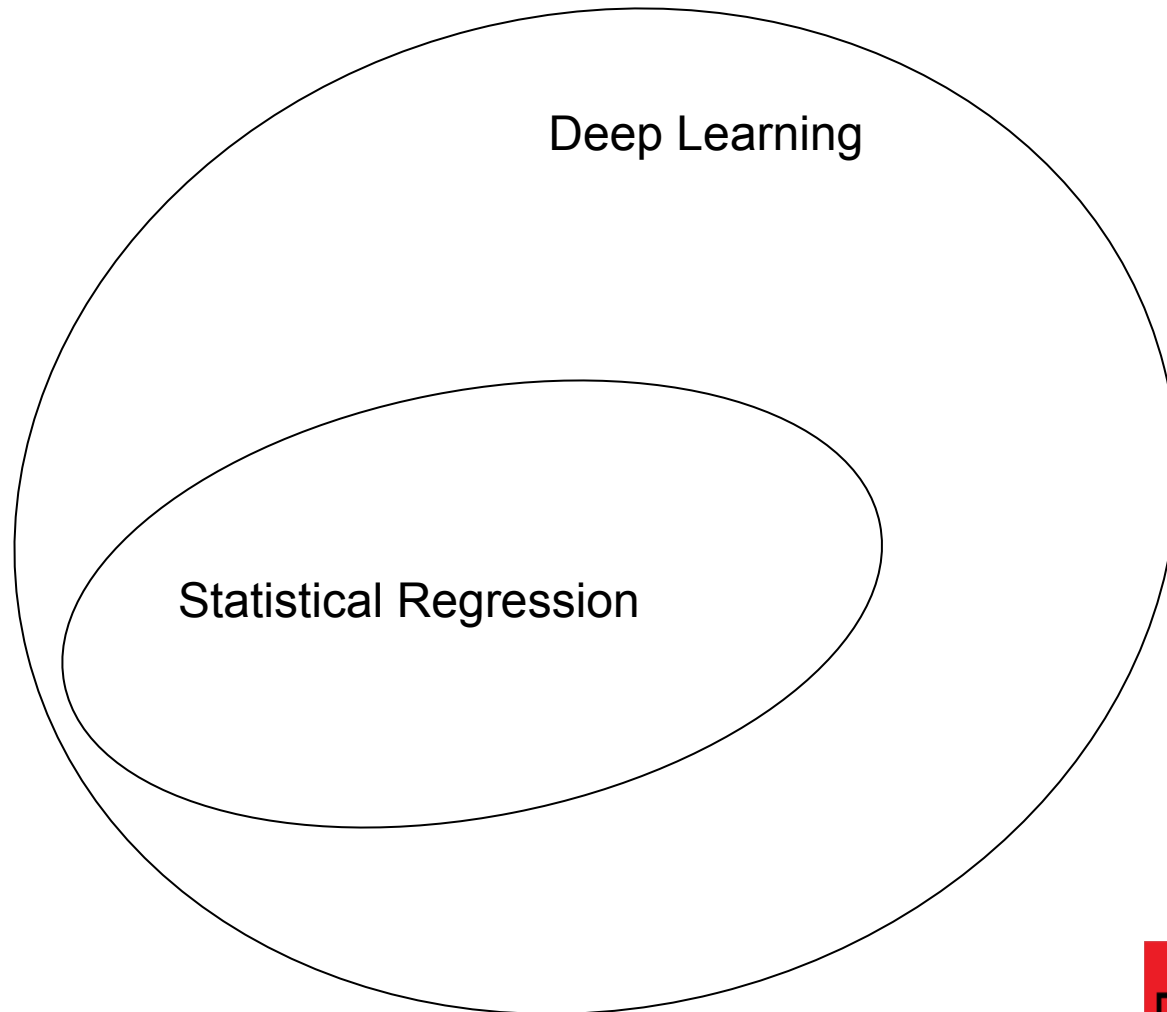
Deepmind: The Mystique of Deep Learning



Initiative on the Digital Economy -- IDE

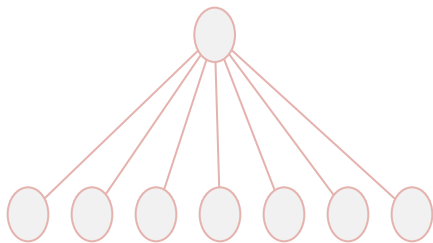
- 4 Program Areas
 - ❖ Productivity and Employment
 - ❖ Data and Information Privacy
 - ❖ New Business Models
 - ❖ Social Dynamics and Market Experimentation Section
- Foundation, Corporation, and Individual support
- Deep Learning in Marketing supported by Suruga Bank

Deep Learning in Marketing



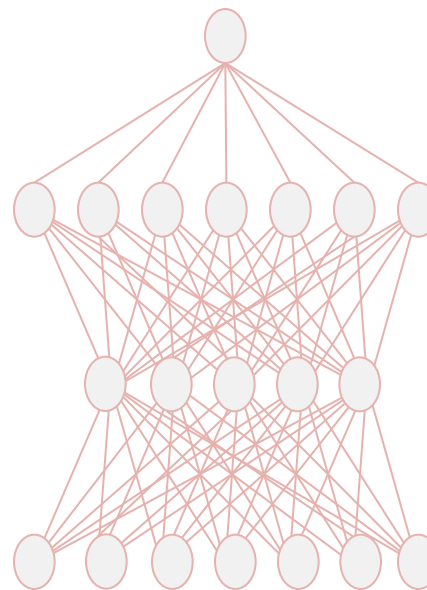
Functional Form

Linear
Regression



Maximum Likelihood
Interpretable
Linear

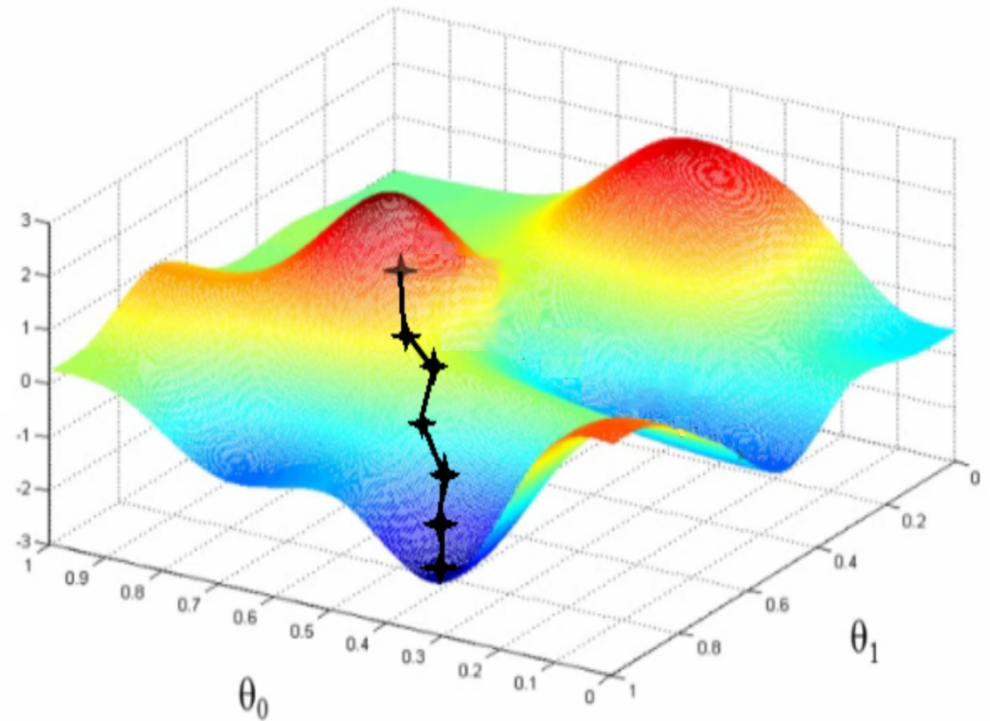
Neural
Network



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

Stochastic Gradient Descent

Minimize error using gradient descent methods.



Two Communities with Different Approaches

Classical Statistics

- High emphasis on error term assumption & statistical properties
- Simplicity & interpretability - Theory
- Use selected data
- Statistical Heritage
- Custom collection of data

Deep Learning

- Emphasis on prediction - “It works”
- Complex neural net
- Use Big data
- Artificial Intelligence
- Lower cost Big Data

Deep Neural Networks are Non-linear

Multiclass Spiral Dataset



Multinomial Logistic Regression

Deep Neural Network



34% Accuracy

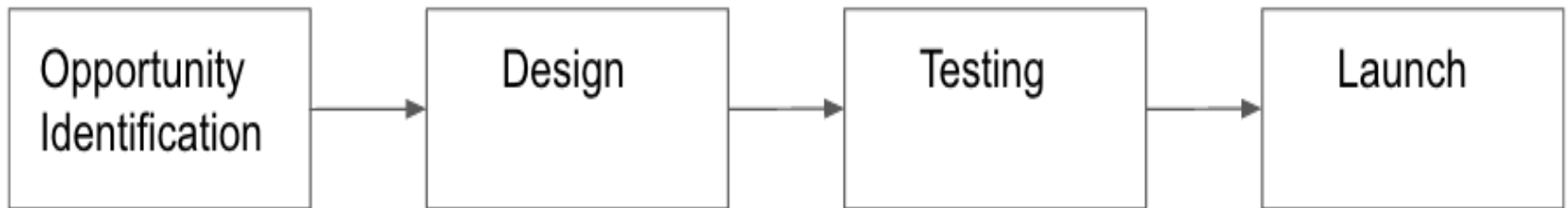


92% Accuracy

Can We Apply Deep Learning to New Products

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

Finding Opportunities for New Products

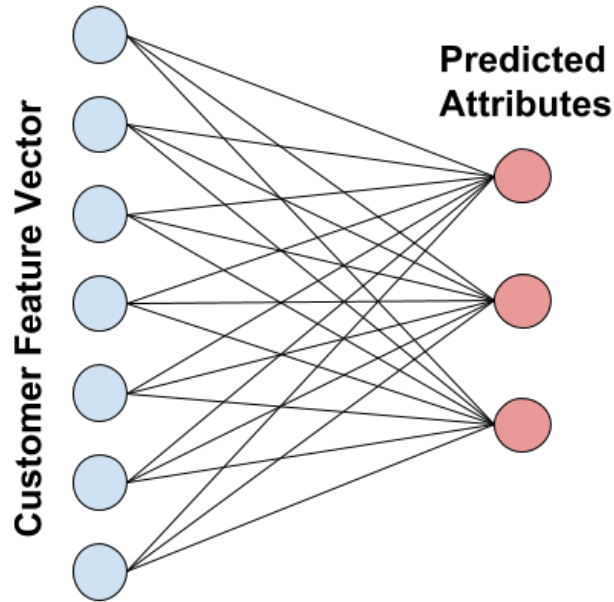


Approach

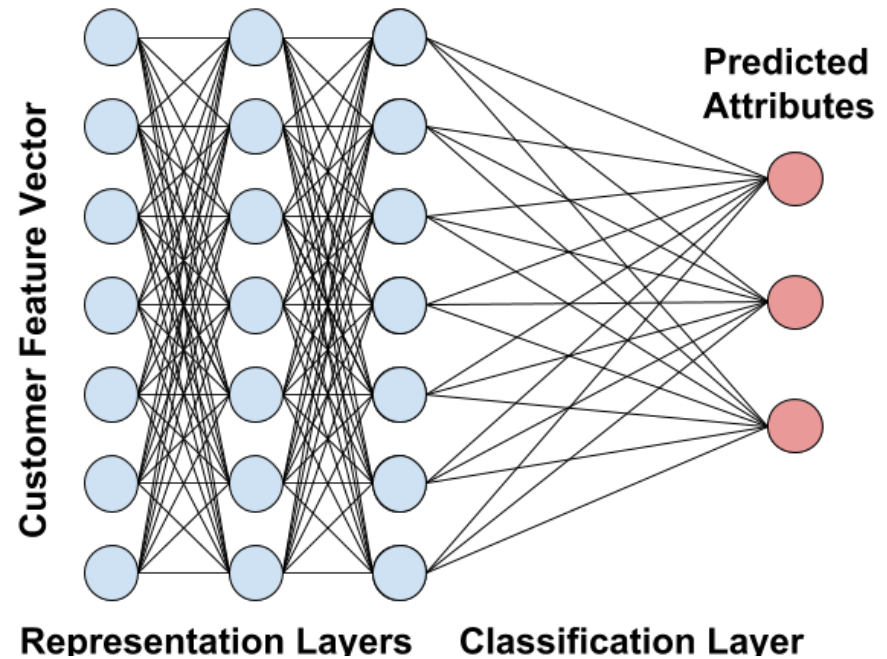
- Credit card advisor selection site
- Synthetic click data from "true" customer plus error
- Can we predict card selection (attributes) ?
- Empirical Data for Credit Cards – early results
- What are the implications for new credit cards?

Credit Card Functional Form

Multinomial Logistic Regression

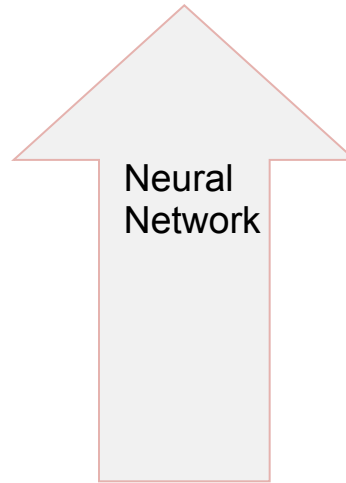


Deep Neural Network



Neural Net Model

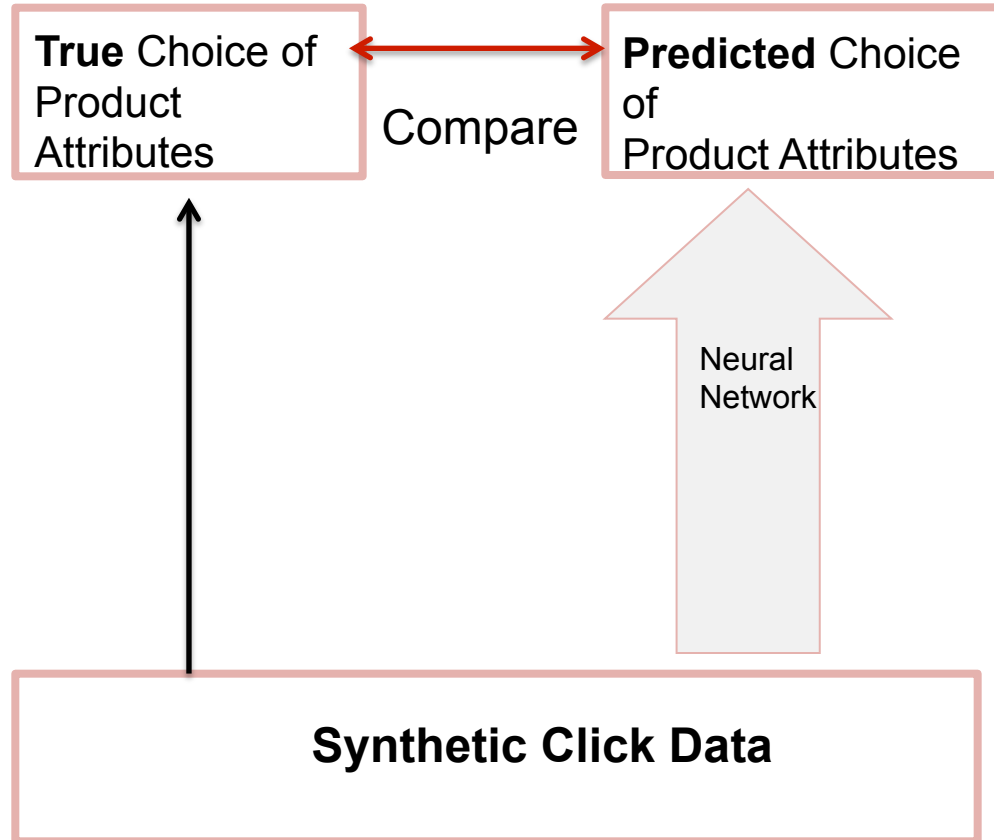
Realized product interest



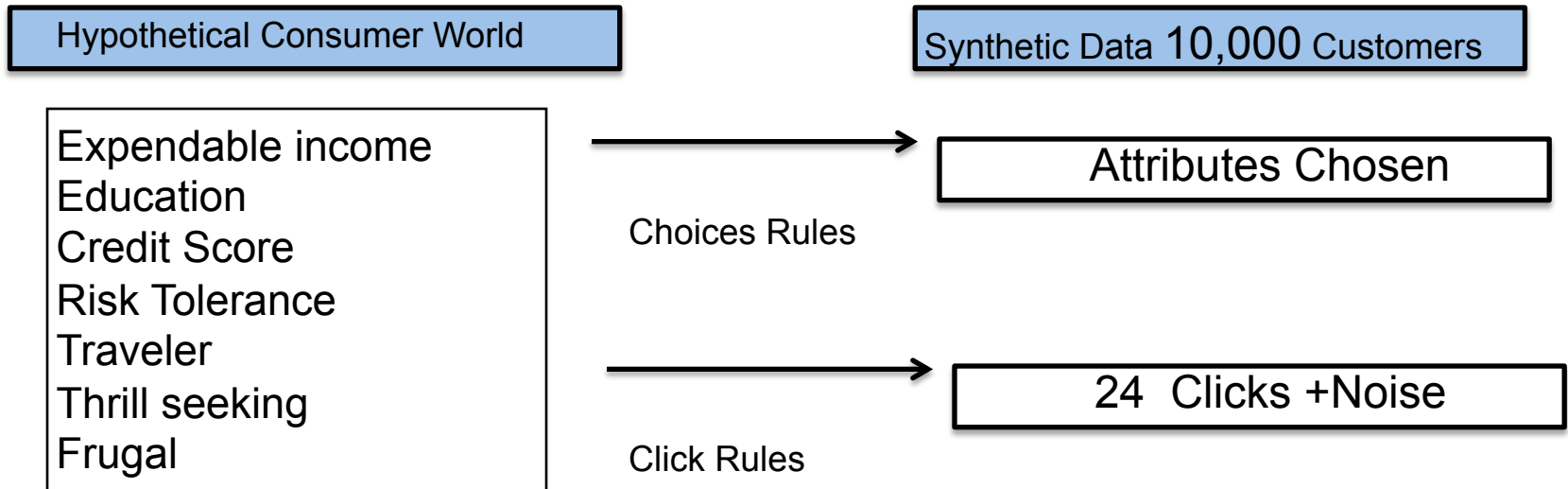
Customer click data



Methodology

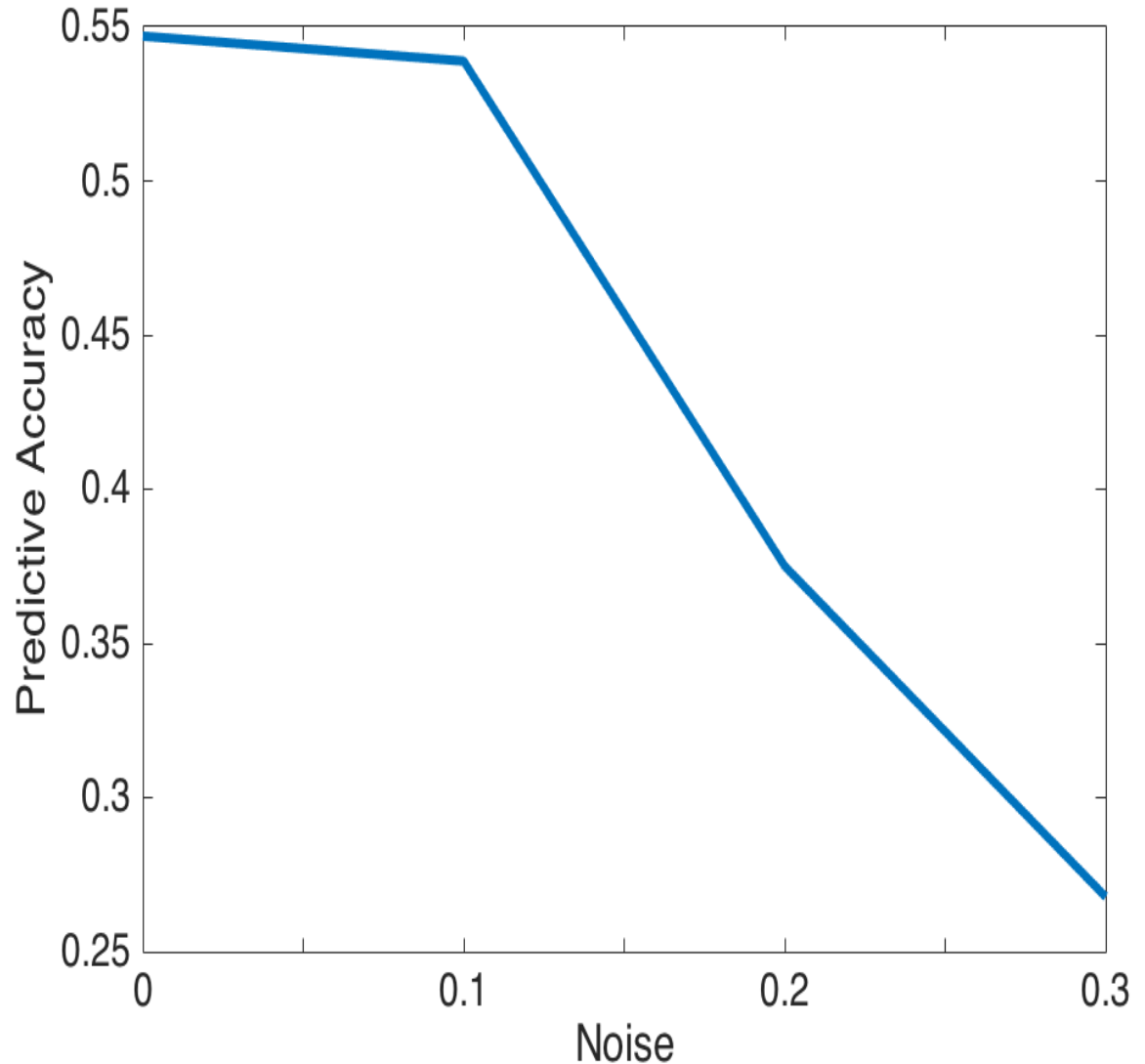


Synthetic Data Model



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



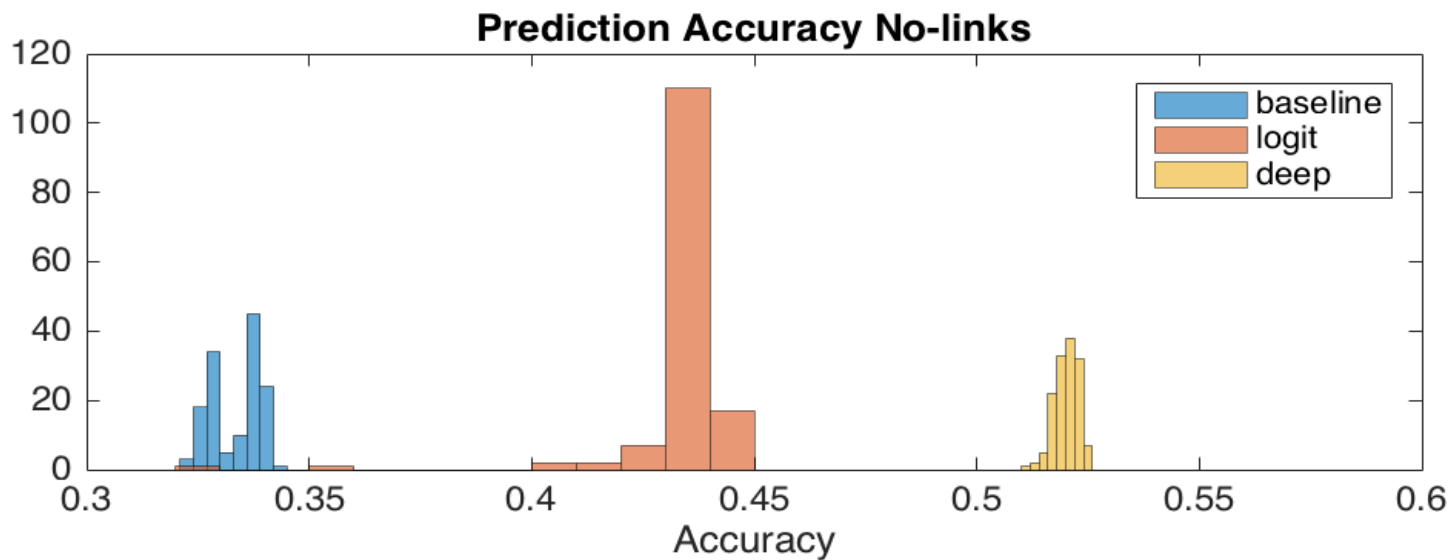
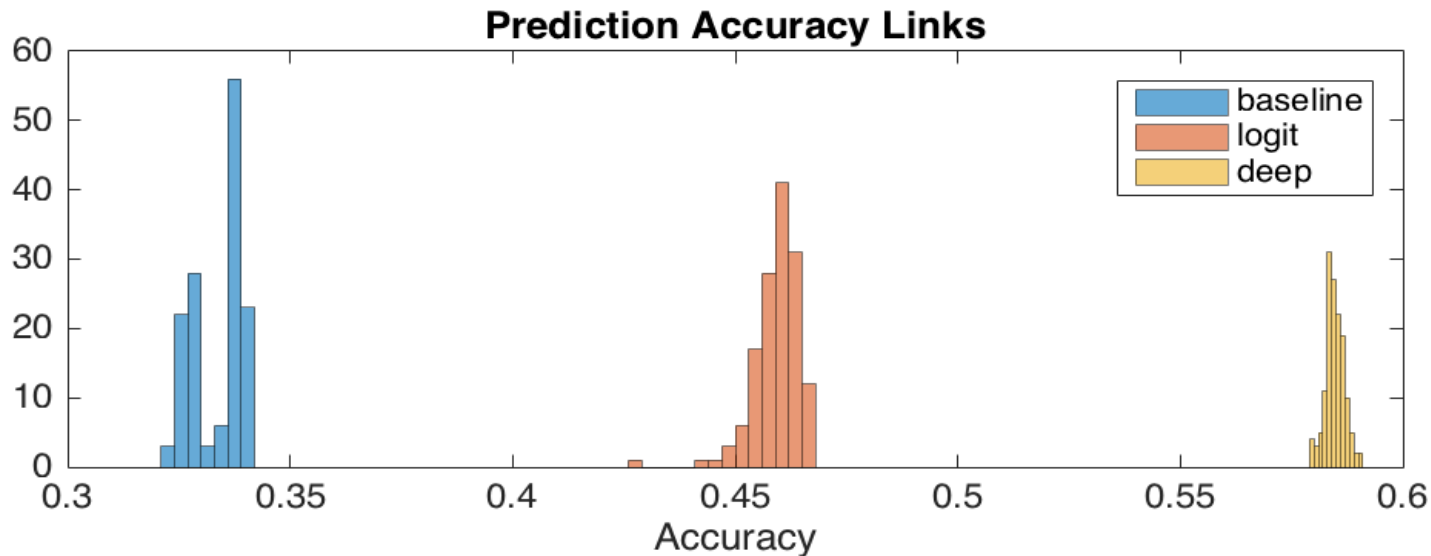
EMPIRICAL DATA – CREDIT CARDS

- 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



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

Add a new product

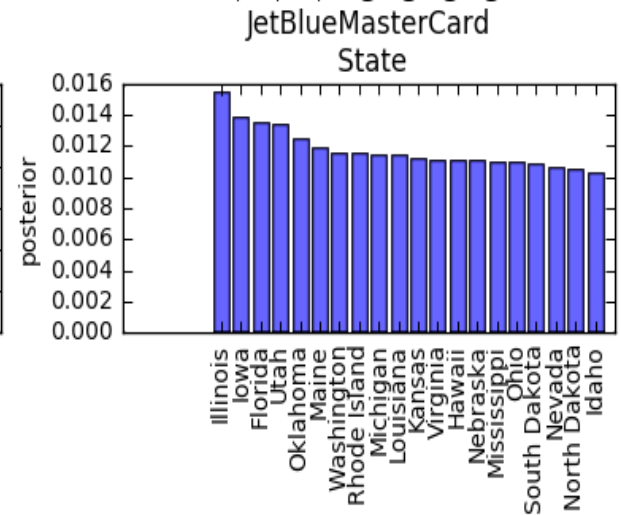
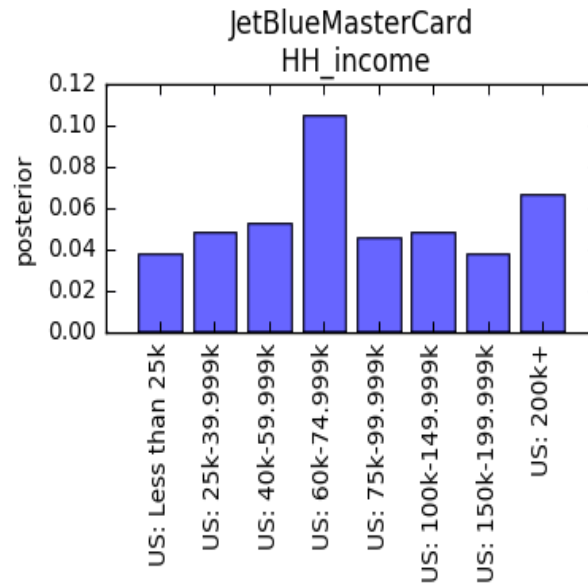
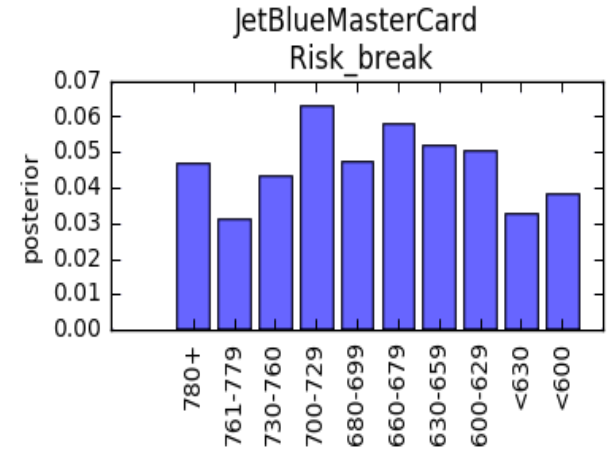
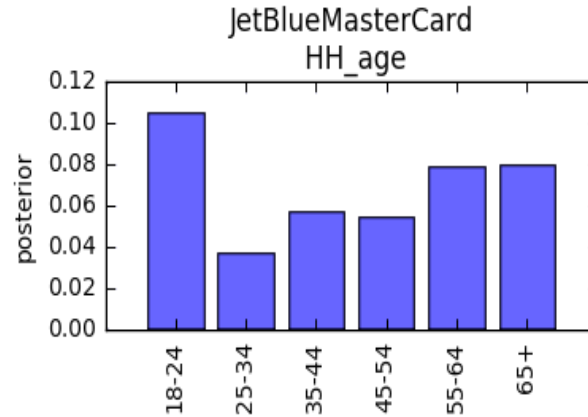
Rewards Program	Rewards Rate	Interest Rate
Cashback	1.5%	14.99%
Cashback	1%	24.99%
Cashback	1%	29.99%
Cashback	1.5%	12.9%

Market Share	Profit (\$M)
14.4%	47
31.2%	103
14.8%	49
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

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?

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

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