Better Marketing Analytics Using Genetic Algorithms

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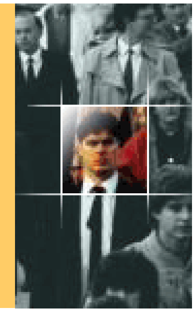
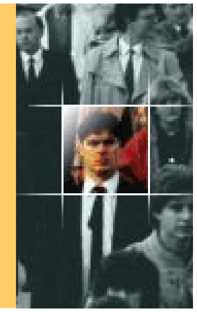
Today's Session



- Direct Marketing Today
- Predictive Modeling Techniques
- Building Models with Genetic Algorithms

Direct Marketing Challenges



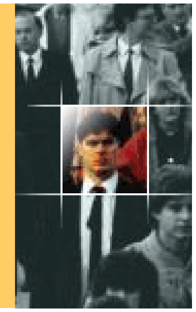
How can I improve my response rates?

Who are my customers?

Can I get that targeting done any faster?

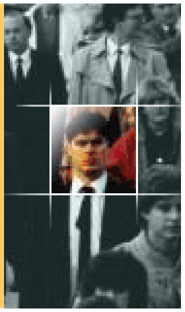
There must be other names out there?

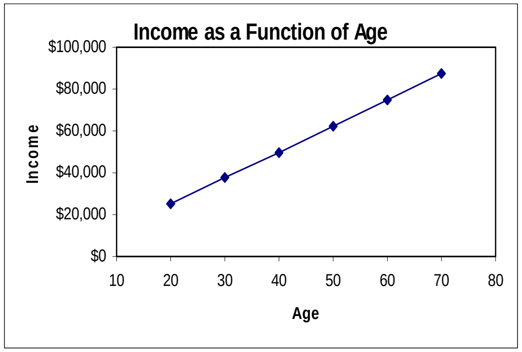
Analytics Can Be the Answer



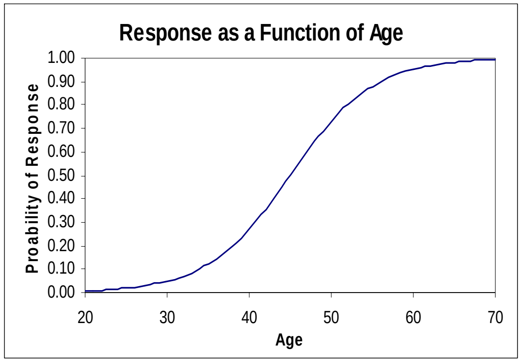
- Analytics can provide 25%+ better results but
  - Too time consuming and expensive
  - Requires specialized expertise
  - Difficult to justify for all but the largest campaigns

The Traditional Modeling Methods

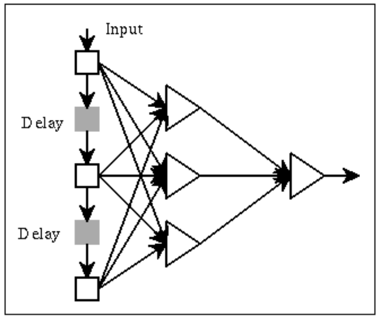




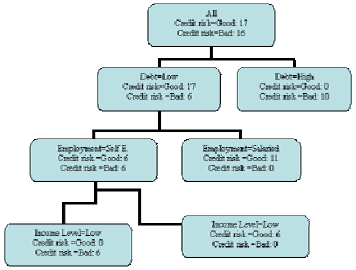
Linear Regression



Logistic Regression

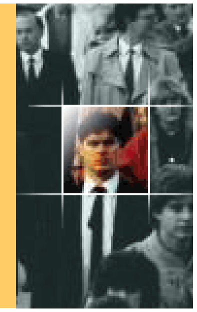


Neural Networks

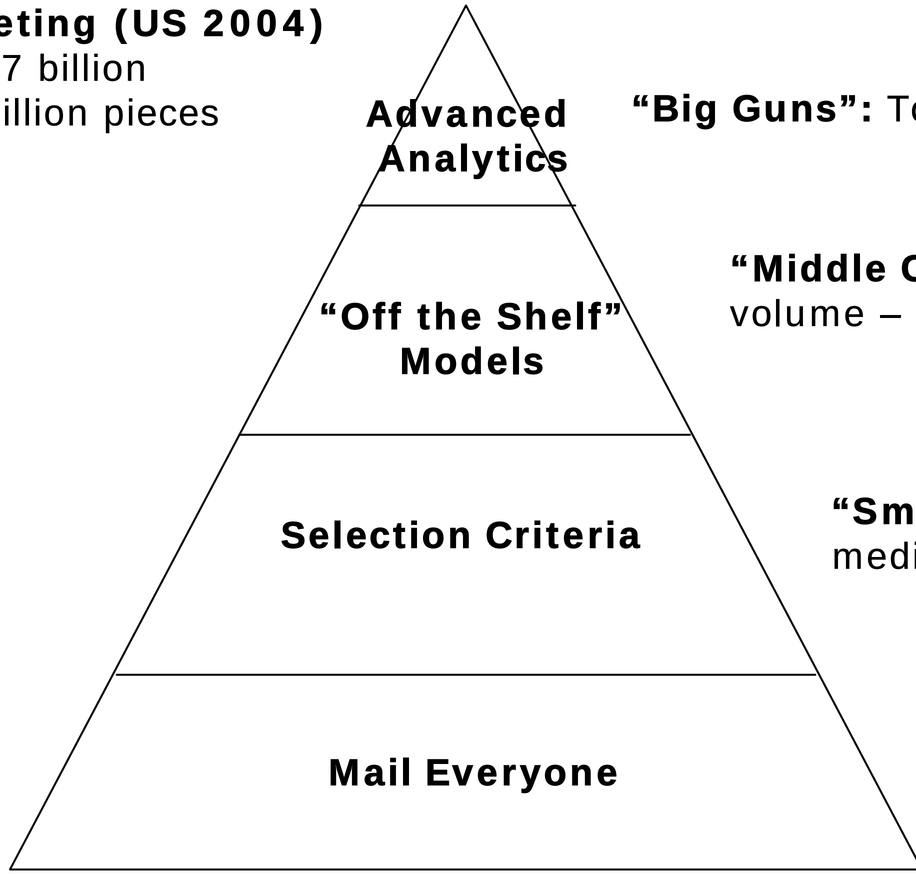


Decision Trees

Reality: Limited Application of Analytics



Direct Marketing (US 2004)
Spending: $47 billion
Volume: 94 billion pieces



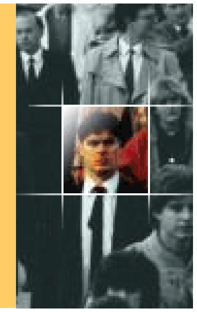
"Big Guns": Top 50-100 direct marketers

"Middle Class" Moderate mail volume – models come with data

"Small Fries": Small and medium business – best guess

"Carpet Bombers": No targeting

Genetic Algorithms for Predictive Analytics



1	0101	1100	0010010011

Gene

Genes used to represent variables and interactions

Interactions
(e.g., x+y, x*y, etc.)

Var1	**Var2**	**Var3**	**...**	**Var n**	**Int 1**	**Int 2**	**Int 3**

Chromosome

Chromosome made up of genes and represents model

Model 1	**V1**	**V2**	**V3**	**V4**	**V5**	**V6**	**V7**	**V8**	**V9**	**...**	**V*n***	**i1**	**i2**	**i3**	**...**
Model 2	**V1**	**V2**	**V3**	**V4**	**V5**	**V6**	**V7**	**V8**	**V9**	**...**	**V*n***	**i1**	**i2**	**i3**	**...**
Model 3	**V1**	**V2**	**V3**	**V4**	**V5**	**V6**	**V7**	**V8**	**V9**	**...**	**V*n***	**i1**	**i2**	**i3**	**...**
Model n	**V1**	**V2**	**V3**	**V4**	**V5**	**V6**	**V7**	**V8**	**V9**	**...**	**V*n***	**i1**	**i2**	**i3**	**...**

Generation

Multiple chromosomes in a generation

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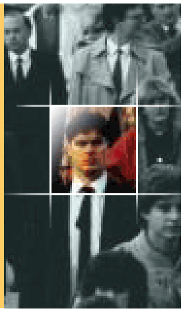
*** Genalytics' patent-pending process**

Begin by Creating a Set of Random Models



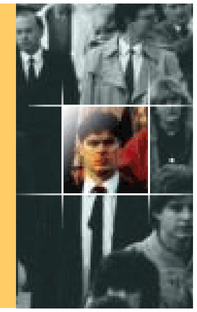
V1	V2	V3	V4	V5	V6	V7	V8	V9	...	Vn	i1	i2	i3	...

Full Chromosome Represents All Data Variables

Model 1	V1	V2	V3	V4	V5	V6	V7	V8	V9	...	Vn	i1	i2	i3	...
Model 2	V1	V2	V3	V4	V5	V6	V7	V8	V9	...	Vn	i1	i2	i3	...
Model 3	V1	V2	V3	V4	V5	V6	V7	V8	V9	...	Vn	i1	i2	i3	...
Model n	V1	V2	V3	V4	V5	V6	V7	V8	V9	...	Vn	i1	12	i3	...

Model chromosomes use only selected variables

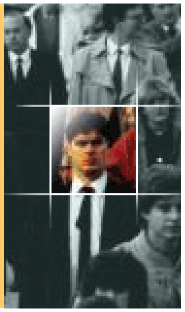
Then Evaluate Fitness for all Models



M1	V1	V2	V3	V4	V5	V6	V7	V8	V9	...	Vn	i1	i2	i3	...	0.20
M2	V1	V2	V3	V4	V5	V6	V7	V8	V9	...	Vn	i1	i2	i3	...	0.32
M3	V1	V2	V3	V4	V5	V6	V7	V8	V9	...	Vn	i1	i2	i3	...	0.45
M4	V1	V2	V3	V4	V5	V6	V7	V8	V9	...	Vn	i1	i2	i3	...	0.62
	...															
M100	V1	V2	V3	V4	V5	V6	V7	V8	V9	...	Vn	i1	i2	i3	...	0.75

Most fit models are more likely to survive and be selected for breeding

Mating "Most Fit"Models



Mating:

110101010100101010101101010101010101010…

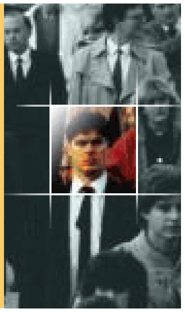
00000101010111101001010010111010101001011…

... becomes

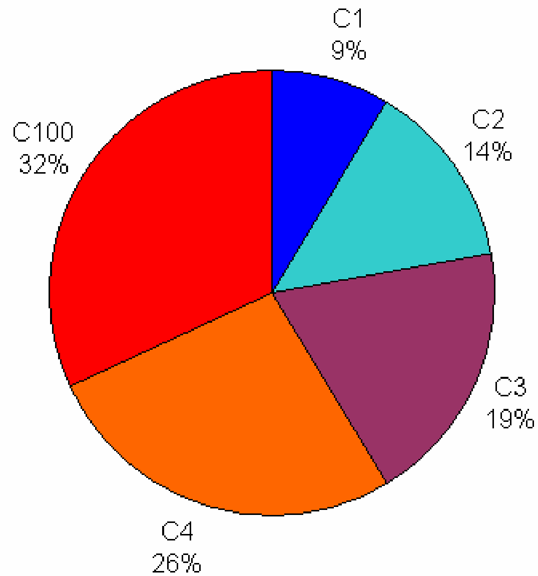
110101010100101010101101010**10101010101010**…

000001010101**101010101101010**11010101001011…

Probability of Mating



- Random number "roulette wheel" selects pairs for breeding
- Proportional to fitness
- Higher fitness are more likely to be selected



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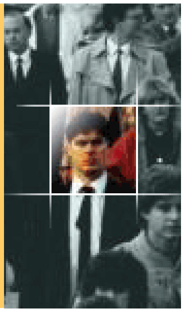
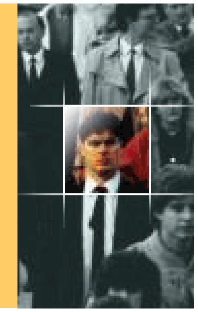
Multiple Ways to Test Model “Fitness”



- Percent correctly classified
- Pearson’s Linear Correlation
- R-Squared
- Lift
- Upper Lift
- Max K-S
- Error-Squared

Putting it all Together



Training Data 70%

f_n = 0.277(AGE) + 5.636(QUANTITY) - 7.112(ZIP) + ...

Score and Rank

"Fitness"

Generation One: Model 1, Model 2, Model 3, Model 4, Model 5, Model 6

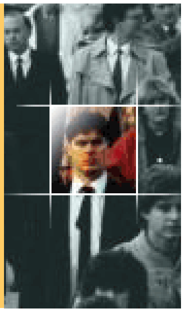
Generation Two: Model 7, Model 8, Model 9, Model 10, Model 11, Model 12

Generation (*n*): Model 13, Model 14, Model 15, Model 16, Model 17, Model 18

Model (*n*)

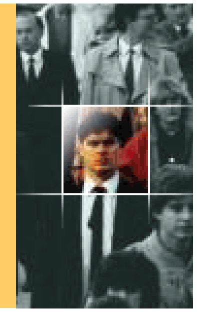
Fitness Accuracy Scale

Low — High



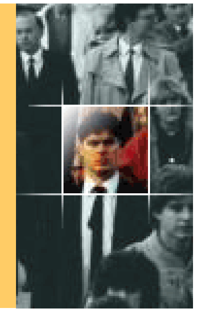
Genetic Algorithm Advantages

Work with More Data



- Traditional Approaches
  - Start with large number of variables
  - Univariate analysis
  - Data reduction
  - Model with “best” 25-50 variables
  - Do you have the most predictive attributes?
- Genetic Approach
  - Start with large number of variables
  - No univariate analysis
  - No data reduction
  - Use all variables in software (hundreds or thousands)
  - Attributes with most predictive power thrive
  - Resulting in 10% better predictions

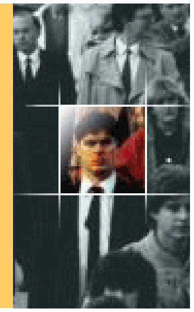
Faster Data Preparation

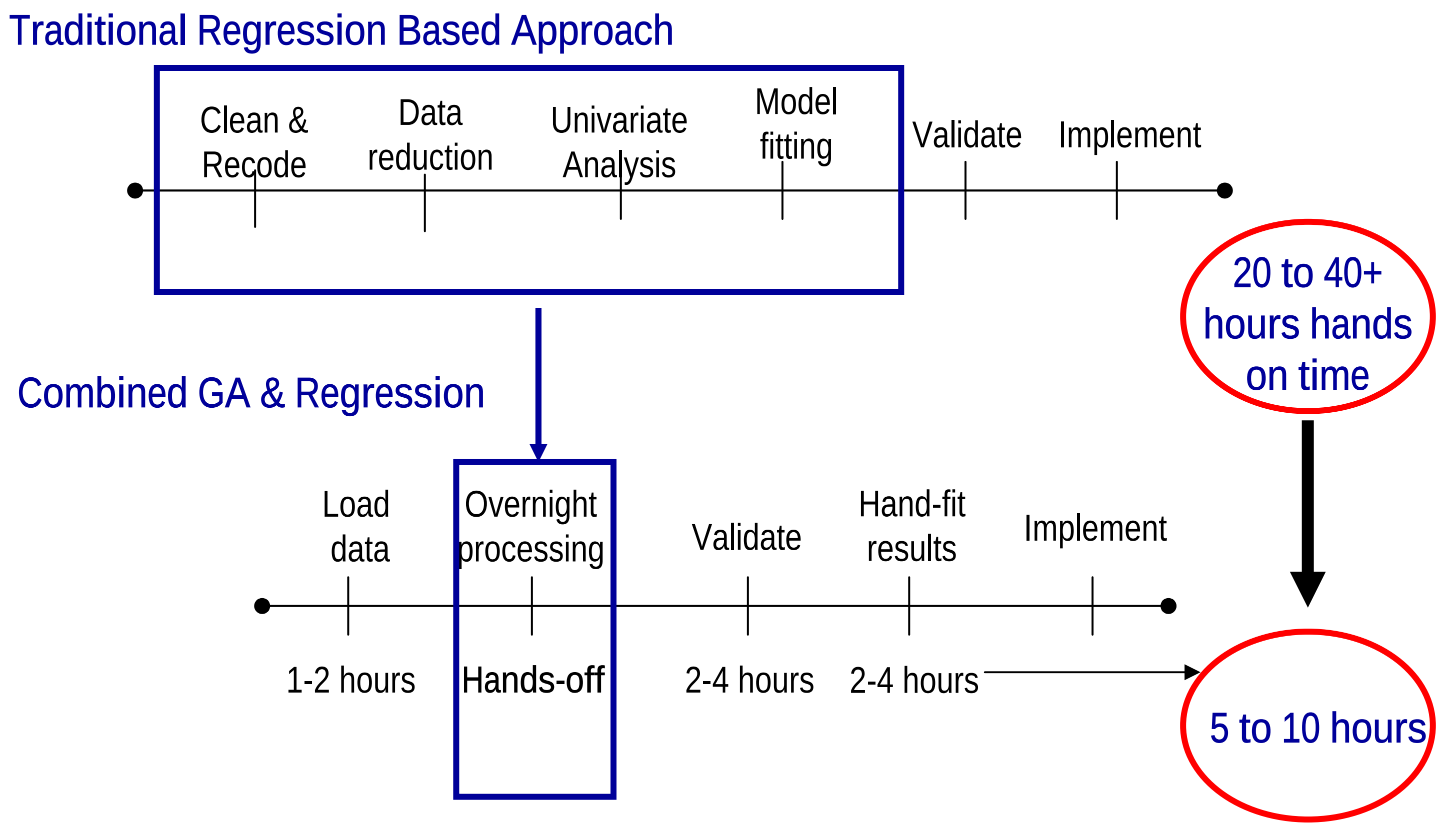


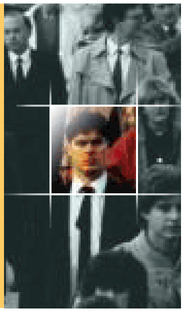
- Automates many data prep steps
  - Transformations (sq, sqrt, exp, log, etc.)
  - Outlier trimming
  - Missing value substitution
  - Interaction detection
  - Variable selection

Level of human control over the process can be tailored to the situation

More Time for Deeper Exploration

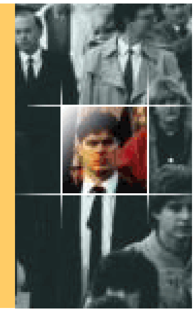






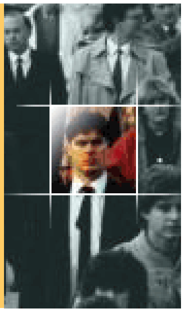
Case Study

Leading Financial Services Provider



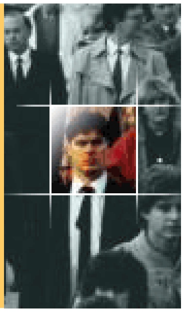
- Environment
  - Increasing competition
  - Bottleneck in analytics
  - Finite number of analysts
  - Aggressive growth targets
- Business Goals
  - Management wants:
  - Higher response rates
  - Fewer charge-offs
  - Quickly test new ideas
  - Faster model turnaround

Challenge 1: New Market Opportunity

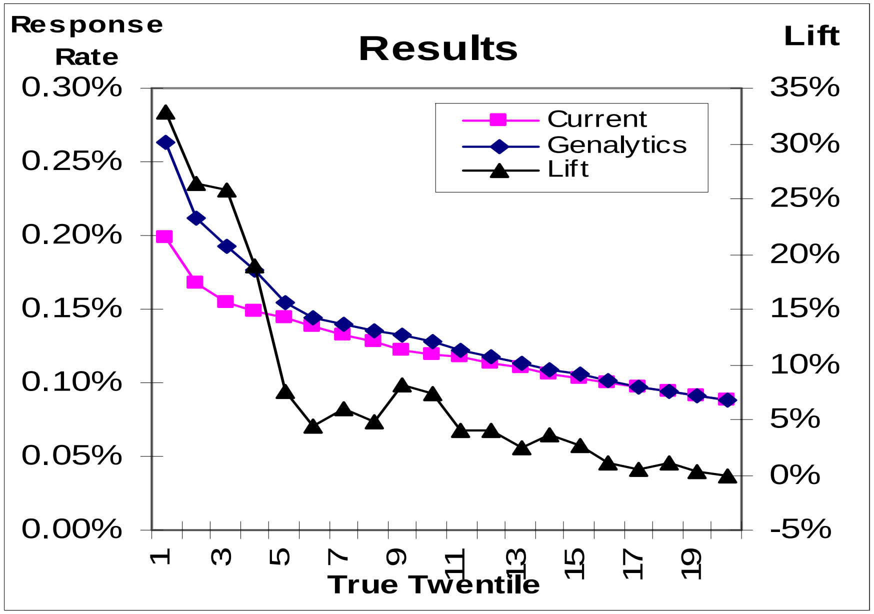


- Situation:
  - Needed further justification to expand new market opportunity
- Hurdle:
  - Quickly build response models against prospect database with over 500 variables

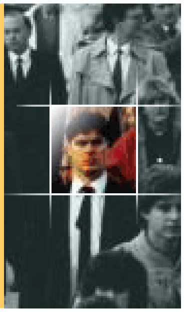
The Results



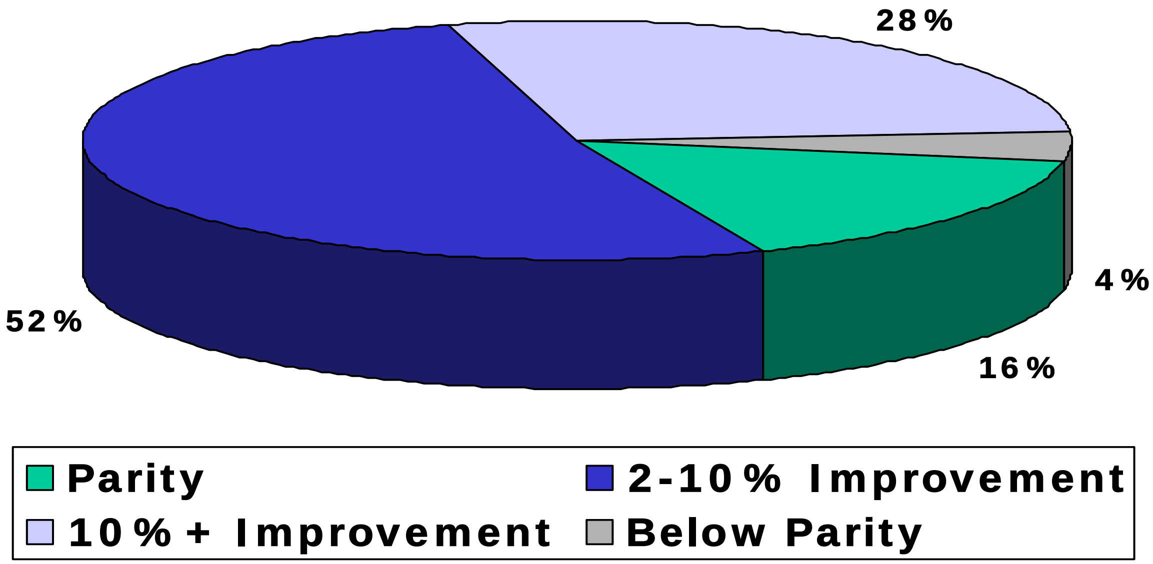
- Genetic Algorithm:
  - Multiple models in days
  - Evaluated all variables
  - Required one day for hand-fitting model
- Results
  - New business drivers
  - 20% increase in accuracy
  - 20% better response rate
  - Realized $2.5M ROI



The Results are Clear

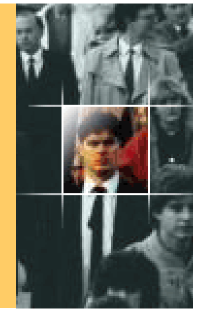


Genalytics' models show improvement over clients existing models

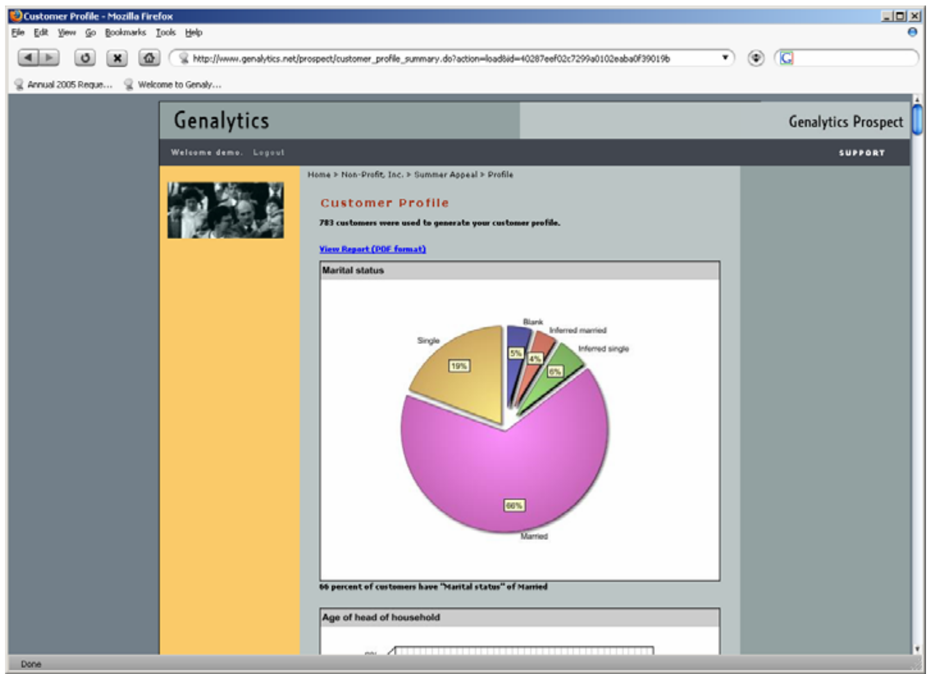


*Results based on comparisons with our largest clients

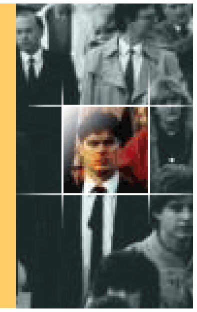
Genalytics Prospect



- Easy to use, Web-based “wrapper” around analytics software



Contact Information



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