

An Efficient Approach to Solving Complex Market Research Problems

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An Example of Maximum Coverage

- Three advertising concepts for juice drink product
- Ten consumers polled

Consumer	Beach	Park	School
А	х		
В	x		
С		х	x
D	х		
E			x
F		х	
G			
н		х	x
I			x
J	x	x	



Maximum Coverage

- Maximum coverage problems are widespread
- Advertizing optimization
 - Maximize number of consumers reached
 - Maximize number of households reached
- Menu optimization
 - Maximize number of interested consumers
 - Maximize number of ingredients used
- Portfolio optimization
 - Maximize first choices among consumers
 - Maximize top box scores

Any TURF application is a maximum coverage problem

Total Unduplicated Reach and Frequency

- TURF (Total Unduplicated Reach and Frequency) is a technique introduced by Miaoulis, Parsons and Free (1990)
 - Venn Diagram based approach



- Maximizes total coverage of combinations
- Originally used to estimate reach of advertising
- Has been used extensively to maximize purchase interest

TURF – Advantages and Disadvantages

Advantages:

- Flexible technique with many applications
- Easy to understand and explain
- Clear guidance
- Visualization possible for small number of concepts

Disadvantages

- Visualization not possible for larger numbers of concepts
- Huge number of combinations when number of concepts is large
 - 5 concepts out of 100 = 75,287,520 combinations
 - 10 concepts out of 100 = 17,310,309,456,440 combinations
- Approximate solutions exist for large problems but generally are not exact



Maximum Coverage

> Any TURF application is a maximum coverage problem

- Want combination of concepts or products with most consumers
- Number of concepts or products in combination is fixed
- Maximal coverage problems can be approached using advanced algorithms
- Exact and approximate algorithms exist
 - Problem is NP-Hard
 - Greedy algorithm is frequently reasonable but does not give exact answers, plus examples exist which illustrate possible results that are decidedly inferior
- Ennis and Fayle (to be published shortly) is first efficient exact algorithm



Maximum Coverage Solution

Idea of solution:

- Too many combinations to directly evaluate
- Need to avoid as many combinations as possible by using exclusion criteria
- We proceed through a series of incremental sub problem solution steps
- Each step executes recursively and uses the results of previous steps to limit the search

> Example:

- Suppose there are 7 concepts and 100 consumers
- Want 5 concepts that appeal to greatest number of consumers



Maximum Coverage Algorithm



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Competitive Portfolio Optimization

- When competitors exist, portfolio optimization is maximal coverage problem
- Want products to work together to maximize market share



Map Label	Market Share	
P ₁	0.5833	
P ₂	0.1667	
P ₃	0.2500	

Market Share for P₂ and P₃ 41.67%



Competitive Portfolio Optimization

Considerations:

- Infinitely many locations possible for prototypes
- Only finitely many consumers and competitors
- ✤ A fine enough grid will contain locations that give optimal results





Competitive Portfolio Optimization

For each grid point determine which consumers are reached in the presence of competition



Use maximum coverage tools to find combination maximizing market share

Portfolio Optimization Example

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LSA results for 9 cookie brands and 250 consumers:



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Portfolio Optimization Example

We seek a portfolio that optimizes market share in the presence of 4 competitors:

Happy Elf 1	Sunny Lemon	
Sugar Farms 2	Chocolate Island 2	

- We find the combination of 3 locations on LSA map that reaches the greatest number of consumers
- We cover the space with a 25 x 25 grid and use maximal coverage tools to find optima
- We use scales to predict profiles for the optima and provide guidance to product development



Portfolio Optimization Example



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Summary

Maximal coverage problems appear in many forms

- TURF-type problems
- Portfolio optimization
- Solutions to large problems approximate until now
- New algorithm avoids poor combinations to find solution
- Algorithm allows for portfolio optimization in presence of competition
- Large TURF-type problems can now be solved exactly



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