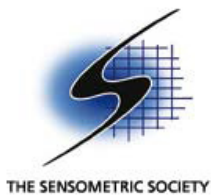


# The Institute for Perception

Presents

## Combinatorial Tools for Creating Optimal Products and Portfolios

*Presented at the 10<sup>th</sup> Sensometrics Meeting in Rotterdam, The Netherlands  
July 23<sup>rd</sup>, 2010*



### *What You Will Learn!!*

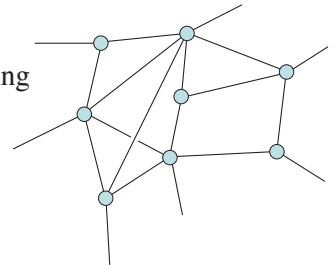
In this course we present a variety of applications and examples demonstrating the power of relatively simple combinatorial tools. We show how optimal products and portfolios can be constructed, how optimal combinations of items can be selected for testing purposes and how optimized market segmentation can be revealed.

#### Optimal Combinations of Product Components

- ◆ Problems in sensory and consumer science requiring computationally intensive tools
- ◆ Beginning graph theory, cliques and backtracking
- ◆ Selecting maximally compatible combinations of features, flavors or ingredients
- ◆ Selecting maximally distinct combinations of products for testing or factories for monitoring

#### Optimal Portfolios and Market Segments

- ◆ Creating a more efficient Total Unduplicated Reach and Frequency analysis
- ◆ Selecting optimal portfolios of feature, flavor or ingredient combinations
- ◆ Determining market segmentation



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### *Meet the Instructors*



**Dr. John M. Ennis** is the Vice President of Research Operations at The Institute for Perception. John has an extensive background in both mathematics and psychology having received his Ph.D. in mathematics from the University of California at Santa Barbara (UCSB) and having conducted his post-doctoral studies in the UCSB psychology department. Winner of the 2003-2004 UCSB outstanding educator award, John has published in prominent journals in mathematics, psychology, statistics and market research and has co-authored a book chapter on neuroanatomy. In addition to his research, John consults on a variety of topics including segmentation and portfolio optimization.



**Charles M. Fayle** is the Lead Software Engineer at The Institute for Perception. Charles has 25+ years of computer programming experience including time spent at Microsoft, Amazon and Comsys. In addition to this work, Charles has conducted extensive research on parser and compiler generators.

Contact Info: Dr. John Ennis at [mail@ifpress.com](mailto:mail@ifpress.com) or +001 804 675 2980

### Overview

Efficient tools together with advances in computing power allow one to find exact solutions to previously intractable product and portfolio optimization problems. In this course we present a variety of applications and examples demonstrating the power of relatively simple combinatorial tools. In each case we show how efficient search techniques allow us to sift through a potentially vast number of possibilities in reasonable time to conduct what is effectively a complete search for optimal solutions. Using these search techniques we show how optimal products and portfolios can be constructed, how optimal combinations of items can be selected for testing purposes and optimized market segmentation can be revealed.

### Optimal Combinations of Product Components

#### **9:00am: Problems in sensory and consumer science requiring computationally intensive tools**

Whenever one wishes to combine features, flavors or concepts the number of combinations explodes as the number of elements involved increases. Without efficient tools that eliminate doomed combinations from consideration early in the search, the time required for completion becomes prohibitively large. We start by reviewing some common situations in which efficient tools make a difference between finding an optimal solution and finding no solution at all.

#### **10:00am: Beginning graph theory, cliques and backtracking**

The tools we develop in the morning session are based on simple ideas from graph theory. We first review what a graph is and we then discuss cliques, i.e. subsets of graphs that are fully interconnected. We follow by explaining some efficient techniques for finding maximal cliques, most notably a technique known as backtracking, and we discuss the usefulness of these techniques.

#### **11:00am: Selecting maximally compatible combinations of features, flavors or ingredients**

Using tools from graph theory, we explain how finding a complete set of maximal cliques is useful when one wishes to select optimally compatible combinations of features, flavors or ingredients. We discuss how to find such a set of cliques and we explain through examples how we have used this technique in practice.

#### **12:00pm: Selecting maximally distinct combinations of products for testing or factories for monitoring**

Turning the results from the previous hour around, we discuss how we have used results from graph theory to find combinations that are maximally distinct. Using these ideas we discuss examples that include product selection for category review testing and factory selection for quality control purposes.

### Optimal Portfolios and Market Segments

#### **2:00pm: Creating a more efficient Total Unduplicated Reach and Frequency analysis**

We begin the afternoon by showing how TURF, a widely used and useful product line extension model, is poorly suited to provide exact answers for large problem sizes. We then show how the efficiency of TURF can be drastically improved by advanced computational techniques.

#### **3:00pm: Selecting optimal portfolios of feature, flavor or ingredient combinations**

In this hour we demonstrate how we have used the computational techniques of the previous section for portfolio optimization purposes. In particular we involve the ideas from the morning session to show how optimal portfolios can be constructed out of sets of combinations of features, flavors or ingredients.

#### **4:00pm: Determining market segmentation**

We conclude by demonstrating how we have combined the computational techniques presented thus far with unfolding methods such as Landscape Segmentation Analysis<sup>®</sup> to determine optimal product portfolios and market segmentation. In these examples, we show results of extensive searches for combinations of potential products that are optimally distributed across the landscapes.

### Additional Details

**Level:** This course will be taught at an introductory level.

**Breaks:** Each hour will consist of 50 minutes of instruction followed by a 10-minute break.