MINI PROJECT 1:

QUANTITATIVE MODELING OF BUSINESS PROBLEMS

OBJECTIVE

The goal of mini project 1 is to practice quantitatively modeling business problems and thinking as a data analyst. This includes business problem analysis, practicing how to ask analytics questions, and interpreting data.

BACKGROUND

A *quantitative* approach to solving a business problem uses equations to break down a business problem into numbers to make a data-driven decision, while a qualitative model uses reasoning with words to arrive at a decision.

For example, suppose the question is: *Should I build a new factory to produce more pencils?* In a quantitative model, we break down the question into a few numbers: (1) cost of building a new factory, (2) number of pencils the new factory will produce, (3) revenue for each pencil. In basic terms, if the revenue for each pencil multiplied by the number of pencils that will be produced will be greater than the cost of building the factory, we should build the factory.

In a qualitative model, we reason about the question with words. For example we might reason that "Our factories last for a very long time, so they will eventually pay for themselves so we should build as many factories as we can afford."

Quantitative models are generally more valuable than qualitative models, because the conclusions in a quantitative model are generally supported by evidence collected over large sample sizes, for example over large numbers of individuals. For this example, the evidence is in the form of the calculations that demonstrate the economic benefit of producing our product.

DIRECTIONS

PART I: INTRODUCTION & BACKGROUND

CASE STUDY: SPECIALTY FOODS INC.

INTRODUCTION:

Specialty Foods Inc. is a food retailer focusing on the higher end of the market. You are a new member of the marketing team that was hired based on your data analytic skills. The company is interested in improving business results through more data-driven analysis and decision making. Traditionally the marketing department has launched campaigns to increase sales using qualitative analysis that has focused on previous experience and an understanding of the market.

Given your data analytic skills, your manager has asked you to help the marketing team by gathering insights into the type of customers the company has and the products they buy. You are also asked to review past campaigns and suggest improvements for future marketing campaigns. In addition to gaining a better understanding of the business your analysis should result in specific recommendations on how the company can improve business results.
(You will not be doing all of this in the current project; we will be revisiting this business and these datasets later.)

BUSINESS OVERVIEW:

Specialty Foods sells products within five main categories: wine, meats, fruits, seafood, and sweets. Each of the aforementioned categories are further divided into standard and premium products. The company has three sales channels and items can be purchased through physical, in-store locations, catalog sales, and through the company's website. The marketing department periodically uses different campaigns to increase sales.

ANALYSIS:

For this mini project each team should clearly understand the Business Problem. In addition to a thorough understanding of the problem you are asked to solve, you should consider how you will approach your analysis. The team should focus on analytics that uncover insights leading to better data-driven business decisions. (Often, you will be given a specific business problem to solve. Other times, you will need to do exploratory analysis in order to understand the data and see how you can use the data to improve the business. For this assignment, the business problem is a series of questions you are being asked to answer, using the data provided in the .csv files.)

As a data analyst you need to understand your data very well in order to provide insights to others on customer segments, product sales and results of marketing campaigns. As you review the details of your data, you should think about what kind of analysis you can perform keeping in mind that your recommendations will focus on how the company can increase sales revenues. For example you can consider customer segmentation, product prioritization, marketing campaign success rates, etc.

This mini project focuses on understanding the Business Problem. Subsequent mini projects will cover additional topics in the analytic process and include Data Curation / Wrangling, Exploratory Data Analysis & Modeling, and Data Visualization & Storytelling including the advanced tools of SQL and Tableau.

DATASETS:

In order to conduct your analysis you are given data on the company's customers, products, and previous marketing campaigns. The data you have available to you contains both socio-demographic and company specific information. There are 3 separate data sources each containing information on customers, products and marketing campaigns.

Customer (please click to download) table includes the following information:

- **ID**: customer unique ID
- **Income**: customer's yearly household income
- **Kids**: number of small children in the household
- **Teens**: number of teenagers in the household
- **Age**: age of customer
- **Divorced**: 1 if the person is divorced, 0 otherwise
- **Married**: 1 if the person is married, 0 otherwise
- **Single**: 1 if the person is single, 0 otherwise
- **Together**: 1 if the person is living with a partner, 0 otherwise
- **Widowed**: 1 if the person is widowed, 0 otherwise
- **Basic**: 1 if education is secondary level (high school), 0 otherwise
- **Graduate**: 1 if education is university level, 0 otherwise
- **Master**: 1 if education is masters level, 0 otherwise
- **PhD**: 1 if education is doctorate level, 0 otherwise
- **State**: US state of residency

Sales (please click to download) table includes the following information:

- **ID**: customer unique ID
- **Recency**: days since last purchase
- **Wines**: amount spent on wine
- **Fruits**: amount spent on fruit
- **Meats**: amount spent on meat
- **Seafood**: amount spent on seafood
- **Sweets**: amount spent on sweets
- **Premium**: amount spent on premium products
- **Regular**: amount spent on standard products
- **Deals**: number of purchases made with a discount
- **Website**: number of website purchases
- **Catalog**: number of catalog purchases
- **Store**: number of in-store purchases
- **Visits**: number of website visits in past 3 months

Marketing (please click to download) table includes the following information:

- **ID**: customer unique ID
- **MC3**: 1 if customer made a purchase based on Campaign 3, otherwise 0
- **MC4**: 1 if customer made a purchase based on Campaign 4, otherwise 0
- **MC5**: 1 if customer made a purchase based on Campaign 5, otherwise 0
- **MC1**: 1 if customer made a purchase based on Campaign 1, otherwise 0
- **MC2**: 1 if customer made a purchase based on Campaign 2, otherwise 0
- **Complaint**: 1 if customer made a complaint in past year
- **Pilot**: 1 if customer made a purchase based on a recent pilot marketing campaign for a new product, otherwise 0
- **Enrollment**: date the customer enrolled with the company

PART II: ANALYSIS / DATA ANALYTICS

DELIVERABLE:

Place the answers to the questions below in a new spreadsheet in the customer file and call it: Answers. If additional sheets are needed, feel free to add them and name the sheets appropriately to identify what questions you are answering.

QUESTIONS:

Remember you should develop a very good understanding of your data. Your team should answer the questions below on the company's customers, products, and marketing campaigns. However you should not limit your analysis to only these questions. As a data analytics professional you should ask additional questions that will lead to greater insights into the business and assist in generating ideas for business solutions.

In addition to brainstorming with your team members, you should discuss with your TAs and learn from other fellows to explore further questions.

For your analysis your team should begin by answering the questions below. However these questions are aimed only to get you started and practice your skills. You should consider further analysis and determine what additional questions will help in both understanding the business and making recommendations to improve the business's results.

Get to know your customers:

1. What's the average amount of your customers' yearly income?
2. What's the most common marital status of your customers?
3. What's the most common educational level? What's the least common?
4. What's the oldest age of your customers? What is the youngest? How about the average? Are there any concerns with the data?
5. Do customer households tend to have more kids or teenagers?
6. Based on your understanding of the customer data, how would you describe the typical customer for your company?

Get to know your products:

1. Which product generates the most sales?
2. Do customers buy more standard or premium products?
3. What is the distribution of sales by distribution channel?
4. What's the average time since the last purchase?
5. Based on your understanding of the sales data, do you have an idea of what products the company may want to focus on?

Understand your marketing efforts:

1. Which campaigns generated the most and least interest?
2. For campaign 4, what is the typical marital status of a customer?
3. For campaign 2, what product category sold the most?
4. What level of education do customers have that typically complain?
5. What additional information would you need to better understand the success or failure of the company's marketing campaigns?

BONUS QUESTION (OPTIONAL):

For this optional question, create a new spreadsheet in the customer file and name it 'Optional'.

Write a small paragraph that explains the difference between quantitative data and qualitative data in your own words.

Using the website **www.kaggle.com**, find a business problem that is interesting to you and review the quantitative data provided to be analyzed. Can you differentiate the quantitative data from qualitative data the business may have also used?

Given the tables you have been provided, what type of analysis do you foresee performing that will help you inform management as to next steps to improve business results.

In addition to the data you have been provided in this case, is there additional information you believe would be helpful in your analysis that has not been provided to you?

As a data analyst your job is to be the subject matter expert in data analytics however you also need to understand how your business performs and the objectives of management. If you were part of the management team asking a business analyst to solve this business problem, what are the questions you would ask of your data scientists and what deliverables would you expect from them?

PART III: TEAM WORK & INDIVIDUAL PARTICIPATION

An important part of this program requires each fellow to work in a team to complete the four mini projects. Together these mini projects cover key aspects of an overall data analytic project similar to those you will face when employed as an analyst.

Similarly many times as an analyst you will work in teams. As part of this program each fellow needs to balance personal and work commitments with the team work required in this program. It is your team's responsibility to determine how best to communicate with each other to complete the mini projects and when you will meet outside of the regularly scheduled Saturday sessions, if necessary.

DELIVERABLE:

In addition to answering the questions in Part II above, each team should create a word document explaining what role each member played in completing the mini project. In the document you will need to include the following:

- Team name: Choose something everyone can agree on that represents the group members.
- Responsibilities: Each member should take responsibility for various aspects of project-based work. In this section, write the name of the fellow and what was their contribution. If any fellow did not participate please list those individuals.
- Individual Submission: Each team member should separately provide a brief explanation in the document explaining what they individually learned or got out of this mini project. Please include your name.