# Assignment 7 - Simulations for Marketing Campaign

*The purpose of this assignment is to use Python to practice modeling applied towards a specific business problem*

This assignment provides you with an opportunity to demonstrate the achievement of the following course learning outcomes:

* Understand and apply the Python programming language
* Practice modeling skills

## Key Information

* **Type:** *Individual*
* **Weight:** 6.25%
* **Delivery:** Course website upload
* **Due Date:** End of lab session

## Expectations

You are expected to complete this assignment individually.

Respect for academic integrity is crucial to your success. Make sure you understand what constitutes acts of academic dishonesty in the page: [What is Academic Dishonesty?](http://mcmaster.ca/academicintegrity/students/whatis.html)

## Instructions

This lab is different than previous labs. In this lab, the code in its entirety is provided to the students. What we require from the students is to use the lab to corroborate their know understanding of Monte Carlo Simulation.

**Business problem context:**

We need to select a group of clients to be contacted, e.g., by phone, about the investment product. Our goal is to maximize sales (number of clients that buy the product) and minimize cost of contact (cost of contacting the client, e.g., salary of client representatives). To achieve our goal we can simulate marketing campaign for the sales using probabilities of sales for each client that we have in the dataset. Simulation modeling would allow us to select parameters min\_probability and max\_Probability that give us a list of clients that need to be contacted.

To enhance our model we can try compute if phone call to a client would increase or decrease a probability of sale (sales uplift) if we have data about previous contacts with clients. As we do not have it, we would choose a simple model of "uplift" - probability of sale will increase by 10% if a clients gets a call from the client representative.

Profit function from phone calls is:

Profit = Nsales \* avg (income\_sale) – N\_contacts \*avg(costs\_contact)

To enhance our simulation model we may use more complex model for costs of contact, e.g. fixed costs plus variable cost based on duration of phone calls.

The students are required to prepare a report according to the following requirements:

1. Discuss the provided code, and how it is solving the problem at hand
2. Describe in your own words Monte Carlo Simulation and its possible applications.

The Monte Carlo simulation is a forecast technique that provides all the possible outcomes of a problem, so we can have a better understanding of the risk related to it and so take more inform decisions on how to approach it .

1. What other techniques can we use instead of Monte Carlo simulation with comparable results.

Other techniques similar to Monte Carlo simulation are:

* Resampling techniques
  + Jackknife
  + Bootstrap
  + Cross-validation
* Scenarios with probability
  + Scenarios
  + Statistics and Modeling

## Rubric

To achieve full marks on this assignment, you must have answered all questions above correctly with code submitted that has no errors.