Optimal investment is used for commercial banks, investment banks, insurance companies and other financial institutions. It is used to help them choose the best combination of stock and bonds to invest. We call this combination a portfolio. The investor is concerned with the value of a portfolio after a certain period of time. Since they cannot predict the future, they should use the current information and fixed money to maximize their wealth. The investors need to know how to maximize the expected returns and minimize risk by choosing the proper portfolio. Thus, Harry Markowitz (1952) built a one-period model to predict the expected returns in a certain time period. Then, Robert Merton (1974-1975) built the continuous time model to maximize the expected utility. I will follow the book written by Rogers (2013) to learn the different methods to solve for the Merton’s continuous time model.

In my proposal, I will explain what the wealth function, value function and Hamilton-Jacobi-Bellman (HJB) equation are. I will learn these three basic equations to
optimize the number of the portfolio and the consumption by several different approaches. Also, I will learn the numerical solution, which provides a guideline to do the coding. This is in order to get the maximization of the expected value of utility function by changing the different variables.