Project 5: Machine Learning

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June 19, 2024

ECE/SSE 591, Summer 2024

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# Deliverable Table

The purpose of this table is to provide a complete view of the concepts covered in chapter 5 of *"Python Data Science Handbook"* (VanderPlas, 2016) and provide a general page location for where the topic was demonstrated.

|  |  |
| --- | --- |
| Deliverables | Location |
| What is Machine Learning? |  |
| Introducing Scikit-Learn |  |
| Hyperparameters and Model Validation |  |
| Feature Engineering |  |
| In-Depth: Decision Trees and Random Forests |  |

Additionally, here is a link to my GitHub were the datasets and the Jupyter Notebook for the project can be downloaded: https://github.com/jwmathis/SSE591\_Project5. In order to run the file, Python and other dependencies must be installed.

# 1. Introduction

This report aims to demonstrate my proficiency in using machine learning to build mathematical models to understand data as covered in Chapter 5 of the “Python Data Science Handbook” by Jake VanderPlas (2016). This report attempts to illustrate the core concepts and functionalities of lby implementing the concepts into practical examples. The code presented in this report was developed using Visual Studio Code with Jupyter Notebook extensions. I will provide detailed explanations, highlighting key features and operations that make machine learning an essential tool for data analysis.

# 2. Predicting Ice Cream Sales Linear Regression

My first example I demonstrate how to perform a simple linear regression using scikit-learn, from data I generated to model evaluation and visualization. For this I decided to model ice cream sales and correlate it to the temperature. To generate the data I use *np.random.seed(42)* to generate random numbers and ensure that the same numbers are generated every time. I use *np.random.normal(30, 10, 100)* to generate temperature values with a mean of 30C and standard deviation of 10C. To better simulate ice cream sales, I use a linear function of temperature with added random noise. To begin the machine learning, I first define my features matrix and target vector by reshaping the temperature array to a 2D array. Then I import *train\_test\_split*  to split the data into training and testing sets. Afterwards I follow the procedure of training the model as outlined in chapter 5. I choose my model, in this case *LinearRegression,* I instantiate the model, then I fit the model to the training data, *Xtrain and ytrain.* Lastly, I use the trained model to predict ice cream sales on the test data. Next I evaluate the model by importing the metrics *mean\_squared\_error t*o computethe mean squared error between actual values and predicted sales and  *r2\_score* to compute the R-squared value to have some indication of the proportion of the variance in the dependent variable that is predictable form the independent variable.

# 3. Fruit Classification

# 4. Pokemon Classification

# 5. Conclusion

This report documents my journey in learning Matplotlib. Matplotlib is a versatile plotting library in Python. I explored concepts that include fundamental plotting techniques essential for visualizing data and customizing the titles, labels, legends and colors of charts and graphs to enhance clarity and aesthetics. Key concepts covered include creating various types of plots such as line plots, bar charts, scatter plots, histograms, and more. By using real data and previous projects, I was able to explore how to go about creating graphs and charts.

# References

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