

**Dr. James Girard Summer Undergraduate Research Program
Faculty Mentor – Project Application**

Due Date: *January 17, 2020 by 5pm*

Faculty Name: Dr. Osama “Sam” Abuomar

Department: Computer and Mathematical Sciences (CaMS)

Research Project Title: Application of Data Analytics to Oceanography Data through Self-Organizing Maps and Predictive Modeling Techniques

Research Project Abstract (Please provide an overview of your project -- this will be shared with students as a project description; maximum 250 words):

In this project, data mining techniques will be employed to validate their efficacy in acquiring information about the physical properties of oceans, and bio-physical and mechanical properties of different materials, from data derived from designed experimental studies. The dataset(s) that will be studied consist of different formulation and processing factors as inputs and different responses as outputs. The data analytics algorithms and techniques include self-organizing maps (SOMs), support vector machines (SVMs), and artificial neural networks (ANNs). SOMs will be used to extract the input(s) of the most significant effect on the output responses. SVMs will be also applied to predict certain classes (categories) that describe the dataset's physical/ mechanical behavior. In addition, principal component analysis and/or linear discriminate analysis will be implemented as a dimensionality reduction technique so that certain patterns and trends can be visually discovered. Particularly, these techniques will be used to separate the specimens into different classes and patterns based on different mechanical, physical, or chemical properties. ANNs will be used to predict certain responses given a set of inputs whose output(s) is unknown or cannot be measured experimentally. This project will highlight the significance and utility of data mining and machine learning techniques in the context of informatics and knowledge discovery.