CDS International Academic Internship

Somesh Pratap Singh | 19110206

# Interning at

Department of Mechanical Engineering, University of Washington

# Under the guidance of

Prof. Anirudh Vashisth

# Report contains the updates from

1 June 2023 to 15 June 2023

# Report written in reverse chronological order

Meeting with Prof. Vashisth | June 9, 2023:

During the meeting, I provided Prof. Vashisth with an explanation of the code's functioning. He raised some important questions, the first about using surrogate data when adding new data. Using surrogate data may affect the accuracy of the model. This is to make sure that the surrogate data does not introduce biases or inaccuracies.

Professor raised a few other questions pertaining the accuracy and effectiveness of the code. I had to continue working on some of these questions for the next few days.

To address the issue of acquiring new samples and real data points, Prof. Vashisth suggested that Ankush (PhD student guiding me) send an email to determine the number of new samples available. Obtaining additional samples can enhance the dataset and contribute to more accurate predictions and better model training.

Ankush shared his insights during the meeting which provided valuable information for understanding the relationship between processing parameters the final desired result.

Prof. Vashisth restated the objectives of the project, emphasizing that the processing parameters' impact on final result is the primary focus, while exploring their influence on surface characteristics is a secondary objective. This clarification helps prioritize the research goals and ensures that efforts are directed appropriately.

Professor then marked out a rough plan and the steps to follow next:

Prof. Vashisth shared a series of chronological steps to be followed in the project:

Step 1: Wait for the new results from experiments. He also assigned me to learn a new image analysis software that would be required as a part of the project.

Step 2: Be ready with my ML model implementation.

Step 3: Design a Design of Experiments (DOE): A new set of processing parameters should be designed for conducting a Design of Experiments (DOE). This step allows for further exploration and testing of various processing parameters.

Step 4: Keep Samples for Validation: It is essential to retain a few samples from the previous steps to validate the solutions obtained from the ML model.

Meetings with Prof. Vashisth | June 5 and June 2, 2023:

During the meeting, I discussed the nature of the input data with Prof. Vashisth. We highlighted that one of the variable is binary. To address this limitation, we proposed a pretty rudimentary form of the function relating input and output. However, we acknowledged that this approach posed challenges in determining the values of individual components from the optimized value of f(A). This issue would require further investigation and resolution.

Prof. Vashisth emphasized that the output data would be a continuous value. This could be calculated using an image analysis software.

Prof. Vashisth assigned some primary tasks to be completed before the next meeting. These tasks include focusing on the assigned ML technique, particularly in a three-dimensional context. Next, he shared some previous code by another lab member and I was to inspect and learn from it, if anything overlapped with our work.

In the meetings with Ankush, I demonstrated the implementation of an ML model to Ankush. We made some predictions for best and worst-case scenarios.

Ankush mentioned that further research might be required to investigate the nature of the relationship between parameters and test outcomes.

The report reflects the progress made, the concerns raised, and the directions provided by Prof. Vashisth. The report captures the key discussions and outlines the subsequent tasks to be completed, it does not include the specific physics, code implementations, theory and other details about the project.