Project Details

1. Name of faculty advisor and email address:
Dr. Harpreet Singh (harpreet@iitgoa.ac.in)

2. Broad area(s) of research to which the project belongs:
Differential geometry, Membrane theory

3. Project title:
Geometric Modeling of Paper Folds.

4. Brief description of the project:
If a paper is crumpled, it deforms into a complicated polyhedral surface with an intrinsic property of in-extensibility. This indicates that the measured distance along this polyhedral surface would not change in the crumpling process. This deformation behaviour can be studied by using the equation of membrane which is based on the isometric deformation of the centre surface. The objective of this project is to analyze the structure of crumpled paper and study some elementary shapes such as developable cones and ridges. The variational framework would further describe the surface bends when subjected to local geometrical constraints. The student will develop a mathematical framework for the geometric modeling of thin lamina which will be evidenced by simulating the behavior of paper or thin sheets under complex loading using Matlab codes.

5. Type of work (Analytical/Computational/Combination of both):
Computational

6. Prerequisite(s) [including the tools to be used in carrying out the project]:
Matlab/Python/Mathematica or any programming language

Refrences:
https://arxiv.org/abs/2012.04834