

***Internship at LRDE,DRDO,Ministry Of Defence***

**Multiclass Semantic Segmentation Using**

**SAR Images**

***Submitted by:***

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*Under the guidance of*



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**8 Weeks Internship**

**June - July 2025**

**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**PES UNIVERSITY**

(Established under Karnataka Act No. 16 of 2013)

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**ATTACH COMPANY CERTIFICATE**

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**in case of unavailability, attach first page of the joining/acceptance letter.**

**DECLARATION**

We hereby declare that the project entitled “**Multiclass Semantic Segmentation Using SAR Images”** has been carried out at LRDE, DRDO ,Ministry Of Defence by me under the guidance of **Dr. Dyana A ,Scientist ‘E’** and submitted in partial fulfilment of the credits for the degree of **Bachelor of Technology** in **Computer Science and Engineering** of **PES University, Bengaluru** during the academic semester for the duration of eight(8) weeks. The matter embodied in this report has not been submitted to any other university or institution for the award of any degree.

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**ABSTRACT**

This project focuses on multiclass semantic segmentation of SAR (Synthetic Aperture Radar) images using a hybrid pipeline involving MATLAB for pre-processing and Python for deep learning-based classification.

SAR images are typically high in resolution and complex in structure, introducing challenges such as speckle noise, data imbalance, and scale variance. The dataset used is provided and controlled by the hosting organization, ensuring reliability and relevance to operational scenarios.

Edge detection and intensity-based Gabor filtering were implemented using MATLAB to extract features. These features were used to generate clustered label masks using adaptive KMeans, where centroids were reused across images to optimize memory use.

Given the large image sizes and limited dataset, the methodology employed patching and tiling to divide each image into manageable segments for training, preserving resolution while enabling efficient model convergence.

A customized U-Net model was trained on these tiles to perform pixel-wise classification. This approach enhances the ability to differentiate between terrain types such as vegetation, urban areas, roads, and barren land.

The final results demonstrate that integrating classical filtering methods with modern deep learning architectures can produce robust and accurate semantic segmentation from noisy radar inputs.

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