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Name of ISRO Centre/Unit

National Remote Sensing Centre, Hyderabad

Title of the research proposal

Physics Aware AI Models for Target Detection in SAR Imagery

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Area of Research

AI, Machine learning, SAR, Target Detection, Natural Hazards, Hyperspectral

Summary of the proposed research and expected deliverables

Deep learning Neural networks is one of the most popular AI tool for classification of remote sensing imagery. However, lack of labeled data is one of the bottle necks in training the models and obtaining better accuracies. Transfer learning has been successful in overcoming certain limitations, however at what level of learning in the NN layer of Deep learning model has been a subject of research. Synthetic aperture radar has been quite useful as a complementary to optical data. Not only that the scattering phenomenon helps in obtaining more information on the physical properties of the target. In this regard including the physics of the scattering process in the AI models would greatly benefit the target detection and characterization. In this research detection based on underlying phenomenon of the targets such is of primary concern. Also, studying physical laws of conservation and other laws and its incorporation in the learning models is of prime importance.

Scope of the Work:
- ➢ Develop physics aware AI models for target classification.
- ➢ The role of multi frequency and multi temporal SAR data for characterization of the phenomenon
  and/or targets.
- ➢ Study physics of Kelvin waves, Bernoulli hump, movement of ships and other manmade hazards
  in the oceans.

Deliverables:
- ➢ Deep learning algorithms based on physics aware processing and learning.
- ➢ Detection of targets on land and ocean.

Understanding physics of scattering among the scatters in multi frequency and multi temporal

SAR imagery and its characterization.