

## Topic 16

1. **Title:** "Enlightening Horizons: Crafting High-Definition Nightscapes through Dynamic Fusion of Night-Time Light with DL/ML and Optical/SAR data"
2. **Description:** In this quest for innovation, consider the possibilities of a ground-breaking solution that leverages the combined strengths of NTL imagery, DL/ML algorithms, and conventional methods. By undertaking this challenge, participants contribute to the advancement of technology, paving the way for a sophisticated approach to data fusion to generate high-definition NTL product, that propels us into a new era of understanding our surroundings
3. **Objectives:**
  - a. Explore creative methods for seamlessly fusing night-time light data with optical and SAR data.
  - b. Aim for a comprehensive and multi-dimensional understanding of the surveillance environment through effective data integration.
  - c. Experiment with DL/ML algorithms to analyse and interpret complex patterns within the night-time light data.
4. **Outcomes:**
  - a. The fusion process aims to precisely highlight the presence of street lights, emphasizing the intricate network of illuminated roadways and thoroughfares. This precision ensures that the HD product accurately reflects the infrastructure of illuminated streets.
  - b. The HD product is expected to vividly showcase night-time lights in areas characterized by human settlements. This includes urban centres, towns, and residential regions, offering a nuanced portrayal of lighting associated with human habitation.
  - c. HD product is expected to exhibit an enhanced level of geographic detail. This includes a finer delineation of settlement boundaries, streets, and topographical features, contributing to a more nuanced understanding of the night-time environment
5. **Relevant Data and Steps to Get the Data from Bhuvan/Other Sources:**
  - a. Participants can access SAR data, optical data with medium resolution from Bhuvan /Bhoonidhi portal and other open source portals.
  - b. Participants can access NTL data from LAADS (level-1 and Atmosphere Archive & Distribution System) portal.
6. **Steps to Be Followed for Achieving the Objectives:**
  - a. Develop a DL/ML algorithm that will generate a HD product by fusing NTL data and SAR/optical data by normalizing the NTL data to SAR/ optical data resolution.
7. **Evaluation Procedure for the Given Topic:**
  - a. In assessing the quality and accuracy of the NTL-HD product, a meticulous visual evaluation will be conducted to ensure that the generated data aligns with specific criteria. The primary objective is to capture and represent night-time light in areas where infrastructure, such as street lights and settlements, is present, while accurately excluding green areas and water bodies.
  - b. Presence of illuminated points corresponding to street lights and settlements should be clearly visible.

- c. Green areas, such as parks and forests, should exhibit minimal to no illumination in the NTL-HD product.
- d. Water bodies, including rivers, lakes, and oceans, should not display any illumination in the NTL-HD product.
- e. The NTL-HD product will be checked with respect to ground truth data or reference maps to verify the alignment of illuminated areas with known infrastructure locations.

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