



Ministry of Education's Innovation Cell

All India Council for Technical Education

New Delhi

Problem Statements of ASEAN-India Hackathon


1 Quantification of Marine Litter using Image Processing

Problem/Current Situation: The accumulation of litter in the biosphere has become one of the foremost environmental concerns of the 21st century due to its highly persistent nature and adverse environmental effects, which are driven by the growth of a globalized consumer society coupled with inadequate preventive and waste management actions.

Solution Needed: "Marine litter quantification has been a topic of interest for environmentalists and governmental agencies. While efforts are being made to collect the floating debris from the oceans and rivers before they reach the sea, it has been found that litter also washes up on the shores. Clean up operations can be better organised if we know the characteristics and the amount of the components of litter washed ashore at the right time. The task is to characterise and quantify the components of marine litter / any debris from an image like the one shown above. These images can be captured by any person who along with location (from GPS) and time stamp can upload the same into a processing portal through the mobile app. Thereafter the image is processed to give some indication of the characteristics of the litter and its quantity and alert the nearby authorities for organising a cleanup. The quantification of the litter can further be refined if necessary at the time of cleanup / transportation/ disposal."

2 Prediction of Oil Spills Events at Sea (POSEatSea)

Problem/Current Situation: Indian and ASEAN countries are located on global oil tanker oceanic superhighway. This route also has sensitive ecosystems such as coral reefs and seagrass meadows in the vicinity. The environmental impact of an oil spill from a tanker ship is well documented. Oil Spills do not occur instantaneously. There are events e.g. machinery malfunction that lead to such disasters. Before a spill occurs the crew might be well aware of the challenging situation and often spend time in avoiding such an event. During such times, the ship movement behavior may change from its normal pattern i.e. travelling at a predicted speed towards the port of call. At present, however there is no mechanism that can look into such patterns and predict a potential spill event to mitigate it in timely manner.



Solution Needed: While the tankers have AIS and the systems are 'on', only predictive models can help flag unusual behavior that need to be monitored. An open-source based solution (R, QGIS w/ GRASS) could consist of a model that feeds on the tanker AIS data. AI/ML/NN (Artificial Intelligence / Machine Learning / Neural Network) based system can assess the fresh AIS data with the historical data of a) the given ship, b) the given type of cargo manifested and c) the given region to flag any pattern (ship course, speed etc) that is unusual. Such mechanism will help the monitoring agencies by narrowing down the region to utilize SAR (Synthetic Aperture Radar) data (satellite or drone based) and thus, can invoke faster mitigation response. Such a solution would cater to multiple of UN-SDGs and UNDOSSD objectives.


3 Cost of Air Pollution to Solar Power Generation (CAPsolar)

Problem/Current Situation: Emerging economies of Asia are looking to Solar power generation as key to their independence from imported energy resources. Even for fossil fuel-rich countries, climate sensitivity and targets are motivation to switch to alternate energy resources such as solar power. This ratio is poised to get further improve due to rollout of electric vehicles. Solar power generation capacity of a country depends on many factors. Since Asian countries such as India and ASEAN are within tropics, the day length is not a major concern for any part of the year. With governments facilitating rooftop solar model within the grids, gigantic areas for solar panel installation aren't mandatory. This leaves the air quality (haze) that determines what wavelengths and intensity of sunlight is received at ground level. Air pollutants have many sources, natural as well as anthropogenic. For both, the source need not to be near same place or even country. Massive duststorms or wildfires have been known to spread the haze across the continent. Due to solar power installation being at the base of it's exponential, it is not yet clear if and at what scale the air quality impacts on solar power generation.

Solution Needed: Solar insolation data and climatology (long-term averages) at global scale is available. Air quality data is available from satellite platforms such as NASA-MODIS series satellites on daily scale. This satellite data can be processed with open access software. A solution would look into available solar power generation data and correlate it with parameters such as Aerosol Optical Depth, to estimate the impact of AOD to solar power generation capacity. This can further be expressed in terms of electricity costing, to put a price tag that a plant has to pay due to bad air quality.

4 Fishing boat Activity Clustering and Timeline Studying (FACTS)

Problem/Current Situation: Many countries may not have robust marine fishery reporting mechanisms at place and rely on self-reporting from the fishermen. Even with fishermen willing to, this may not be suitable for country/EEZ level studies especially in Asian context where thousands of smaller boats operate rather than limited large corporate fishing vessels. It is important for researchers, policy makers and security agencies alike to know where these boats prefer to fish at what time of the year.



Solution Needed: The data from AIS can be used but there are limited tools to import such data in interactive manner with the help of GIS. Further, many countries may have at harbor reporting mechanisms but not 'at-ground' reporting. Such tool can mitigate such a shortfall. Analysis of AIS may include clustering the data based on flag of country origin, repeated visit to the same location of fishing etc. Trend for an individual vessel may be pulled to map movement history, to be linked with reported catch later. There can be provision to import satellite data or to export the AIS analysis data into GIS formats (e.g. KML files) to be used in other GIS platforms.

5 Flagging of (AIS) INactivity Data (FIND)

Problem/Current Situation: AIS is a useful system that helps avoiding ship collision and allows managers for fleet management especially for emergencies e.g. adverse sea conditions. Vessels keep the AIS beacons on in order to stay safe. However, sometime the vessels do not transmit. The reasons for this may be unknown. As much as the AIS activity data are important, the inactivity data can also be put to use to understand the possible reasons behind such behavior and if needed, respond in the appropriate manner.

Solution Needed: The interactive tool should be able to categorize the AIS inactivity episodes for a single vessel or multiple vessels in a selected region. Further, the data may be classified based on the ship behavior prior to the inactivity, as well as based on various inactivity parameters such as location, time and duration of inactivity.

6 Automated Animal Identification and Detection of Species (AAIDeS)

Problem/Current Situation: Marine fishery is very dynamic in nature. During active season landing of fish may be overwhelming for a manual monitoring. At the same time, taking cue of the fish landing is important for researchers and administrators. Manual reporting is limited with sample size, often too small, that lead to high level of errors and prone to wrong extrapolation for meaningful fish stock assessment. This calls for automation to be only feasible method to overcome limitations of manual monitoring and reporting.

Solution Needed: The manual mode may rather be used to better train computer algorithms. A solution should focus on image recognition for species made available in the database. Over the time the database may get richer and thus, making the machine learning better. Such a system should envision cameras installed at the harbours and weigh-bridges, where species may be identified by AI and their proportion (in mixed catch) can be estimated, in order to report the captured biomass effectively and with minimal manual intervention. At present, the catch effort is often the weakest link in stock assessment model. Such harbor based systems may reduce the errors significantly. Another use is to integrate the cloud-based algorithms to help report catch through app(s) where all a fisherman need to do is to click the photo of the catch and enter the estimated catch weight.



7 Traffic Management system in coastal regions

Problem/Current Situation: "Navigation along the coast is always a challenge due to various navigational hazards and restricted sea room. Heavy Traffic along the coast makes it more difficult.

Solution Needed: "There are different type of vessels on the coast be it fishing, sailing, pleasure crafts, coastguard, naval ships or merchant vessels. If we can use satellite images and provide an overview information about concentration of traffic to all vessels navigating along the coast , it will definitely aid in avoiding collision by providing early warning."

8 Enhancing coastal security

Problem/Current Situation: Security of a coast is a challenge considering movement of traffic along the coast as near as 12NM where all vessels have right of innocent passage.

Solution Needed: If we can develop a system of identifying vessels of coastal state (registered) as with other vessels using AIS/LRIT/Other inputs, then the unregistered vessels can be segregated from the registered vessels such that movement and intention of unregistered can be tracked and focussed upon.


9 Block chain in logistics

Problem/Current Situation: Logistics is a service industry where Time and cost the critical factors. There are numerous parties involved in transport of goods from origin to final destination, which includes many processes .Many of the processes are manual and time consuming resulting in delay in delivering of goods

Solution Needed: If we can develop an online system which is secure and transparent, then these delays can be avoided resulting in faster delivery as well as cost saving. Block chain can be used to provide solution .

10 To track, provide alert to ships before piracy attack & continue to pin point track the attacking boat info to CG etc

Problem/Current Situation: "Piracy, armed robbery& pilferage is a serious concern to shipping worldwide including coastal waters in ASEAN region & ports. Though there are statistics /report available on public domain on area of attack with details, there is no system which alerts the potential target such as to take early avoiding action/precautions. Also many a times, the attacking boat after attack escapes in the darkness"



Solution Needed: Using Satellite imaging, AIS data etc a solution can be provided using AI/ML to provide the much needed pre alert as well continue track the offenders.

11 Online Remote Proctoring

Problem/Current Situation: In online test without proctoring, cases are often reported of impersonation and cheating. Students either ask some else to take the test on their behalf or use methods of cheating like referring to a textbook, using smartphones or other devices to search for answers online or taking help from a friend. The two major concerns of the customer are cheating and student authentication.

Solution Needed: It ensures the candidate focuses on the test screen during the test; there is enough light in the room and checks for suspicious objects in video and background voice activity to red flag the test. It also uses face recognition to do student authentication.
