

# SIH Problem Statement Document

## PS Number: SIH1776

ITBP deals with the Border guarding of India's 3488 kms long international boundary with China which comprises of geographically challenging contours. Protecting this border requires surveillance of a large coverage area that mostly corresponds to hard to police terrains and more so in extreme weather conditions. Modern surveillance systems say video, photography related facilities like, cameras, drones and different types of sensors create huge amounts of extracted data but they need manual observation and deduction which may take much time and result in no detection of threats. Border security personnel are challenged for real-time threats and/or anomalies including but not limited to cross border incurrence, crossing activities, and natural calamities like landslide. Surveillance systems provide large amounts of data that flood human operators and thus prevent effective threat identification and containment. Besides, in the complicated terrains, non-recurring equipment breakdowns also prevent quick actions.

Specifically, this project addresses the deficiency of current approaches regarding intelligent threat detection and anomaly identification as well as provides a solution for improving the route patrol configuration to increase the security level in dangerous areas like borders, important facilities, and urban security zones. The basic problem is in real-time identification of possible threats and abnormalities, as well as in the routing of patrols for their enhanced efficiency. It will include physical sources like satellite images, drones, CCTVs, web scraping among others to capture every data required in enhancing the underlying models. Other studies like the crowd monitoring system that was developed by Shivram and VenkataKrishnan [1] has demonstrated that image processing coupled with automation dramatically improves the capability of detection and monitoring of large and dynamic environment.

Also, Samonte et al. [2] showed that smart video surveillance systems implemented with the opportunity of real time monitoring and security risk analysis can manage large amounts of data in dense environments. This will be practiced in the project so that real time analysis could be made and a quick response to the threats is provided. In addition to this, Shrivastav and J [3] noted that by incorporating the use of machine learning model in conjunction with real time data analysis, the whole process of detection stands to benefit from increased accuracy and enhanced situational awareness especially when it comes to constantly monitored areas.

In the area of image enhancement, Kim and Sinha [4] provided a survey on low-light image enhancement which is useful to this work as low light situations are common in the border region. It will used to help in the image processing techniques for the project to be able to detect targets even in poor visibility conditions.

This is the goal towards designing and implementing an Artificial Intelligence based Intelligent Threat Detection and Anomaly Detection System that will process data feed from cameras, drones, sensors, and satellite images to detect intruders and detect any deviation and disseminate such information to ITBP personnel in real-time. The system should also make predictions on failures of equipment and give automatic maintenance notifications. Some of the main difficulties will be related to the possibility of analyzing vast amount of data in real-time basis, guaranteeing its proper functioning in various climatic conditions, and its compatibility with the current ITBP components. The expected result is achieving a high level of a threat detection system's efficiency; increasing the level of situational awareness; and improving the effective use of resources for increasing border protection.

## References:

- [1] Shivram, K., & VenkataKrishnan, R. (2021). CROWD MONITORING SYSTEM USING IMAGE PROCESSING. Sathyabama Institute of Science and Technology.
- [2] Samonte, M. J. C., Garcia, A. C., Gorre, J. E. E., & Perez, J. a. K. R. (2022). CrowdSurge: A Crowd Density Monitoring Solution Using Smart Video Surveillance with Security Vulnerability Assessment. Journal of Advances in Information Technology, 13(2). <https://doi.org/10.12720/jait.13.2.173-180>
- [3] Shrivastav, P., & J, V. R. (2023b). A Real-Time Crowd Detection and Monitoring System using Machine Learning. <https://doi.org/10.1109/jdciot56793.2023.10053517>
- [4] Kim, W., & Sinha, G. R. (2022). Low-Light Image Enhancement: A Comparative Review and Prospects.