AI Hackathon on Smart Parking for Urban Traffic Management

Terms & Conditions

Computer Vision Technology Development Cell, IIT Tirupati Navavishkar I-Hub Foundation (Section 8 Company under IIT Tirupati)

1. Background

IIT Tirupati Navavishakr I-Hub Foundation (IITTNIF) is one of the Technology Innovation Hub (TIH) established by department of Science and Technology (DST) under a National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS). The Mission aims to create a strong foundation and a seamless ecosystem for CPS technologies by coordinating and integrating nationwide efforts encompassing knowledge generation, translation research, technology, product development, human resource development, innovation &commercialization standards, and international collaborations.

Positioning and Precision Technologies (PPT) is one active technology part of CPS, are indispensable tools for monitoring, integrating, and analyzing spatially and temporally distributed resources to aid in effective decision-making across multiple domains. These technologies include remote sensing (non-invasive), Geographical Information Systems (GIS) and Global Positioning Systems (GPS). To promote the NMICPS mandates in PPT, IITTNIF established several technology development cells (TDC) and Computer Vision is one among them working on Translational Research and Development to solve several real time problems in several departments.

To explore innovative, scalable, and cost-effective solutions, CV TDC at IITTNIF is organizing this Hackathon aimed at engaging startups, incubators, research institutions, and technology experts. The objective is to identify an AI-based video (CCTV feed) analytics solutions for real-world use cases observed in urban parking environments.

Successful prototypes from this Hackathon will be considered for further development and deployment through formal engagements.

2. Problem Statements

Aim: to develop practical and reliable AI-based solutions for parking management using CCTV footage by collecting real-world video data and building smart algorithms and dashboards to reduce urban traffic congestion.

2.1 Objectives

S. No	Objective	Description
1	**Data Collection**	Participants are expected to capture CCTV - style video footage of parking zones from a variety of environments such as shopping malls, residential complexes, college campuses, public parking areas, and retail spaces. This diverse dataset will help in building and testing AI models that are robust and effective across different lighting conditions, layouts, and vehicle types.
2	**Algorithm Development**	Using the collected video data, participants must design AI/computer vision models capable of detecting all visible parking slots in a given scene. The models should further classify each slot as either occupied or empty in real-time or near-real-time. The focus is on building solutions that are accurate, scalable, and capable of handling environmental variability.
3	**Dashboard Creation**	Participants should also create a simple and user-friendly dashboard that visualizes the output from their detection algorithm. The dashboard should display the total number of parking slots, number of occupied and vacant slots, and ideally update in real time based on video input. The aim is to provide a functional interface that can be used for live monitoring and

		decision-making.

2.2 Tools Recommendations

A. Video Data Collection & Annotation

- Roboflow **/** CVAT **/** LabelImg – For annotating parking slots (bounding boxes, masks, labels).
- OpenCV – For video processing, frame extraction, and pre-processing tasks.

B. Parking Slot Detection & Classification

- YOLOv8 / YOLO-NAS / YOLOv5 – For object detection models (real-time, lightweight, and accurate).
- Detectron2 / MMDetection – For advanced object detection or instance segmentation.
- TensorFlow / PyTorch – Frameworks for deep learning model development and training.
- Google Colab / Kaggle Kernels – Free GPU-based environments for training/testing models.

C. Dashboard Development

- Streamlit – Quick and easy way to build interactive web apps for ML models.
- Flask / FastAPI – Lightweight Python web frameworks for serving ML models via REST APIs.
- React.js / Vue.js – For more advanced, responsive dashboards.
- Chart.js / Plotly – For visualizing slot counts and trends.

D. Integration & Deployment

- Docker – To containerize the solution for portability and scalability.

- NGINX – For hosting the dashboard/web service.
- Firebase / Heroku / Render – For quick web app deployment and demonstration.
- GitHub / GitLab – For version control and collaborative development.

*The list mentioned above is indicative. The participants are free to use their own tools.

3. Implementation Mechanism

3.1 Eligibility

- The hackathon is open to students, researchers, startups, independent developers, and technology professionals across India.
- There is no restriction based on institutional affiliation. Participants from academic institutions, incubators, startups, or working professionals may apply.
- While prior experience in computer vision, AI/ML, or dashboard development is preferred, it is not mandatory. Enthusiastic beginners are welcome to participate.
- Participants may register as individuals or form a team. A team can have a maximum of 4 members. Cross-institutional and interdisciplinary teams are encouraged.

3.2 Participation Guidelines

- All submissions must be the original work of the participants. Plagiarism or use of pre-trained models without proper attribution will lead to disqualification.
- Each team must collect and submit at least one original CCTV-footage video (1–3 minutes) showing a parking area. The footage must be captured from a fixed viewpoint resembling a typical CCTV installation. Environments can include shopping malls, college campuses, office complexes, retail areas, etc. Use of publicly available videos (e.g., from YouTube or surveillance archives) is not permitted.
- Participants must submit their algorithm code, video data, and a working dashboard prototype before the deadline. Submissions should include proper documentation explaining the model architecture, training/testing approach, and usage instructions.
- Videos should not violate privacy norms. Participants must ensure that video

content does not include personally identifiable information. Footage must be collected with appropriate permissions, especially if taken in private or institutional premises

3.3 Submission

- Video Data Submission: Raw footage with a short description (location type, camera specs, time of day).
- Source Code: Well-documented code for slot detection and classification.
- Demo Dashboard: Functional prototype or mockup with video integration.
- Technical Report: 2–4-page document explaining the methodology, video footage collection details, model performance, and dashboard features.

3.4 Screening and Selection

A panel of evaluators will screen the applications based on the generic eligibility criteria listed below.

S. No	Criterion	Description	Marks (%)
1.	Accuracy	Evaluation based on classification accuracy of parking slots as occupied or vacant, with bonus points for real-time or near-real-time performance	30
2.	Robustness	Evaluated based on the ability to perform well in diverse conditions such as varying lighting, camera angles, and parking layouts. Scalable and practical implementations are highly valued.	30
3.	Quality of Data	provide high-quality, self-captured video data from diverse parking environments.	20
4.	Dashboard	dashboard should present parking information clearly and intuitively, with real-time updates and a user-friendly interface that supports effective monitoring and decision-making	20

Among the obtained applications, based on the recommendations of evaluation committee, top 3 will be selected as winners of the Hackathon challenge.

3.5 Registration Fees

To participate in the Hackathon, all interested individuals are required to complete

the registration process through the official portal. The registration is open to students, academicians, researchers, startups, and professionals working in the field of computer vision, AI, and related domains. A nominal registration fee has been introduced to support event operations, ensure participant commitment, and offer value-added resources such as mentorship, certification, and access to post-event opportunities. The fee structure is designed to be inclusive while reflecting the nature and scope of participation for each category.

Participant Category	Fee (INR)	Notes
Students	₹1000	Applicable for UG/PG students and independent participants
Academicians / Researchers	₹3000	Faculty members, Ph.D. scholars, and researchers from academic institutes
Startups / Industry Professionals	₹5000	Early-stage companies or individuals working in the private sector

3.6 Prizes and Awards

For the selected applicants the following prize money is distributed along with a participation certificate.

S. No	Rank	Amount
1	Winner (1st Rank)	2 Lakhs
2	1st Runner (2nd Rank)	1 Lakh
3	2nd Runner (3rd Rank)	0.5 Lakh

3.7 Timelines & Duration

S. No	Milestone	Date
1.	Launch of Hackathon	22th July 2025
2.	Submission Deadline	30th August 2025
3.	Shortlisting Announcement	One Week after Submission Deadline
4.	Presentation round	One Week after Submission Shortlisting

3.8 Support & Queries

The participants are encouraged to reach out to the designated SPOCs for any queries related to: Application process and eligibility.

S. No	Name	Designation	Contact	Email
1	Dr. Venkat	Technology Manager – CV	9676083794	Techmgr.cv@iittnif.com
2	Ms. Renuka	Sr. Program Coordinator	9790913914	sr.program.coordinator@iittnif.com

3.9 Disclaimers

a. The Data Collection: Participants must obtain written permission before using any CCTV cameras or footage for the hackathon and ensure full compliance with applicable laws and regulations, including the Public Safety Rules. Since the hackathon involves the use of real-time information, strict adherence to privacy, data protection, and legal approval requirements is mandatory. Any unauthorized use of data will lead to disqualification. Participants are also advised to verify and comply with any other relevant legal frameworks governing surveillance and data usage.

b. Intellectual Property Disclaimer: By submitting a solution to the IITTNIF Hackathon, participants represent and warrant that their submission is their original work and does not infringe upon the intellectual property rights of any third party. Participants retain ownership of their projects, but grant IITTNIF a non-exclusive, worldwide, royalty-free license to use, modify, and distribute the submitted work for promotional and marketing purposes related to the hackathon, apart from the other rights granted in the T&C. Neither IIT Tirupati nor IITTNIF shall be liable for any intellectual property infringement claims arising from the participants' submissions.

c. Liability Disclaimer: Participants acknowledge that their participation in the IITTNIF Hackathon is voluntary and at their own risk. IITTNIF shall not be liable for any direct, indirect, incidental, special, or consequential damages arising out of or in connection with

the hackathon, including but not limited to technical malfunctions, network failures, or any other issues that may affect participation. IITTNIF reserves the right to disqualify any participant who engages in misconduct, violates the hackathon rules, or acts in a manner that is detrimental to the event. This includes any claims, damages, or legal actions stemming from the malfunction, security vulnerabilities, or any other issues related to the submitted projects.

d. Prize Disclaimer: The prize money for the IITTNIF Hackathon is subject to the terms and conditions outlined in this document and in the T&C Document.

- **Jurisdictional Restrictions:** If local laws, sanctions, or other legal or financial regulations prevent IITTNIF from sending prize money via wire transfer or in digital assets to certain jurisdictions, participants from such jurisdictions may be ineligible to receive the prize. In such circumstances, IITTNIF is not obligated to provide an alternative prize or compensations.
- **Payment Restrictions:** IITTNIF is not liable for any issues arising from the transfer of the prize that is not under its direct control, including but not limited to bank restrictions on money transfers, limitations any transfers or transactions, or any other financial constraints that may prevent the transfer of prizes to the winner.
- **Intellectual Property and Legality:** Prior to the disbursement of any prize, if it becomes known that a winner has violated intellectual property rights or the submitted solution involves illegal activities, IITTNIF reserves the right to withdraw the prize. Participants are responsible for ensuring that their submissions do not infringe upon the intellectual property rights of others and are in compliance with all applicable laws.

IITTNIF reserves the right to modify, suspend, or cancel the prize distribution at its sole discretion. Winners are responsible for any applicable taxes, fees, or charges associated with receiving the prize money. IITTNIF shall not be liable for any disputes or issues arising from the use or transfer of the prize Money.

e. Third party platform Disclaimer: The IITTNIF Hackathon may involve the use of

third-party platforms for communication and project submission purposes. Participants acknowledge that IITTNIF has no control over these platforms and shall not be liable for any issues, data breaches, or damages arising from their use. Participants are encouraged to review the terms of service and privacy policies of these third-party platforms before using them.

f. General disclaimer: IITTNIF Hackathon is subject to change, modification, or cancellation at any time without prior notice. IITTNIF reserves the right to amend the rules, requirements, and prizes at its sole discretion. By participating in the hackathon, participants agree to be bound by the terms and conditions set forth in this document and any additional rules or guidelines provided by IITTNIF. In the event of any conflicts or inconsistencies, the decisions of IITTNIF shall be final and binding.

Notwithstanding anything to the contrary contained in this Agreement, any and all liabilities of IIT-T or IITTNIF to the participants or third parties shall not exceed Rs. 10,000/-.

The Participants shall keep IIT-T, IITTNIF, its faculty, staff, researchers or fellow participants indemnified against any liability arising out of the acts or conduct of the participant.