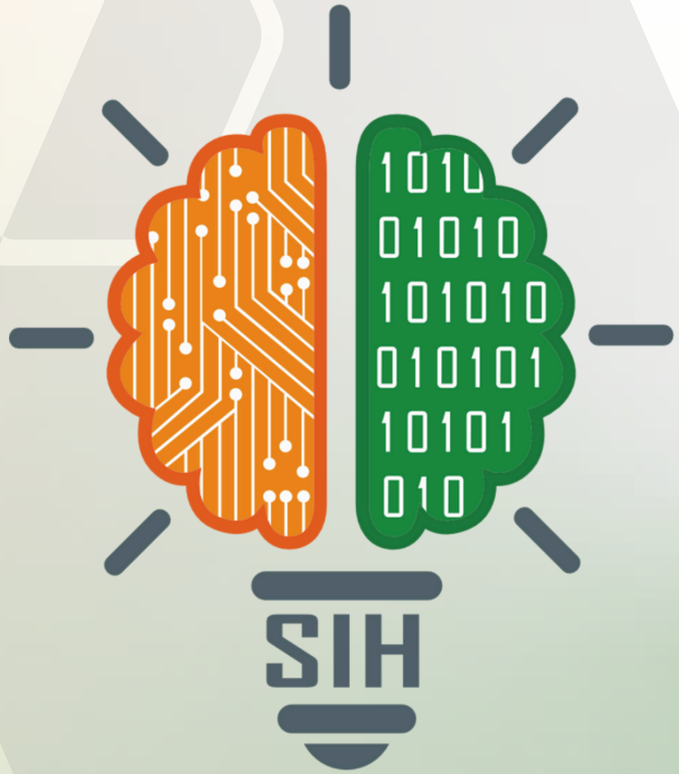
SMART INDIA HACKATHON 2024

- **Problem Statement ID-** SIH1725
- **Problem Statement Title-** Utilization of images for monitoring of progress of construction activities for building construction projects.
- **Theme-** Smart Automation
- **PS Category-** Software
- **Team Absolute Barbeque Nation**



TEAM ABN

KEY CHALLENGES IN CONSTRUCTION PROJECTS

TIME & COST OVERRUNS

- Project delays from inefficient monitoring
- Design changes during construction causing rework and delays

QUALITY & SAFETY ISSUES

- Inconsistent quality inspections missing defects
- Difficulty in identifying and mitigating safety hazards on large sites

ADMINISTRATIVE BURDEN

- Excessive paperwork slows decision-making
- Complex regulatory compliance requirements causing project risks

RESOURCE & MATERIAL MANAGEMENT

- Resource mismanagement leads to wasted labor and materials
- Inaccurate quantity surveying causing shortages or over-ordering

REGULATORY COMPLIANCE & SCALABILITY

- Lack of real-time data leads to poor decision-making
- Traditional methods fail to scale for large or complex projects

Gadkari raises concerns over 'poor quality DPRs' for highway construction

'In the last 10 years, no good work had been done in preparation of DPRs... I am worried about the poor quality of DPRs prepared by consultants,' the road transport and highways minister said

He added that it is regrettable that full payments are not made to DPR consultants by the government.
Gadkari said the entire effort in the ministry is to float the tender for construction of highways, without focus on the quality.
There is not a single highways project that does not have black spots, he added.
Gadkari exhorted NHAI to hire competent people for DPR preparation for the construction of highways.

-Business standard

Delhi schools file complaints against PWD for using low-quality material for construction work

-TheIndianExpress

Poor quality material used to build Gurugram roads, shows MCG report

By Leena Dhankhar

Over 450 infrastructural projects hit by cost overrun in May 2024

In May this year, 458 infrastructure projects in India, each with an investment of Rs 150 crore or more, experienced a cost overrun totaling more than Rs 5.71 lakh crore, according to an official report.

Structural Collapses Killed 5 People a Day on Average in 2018-2022 | Numberspeak

Assembly panel finds quality of govt. hospital building poor

Published - September 26, 2024 09:02 pm IST - TIRUCHI

TECHNICAL APPROACH

DATA COLLECTION

DATASET COLLECTION PROCESS

Collecting a meaningful dataset is the first step in creating a solution. We have to curate a dataset containing not only all the different classifications(Ex. Foundation, Middle phase, and finishing) but also the number of entries, which must be high to train the model on a large amount of data to reduce the chances of misclassification.
The major problem with this is the collection of the data.

Data Mining

Split image in grids

A single picture of a site will contain many regions that individually can help us to distinguish between the construction phase. Using a grid process to divide the picture into multiple grids we can extract a large dataset from a relatively lower amount of images.

Timelapse of construction

We can collect videos of the construction projects and divide the whole video into pictures using a software. with this we can collect the photos of multiple sites and just from one video create a dataset of at least 250 entries

BASIC WORKFLOW

Web Page Developed in house

Uploaded Image by the user

Source Image with Category

Model 1 For Category A

Model 2 For Category B

Model 3 For Category C

Model 4 For Category D

Given Output based on the progress

Uploading the target

image on fine Tuned LLM

Finetuned Pre Hosted LLM

Output of the LLM and our model combined

If Accuracy < X%

Error Raised

PROGRESS MONITORING

USP

2-D to 3-D conversion of Blueprints to BIM generation using our ML solution

X

OUR ML MODEL SOLUTION

IMPACT & BENEFITS ON TARGET AUDIENCE

	FOR CONSTRUCTION MANAGERS:	FOR HOME MINISTRY:
Automated Progress Monitoring	Provides ***real-time insights*** into project status, allowing managers to detect delays early, allocate resources more effectively, and ensure timely completion of projects.	Offers better oversight and tracking of multiple public construction projects simultaneously, improving ***accountability*** for government-funded projects and ensuring ***timely delivery.***
Quality Control & Defect Detection	Enables early identification of defects, ***reducing costly rework and ensuring a higher quality of construction***, which in turn enhances the company's reputation for reliable project delivery.	Guarantees quality assurance in public infrastructure, ***reducing long-term maintenance costs***, and improving public safety in government-managed projects.
Integrated Data (BIM, Drone, Sensors)	Offers a ***comprehensive view*** of all project data, facilitating better ***decision-making,*** and enabling seamless collaboration among different teams working on the project.	***Standardizes data collection*** across projects, helping in the formulation of data-driven policies and promoting smoother inter-department collaboration on public projects.
Material Tracking & Quantity Surveying	Delivers accurate material tracking and quantification, leading to ***optimized inventory management,*** reduced material waste, and overall cost savings.	Improves ***budget management*** by ensuring resources are used efficiently, reducing instances of over-budgeting, and promoting transparency in public procurement processes.
Regulatory Compliance Automation	Automates the verification of regulatory compliance, significantly ***reducing the risk of violations and speeding up approval processes***, allowing for smoother project execution.	***Simplifies the enforcement of construction standards***, reducing the manpower needed for on-site inspections, and ensuring that public projects comply with government regulations.
Scalability for Large Projects	Ensures efficient management of complex, large-scale projects by ***improving coordination across multiple sites***, making it easier to oversee project progress and resource allocation.	Enhances the management of nationwide infrastructure projects by ***enabling the implementation of standardized best practices*** across diverse, large-scale government projects.

FUTURE PROSPECTS

- ***Adoption of Dropne technology and collaboration with drone manufacturers:***

Inclusion of drones in order to get better and more precise, timely images of the site reducing the workload and also keeping a tab over misinformation passing down the operational pipline

- ***Integration with Government Initiatives:***

Aligning with Smart Cities Mission and Digital India
Supporting efficient project execution for the *National Infrastructure Pipeline (NIP)*

- ***Enhancing BIM Adoption:***

Complementing the growing use of *Building Information Modeling (BIM) in India*
Potential to become a key tool in implementing the National BIM Strategy

- ***Real Estate Regulation Compliance:***

Aiding compliance with *RERA (Real Estate Regulation and Development Act)*
Improving transparency for homebuyers and investors

- ***Construction Safety Enhancements:***

Aligning with safety guidelines by *the National Safety Council*
Supporting enforcement of the Building and Other Construction Workers Act.

- ***Integration with Existing Software Ecosystems:***

Potential for integration with popular *ERP systems used in Indian construction (e.g., SAP, Oracle)*
Compatibility with widely-used project management tools like Primavera and MS Project plus construction

ADDITIONAL FEATURES

- **Resource Forecasting**: "Estimate labor/material needs."
- **Site Layout Analysis**: "Map site layout using geospatial data."
- **Milestone Verification**: "Verify alignment with timelines."
- **Hazard Detection**: "Identify safety hazards."
- **Fraud Prevention:** "Detect falsified reports"
- **Automated Reporting**:"Provide detailed statistics with easy-to-read reports for better decision-making."

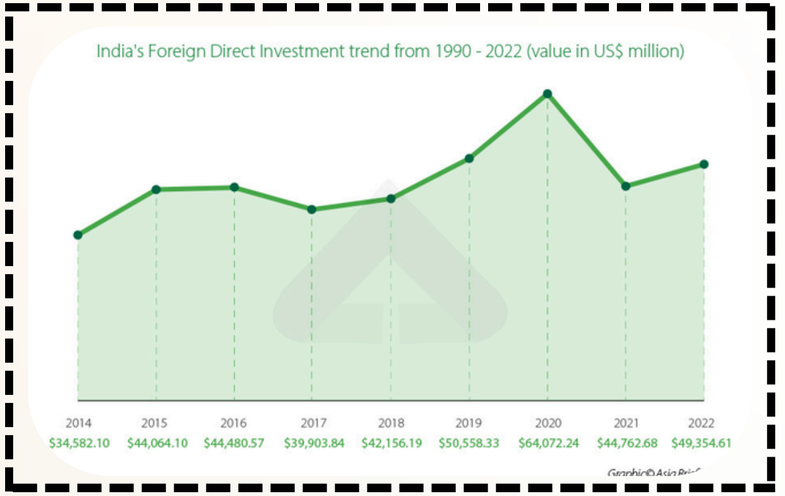
INNOVATION & UNIQUENESS

- **Real-Time Corrections:** Immediate feedback on images.
- **Fraud Detection:** Auto-identifies discrepancies.
- **Predictive Analytics:** Forecasts resource needs.
- **Holistic Monitoring:** Combines stage tracking and hazard detection.
- **Scalable:** Manages large projects efficiently.

FEASIBILITY AND VIABILITY

- **Regulatory:** Ensures compliance with industry standards and streamlines audit processes.
- **Operational:** Scales easily across different project sizes and complexities.
- **Economic:** Reduces inspection costs and attracts investment through improved efficiency.
- **Sustainability:** Lowers carbon footprint by reducing physical inspections and enhancing resource management.
- **Demand & Adoption:** High demand from urban projects, with user-friendly design and strong training support.

GROWTH IN INVESTMENT IN INFRASTRUCTURE



DATA REPRESENTING PAIN POINTS

While BIM has the potential to reduce construction costs by up to 20%, its adoption rate in India remains low at around 7-8% of projects, largely due to data quality issues

15000 crore used in the ,maintenance and repair due to the use of lower quality material and reducing the safety standards procedures to cut costs.

135 infrastructure projects are delayed by five years or more, with 809 projects behind schedule, according to a July 2023 report.

Building Collapses: Between 2012 and 2020, India saw more than 38,000 reported cases of building collapses, resulting in over 3,500 deaths.

RESEARCH AND REFERENCES

Key studies and sources that informed the development of our machine learning solution for construction progress monitoring are-

- New18
- TheHindu
- Infrastructure Investment Information
- BIM Article

Thank You

Thank you for your time and consideration. We look forward to your feedback and the opportunity to further refine our solution.