

Story of Innovation: From Accidents Data to Data Analysis Visualization

In the bustling world of hackathons and data-driven events, where young minds come together to tackle real-world challenges, a special opportunity arose at the Karnataka State Police Datathon. This event wasn't just about technology; it was about making a difference in the lives of those who work tirelessly to keep us safe.

As engineering students, we found ourselves drawn into a space where our ideas could have a real impact on police safety and accident analysis. The hackathon wasn't just a competition; it was a chance for us to step into the shoes of those who rely on data to protect and serve our communities.

Amidst the excitement of the hackathon, we dove into the challenge of finding solutions that could simplify the demanding work of police departments. The thought of transforming cumbersome logs and manual records into visual tools that could help officers make quicker, more informed decisions inspired us to push our boundaries and think beyond just lines of code.

In this journey of collaboration, creativity, and empathy, we set out to bridge the gap between data analysis and real-world impact. The hackathon became a platform for us to contribute not just our technical skills but also our passion for making a difference in the world around us. As the datathon progresses, the team gets more excited about the potential their analysis holds. Every data point is a puzzle, every trend a potential insight. Each keystroke and algorithm run challenges their analytical skills, teamwork, and problem-solving abilities.

Little do they know, this dive into accident analysis will test them and ignite innovation, leading them to unexpected growth. As they start this data-driven journey, they stand at the beginning of a narrative that promises to uncover hidden stories and light the way to a safer future.

Chapter-1:Identifying the Problem Statement

1.1 What made us to choose the problem statement:-

Our journey began when we had to pick a problem statement for the KSP datahon. There were five topics to choose from:

1. Predictive Crime Analytics,

2. Traffic Flow Optimization and Congestion Management,
3. Police Performance and Resource Management, 4. Data Privacy in Law Enforcement, 5. **Accident Data Analysis.**

At first, we were unsure which one to select. Then, we remembered a tragic event from a year ago when one of our friends lost his life in a road accident. Sadly, not just him, but many young people are becoming victims of road accidents nowadays. We know the reasons behind these accidents, but the police struggle to analyze them properly. That's when we decided to focus on the problem statement of Accident Data Analysis. and another reason to select this problem statement it would be easier to implement than another problem statement as we had some knowledge regarding the predicting and the analysis model.

1.2 Understanding the Procedure :-

The journey into understanding how accidents happen started with gathering data from different places like police reports and hospital records. It was tough because we had to enter all that information by hand into computers and files. Once we had all the data, we looked at it closely to see how often accidents happened and what kinds of vehicles were involved. Then we really got into the details: reading through each accident report to find out what factors might have caused the accidents. We looked at things like the weather and how people were driving. After all that work, we wrote up what we found and shared it with the right people. Based on what we learned, we figured out ways to make the roads safer. But it didn't stop there—we kept checking to see if our ideas were working and made changes if they needed to. Even though the old way of doing things was hard, new ways of looking at the data might make it easier and help keep everyone safer on the roads.

1.3 Exploration of New Technological Stacks:-

As we delved into traditional police analysis methods and sifted through data stored in Excel sheets or manual logs, we recognized the need for innovative solutions proposed by the Datathon team. Their analysis aims to spot accident-prone areas, known as gray spots, considering factors like date, time, and road type. They also aim to understand what causes multiple injuries or fatalities, including factors like landmarks near accidents and road conditions, suggesting improvements where needed. Moreover, they'll look into pedestrian behaviour, vehicle types, and the demographics of those involved. By combining all these factors and traffic patterns, they hope to improve traffic management. Ultimately, they plan to create an AI model that predicts accidents and recommends better traffic plans. To implement

these ideas, we'll need to research technologies. For the live dashboard, we'll use HTML, CSS, JavaScript, and tools like PowerBI. For predicting accidents, we'll use Python, TensorFlow, or PyTorch. Deployment will be handled using Docker and Kubernetes, and for real-time notifications, we'll use Node.js and messaging queues like Apache Kafka.

As for our journey into understanding accidents, it all began with gathering data from police reports and hospital records. It was tough work, manually entering everything into computers and files. Once we had all the data, we examined it closely to see how often accidents happened and what vehicles were involved. Then we dug deep into each accident report, looking for causes like weather and driving behavior. After analyzing everything, we shared our findings and came up with ways to make roads safer. But it didn't end there—we kept checking to see if our ideas worked and made changes if needed. Even though it was hard work, new ways of looking at the data might make it easier and keep everyone safer on the roads.

Chapter-2: -Approaching towards the Idea:-

2.1 Idea Approach: -

Our team spent a lot of time brainstorming to figure out the best and most feasible tech stack for the solution we had in mind. It took us a whole week of discussions and debates, but in the end, we came up with a fantastic output. We had discussions with our mentor during this process, whose valuable input helped us navigate and refine our ideas. Their guidance paved the way for us to choose the right path forward. We finalized a summary of our idea, which we'll be submitting for the initial stage of the KSP Datathon. This summary will play a crucial role in the shortlisting process, as it outlines the key aspects of our solution and its potential impact. It was a challenging process, but we're excited about the direction we're heading in.

The final summary of the Idea we submitted:

Combining advanced technologies and innovative approaches, our road safety solution aims to revolutionize driver behaviour and accident prevention. Leveraging PowerBI or Tableau, we offer a dedicated live dashboard that provides real-time insights into key metrics related to road safety, ensuring user-friendly navigation and visually appealing displays. Our predictive analysis model, incorporating classification and recommendation algorithms, identifies accident hotspots and offers personalized recommendations for safer driving practices. Real-time notifications keep drivers informed about accidents, weather changes, and road conditions, enhancing awareness. Computer vision technology detects driver behaviors such as seat belt usage and helmet wearing, while respecting privacy

concerns. Additionally, our integrated Gamified Safety System encourages safe driving practices through personalized scoring, leaderboards, and competitions, fostering a culture of responsibility and improving overall road safety awareness.

Our idea of being shortlisted was a joyful milestone for our team, validating our efforts. Yet, it signaled only the beginning of our journey, with much work still ahead. We celebrated our progress but remained focused on the challenges ahead, ready to continue our efforts with determination.

Chapter-3: -Prototype development: -

3.1 Challenges Faced in Implementing the Solution: -

Our journey has been a roller coaster, from finalizing our idea to being shortlisted in the KSP Datathon. However, the real challenges arose when we delved into implementing our solution. Developing an advanced data analysis system to identify accident patterns, high-risk locations, and contributing factors like weather, road conditions, and driver behaviour was no small feat. Despite these hurdles, we remained undeterred. Through collaborative brainstorming sessions and insightful discussions with our mentor, we refined our approach and found the right path forward. These challenges served as opportunities for growth, reinforcing our belief that nothing is impossible. With determination and perseverance, we emerged with a refined idea, ready to tackle the complexities of enhancing road safety measures in our community.

3.2 Development phase of the prototype: -

As our development journey continued, we carefully picked different tools to help us solve the problem. We chose things like Power-BI for showing data, web development tools for building the dashboard, and an LLM model for asking questions. With these tools, we imagined making a special dashboard where we could see and understand all the data in one place. But we didn't stop there. We wanted to make it even easier for people who might not understand the data well, like police officers. So, we decided to add a feature where they could ask questions and get quick answers. This step was important because it made our project more useful for real-life situations, where people need to make decisions based on the data they see.

3.3 Discussion regarding the prototype development

As we kept going with our project, we realized we couldn't just trust our own ideas. When we talked to mentors and teachers, they pointed out some problems with how we were thinking. We were only looking at things from our perspective. They said it's important to see things from the point of view of the people who would use our solution. While

discussing it with teachers they insisted our team members go out into the field to talk to the people we were trying to help with our accident data analysis. So, our team decided to go out and talk to them. This way, we could understand better what they really needed and how we could make our solution work for them.

Chapter-4 Field Hypothesis and Testing: -

4.1 Interaction in the Field (Police Department-Bommanahalli)

Once we decided to dive into fieldwork, we wasted no time. We knew that for it to be successful, we had to immerse ourselves in the market. After completing the necessary procedures and getting permission from the college dean and faculty members, we headed to the nearby Bommanahalli Police Station. Upon arrival, we inquired about meeting the higher officials, but the Station Inspector was unavailable due to a meeting. After waiting patiently for nearly an hour, we had the opportunity to speak with **Sub-Inspector ASHIF B MANIYAR**. Despite his youthful appearance, he showed keen interest in our solution and the hackathon. Although he admitted he wasn't familiar with the KSP Datathon, he eagerly watched our demo and provided valuable feedback. As a civil student at BMS College Bangalore, he shared insights and recommended that we meet the Station Inspector, who had previous experience in the traffic department. Thanks to his recommendation, we were able to arrange a meeting with the Inspector despite his busy schedule.

4.2 Interaction in the field (Police Department-Bommanahalli)

When we met **Station Inspector Mr. CHANDRASEKHAR**, he was nice and calm. He invited us into his office, gave us water, and then we talked about our project. He asked why we were there since our project was related to the traffic department, not law enforcement. But then he told us that he used to work in the traffic department six years ago. He shared how our project could have helped with accident awareness campaigns back then. He thought our visual data would have been much better than the old manual way of doing things. After our discussion, Mr. CHANDRASEKHAR recommended that we meet with some traffic department officers. He even offered to introduce us to one of his friends working near ELECTRONIC CITY. This friend could provide valuable insights and advice regarding our project.

4.3 Interaction in the field (Traffic Department-Electronic City)

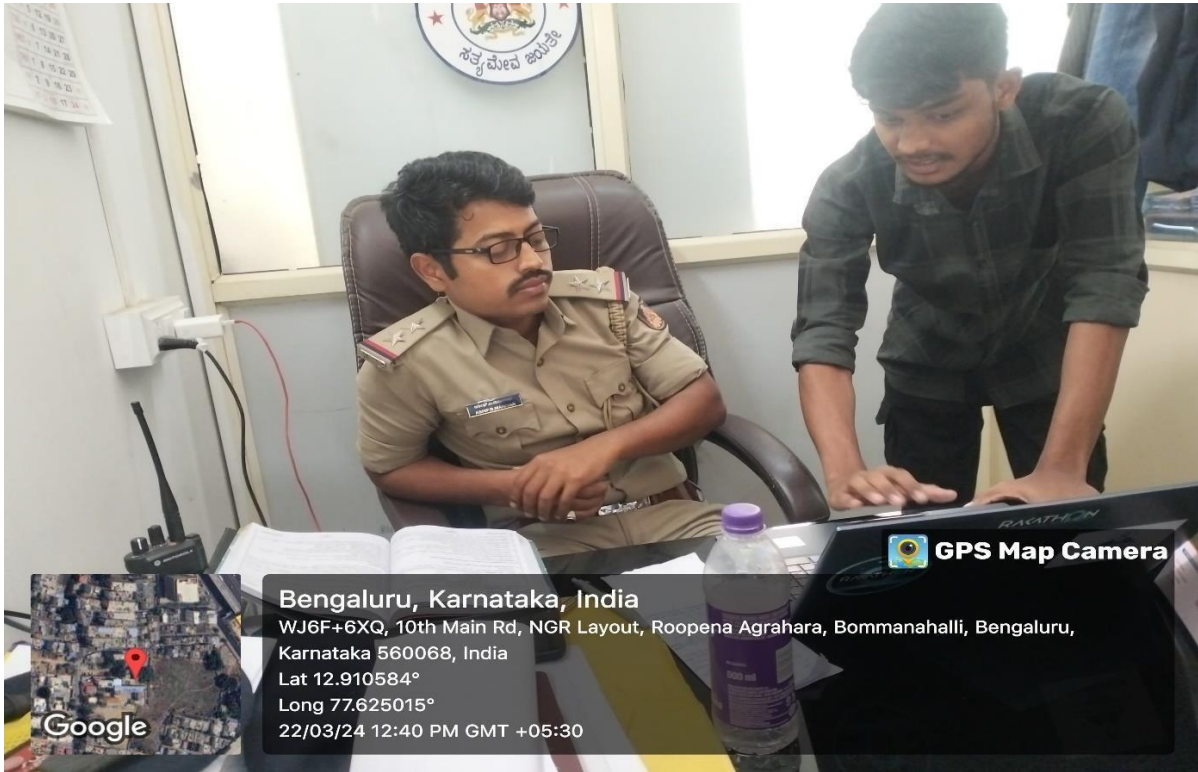
Chandrasekhar sir connected us with **Mr. SHYAM sir, an inspector** at the **traffic department** in Electronic City. When we met Mr SHYAM, sir, he welcomed us warmly, but he had to step out briefly for an urgent matter. However, he arranged for one of his officers to stay and learn about our project. While Shyam sir was away, we continued our interaction with his subordinate officer, who remained attentive and engaged. We shared our project details and demonstrated its functionality to the officer and the team. They were impressed by how we utilized PowerBI for data visualization. Mr SHYAM sir provided insightful feedback, which we considered for improving our project. He also discussed the advancements in traffic technology under the new commissioner's leadership. After our discussion, they kindly invited us for lunch, expressing

interest in our project's progress. SHYAM Sir assured us of continued support from the department. This marked the fruitful conclusion of our fieldwork journey.

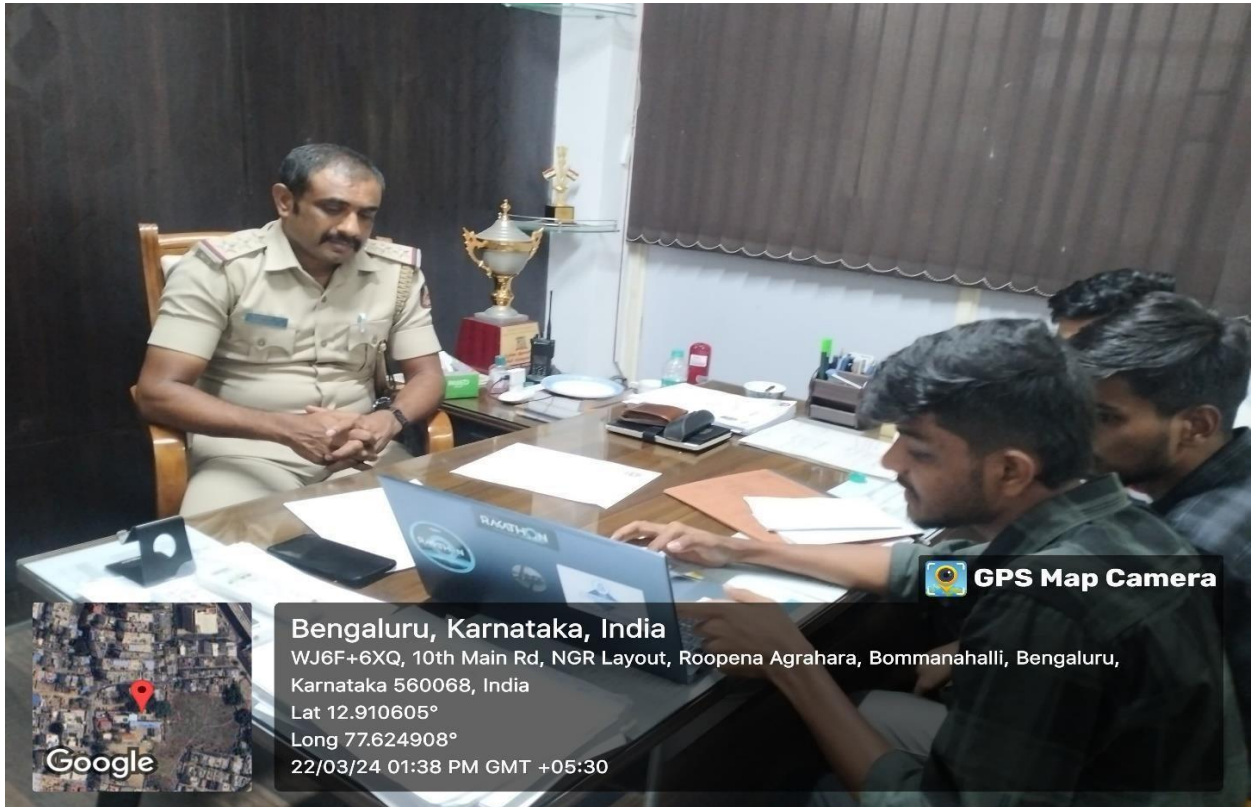
Field Work Experience



Interaction with Mr Asif B Maniyar



Interaction with Mr Chandrasekhar



Interaction with Ravishankar at Shyam Sir Office

Conclusion:

In wrapping up our project on traffic accident analysis, we've learned a lot through careful research, planning, and talking with the people involved. From the start of our fieldwork and discussions with officials, we've faced challenges but kept going, making our solution better as we went along. The insights we got from talking to people and our mentors helped shape our project, and the support from the department showed us how important our work is for making roads safer. Looking ahead, we're committed to making our project even better and helping improve how traffic is managed. We're thankful for all the help we've received and excited to keep making a difference in traffic accident analysis.