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**C**lear visibility is crucial to ensuring safety and efficiency in transportation. However, adverse weather conditions such as fog, rain, and sandstorms often obscure vision, significantly increasing the risk of accidents, fatalities, and economic losses. In India, weather-related road accidents have risen by 6% annually, driven by the increasing number of vehicles and the lack of adequate visibility-enhancing technologies. The challenges are not confined to roads alone. Aviation, railways, and surveillance systems are equally affected, highlighting the pressing need for innovative solutions to counter visibility issues.

In aviation, for instance, low visibility can result in flight delays, cancellations, or even tragic accidents. The helicopter crash in 2022 that claimed the life of India's first Chief of Defence Staff starkly illustrates the dangers posed by poor visibility. Railways, too, face operational disruptions and delays, while

### KlearVisen: Cutting-Edge Technology for Visual Clarity in Challenging Conditions

At its heart, KlearVisen employs sophisticated AI-powered algorithms that process real-time video feeds, eliminating visual noise caused by raindrops, fog, or condensation on camera lenses and in the atmosphere. The result is a crystal-clear video stream that significantly improves safety and operational efficiency under compromised visibility conditions.

KlearVisen analyses video frames pixel by pixel to detect and remove weather-induced distortions. It is designed for real-time application, allowing users to maintain visibility during rapidly changing weather. The system's lightweight structure ensures compatibility with existing traffic management and surveillance setups, while its reliance on widely available hardware makes it cost-effective and scalable.

compromised surveillance systems heighten security risks. Even advanced technologies such as automated driving systems, reliant on clear video feeds, struggle in adverse weather.

Acknowledging the gravity of these issues, **Proficient Vision Solutions Pvt. Ltd.**, a startup, in collaboration with **IIT Kharagpur**, has developed KlearVisen. This groundbreaking technology enhances visibility in adverse weather by mitigating the effects of rain, fog, and other environmental distortions on video streams. By harnessing Artificial Intelligence (AI) and computer vision, KlearVisen promises to revolutionise transportation, surveillance, and beyond.

# KlearVisen: Revolutionising Visibility for Safer Roads and Transport

## Applications Across Vital Sectors

- 1. Smart Traffic Management Systems (STMS):** The Motor Vehicles (Amendment) Act, 2019 highlights the importance of smart technologies, such as CCTV cameras, speed monitoring systems, and Automatic Number Plate Recognition (ANPR). However, these tools often falter in heavy rain or dense fog. KlearVisen ensures they function optimally, enhancing traffic safety and reducing accidents.
- 2. Aviation:** In aviation, where low visibility frequently leads to delays, safety concerns, and cancellations, KlearVisen's real-time video clarity supports navigation, runway operations, and ground surveillance, helping prevent accidents and minimise economic disruptions.
- 3. Railways:** Fog and other weather conditions often disrupt railway operations, delaying trains and increasing safety risks. KlearVisen aids train operators by improving visibility and ensuring uninterrupted station surveillance.

- 4. Autonomous Driving and Navigation:** Self-driving vehicles heavily rely on video feeds for navigation and decision-making. KlearVisen's ability to clean real-time video ensures these systems operate safely in adverse weather, marking a crucial step towards reliable autonomous mobility.
- 5. Surveillance and Security:** Poor weather can hinder surveillance systems, reducing their effectiveness in critical security operations. KlearVisen enhances video clarity, making it a valuable tool for emergency responders, law enforcement, and border security teams.



Receiving the CII Startuppreneur Award for "Real-Time Fog & Rain Removal from Videos" on March 16, 2023, at the Centre of Excellence for Innovation, Entrepreneurship, and Startups (CIIES) in Hyderabad. Pictured on the right is Prof. Sudipta Mukhopadhyay, Founder Mentor of Proficient Vision Solutions.

## From Concept to Reality

KlearVisen's journey began with Shri Abhishek Tripathi, who observed the challenges posed by northern India's fog-heavy winters. His research at IIT Kharagpur resulted in algorithms capable of removing weather-induced distortions from video feeds. These efforts culminated in a global patent, forming the foundation of KlearVisen.

Subsequently, Ms. Bijaylaxmi Das and Shri Abhinav Chopra refined the algorithms for real-time processing, making the technology ready for deployment. Backed by a dedicated team and guided by Professor Sudipta Mukhopadhyay, the project evolved from a research initiative into a market-ready solution.

## Recognition and Government Support

KlearVisen has garnered national and international accolades, including:

- **India Innovation Growth Programme (IIGP):** Ranked as a top innovation for fog and rain removal algorithms in 2016 and 2017.
- **FICCI R&D Award:** Acknowledged at the Global R&D Summit in 2017.
- **Abdul Kalam Technology Innovation National Fellowship (2018):** Awarded to Professor Mukhopadhyay for contributions to weather-related video clarity technologies.
- **National Technology Startup Award (2021):** Honoured by the Department of Science & Technology's Technology Development Board.

## Future Prospects and Broader Impacts

KlearVisen's development continues, with research focussing on expanding its applications. Proficient Vision Solutions envisions integrating the technology into

## How KlearVisen Works

The algorithms powering KlearVisen act as a "digital raincoat" for video streams, filtering out weather-related artefacts without compromising quality. During rainfall, for example, the system eliminates distortions caused by raindrops on camera lenses, ensuring uninterrupted clarity. In foggy conditions, it removes the hazy effects, uncovering details hidden by poor visibility.

By addressing these challenges in real-time, KlearVisen not only enhances visual clarity but also significantly improves situational awareness. Firefighters navigating smoke-filled areas, soldiers operating in challenging terrains, and emergency responders tackling crises all stand to benefit from this revolutionary technology.

advanced surveillance systems and national security infrastructure.

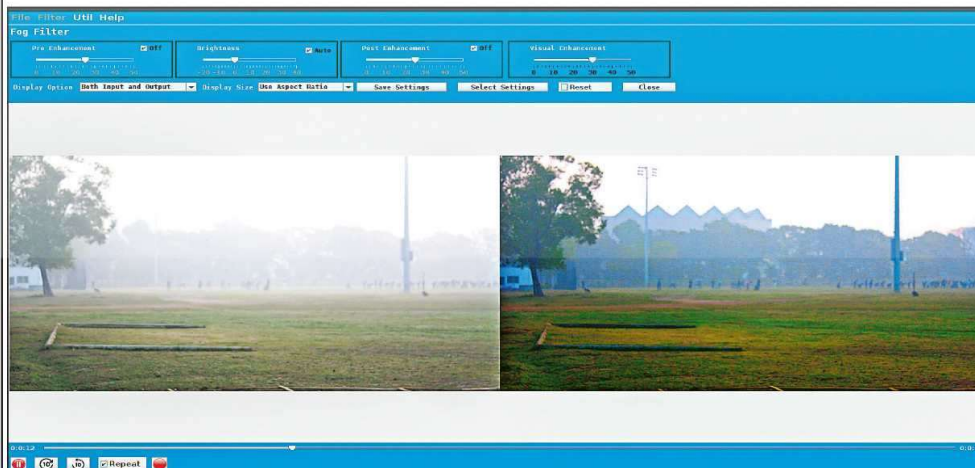
As a tool for addressing visibility challenges, KlearVisen stands out for its innovative approach and its potential to save lives, reduce accidents, and enhance operational efficiency. Its contribution to India's vision of a safer, technologically advanced future is monumental.

## Advice for Aspiring Innovators

The journey of KlearVisen offers invaluable lessons for budding entrepreneurs. As Professor Mukhopadhyay advises, success hinges on identifying real-world problems, perseverance in the face of challenges, and building a skilled, motivated team. "There will be frustrating times," he notes, "but persistence and teamwork can turn an idea into a reality that advances India's ability to solve its own problems."

KlearVisen is not just a technological breakthrough; it is a vision for a safer, more efficient future. By clearing the way, even in the worst weather, KlearVisen ensures that transport, security, and surveillance systems function optimally, no matter the conditions.

(The author is a science communicator. Feedback on this article can be sent to [feedback.employmentnews@gmail.com](mailto:feedback.employmentnews@gmail.com)) Views expressed are personal.



KlearVisen software in action at IIT KGP Ground: Left side shows the original foggy video, while the right side reveals a more clear (fog-free) output in real-time.