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Far from the madding crowd

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Highlights

Crowd Risk Index can predict behaviour of large gatherings by the minute, providing early warning to help avoid disaster scenarios
'Psychological trigger, a largely overlooked factor'

By Melvin Mathew

Researchers at the Indian Institute of Science have found a potential solution to manage crowds at cultural and religious gatherings — to help avoid fatalities in case of future untoward scenarios such as a stampede.

The comprehensive crowd risk prediction model, Crowd Risk Index (CRI), holds the possibility to develop early warning systems in crowded areas.

India is known to celebrate a multitude of religious, cultural and traditional festivals resulting in thousands of citizens gathering at a specific place. Every year, reports emerge of crowd management gone awry and disasters such as stampedes that claim lives.

IISc researchers are using machine learning to predict such risk scenarios in a crowded environment and allow the authorities to take preventive action.

The research was conducted by
Dr Gayathri Harihara Subramanian and Dr Ashish Verma. A paper titled 'Crowd risk prediction in a spiritually motivated crowd' was published in the journal Science Direct.

During research spanning almost four years, poring over literature, researchers found overcrowding to be a major cause of disasters.

They discovered that group behaviour played a major role in such scenarios. According to the study, 70% of the people in a religious gathering are participating as a group. A very important factor, often overlooked, is psychological triggers, the research suggested.

Researchers found psychological triggers could greatly influence groups. They could increase crowd anxiety levels and influence the aggressiveness of the group. Weather conditions were also found to be a key influencer in crowd anxiety.

For the primary case study, researchers considered the Kumbh Mela of 2016. A team of researchers camped at the mela and collected data using Go-Pro head-mount cameras, mobile phones and CCTV cameras. Qualitative data on patience and aggression levels were also collected through surveys and questionnaires.

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Using the data, researchers developed a unique model that is capable of predicting the level of risk at one-minute intervals.

“The CRI can predict the risk-level of an area as low, medium or high, every one minute. For our research, we have also incorporated weather and psychological factors. This is a very comprehensive model that takes into account several aspects,” Dr Gayathri Harihara Subramanian told BM.

Dr Ashish Verma, convenor of the Sustainable Transportation (IST) Lab, department of civil engineering, IISc, said, “The CRI will allow prediction of risk levels for future events of a spiritual nature (where large crowds gather). The project was part of the larger Kumbh Mela experiment project, which is an Indo-Dutch collaboration. It was funded by the Ministry of Electronics and IT, Government of India and Netherlands Organisation for Scientific Research. We want to utilise the research findings to develop an early warning system. Event organisers would be able to see a heat map of risk areas 30 minutes in advance.”

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— Dr Gayathri Harihara Subramanian, IISc

While the case study is limited to the Kumbh Mela, researchers claimed CRI can be used during religious festivities and processions held around the country. According to them, the learnings from the study can also be applied to manage traffic.

“We would need more empirical data for such a scenario to recalibrate the model. For example, on December 31, huge crowds gather on roads; the model can be applied to this scenario as
well as fervent activities like sports where onlookers gather in vast numbers or at open air political gatherings,” added

Verma.The researchers have also prepared crowd risk management guidelines and submitted them to the National Disaster Management Authority.