

Smart solutions for enhanced quality of life

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WFEO

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Requirement

Kumbh Mela is one of the most sacred pilgrimages in India, the largest and densest human gathering in the world attended by around 200 Million people. Major stampedes could happen, leading the UP Police to use 'Artificial intelligence' for better surveillance and crowd management during Kumbh Mela, Prayagraj held from 5 January to 4 March 2019. Around 1000 Cameras have been installed at vantage points.

These cameras are being used for Crowd Management Analytics like Line Count and Crowd Count at all vantage points like prominent bathing Ghats and entry/exit routes.

Whenever the density exceeded 3 people per square meter a soft alert is generated to start action. In case this figure reaches 5 or above, then stampedes are likely to happen. Accordingly the camera field of view in area square meter coverage was determined.

Challenges

In such a dense scenario, following major challenges are observed:

1. Severe occlusion making only a part of the head visible.
2. Bags on top of people heads further add to the occlusion problem.
3. Area to be covered vs cameras installed.
4. 2M camera used.
5. Large camera field of view covering a wide area.
6. Camera Angle of view.
7. Dust generated by the crowd clouds the camera.
8. General full body and head counting techniques fail leading to estimation as a best practice

Deep Learning: The Technology

To solve the dense crowd count problem deep learning provides a solution. A deep neural network is first constructed and then it is trained using large amounts of data (labelled with various classes using annotations) and in multiple iterations (upwards of 10000). This step is performed on high end GPUs. In this step the weights, are adjusted to reduce the error between the output and the expected output. After multiple iterations the learning curve starts to taper which indicates that no further learning is being gained and also the error rate is now minimal. This indicates converging of the model training.

The trained model is then ready to test to indicate the accuracy levels. After successful and consistent performance, the model is ready to be deployed in real world environment. The model is hence able to use its learning to make inferences on real world scenarios.