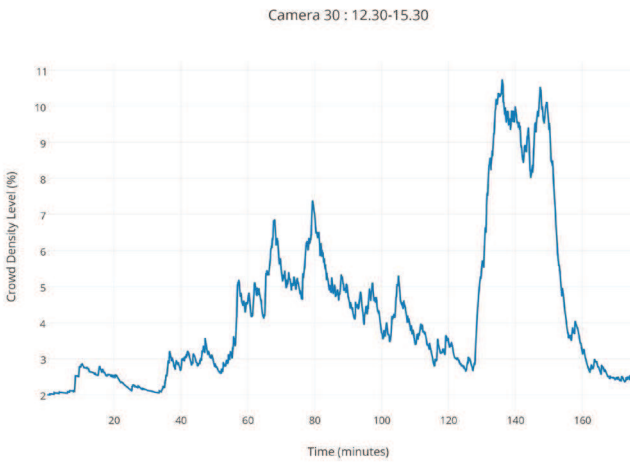
Smart Stadium: Multi-Modal Sensing and Analytics for Understanding Crowd Behaviour

Person detection and tracking, either within a single camera view or throughout a camera network, is mature technology that is already integrated into many commercial camera offerings. A truly intelligent surveillance system not only detects the presence of persons, but more importantly categorises their behaviour. However, most approaches are almost entirely supervised in nature, that is, they require significant numbers of example human-annotated video scenes showing the activity of interest. Security risks and emergency situations are rare occurrences and it is difficult to gather a sufficient variety of training data to build a robust and reliable monitoring system.

This research proposes that significant short-term advances can be made by focusing on the crowd, rather than solely on the individuals. Additionally, adopting a holistic approach by both coarsely quantifying the size of a crowd in a given location and by detecting and classifying significant deviations in normal crowd behaviour that potentially signal the occurrence of an unusual/abnormal or emergency event will result in short-term advances.

This project adopts a novel multi-modal approach to crowd behaviour analysis extending beyond cameras to integrate other useful sources of information available within a sensor-equipped smart stadium environment, specifically audio sensing and user-based localisation. The hypothesis is that "steady state" multi-sensory location-based crowd signatures can be learned (and continuously adapted) to allow abnormal events to be detected as outliers and subsequently classified.



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