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Soft + Hardwired Attention: An LSTM Framework for Human Trajectory Prediction and Abnormal Event Detection

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Abstract

As humans we possess an intuitive ability for navigation which we master through years of practice; however existing approaches to model this trait for diverse tasks including monitoring pedestrian flow and detecting abnormal events have been limited by using a variety of hand-crafted features. Recent research in the area of deep-learning has demonstrated the power of learning features directly from the data; and related research in recurrent neural networks has shown exemplary results in sequence-to-sequence problems such as neural machine translation and neural image caption generation. Motivated by these approaches, we propose a novel method to predict the future motion of a pedestrian given a short history of their, and their neighbours, past behaviour. The novelty of the proposed method is the combined attention model which utilises both “soft attention” as well as “hard-wired” attention in order to map the trajectory information from the local neighbourhood to the future positions of the pedestrian of interest. We illustrate how a simple approximation of attention weights (i.e hard-wired) can be merged together with soft attention weights in order to make our model applicable for challenging real world scenarios with hundreds of neighbours. The navigational capability of the proposed method is tested on two challenging publicly available surveillance databases where our model outperforms the current-state-of-the-art methods. Additionally, we illustrate how the proposed architecture can

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