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DOCTOR OF ENGINEERING SCIENCES

of **Tien Do Huu**

The public defense will take place on **Monday, 1st February 2021 at 1pm.**

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GRAPH-BASED DEEP LEARNING FOR SOCIAL MEDIA AND SMART CITY DATA ANALYTICS

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Abstract of the PhD research

We address the two challenges of big heterogeneous data originated from social media and smart cities, namely data quality enhancement and data exploitation. In the first challenge, we consider several subproblems commonly found in social media data and smart city data, including user location prediction, traffic data denoising, and hyperlocal air quality prediction. For the second challenge, we aim to gain insights from data, namely we focus on detecting fake news using social media data. As there exist correlations across datapoints in social media and smart city data, we propose exploiting these correlations using graph-based deep learning techniques to address the aforementioned challenges.

Our contributions are associated with the concerned applications. In user location prediction, we propose a novel deep multiview model combining multiple aspects of social media data. One of the inputs of the multiview model is node representation, which is learned using a graph-deep-learning-based technique. In order to denoise traffic data, we design a special graph auto-encoder with a Kron-reduction-based pooling scheme. We devise a graph variational auto-encoder in dealing with the air quality prediction problem. For fake news detection, we propose using a graph convolutional neural network, which captures the relation between articles shared by suspicious publishers. Having experienced graph neural networks on different applications, our last contribution focuses on a more fundamental problem of regularizing graph neural networks by introducing a novel regularization technique based on dropping nodes. We conduct comprehensive experiments on benchmark datasets to verify the effectiveness of the proposed methods.

Finally yet importantly, although some of our methods are designed for specific problems (e.g., air pollution prediction), our formulations are general, leading to the possibility of using these methods for different applications (e.g., recommender systems) in related domains.