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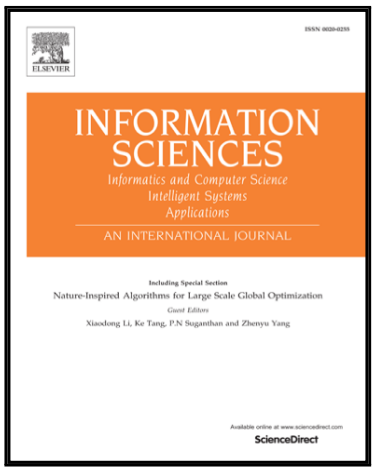

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ACCEPTED MANUSCRIPT

Reality Mining: A Prediction Algorithm for Disease Dynamics based on Mobile Big Data

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Abstract

Predicting disease dynamics during an epidemic is an important aspect of e-Health applications. In such prediction, Realistic Contact Networks (RCNs) have been widely used to characterize disease dynamics. The structure of such networks is dynamically changed during an epidemic. Capturing such kind of dynamic structure is the basis of prediction. With the popularity of mobile devices, it is possible to capture the dynamic change of the network structure. On this basis, in this study, we evaluate the impact of the network structure on disease dynamics, by analyzing massive spatiotemporal data collected by mobile devices. These devices are carried by the volunteers of Ebola outbreak areas. Based on the results of this evaluation, a model is designed to recognize the dynamic structure of RCNs. On the basis of this model, we propose a prediction algorithm for disease dynamics. By extensive experiments, we show that our algorithm improves the accuracy of the disease prediction.

Keywords: Reality Mining; Disease Dynamics; Prediction Algorithm; Mobile Big Data.

1. Introduction

As an important aspect of e-Health [19, 20, 21], quantifying and even predicting disease dynamics during an epidemic [17, 38, 35, 36] is very important to effectively allocate resources and to quickly make a response in a public health event. For the public health, underestimating the impact of

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