

Accepted Manuscript

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Evaluation and prediction

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PII: S1574-1192(17)30026-3
DOI: <https://doi.org/10.1016/j.pmcj.2017.10.006>
Reference: PMCJ 900

To appear in: *Pervasive and Mobile Computing*

Received date: 11 January 2017
Revised date: 21 June 2017
Accepted date: 9 October 2017

Please cite this article as: C. Comito, D. Talia, Energy consumption of data mining algorithms on mobile phones: Evaluation and prediction, *Pervasive and Mobile Computing* (2017), <https://doi.org/10.1016/j.pmcj.2017.10.006>

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Energy Consumption of Data Mining Algorithms on Mobile Phones: Evaluation and Prediction

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Abstract

The pervasive availability of increasingly powerful mobile computing devices like PDAs, smartphones and wearable sensors, is widening their use in complex applications such as collaborative analysis, information sharing, and data mining in a mobile context. Energy characterization plays a critical role in determining the requirements of data-intensive applications that can be efficiently executed over mobile devices. This paper presents an experimental study of the energy consumption behaviour of representative data mining algorithms running on mobile devices. Our study reveals that, although data mining algorithms are compute- and memory-intensive, by appropriate tuning of a few parameters associated to data (e.g., data set size, number of attributes, size of produced results) those algorithms can be efficiently executed on mobile devices by saving energy and, thus, prolonging devices lifetime. Based on the outcome of this study we also proposed a machine learning approach to predict energy consumption of mobile data-intensive algorithms. Results show that a considerable accuracy is achieved when the predictor is trained with specific-algorithm features.

Keywords:

Energy-Efficiency, Mobile Computing, Data Mining

1. Introduction

The large availability and the increasing power of wireless devices is opening the way to support analysis and mining of data in a mobile context [4]. Enabling mobile data mining is a significant added value for nomadic users and organizations that need to perform analysis of data generated either from a mobile device or from remote sources. Mobile data mining may include different scenarios in which a mobile device can play the role of data producer, data analyzer, client of remote data miners, or a combination of them. Accordingly, an increasing number of smartphone and PDA-based data intensive applications have been recently developed [1, 2, 4]. Examples include smartphone-based systems for body-health monitoring, vehicle monitoring, and wireless security systems. Advanced support for data analysis and mining is necessary for such applications. A key aspect that must be addressed to enable effective and reliable data mining over mobile devices is ensuring energy efficiency, as most commercially available mobile

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