

# Chapter 34

## Mobile Application and User Analytics

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### ABSTRACT

*Mobile analytics is the systematic study of mobile device and application usage, and application performance, for the purpose of improving service quality. This chapter motivates the need for mobile analytics as an essential cog in the emerging economy built around devices, applications, and communication. A taxonomy of mobile analytics problems is presented, and technical details of a typical mobile analytics solution are discussed. Scale, heterogeneity, dynamically changing environments, and diverse privacy requirements pose challenges to collecting and processing data for such analysis. This chapter examines how analytics solutions handle these challenges. The core of the chapter consists of a technical section describing the general architecture of a mobile analytics solution, procedures to collect and process data, event monitoring infrastructure, system administration processes, and privacy management policies. Case studies of a number of analytics solutions available as commercial products or prototypes are presented.*

### INTRODUCTION

So-called “smart phones” and tablets are now multipurpose devices that have, for many people, replaced the traditional desktop or laptop computer. Voice communication is just one application (“app”) among many. Mobile devices support not just personal applications like shopping, games, and Internet surfing, but also limited office use; increased productivity is incentive enough to overcome security concerns inherent in letting employees keep confidential email and documents on their personal devices. *App stores* centered on mobile operating systems are hubs of innovative software development today (Cuadrado, 2012). Since mobile devices are accessories, user behavior and habits can be understood by monitoring location and other context, helping app distributors offer more relevant services to users. Given the plethora of choices available to users, commercial success in the mobile software industry is dependent

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upon understanding app usage and providing improved and more innovative features. Some examples will illustrate the kinds of insights that are sought after:

- The designer of an arcade game mobile app wants to know the demographics of users who download the free version from an app store versus those who pay.
- A restaurant-finder service-cum-mobile app designer wants to know why her service is popular among young professionals in New York but not in Los Angeles.
- The IT administrator of a corporation wants to understand why employees in Zurich saw their email apps crash intermittently yesterday while London employees did not. Could the predominance of iOS devices in the London office (as opposed to the predominance of Android in Zurich) explain this?

Such questions can be answered by systematically studying how mobile devices and applications are used, and by monitoring application performance. This process is termed *mobile analytics* and its purpose is to gain insights, discover patterns, and improve service quality. Mobile analytics requires:

1. A system architecture and mechanisms to generate analyzable data, and
2. Algorithms to process the data and gain desired insights.

Architectures are scenario-independent and have few variations across mobile analytics solutions, whereas data types and processing algorithms vary widely with scenario and a comprehensive coverage of these would be too large to fit in one chapter. Therefore, we focus mainly on architectural issues in this chapter.

Mobile analytics involves the collection, processing, and presentation of data. It relies on diverse disciplines like statistics, modeling, programming, and communications. A good analytics solution must separate the wheat from the chaff, and drill down into the essential factors that explain how users and applications behave. While fields like big data analytics, computer forensics, and IT operations research share these characteristics and attempt to solve similar problems, there are specific reasons, listed below, that motivates the treatment of mobile analytics as a special field of inquiry.

- **Business Reasons:** The ecosystem surrounding mobile apps is commercially lucrative and highly competitive. Understanding user demographics, gaining visibility into user experience, and avoiding service failures and downtimes, is vital. A holistic analytical framework specific to mobile apps and users enables developers, business managers, and IT operators, to do a better job of serving customers.
- **Technical Reasons:** Mobile computing environments have special characteristics that present unique analytics challenges, differentiating from traditional analytics. Some of the key differentiating challenges are given below:
  - Mobility results in dynamic context (especially location) changes, and there is a crucial need to collect contextual data.
  - Distributed client-server applications, and dependencies on multiple remote web services (Loreto2009), are common; e.g., email, maps, restaurant-finder, and gaming. This requires collecting and correlating data from dispersed and moving sources.

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