Chapter 5
Emerging Technologies Serving Cytopathology:
Big Data, the Cloud, and Mobile Computing

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ABSTRACT

Cytopathology became a popular since George Papanicolaou proposed the famous test Pap 60 years ago. Today cytopathology laboratories use the microscope as primary diagnostic device; however modern laboratories host numerous modalities for molecular tests and exchange data via networks; additionally, there are imaging systems producing pictures and virtual slides at enormous sizes and volume. The latest technological developments for cloud computing, big data and mobile devices has changed the way enterprises, institutions and people use computerized systems. In this chapter are explored potential applications of these technologies in the cytopathology laboratory including: data storage, laboratory information

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The term “cloud services” (also known in modern technology jargon as “the cloud”) refers to a network of servers connected by the Internet or any other type of network that enables users to combine and use computing power on an as-needed basis. Cloud computing is a novelty that rapidly showed tremendous opportunities for applications in medicine and health care improvement (Eugster, Schmid, Binder, & Schmidberger, 2013; Fernandez-Llatas, Pileggi, Ibanez, Valero, & Sala, 2015; Glaser, 2011; Kuo, 2011; Lupse, Vida, & Stoicu-Tivadar, 2012; Mirza & El-Masri, 2013; Patel, 2012; Rosenthal et al., 2010; Wexer, Ninan, Ma, & Dominguez, 2013). It is expected that by 2018 there will be approximately a 27% increase in the US cloud computing market for medical images at a Compounded Annual Growth Rate (CAGR). This is mainly due to the growing volume of medical images and the increasing costs of ownership for maintaining Picture Archiving and Communication Systems (PACS) (GlobalData, 2012). To deal with this challenge, analysis techniques, especially suitable for the laboratory environment, have been developed for future application (A. Pouliakis, Archondakis, Karakitsos, & Karakitsos, 2014; A. Pouliakis, Spathis, et al., 2014).

In parallel to cloud computing there are new developments for mobile computing. Especially in the health sector Mobile Health (mHealth), which is defined as the practice of medicine and public health supported by mobile devices, is nowadays evolving. Available mHealth applications are nowadays used for collecting community and clinical health data, delivering healthcare information of patient vital signs in real-time, as well as direct healthcare provisioning. Today there are available handheld computing applications for: ambulatory medicine (Banitsas, Perakis, Tachakra, & Koutsouris, 2006; Kiselev, Gridnev, Shvartz, Posnenkova, & Dovgalevsky, 2012; Pavlopoulos, Kyriacou, Berler, Dembeyiotis, & Koutsouris, 1998; Rosales Saurer, Mueller-Gorchs, & Kunze, 2009; Zerth, Besser, & Reichert, 2012), diabetes management (Ribu et al., 2013; Skrovseth, Arsand, Godtliebsen, & Hartvigsen, 2012; Spat et al., 2013), asthma management (Finkelstein, Hripcsak, & Cabrera, 1998; Gupta, Chang, Anyigbo, & Sabharwal, 2011), control of obesity
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