The research challenge addressed in this part is the effective and efficient management of multimedia information (e.g., video, audio, images, texts, three-dimensional (3D) models, etc.) within pervasive environments, especially for cultural heritage applications. In particular, the main current research issues are addressed, which aim at providing novel techniques for supporting query by content and example mechanisms for multimedia databases and digital libraries, multimedia recommendation, and media content presentation strategies, multimedia applications, and services.

Generally, content-based multimedia information retrieval provides new models and methods for effectively and efficiently searching through the huge variety of media that are available in different kinds of repositories (digital libraries, Web portals, social networks, multimedia databases, etc.).

Chapter 14 provides the foundations and the current state of the art of content-based multimedia information retrieval, including the most promising browsing and search paradigms for the several types of multimedia data, analyzing their role in cultural heritage applications. Eventually, the authors discuss the major challenges in future researches.

The intrinsic complexity and diversity of data in multimedia digital libraries (MDLs) require devising techniques and solutions that are inherently different from those usually adopted in traditional information retrieval and database systems. Moreover, the size and the dynamicity of MDLs force researchers to strive for efficiency, so as to guarantee real-time results to the users. Finally, semantics should also be brought into play in order to facilitate users’ experience in querying, browsing, and consuming multimedia information.

Chapter 15 presents an approach toward the efficient, effective, and semantically rich data retrieval in MDLs. With respect to the commonly used holistic approach, where the multimedia datum is considered as an atomic entity, our reductionist strategy considers the multimedia information as a complex combination of component subparts and eases the fulfillment of the three above properties of efficiency, effectiveness, and semantic richness. Indeed, by decomposing multimedia information into simpler and smaller component objects, we are able to index such components without giving up the ability to query the original information as a whole.
As a further issue, in the last decade the spread of broadband Internet connections even for mobile devices has contributed to an increased availability of multimedia information on the Web. At the same time, due to the decrease of storage cost and the increasing popularity of storage services in the cloud, the problem of information overload has become extremely serious even in personal/company archives. The need of managing, retrieving, and presenting all these data has promoted the development of advanced multimedia information systems based on models and techniques proposed in the scientific literature. Nowadays, detecting frameworks that account for the specificity of target domains, such as the cultural heritage domain, is an important challenge. This context is really interesting both for its impact on the users’ life and education and also because it requires to rethink the existing models for many different aspects, including (a) the different roles of each heterogeneous data, (b) how the importance of users’ patterns can be extracted, as well as (c) how data have to be presented in an integrated way. Most of these challenges have been extensively studied in the area of multimedia recommendation techniques, in which multiple representations of the same information need to be handled. A video, for instance, can be described by a temporal sequence of frames; a textual description; a set of users’ tags, comments, or emotions; a set of users that watched it; a set of similar videos; and so on. However, these features are not equally important for everyone. For example, in the choice of the next video to watch, a user may be guided by descriptions, emotions, tags, users’ communities, or even combinations of these descriptors. A good multimedia recommender system should address the specificity of each user in browsing and choosing the multimedia content.

In this scenario, Chap. 16 investigates how multimedia information systems in the cultural heritage domain can significantly benefit from the application of properly tuned techniques borrowed by state-of-the-art multimedia recommendation and delivery systems. To support their claim, the authors propose a survey of such existing techniques and discuss their potential impact in the design of multimedia information system in the cultural heritage domain.