The emerging popularity of multimedia data, as digital representation of text, image, video and countless other milieus, with prodigious volumes and wild diversity, exhibits the phenomenal impact of modern technologies in reforming the way information is accessed, disseminated, digested and retained. This has iteratively ignited the data-driven perspective of research and development, to characterize perspicuous patterns, crystallize informative insights, and realize elevated experience for end-users, where innovations in a spectrum of areas of computer science, including databases, distributed systems, machine learning, vision, speech and natural languages, has been incessantly absorbed and integrated to elicit the extent and efficacy of contemporary and future multimedia applications and solutions.

Under the theme of pattern mining and similarity querying, this manuscript presents a number of pieces of research concerning multimedia data, to address an array of practical tasks encompassing automatic annotation, outlier detection, community discovery, multi-modal retrieval and learning to rank, in their respective contexts including satellite image analysis, internet traffic surveillance, image bioinformatics, and Web search. A repertoire of extant and novel techniques pertaining to graph mining, clustering analysis, tensor decomposition and probabilistic graphical models has been developed or adapted, which satisfactorily met differing quality and efficiency requisites postulated by specific application settings, best exemplified by the 40 times speed-up in annotating satellite images and the up to 30% performance improvement in predicting web search user clicks, yet without the loss of generality to similar and related scenarios.

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