DEVELOPMENT AND RESEARCH OF A CONTENT-BASED IMAGE RETRIEVAL SERVICE

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Technological progress in the field of image processing has accelerated significantly in recent years, propelled by rapid advancements in artificial intelligence and machine learning. The growing interest in intelligent visual data analysis in today's world has led researchers and developers to focus on creating more powerful tools for efficiently processing large volumes of images. These tools are designed to meet the escalating demands of various industries that rely on precise and fast image analysis, from healthcare diagnostics to automated surveillance systems.

The aim of the research is to present a content-based image retrieval (CBIR) service that employs machine learning algorithms and Big Data technologies to optimize visual search. The development of such a service is motivated by the need for high processing efficiency and fast system performance capable of handling extensive sets of visual data. This system is applicable in both commercial and scientific environments, demonstrating its broad utility and adaptability. It seeks to bridge the gap between vast image repositories and the end-user's need for specific visual information, thereby streamlining workflows and enhancing data accessibility.

To achieve the goals of this study, the VGG16 neural network is utilized, known for its high efficiency in image classification and analysis [1]. The choice of VGG16 is due to its architecture, which has been extensively validated in various image recognition tasks, proving its robustness and reliability. The Milvus vector database is used for storing and quickly retrieving large quantities of feature vectors, which are essential for maintaining the high-speed retrieval rates required by modern applications. The Postgres relational database manages the storage of image metadata, such as file paths, which facilitates efficient data management and scalability. The server-side is developed using the FastAPI web framework, enhancing backend functionality with its high performance and easy scalability. Additionally, the user interface is designed with the React library, ensuring an intuitive and responsive user experience that caters to both novice users and expert analysts.

The developed service enables users to search for images based on content swiftly and with high precision. This capability opens up new possibilities for data analysis in various fields, ranging from marketing to security, which are increasingly relevant in the technological industry today. In marketing, for example, the ability to quickly retrieve images that match specific visual themes can significantly enhance targeted advertising campaigns. In the realm of security, rapid image retrieval can aid in real-time surveillance and threat identification, thereby contributing to safer public spaces. Such advancements underline the critical role of sophisticated image analysis tools in addressing contemporary digital challenges and pushing the boundaries of what is possible with visual data.

References:

1. K. Simonyan, A. Zisserman. "Very Deep Convolutional Networks for Large-Scale Image Recognition" // International Conference on Learning Representations, 2015.