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Soft Computing Methods for Big Data Problems

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Abstract


Generally, big data computing deals with massive and high-dimensional data such as DNA microarray data, financial data, medical imagery, satellite imagery, and hyperspectral imagery. Therefore, big data computing needs advanced technologies or methods to solve the issues of computational time to extract valuable information without information loss. In this context, generally, machine learning (ML) algorithms have been considered to learn and find useful and valuable information from large value of data. However, ML algorithms such as neural networks are computationally expensive, and typically, the central processing unit (CPU) is unable to cope with these requirements. Thus, we need a high-performance computer to execute faster solutions such graphics processing unit (GPU). GPUs provide remarkable performance gains compared to CPUs. The GPU is relatively inexpensive with affordable price, availability, and scalability. Since 2006, NVIDIA provides simplification of the GPU programming model with the Compute Unified Device Architecture (CUDA), which supports for accessible programming interfaces and industry-standard languages, such as C and C++. Since then, general-purpose graphics processing unit (GPGPU) using ML algorithms are applied on various applications, including signal and image pattern classification in biomedical area. The importance of fast analysis of detecting cancer or non-cancer becomes the motivation of this study. Accordingly, we proposed soft computing methods, self-organizing map (SOM) and multiple back-propagation (MBP) for big data, particularly on biomedical classification problems. Big data such as gene expression datasets are executed on high-performance computer and Fermi architecture graphics hardware. Based on the experiment, MBP and SOM with GPU-Tesla generate faster computing times than high-performance computer with feasible results in terms of speed and classification performance.

Keywords

GPGPU – Big data – Soft computing – SOM – MBP – [Biomedical classification problems](#)




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