A Distributed Computing Platform for fMRI Big Data Analytics

Abstract

Since the BRAIN Initiative and Human Brain Project began, a few efforts have been made to address the computational challenges of neuroscience Big Data. The promises of these two projects were to model the complex interaction of brain and behavior and to understand and diagnose brain diseases by collecting and analyzing large quantities of data. Archiving, analyzing, and sharing the growing neuroimaging datasets posed major challenges. New computational methods and technologies have emerged in the domain of Big Data but have not been fully adapted for use in neuroimaging. In this work, we introduce the current challenges of neuroimaging in a big data context. We review our efforts toward creating a data management system to organize the large-scale fMRI datasets, and present our novel algorithms/methods for the distributed fMRI data processing that employs Hadoop and Spark. Finally, we demonstrate the significant performance gains of our algorithms/methods to perform distributed dictionary learning.

Conclusion

The neuroscience has entered into the bigdata era justas other leading sciences. This arrival though requires a cultural shift among the community from enormousisolated efforts applying a single technique to the smaller problems in laboratoriestoward more horizontal approachesresearchers integrate data collected using a variety of techniques to solve bigger problems addressing the centralquestions of how the brain functionally and structurally connected. We have categorized the current computational efforts of neuroscience experts for in dealing with the bigdata challenges in 6 groups of data management, data visualization, Cloud storage, computing platforms, processing pipelines and processing engines.
SYSTEM REQUIREMENTS:

HARDWARE REQUIREMENTS:

- System: Pentium IV 2.4 GHz.
- Hard Disk: 40 GB.
- Floppy Drive: 1.44 Mb.
- Monitor: 15 VGA Colour.
- Mouse: Logitech.
- Ram: 512 Mb

SOFTWARE REQUIREMENTS:

- Operating system: Windows 7/UBUNTU.
- Coding Language: Java 1.7, Hadoop 0.8.1
- IDE: Eclipse
- Database: MYSQL

References

