Parallelizing Semi-Supervised Learning Algorithms with MapReduce

ReDAS

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COMPUTER SCIENCE

Motivation

- Semi-supervised learning(SSL) algorithms are slow when working with large-scale data.
- Some SSL methods have already been parallelized, but not all.

Goal

- Parallelize SSL algorithms utilizing MapReduce.
- Learning the research paradigm.

Objectives

- Introduce an efficient and significantly faster way to work with large-scale data for some SSL methods by parallelizing them within the MapReduce framework.

Expected Impact

- Parallelize semi-supervised algorithms that have not yet been parallelized.
- Improving the runtime and efficiency of a semi-supervised algorithm by removing bottlenecks.

Deliverables

- Report
- Poster presentation
- Documentation of the process
- Potentially software

Methods: Objective 1

- Study the algorithms
- Write pseudocode for the typical semi-supervised method
- Convert the typical semi-supervised pseudocode to MapReduce pseudocode

Methods: Objective 1

- Implement the MapReduce pseudocode with Python 3.
  - Mapper
  - Combiner
  - Reducer
  - Driver program.

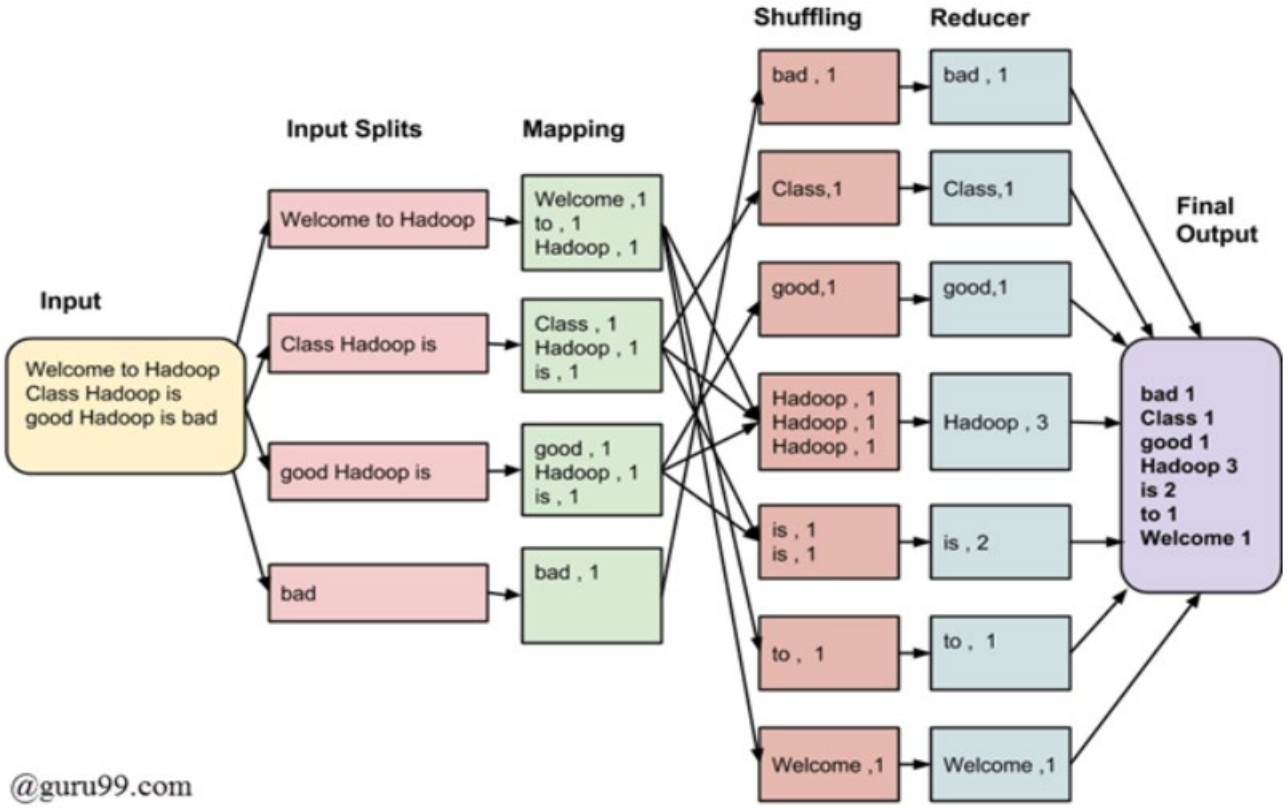
Methods: Objective 1

- Test, debug, test again, etc. until the bugs are worked out.
- Repeat testing until conclusion is reached.

Methods: Objective 1

- Example: Semi-Supervised Expectation Maximization (SS-EM)
  - Define parameters
  - E-Step
    - Assign expected labels
  - M-Step
    - Calculate probability of newly assigned labels
  - Repeat E & M step until convergence is reached.

Methods: Objective 1



https://www.guru99.com/introduction-to-mapreduce.html

Results: Objective 1

- I am currently in the stage of converting the semi-supervised pseudocode to MapReduce pseudocode.

Remaining Work

- I still have yet to write and implement the MapReduce code with Python 3.
- Testing the code once implemented.
- Create report, poster, and documentation.

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