Parallelizing Semi-Supervised Learning Algorithms with MapReduce

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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

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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