Parallelizing the Itemset Tree Data Structure

Project proposal for CSCE 561 – Fall 2015

Jennifer Lavergne

Laboratory for InterNet Computing

Project Goals

- **Phase 1:** Modify to itemset tree algorithm specified in general mining paper to either:
  - Build separate trees
  - Break apart a completed tree
- **Phase 2:** Modify the itemset tree search algorithm to run parallel on multiple trees
  - Run on multiple trees
  - Combine results
- **Phase 3:** (a) Test different ways to split the tree and recombine the results. (b) Test different support calculations and minimum support thresholds.

BACKGROUND

Association Rules

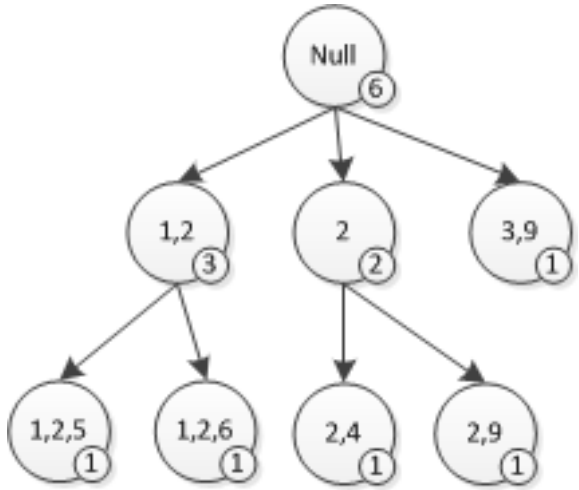
- **Association rule -** an implication {X ⇒ Y, support, confidence}. Where X and Y are subsets of the itemset I and X∩Y = Ø
  - Example: {{bread, milk} ⇒ {cheese}, 30%, 75%}

- **Support** = #occurrences of I in database/#rows in database
  - **Minsup** – The minimum support threshold for an itemset I to be considered frequent

- **Confidence** = Support(X ∪ Y)/Support(X) for itemset I = X ∪ Y.
  - **Minconf** – a user specified threshold that indicates the interestingness of a candidate rule I: conf(I) ≥ minconf

Itemset Trees

- A data structure which aids in users querying for a specific itemset and it's support: Targeted Association Mining
- Item mapped to numeric values: {bread} = {1}, {cheese} = {2}
  - Numbers must be in ascending order within the itemset
  - Ex: I = {1, 2, 56, 120}
- **Note:** Can be used to find all or specific rules within a dataset.



PROJECT DESCRIPTION

Phase 1: Itemset Tree Code

- Modify existing code or write your own.
  - Build separate trees
  - Break apart a completed tree

- Read papers:
  - Itemset trees
  - Ordered Min-Max Itemset Tree

Phase 2: Parallelize search

- Modify existing code or write your own:
  - Run parallel search algorithm on multiple trees
  - Combine results of the parallel

- Possibly use a modified support calculation and min-sup threshold based upon the number of subtrees and the overall support of each subtree.
  - support = count (itemset in subtree)/total in main tree
  - support = count (itemset in subtree)/total in subtree
  - Try others?

Phase 3: Tests

Test different ways to split the tree and recombine the results.

- **Test1:** Generate and split an unordered tree v.s. generating multiple unordered trees.

- **Test 2:** Generate and split an ordered tree v.s. generating multiple ordered trees.

- **Test 3:** Test other support calculations and different minimum support thresholds.

Questions?

Jennifer Lavergne

jjslavergne@louisiana.edu

References

- M. Kubat, A. Hafez, V. V. Raghavan, J. Lekkala, and W. K. Chen, "Itemset trees for targeted association mining", *IEEE Trans. on Knowledge and Data Engineering*, 2002

- Yu Li and Miroslav Kubat. 2006. Searching for high-support itemsets in itemset trees. *Intell. Data Anal.* 10, 2 (March 2006), 105-120

- Jennifer Lavergne, Ryan Benton, and Vijay V. Raghavan. 2012. Min-Max itemset trees for dense and categorical datasets. In *Proceedings of the 20th international conference on Foundations of Intelligent Systems* (ISMIS'12), Li Chen, Alexander Felfernig, Jiming Liu, and Zbigniew W. Raś (Eds.).