Top 10 Algorithms in Data Mining

Xindong Wu (吴信东)
Department of Computer Science
University of Vermont, USA;
合肥工业大学计算机与信息学院
“Top 10 Algorithms in Data Mining”
by the IEEE ICDM Conference

1. The 3-step identification process
2. 18 identified candidates in 10 data mining topics
3. The top 10 algorithms
4. Follow-up actions
The 3-Step Identification Process

1. **Nominations.** ACM KDD Innovation Award and IEEE ICDM Research Contributions Award winners were invited in September 2006 for nominations
   - Each nomination was asked to come with the following information:
     - a) the algorithm name
     - b) a brief justification
     - c) a representative publication reference
   - Up to 10 nominations from each nominator
     - The nominations as a group should have a reasonable representation of the different areas in data mining
   - All except one in this distinguished set of award winners responded.
2. **Verification.** Each nomination was verified for its citations on Google Scholar in late October 2006, and those nominations that did not have at least 50 citations were removed.
   - 18 nominations survived and were then organized in 10 topics.

3. **Voting** by the wider community.
   - (a) Program Committee members of KDD-06, ICDM '06, and SDM '06 and
   - (b) ACM KDD Innovation Award and IEEE ICDM Research Contributions Award winners
   - The top 10 algorithms are ranked by their number of votes, and when there is a tie, the alphabetic order is used.
Agenda

1. The 3-step identification process
2. 18 identified candidates (in 10 data mining topics)
3. The top 10 algorithms
4. Follow-up actions
18 Identified Candidates

- **Classification**

- **Statistical Learning**

- **Association Analysis**
  - #8. **FP-Tree**: Han, J., Pei, J., and Yin, Y. 2000. Mining frequent patterns without candidate generation. In SIGMOD ’00.

- **Link Mining**
18 Candidates (2)

- **Clustering**

- **Bagging and Boosting**

- **Sequential Patterns**
  - #15. **PrefixSpan**: J. Pei, J. Han, B. Mortazavi-Asl, H. Pinto, Q. Chen, U. Dayal and M-C. Hsu. PrefixSpan: Mining Sequential Patterns Efficiently by Prefix-Projected Pattern Growth. In ICDE ’01.

- **Integrated Mining**
  - #16. **CBA**: Liu, B., Hsu, W. and Ma, Y. M. Integrating classification and association rule mining. KDD-98.

- **Rough Sets**

- **Graph Mining**
  - #18. **gSpan**: Yan, X. and Han, J. 2002. gSpan: Graph-Based Substructure Pattern Mining. In ICDM ’02.

Top 10 Algorithms in Data Mining: Xindong Wu and Vipin Kumar
Agenda

1. The 3-step identification process
2. 18 identified candidates
3. The top 10 algorithms
4. Follow-up actions
The Top 10 Algorithms

- **#1: C4.5**, presented by Hiroshi Motoda
- **#2: K-Means**, presented by Joydeep Ghosh
- **#3: SVM**, presented by Qiang Yang
- **#4: Apriori**, presented by Christos Faloutsos
- **#5: EM**, presented by Joydeep Ghosh
- **#6: PageRank**, presented by Christos Faloutsos
- **#7: AdaBoost**, presented by Zhi-Hua Zhou
- **#7: kNN**, presented by Vipin Kumar
- **#7: Naive Bayes**, presented by Qiang Yang
- **#10: CART**, presented by Dan Steinberg
1. The 3-step identification process
2. 18 identified candidates
3. The top 10 algorithms
4. Follow-up actions
Open Votes for Top Algorithms

- Top 3 Algorithms:
  - C4.5
  - SVM
  - Apriori

- Top 10 Algorithms
  - The top 10 algorithms voted from the 18 candidates at the panel are the same as the voting results from the 3-step identification process.
Follow-Up Actions

- A survey paper on Top 10 Algorithms in Data Mining (X. Wu, V. Kumar, J.R. Quinlan, et al., Knowledge and Information Systems, 14(1), 2008, 1~37)
  - Written by the original authors and presenters
  - Cited 1841 times on Google Scholar as of 1/19/2016
- How to make a good use of these top 10 algorithms?
  - Curriculum development
  - A textbook on The Top 10 Algorithms in Data Mining, Chapman and Hall/CRC Press, April 2009
- Various questions on these 10 algorithms?
  - Why not this algorithm or that topic?
- Will the votes change in the future?
  - Sure, let’s work together to make positive changes!