Are All the "Discovered" Patterns Interesting?

- Data mining may generate thousands of patterns: Not all of them are interesting
  - Suggested approach: Human-centered, query-based, focused mining
- **Interestingness measures**
  - A pattern is interesting if it is easily understood by humans, valid on new or test data with some degree of certainty, potentially useful, novel, or validates some hypothesis that a user seeks to confirm
- **Objective vs. subjective interestingness measures**
  - Objective: based on statistics and structures of patterns, e.g., support, confidence, etc.
  - Subjective: based on user's belief in the data, e.g., unexpectedness, novelty, actionability, etc.

Find All and Only Interesting Patterns?

- Find all the interesting patterns: Completeness
  - Can a data mining system find all the interesting patterns? Do we need to find all of the interesting patterns?
  - Heuristic vs. exhaustive search
  - Association vs. classification vs. clustering
- Search for only interesting patterns: An optimization problem
  - Can a data mining system find only the interesting patterns?
  - Approaches
    - First general all the patterns and then filter out the uninteresting ones
    - Generate only the interesting patterns—mining query optimization

Other Pattern Mining Issues

- Precise patterns vs. approximate patterns
  - Association and correlation mining: possible find sets of precise patterns
    - But approximate patterns can be more compact and sufficient
    - How to find high quality approximate patterns??
  - Gene sequence mining: approximate patterns are inherent
    - How to derive efficient approximate pattern mining algorithms??
- Constrained vs. non-constrained patterns
  - Why constraint-based mining?
  - What are the possible kinds of constraints? How to push constraints into the mining process?

Pattern Interestingness Measure

- Simplicity

  e.g., (association) rule length, (decision) tree size

- Certainty

  e.g., confidence, P(A|B) = #(A and B)/ #(B), classification reliability or accuracy, certainty factor, rule strength, rule quality, discriminating weight, etc.

- Utility

  potential usefulness, e.g., support (association), noise threshold (description)

- Novelty

  not previously known, surprising (used to remove redundant rules, e.g., Illinois vs. Champaign rule implication support ratio)