Mining and Linking Patterns Across Live Data Streams and Stream Archives

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Motivation

Streaming Data Everywhere Carries Hidden Insights

Need for interactive exploration of complex patterns

System Objectives

Pattern Mining: Highly efficient mining of complex patterns within live data streams and stream pattern archives.
Summarization: Summarize extracted patterns into descriptive yet highly compact formats by employing multi-resolution compression strategies.
Evolution tracking: Track evolution of pattern changes over time from past, to present and even to the near future.
Visualization: Intuitively display the mining results to human analysts through visual displays and interactions.

Pattern Extraction and Summarization

Pattern Extraction: Developed innovative pattern detection algorithms [1,2,5] to efficiently extract interesting patterns from data streams.
Pattern Summarization: Designed novel multi-resolution compression strategies that compress these extracted patterns into descriptive yet highly compact formats at stream speed [4]

Evolution Tracking

Evolution Tracking: monitors interrelationships between historical, live and prospective patterns to determine evolution of patterns over time and other trends [3]

Pattern Matching

Pattern Matching: Developed matching algorithms that, given a pattern of interest in the current stream window, identify matching ones from historical pattern archive at any resolution [4]

ViStream System Architecture

Rich integrated computational and visual functionalities

Results and Contributions

- ViStream tool supports interactive pattern exploration for mining, compressing & querying stream patterns
- Experimental studies demonstrate scalability of pattern extraction and summarization techniques
- User studies confirm the effectiveness of technology for high-quality compression and matching
- Release of ViStream technology as freeware software

References


Software released @ davis.wpi.edu/xmdv
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