The present day

- Visual-Analytics tools
- Initially focusing on techniques to empower analysts
  - So Analysts can discover quicker, easier, and more accurately.
The Claim

- "We argue that the process through which an analyst arrives at the conclusion is just as important as the discoveries themselves."

- But this is not a trivial task!
- However, we can be guided by a tools interaction log!
- The experiment looks to see if we can recover analysts: strategies, methods, and findings through this log.
WireVis - A hierarchical interactive VA Tool

- Developed jointly with Bank of America
- Shows us wire activities in bank accounts
  - Depicts relationships among accounts, time, and transaction keywords
WireVis

Figure 2: A view of the entire system showing the heatmap (top left), search by example (top right), keyword graph (lower right), and strings and beads (lower left).
Logging Analyst activities and reasoning processes within WireVis

- **Operational-Analysis Tool**
  - Participants interactions over time within WireVis

- **Strategic-Analysis Too**
  - Set of actions taken to achieve a specific goal (without regard to path taken)
Figure 2 - Displaying annotation area, participants interaction with views, depths of heatmap, areas of investigation, time range, time scale, and other options
Strategic-Analysis Tool

Figure 3 - (a) time (b) keywords (c) accounts. Each cell represents a transaction within the treemap. Patterns could be searched between two similar transactions.
Background

- Capturing User Interactions
  - Archive and retrieve record of user interactions (like an "instant replay")
    - See Glass Box, and Graphical Histories Presentation next
  - Systems do not fully address "why" interaction occur

- Interactive Construction of the Reasoning Process
  - Node-link model
  - See Aruvi framework paper: Supporting the Analytical Reasoning Process in Information Visualization
    - Allow users to record their reasoning process
Evaluation: User Study capturing analysts reasoning processes

- Experiment setup with some training data to analyze
  - Participants inputs were logged
- Transcribing (the truth of what analyst did)
  - Finding - Decision made after discovery
  - Strategy - Means arrived at the finding
    - (example: search for suspicious words)
  - Method - links/steps between finding and strategy
- Coding: 4 coders determining what Participants did from the logs
- Grading
  - Comparison between coding and the truth
    - See how much reasoning we captured.
Results from Evaluation Criteria

- Coders can infer 79% of findings, 60% of strategies, and 60% of methods
  - Considering false detection, these numbers drop to 76%, 55%, and 58% respectively

- Variation in reasoning inferred across participants by each of 4 coders
  - Shows us that analyzing reasoning is hard
    - Coders experienced in fraud detection may have done better
    - Participants may just have very different thought processes
      - See Figure 5 where P2 and P4 methods had low accuracy
P2 and P4 difficulty identifying Method

Figure 5 - Average accuracy of Coders finding Participants findings, methods, and strategies.
Importance of Time

- Ideally we want to extract information quick!
- Time spent did not correlate to accuracy in experiment

Figure 8 - Accuracy of Coders recovering findings of Participants
Findings and Conclusion

- When given interaction logs in text, it is also valuable to have a visual representation.
- Understanding interactivity and how visual representation affects reasoning remains difficult.
References

- WireVis: Visualization of Categorical, Time-Varying Data From Financial Transactions. Chang, Remco et al.
- Supporting the Analytical Reasoning Process in Information Visualization. Shrinivasan, Yedendra et al.
Comp 250 Presentation: Recovering Reasoning Processes from User Interactions

Wenwen, Dou, Dong Hyun Jeong, Felesia Stukes, William Ribarsky, Heather Richter Lipford, and Remco Chang

Slides and Presentation by Michael Shah 9/12/12
Discussion Questions

1. Coders generally did not become more accurate when spending more time on analysis, doesn't this seem unintuitive? We did notice as coders gained more experience they became more accurate however, this makes sense.

2. If the Coders cannot infer the reasoning behind Participants 2 & 4's methods, is this a flaw on the coders part or in our interaction logs?

3. It was interesting that the Coders took a strategy of looking for gaps in time where the analysts were making annotations (possibly after finding a discovery) as a strategy for where to look for discoveries. What other "natural" markers could we use? fNIRS students, would hooking up our participants to the FNIRS have helped you make annotations as a Coder?

4. What do you think about an idea of logging the Coders annotations and building a knowledge-base, and then just getting rid of the coders? Would this work if we had enough "insight" after we've trained the system to make this work?

5. (Idea borrowed from Remco's Analytic Provenance slides) Could it be that the Coders had some analysis bias that lead them to inaccurate results?