

A Knowledge Task-Based Framework for Design and Evaluation of Information Visualizations

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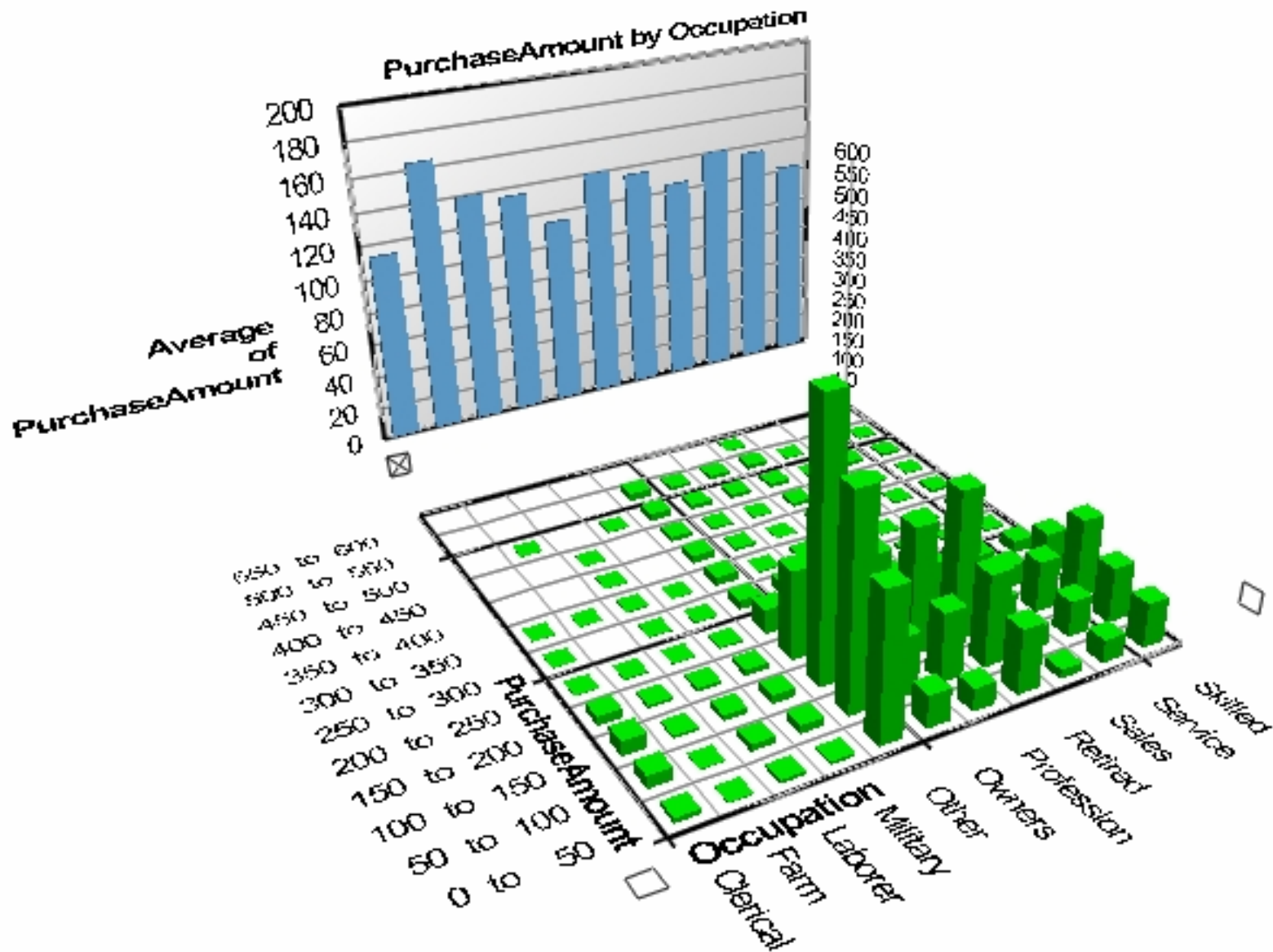
Representation Primacy

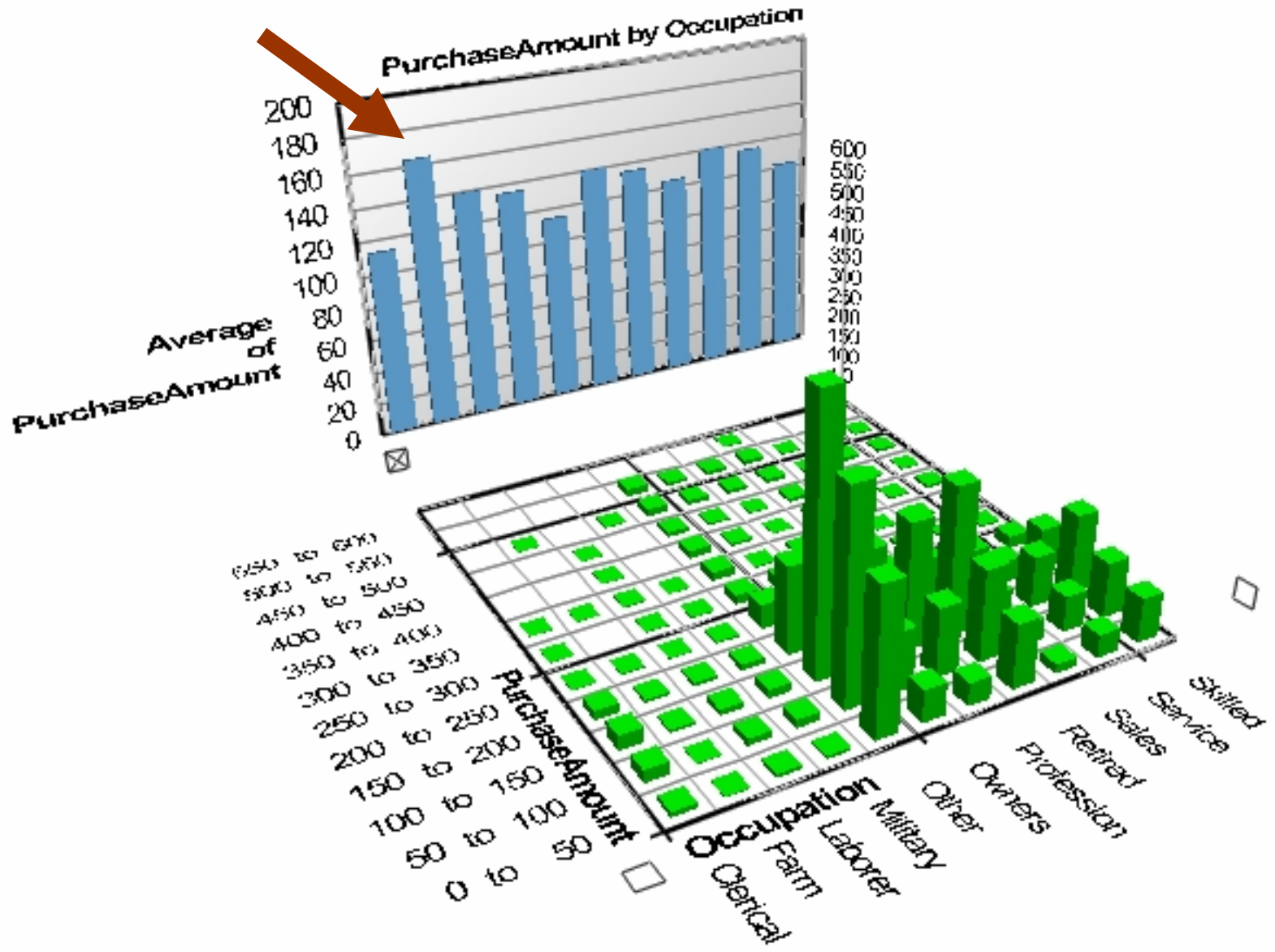
On the whole,
InfoVis has been concerned more with

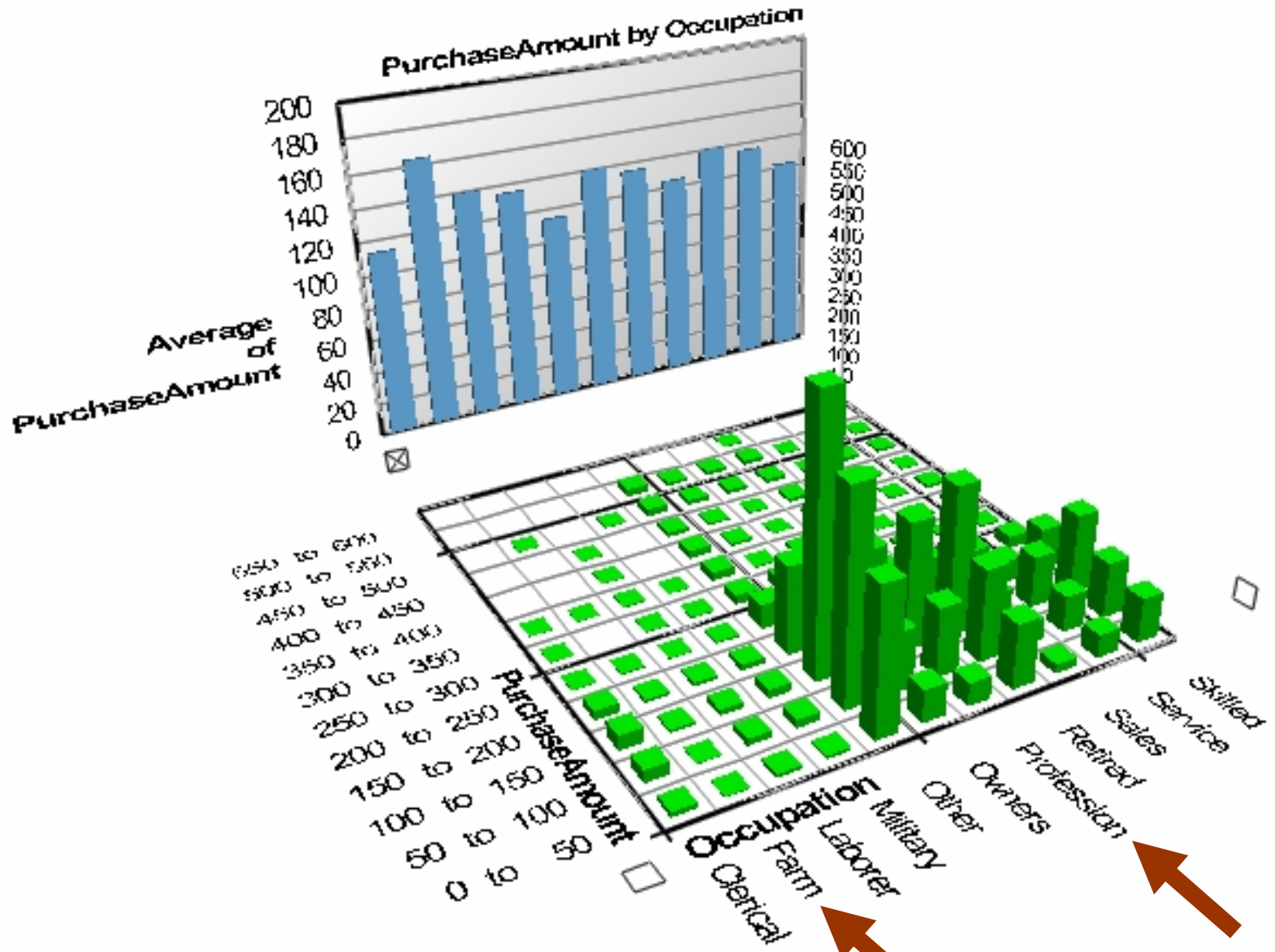
faithfully representing data

than with

facilitating analytic processes.

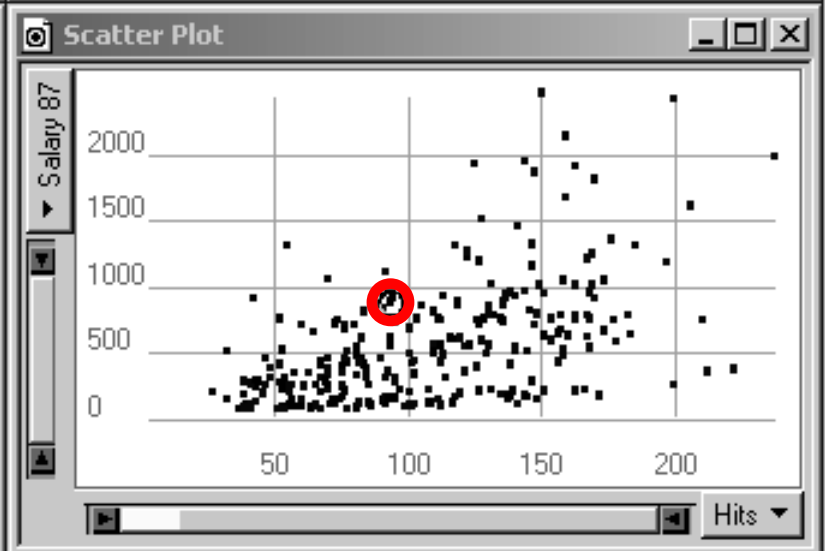
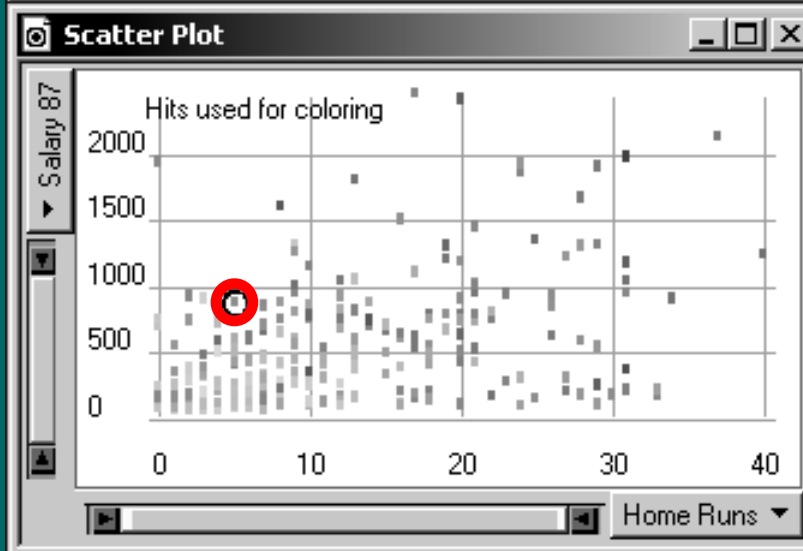
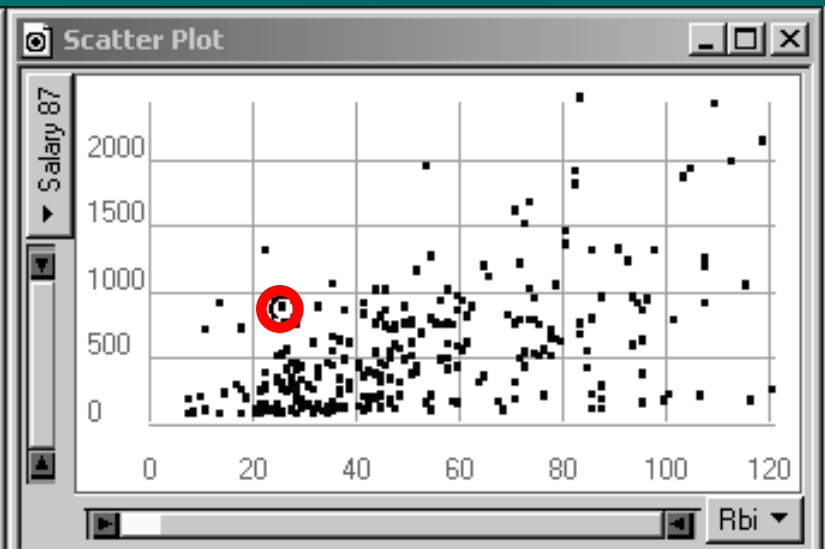
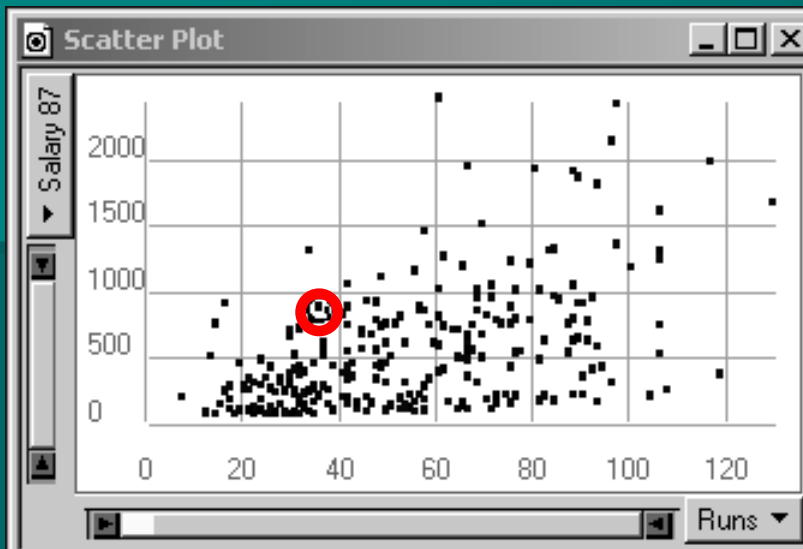


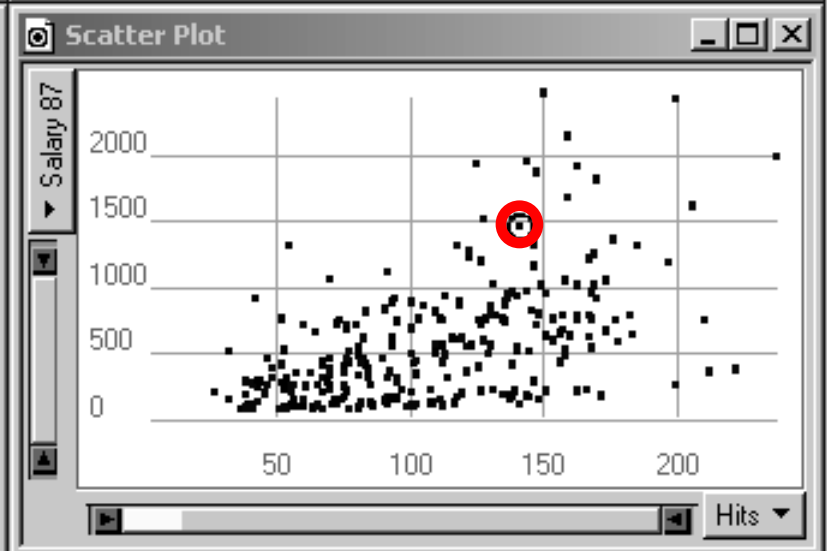
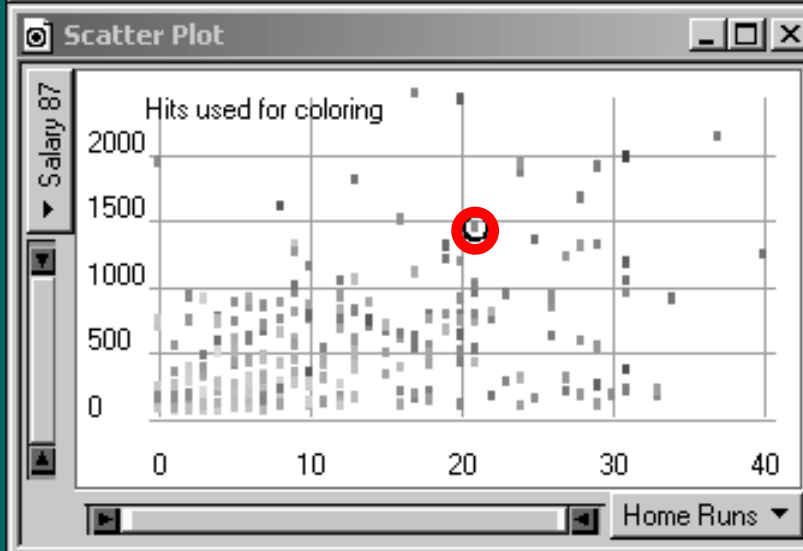
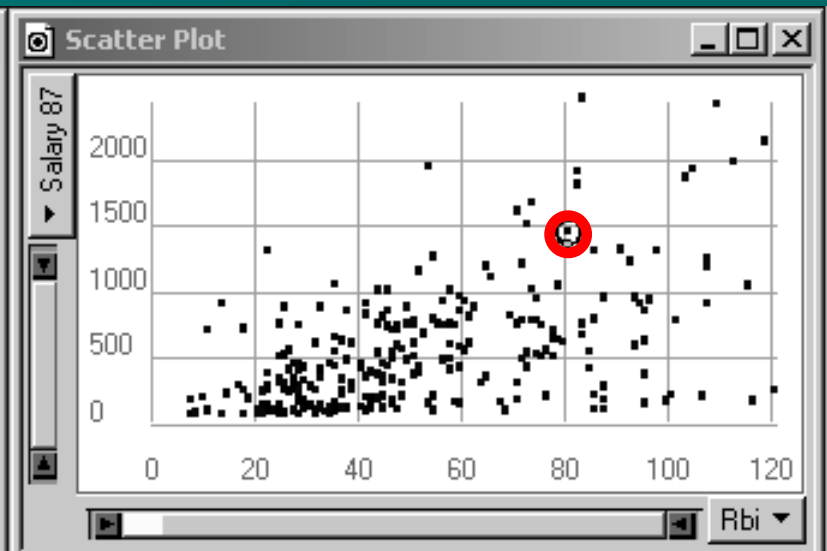
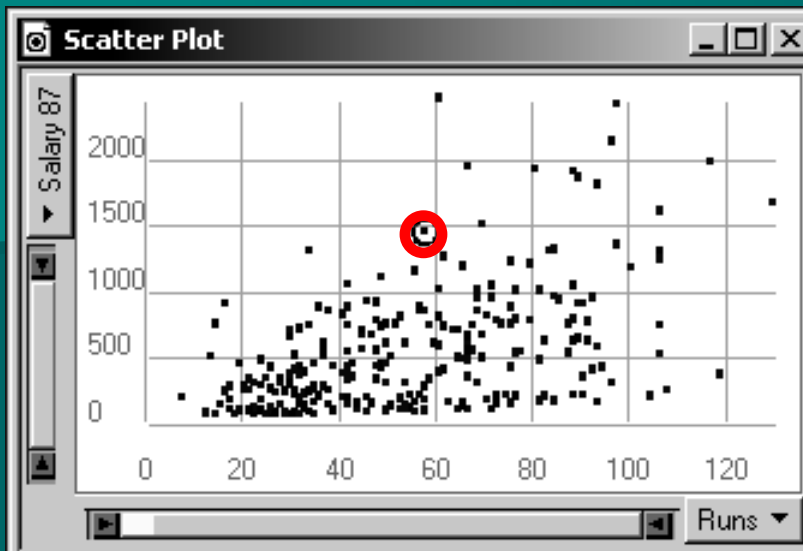


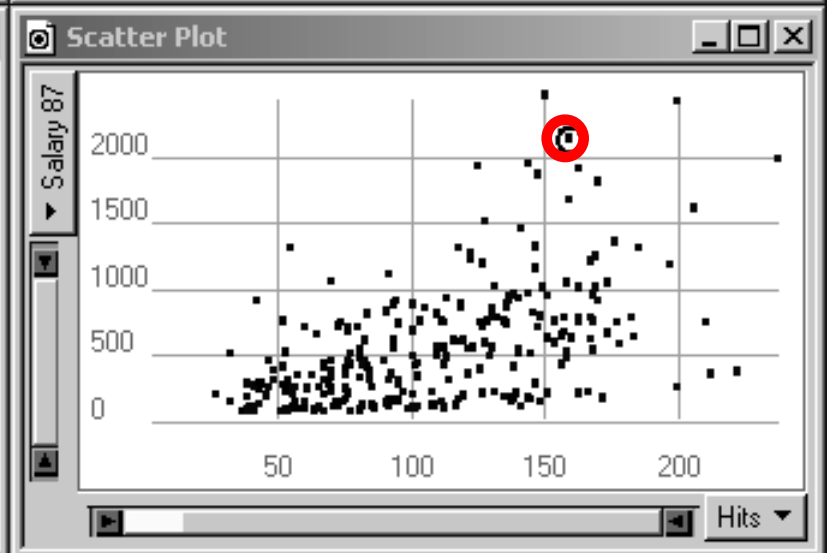
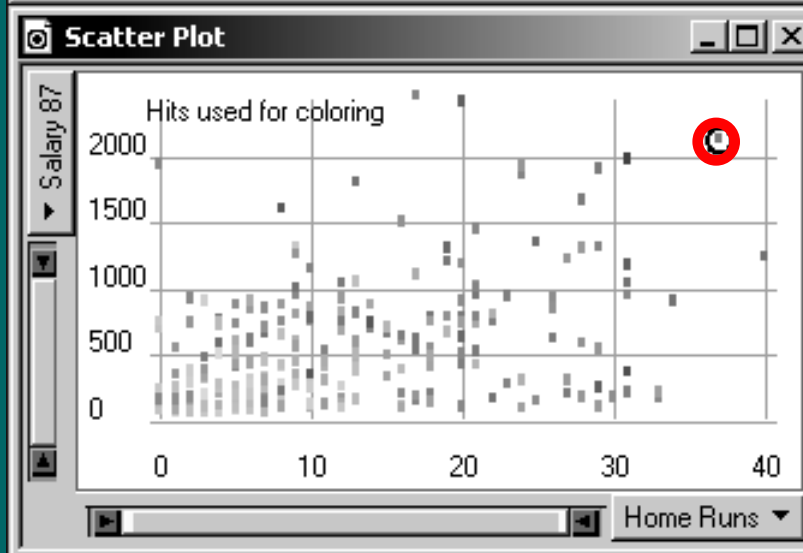
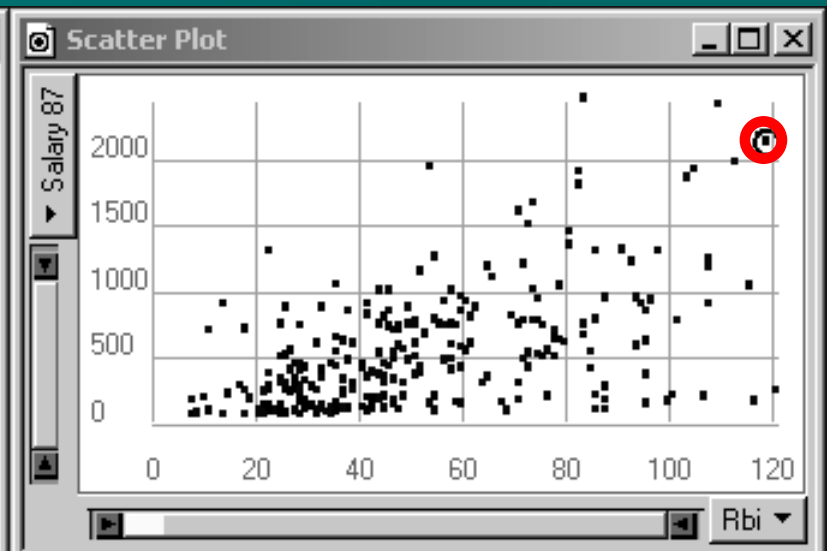
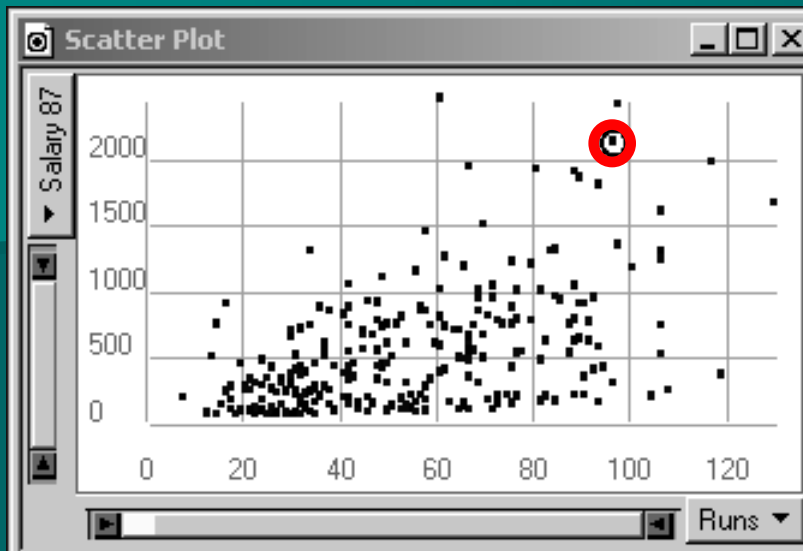


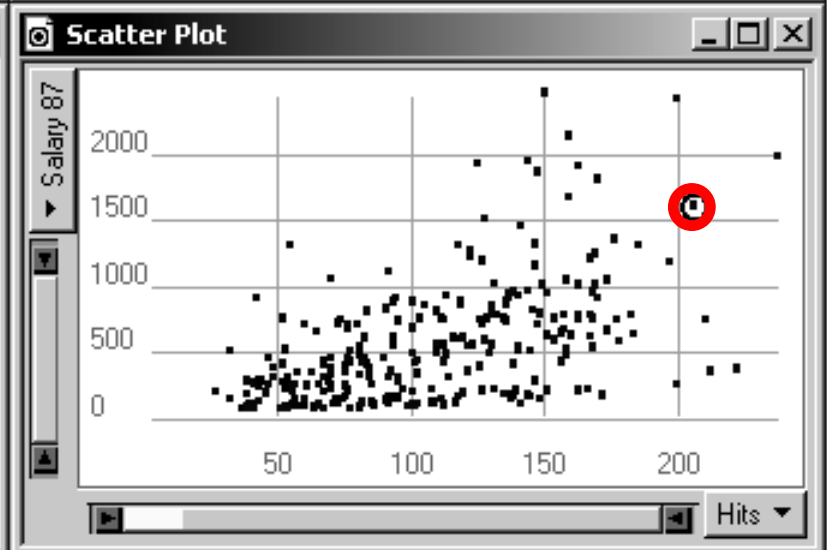
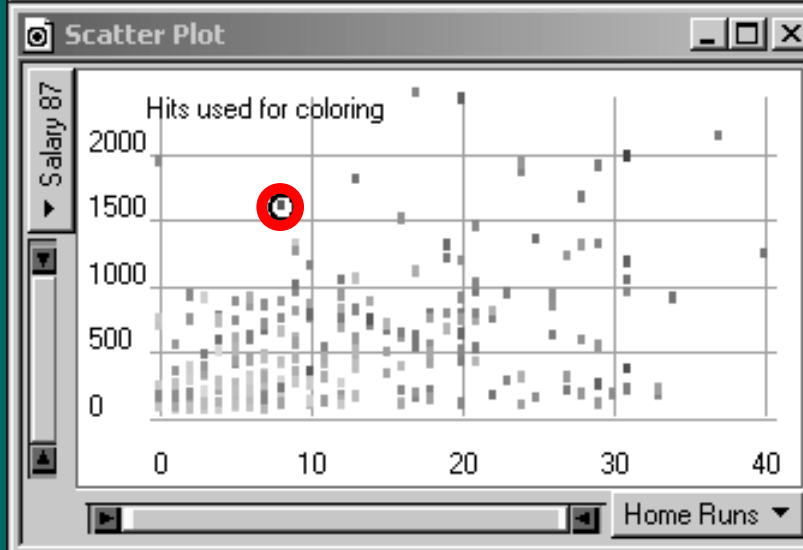
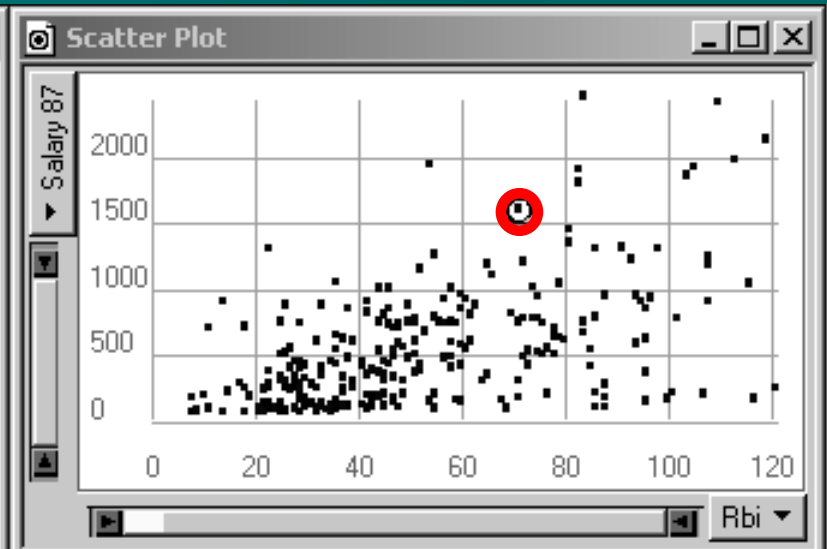
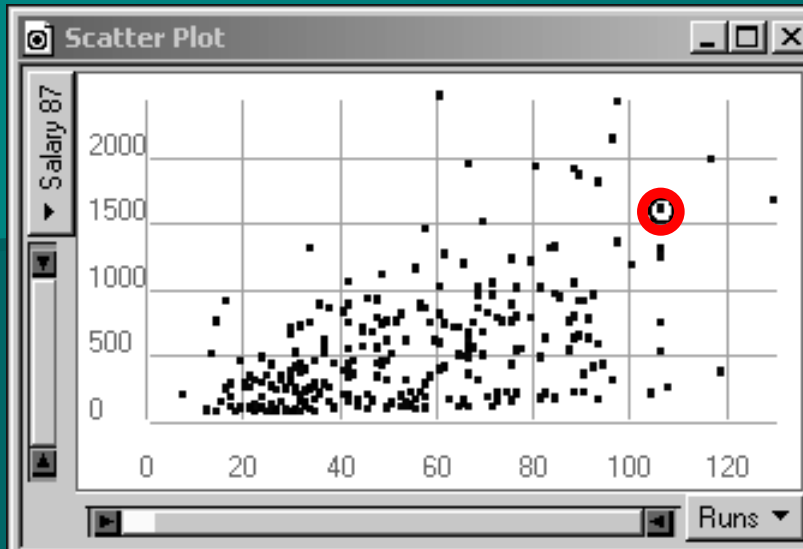
SeeIT (Visible Decisions)
Grocery Store Spending Survey Visualization

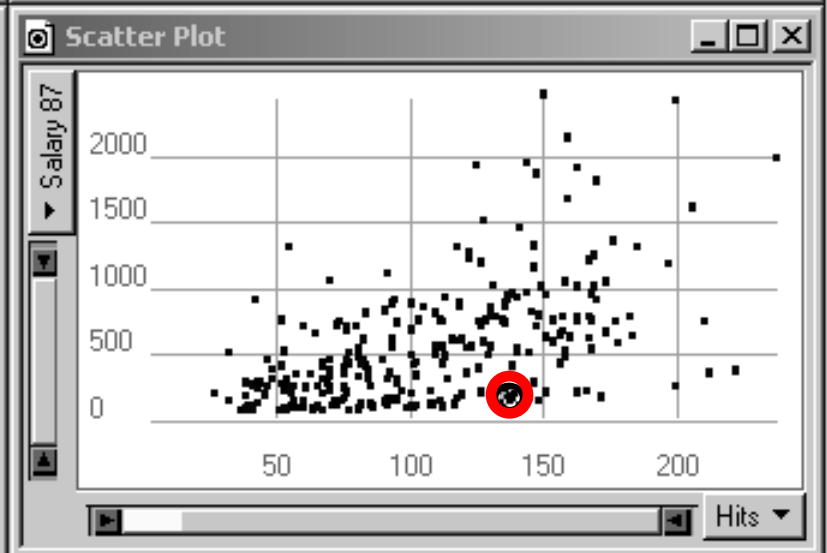
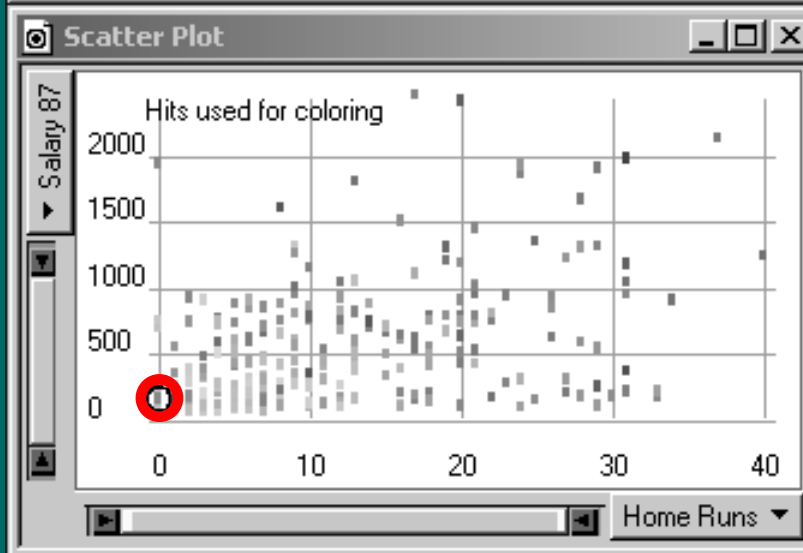
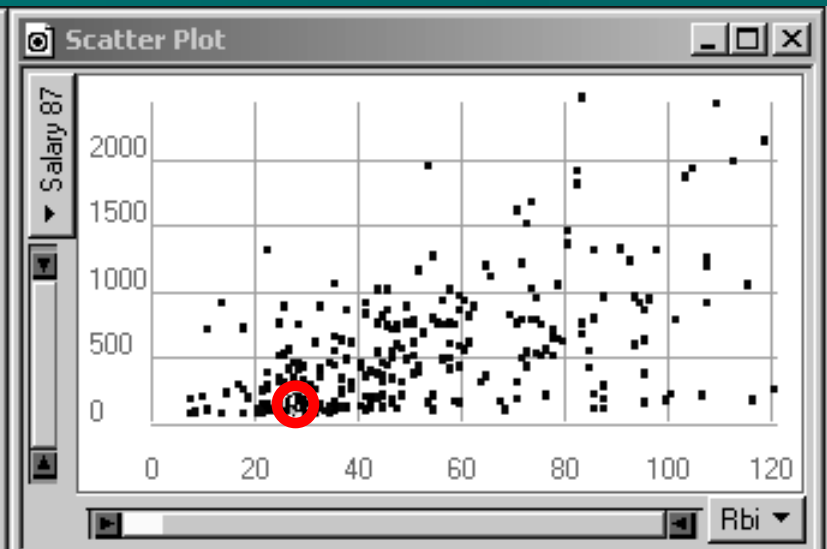
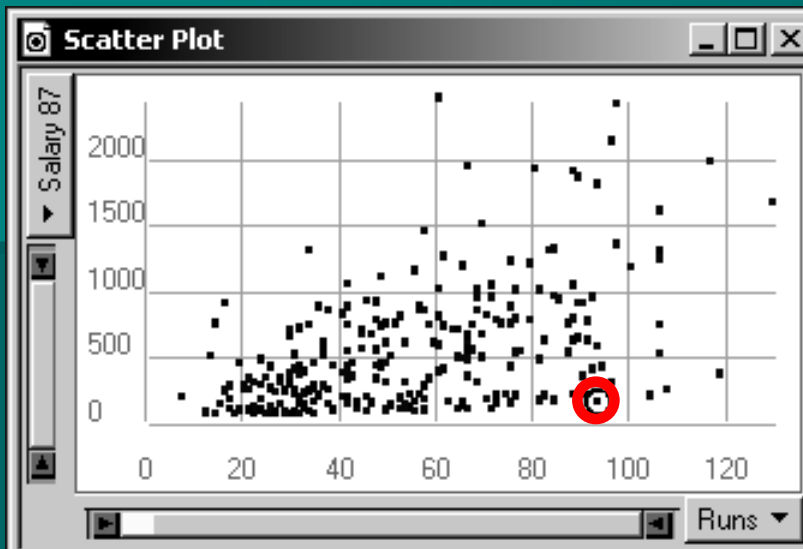












Not Just Information Anymore

“[Managers] *think* they understand the relationships between cause and effect in their organizations. But in fact, the links between actions and results are infinitely more complicated than most managers suspect...”

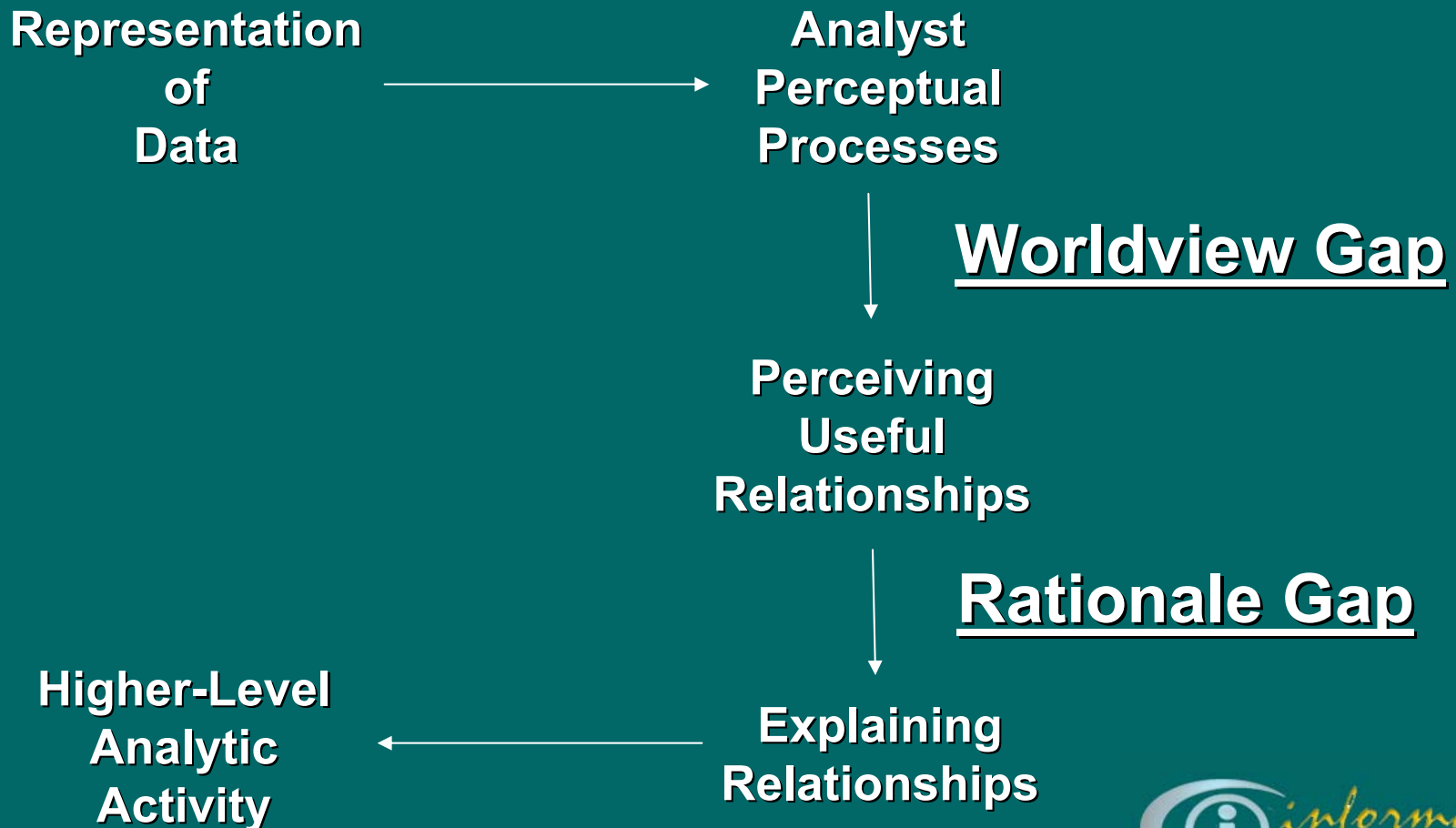
David Freedman
Harvard Business Review

Can we help?

User Analytic Goals

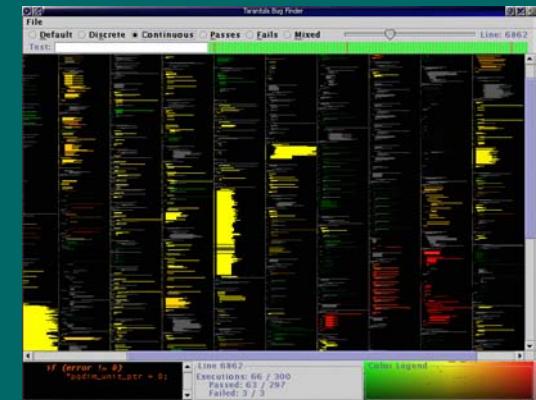
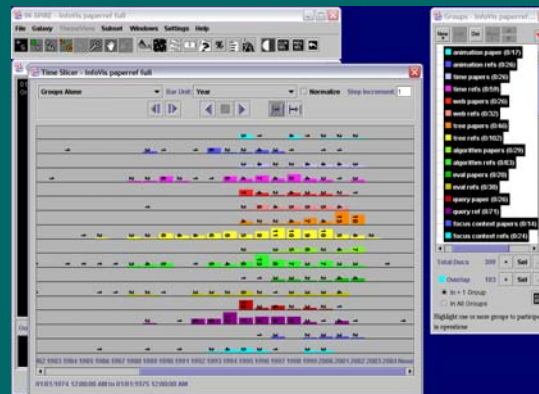
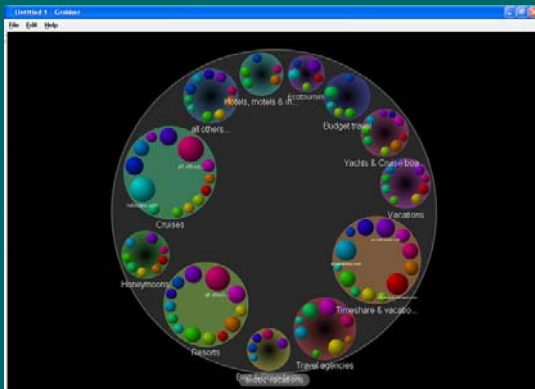
- Complex decision-making
- Learning a domain
- Identifying the nature of trends
- Predicting the future

The Analytic Gaps



Bridging the Gaps

- Six knowledge tasks for designers for bridging analytic gaps
 - Grouped according to which gap they fill (worldview, rationale)



Knowledge Task Summary

■ **Worldview Tasks**

“Do we show the right things to the user?”

1. Domain parameters
2. Multivariate explanation
3. Hypothesis confirmation

■ **Rationale Tasks**

“Will the user believe what they see?”

1. Expose uncertainty
2. Concretize outcomes
3. Formulate cause/effect

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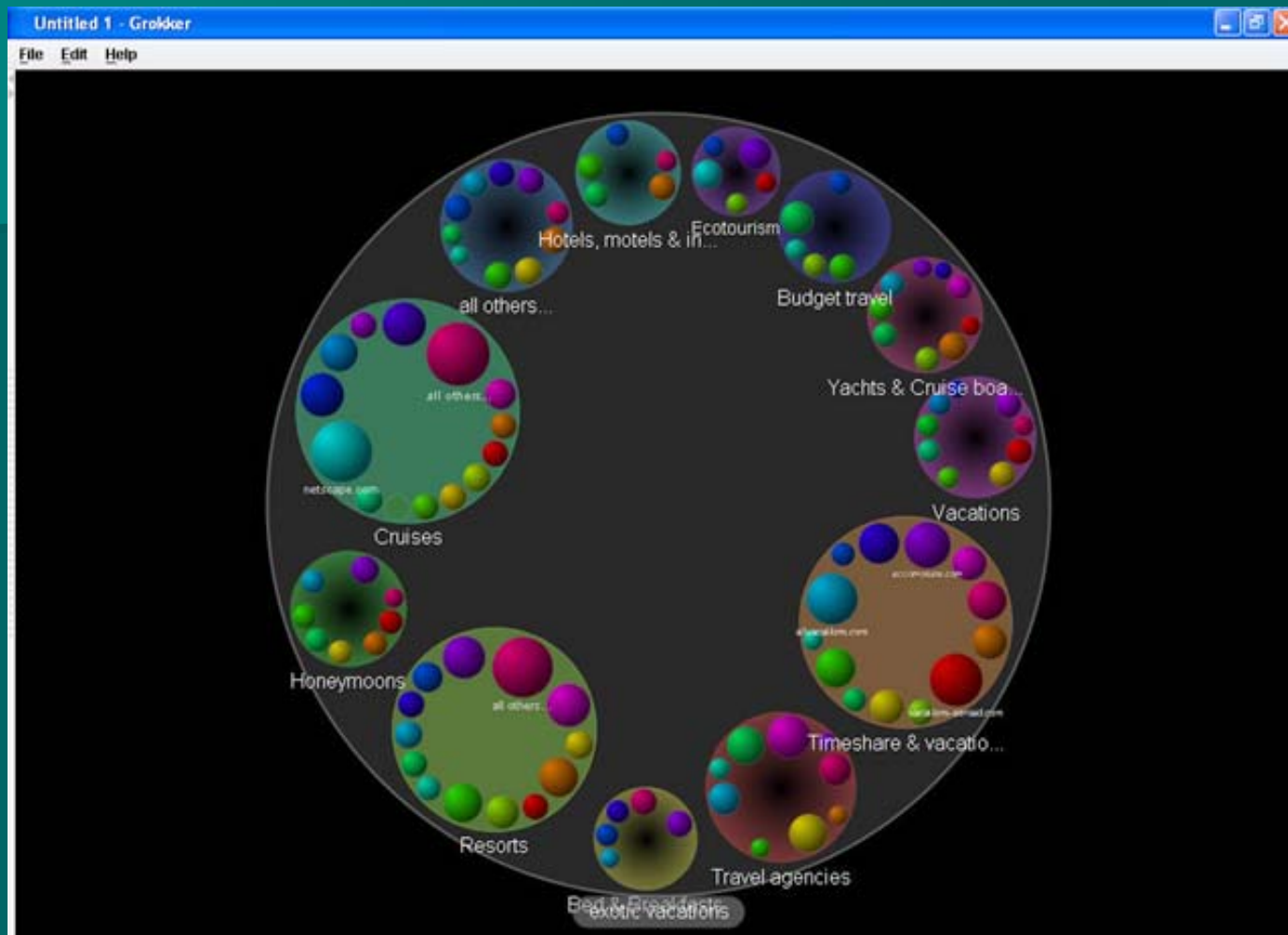
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Worldview Task 1: Determine Domain Parameters

Facilitate acquisition and transfer
of knowledge and/or metadata
about domain parameters

Worldview Task 1: Determine Domain Parameters

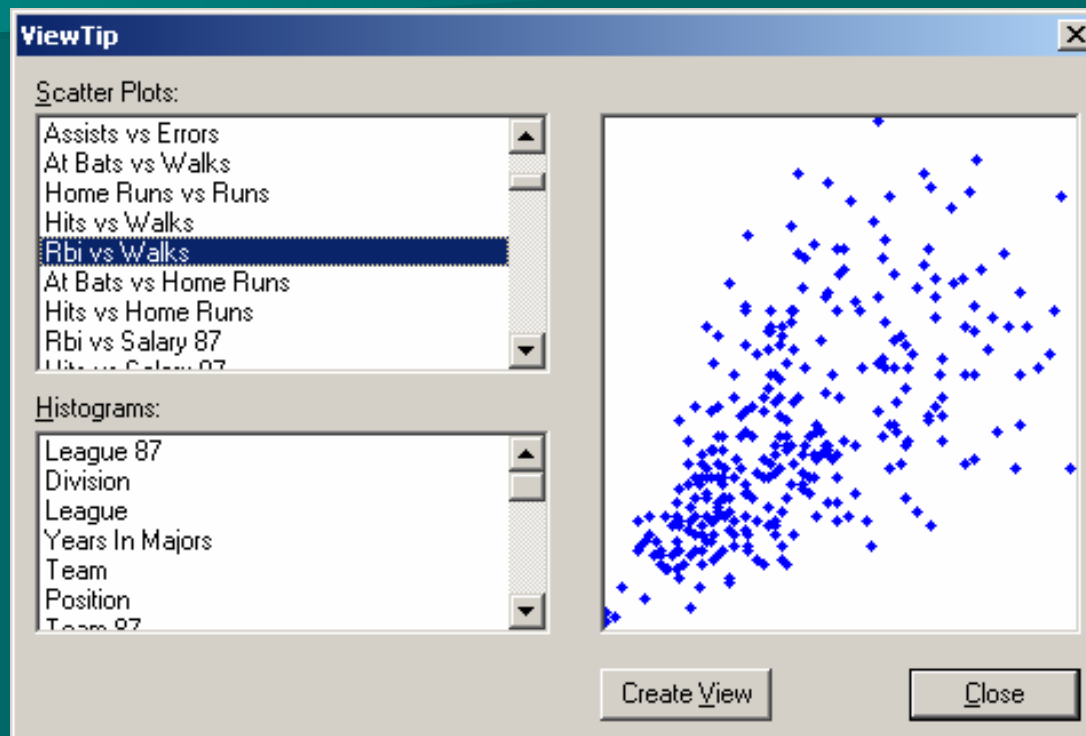


Grokker 2 (Groxis)
WWW Map for "Exotic Vacations"

Worldview Task 2: Multivariate Explanation

Support the discovery of useful
correlative models – especially
those involving many variables

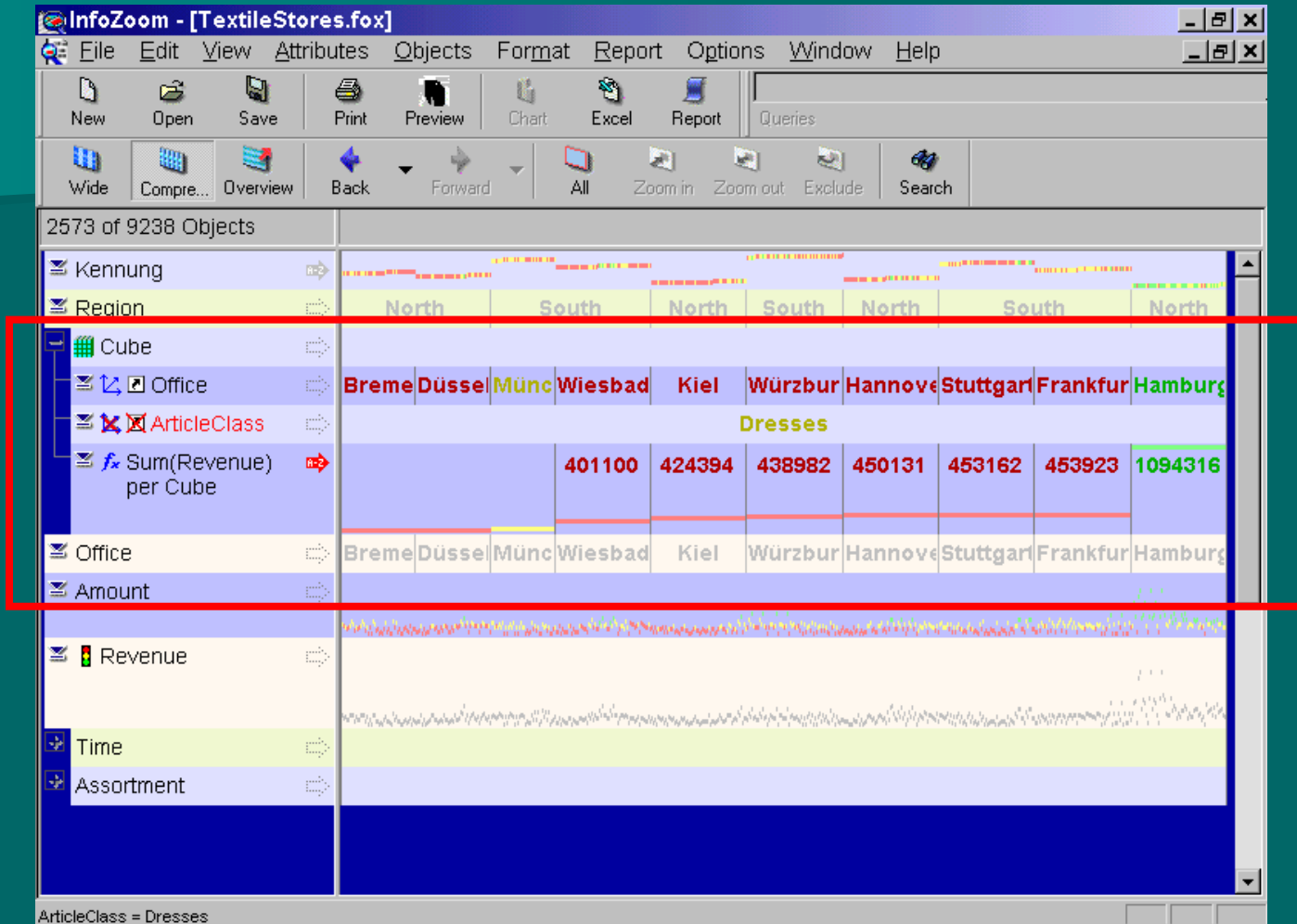
Worldview Task 2: Multivariate Explanation



Worldview Task 3: Confirm Hypotheses

Provide facilities for users to
formulate and confirm hypotheses
about the data set

Worldview Task 3: Confirm Hypotheses



InfoZoom 3.71 (HumanIT)
Retail Data Visualization

Worldview Task 3: Confirm Hypotheses

Groups - EP3 test Beth

New Edit Del Move

- Landed on island (0/38)
- Crashed (0/35)
- Aliens abducted (0/24)

Name	Date	D	Lan...	Cra...	Alie...	Changed
TAKE 1 OF 2--POTEN...	2000/12/...	★	⊗	✓	✓	
AVAILABLE-- BOOK, ...	2001/01/...	★	⊗	✓		
TAKE 12 OF 18--GEN...	2001/04/...	★	✓	✓	⊗	
TAKE 2 OF 2--POTEN...	2000/12/...		✓	✓	⊗	
TAKE 1 OF 2--PAKIST	2001/05/...		✓	✓	✓	

Q: MAYBE? OR IN REALITY?

A: IN REALITY YES WE ARE WAS (LAUGHS) WA... WITH

Highlights: 0

crash

Total Docs 188 + Sel -

Overlap 31 + Sel -

In > 1 Group In All Groups

CR SEL

Prev Next

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■ **Rationale Tasks**

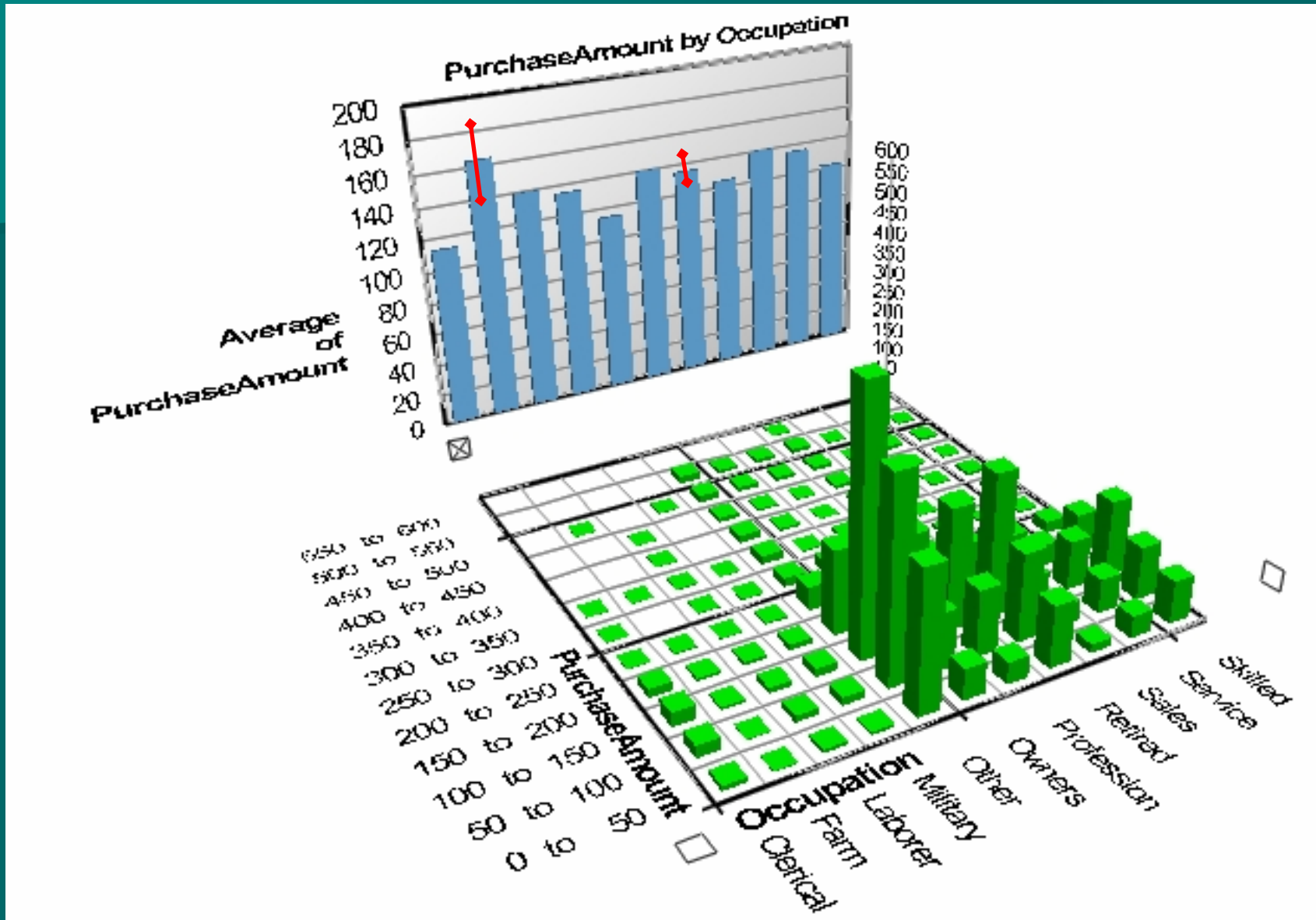
“Will the user believe what they see?”

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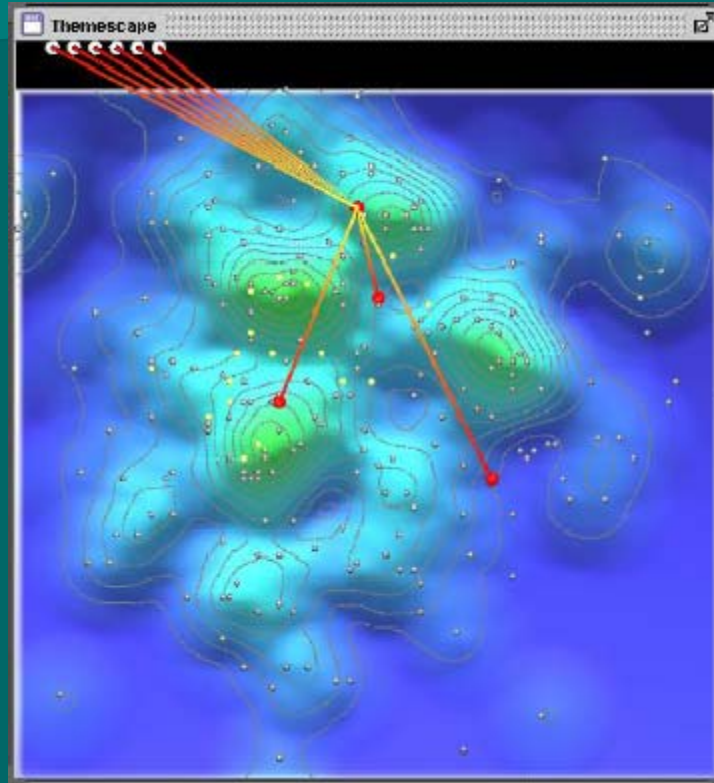
Rationale Task 1: Expose Uncertainty

Expose the sources and effects of uncertainty in data measures and aggregations

Rationale Task 1: Expose Uncertainty



Rationale Task 1: Expose Uncertainty

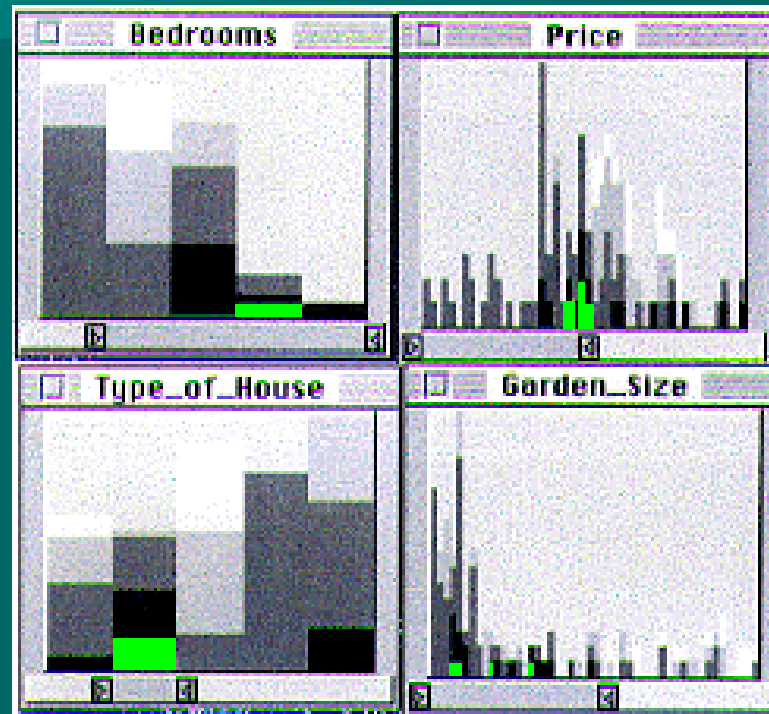


ThemeExplorer (Diakapoulos et al., InfoVis '04)
Explicitly Representing Uncertainty in a Themescape

Rationale Task 2: Concretize Relationships

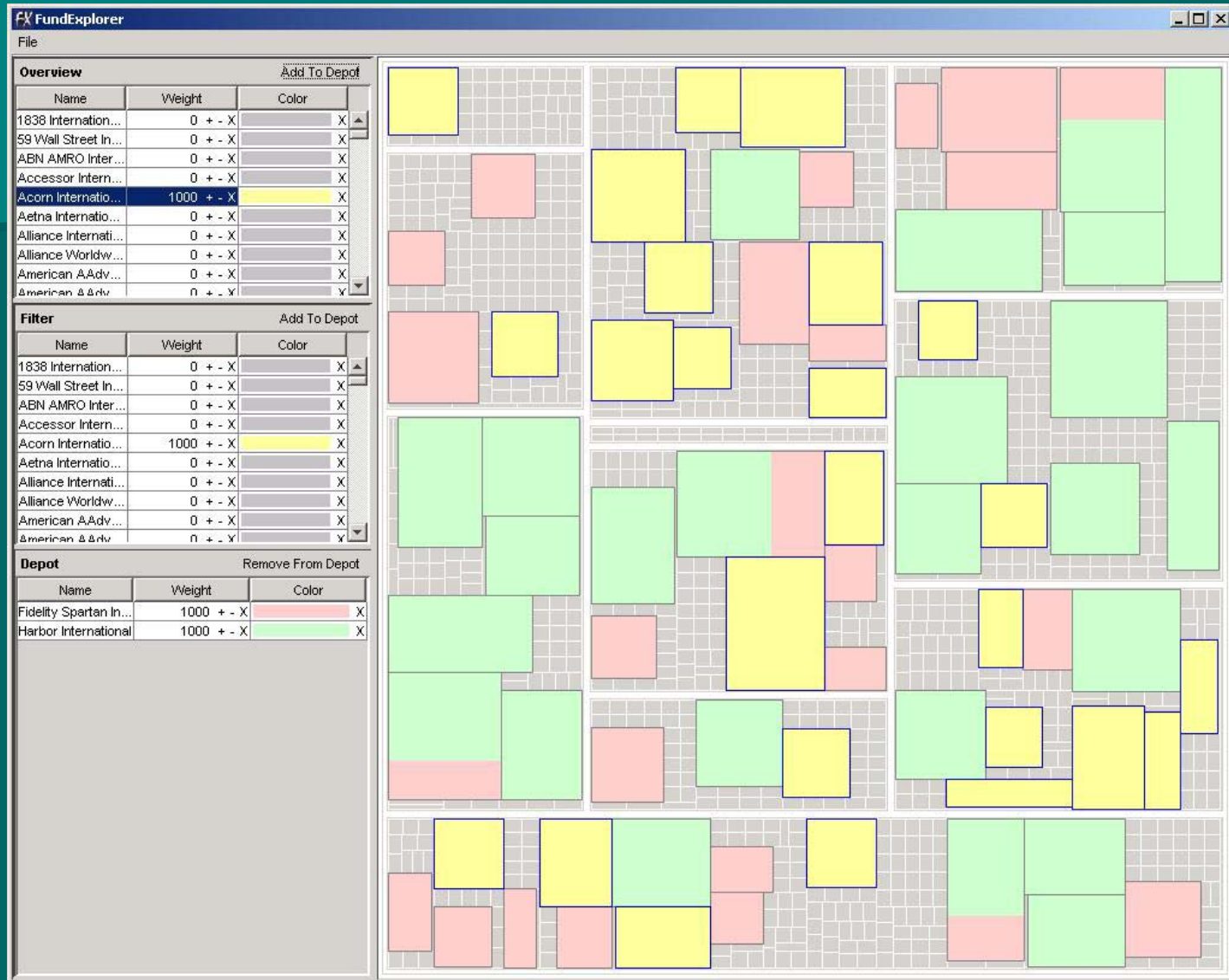
Show the elements comprising relationships and translate into real-world outcomes

Rationale Task 2: Concretize Relationships



Attribute Explorer (Tweedie et al., CHI '94)
House Searching

Rationale Task 2: Concretize Relationships

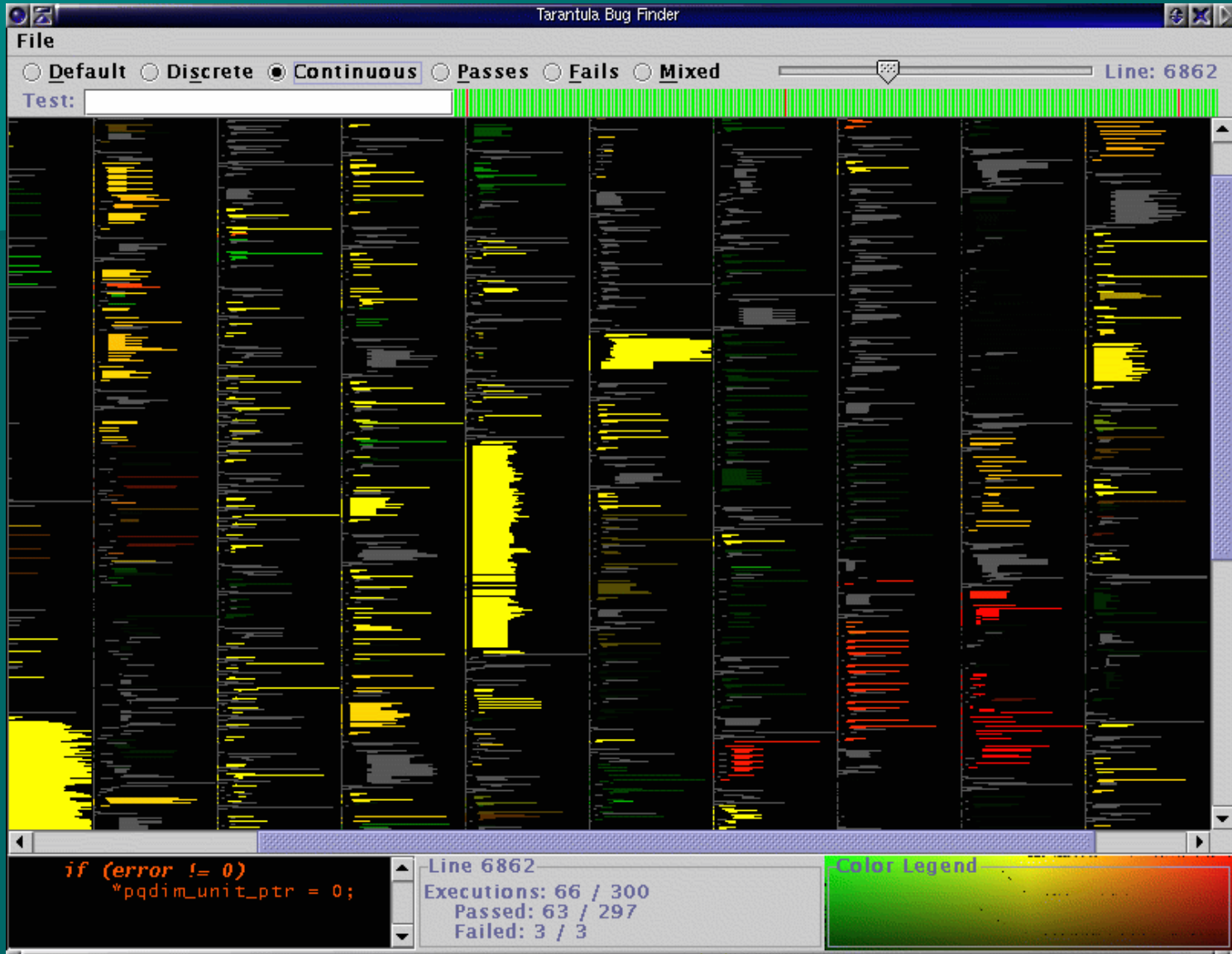


FundExplorer (Csallner et al., InfoVis '03)
Mutual Fund Diversification Tool

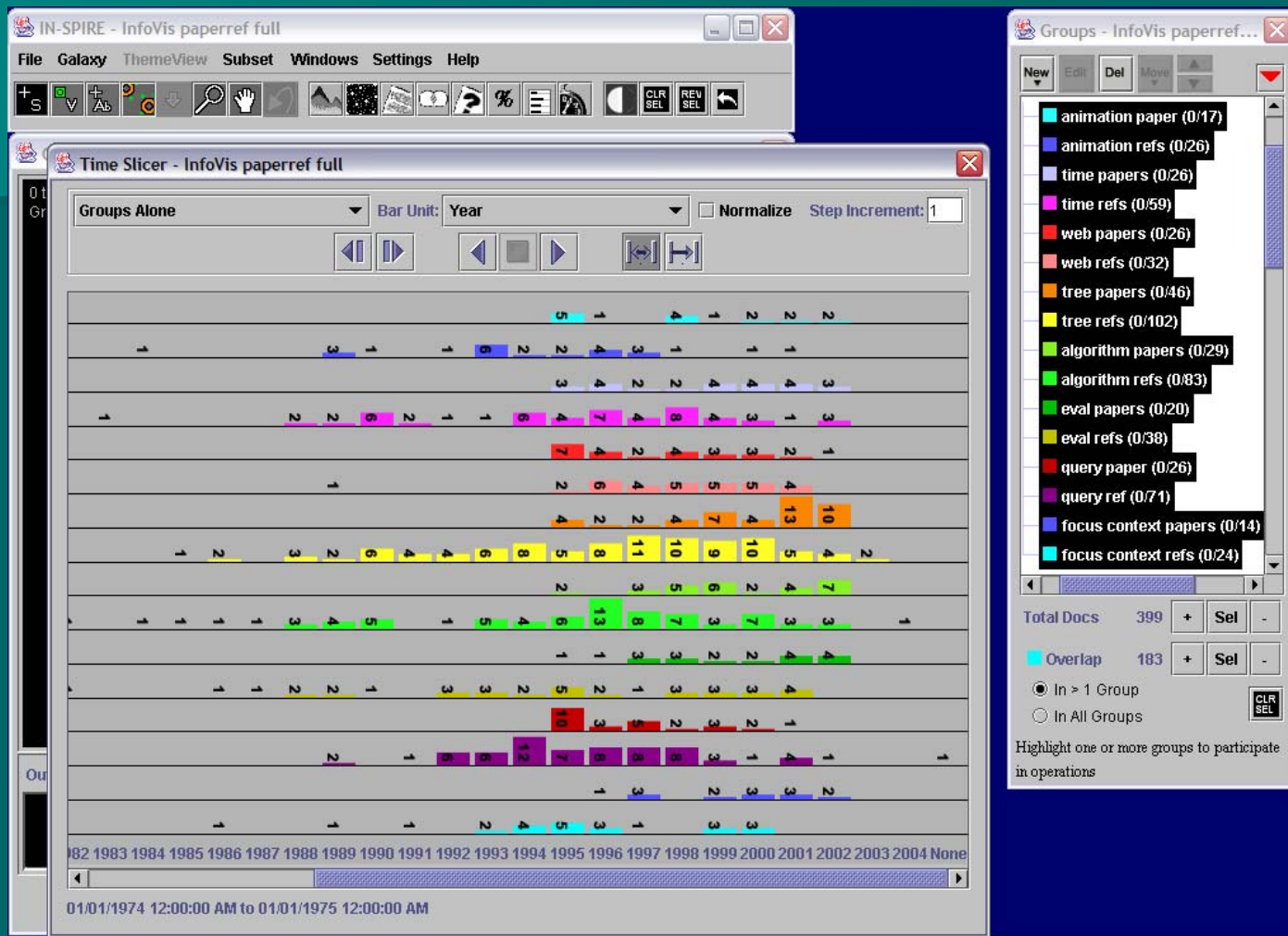
Rationale Task 3: Formulate Cause and Effect

Clarify the source and nature of
possible causations

Rationale Task 3: Formulate Cause and Effect



Rationale Task 3: Formulate Cause and Effect



IN-SPIRE (PNNL)
Time Evolution of Document Themes

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Using the Tasks

- Generate novel user and system subtasks
- Identify shortcomings in data
- Discover useful representations
- Heuristic evaluation of analytic capability

Future Directions

- Conduct case studies of design and evaluation
- Rethink lower-level tasks and task taxonomies in an analytic light

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