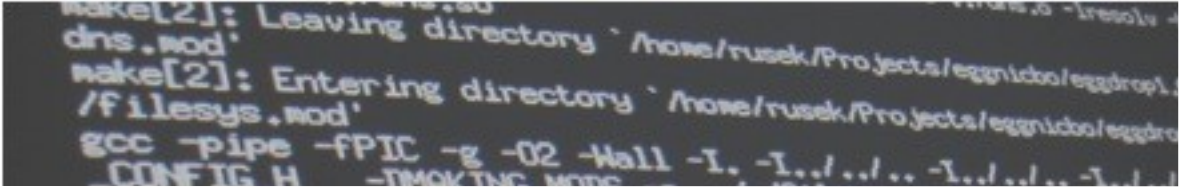

Backhoe: a packet trace & log browser

Sergey Bratus
Axel Hansen
Fabio Pellacini
Anna Shubina

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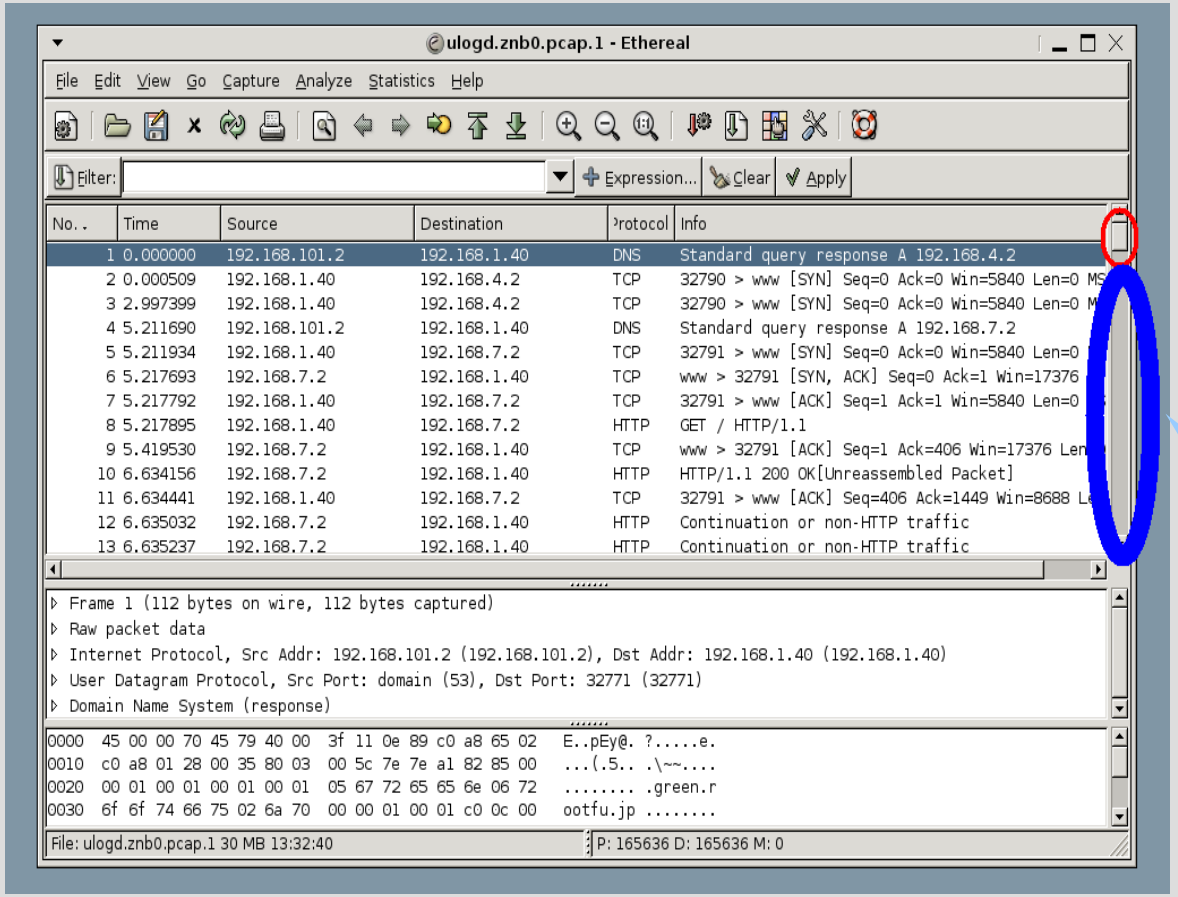
Cyber Security and Trust Research & Development
http://www.ISTS.dartmouth.edu

Motivation

Network analysis tools give no clue of what lies beyond the current “window”.



Can we:

- drill down to packets &
- provide a visual summary?

Uncertainty

Measure uncertainty...

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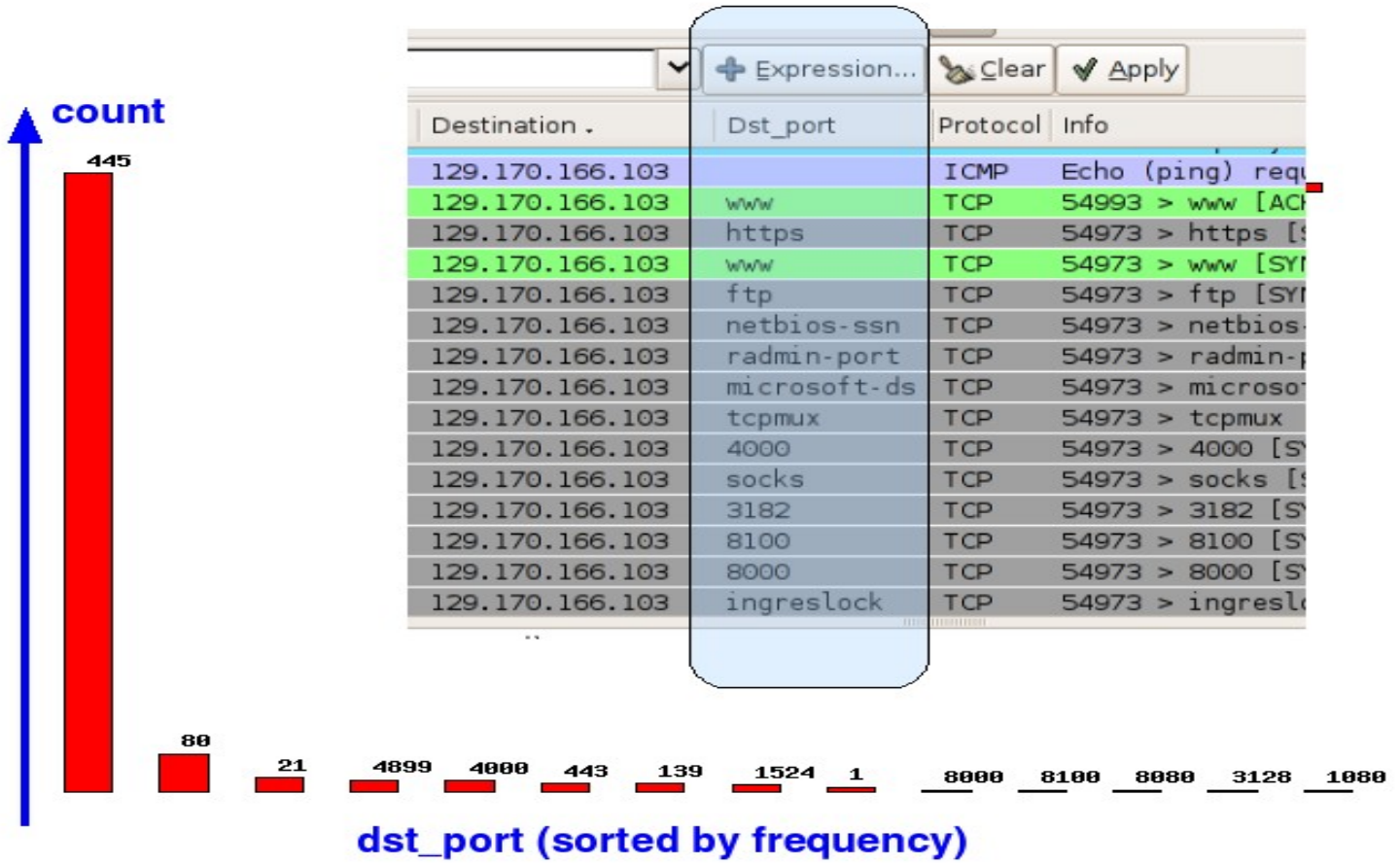
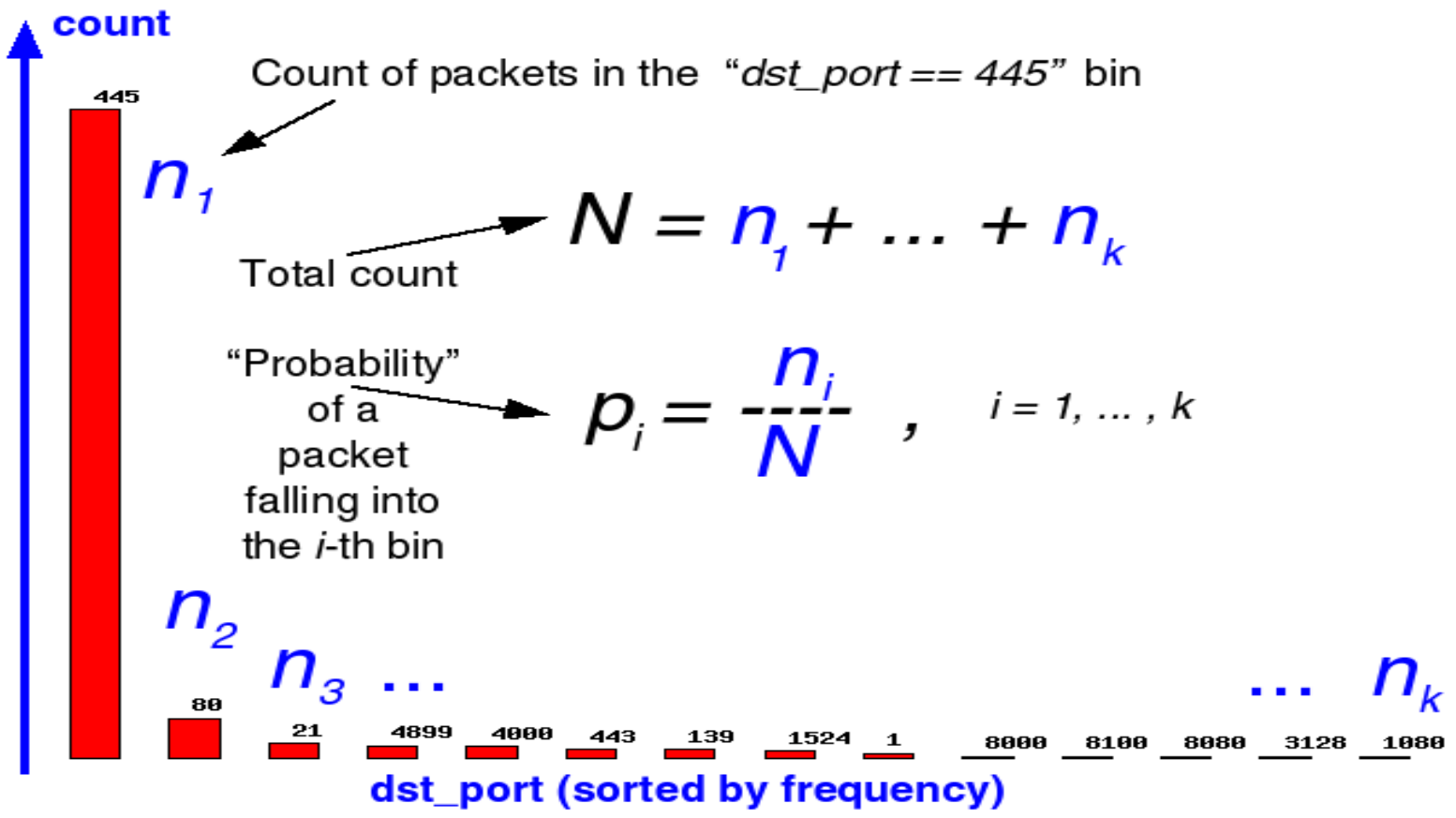
as entropy of field value frequency distributions



Entropy reminder

Entropy of a discrete distribution:

$$H(X) = \sum_{i=1}^{k} p_i \cdot \log_2 \frac{1}{p_i}$$



Backhoe: the "Strata" view

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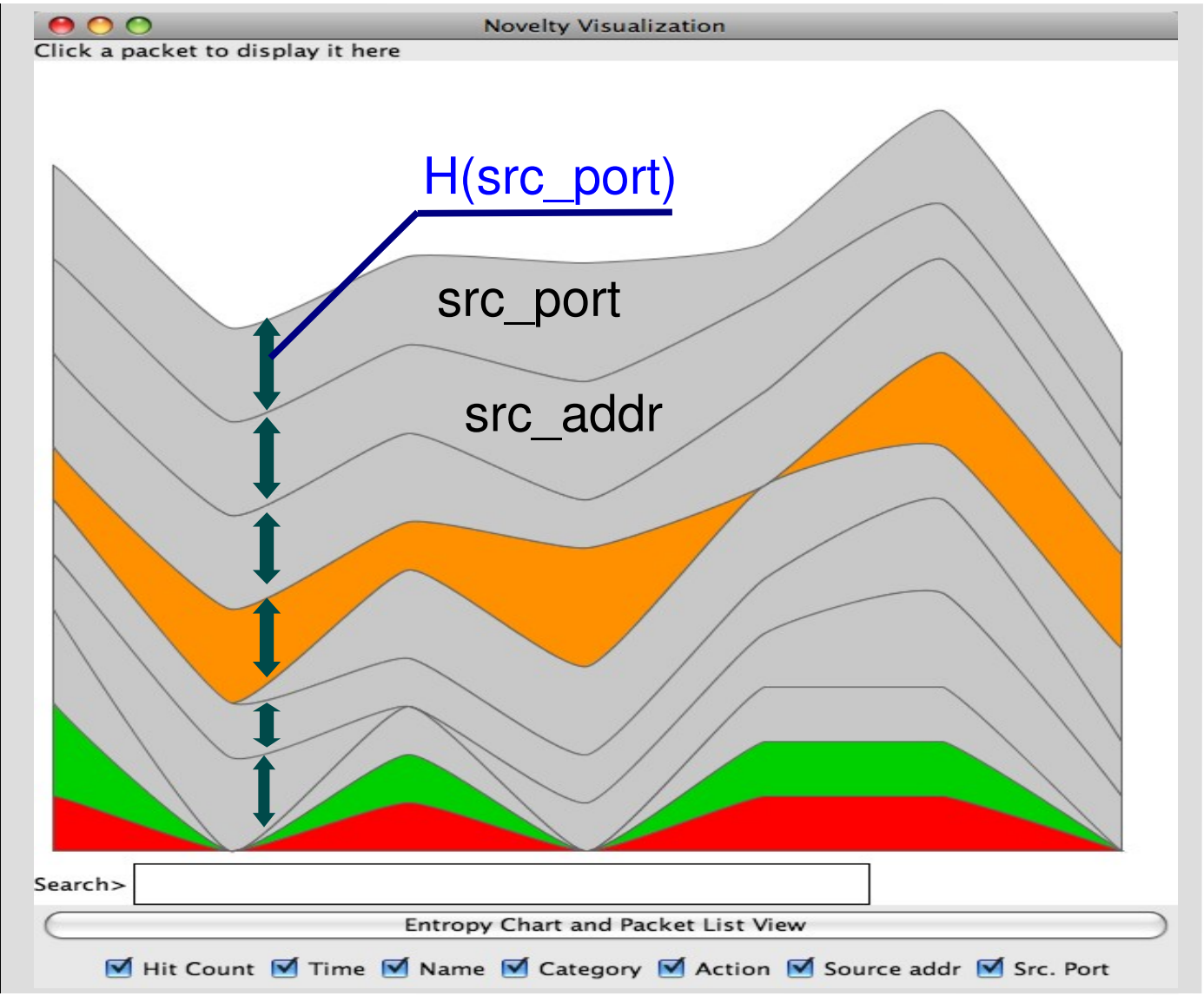

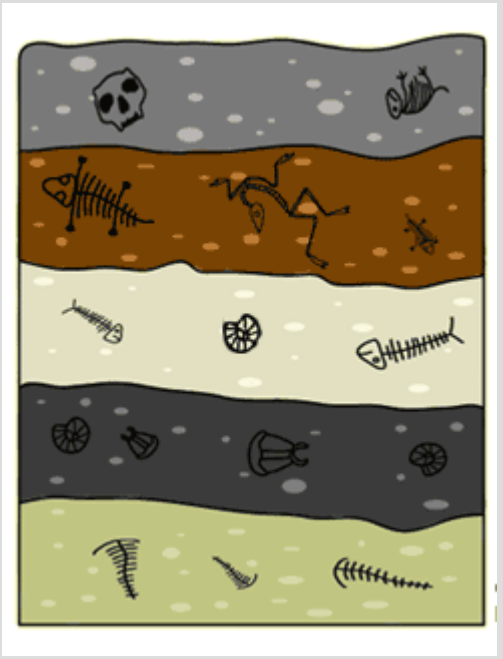

“Packet fall” view

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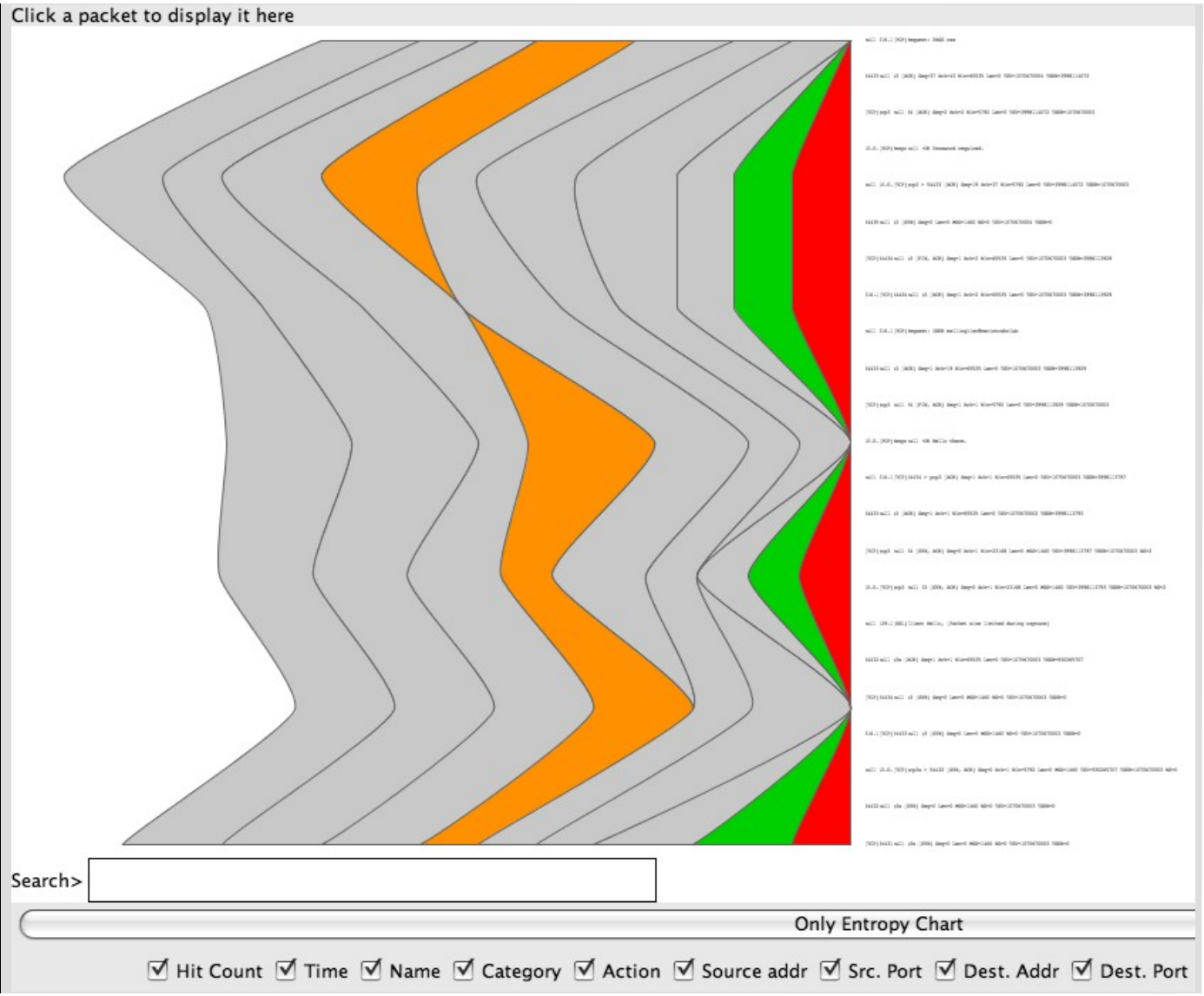

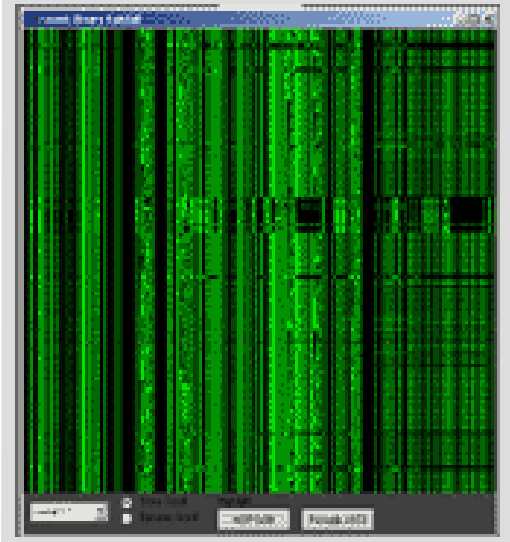

“Packet fall” + fish eye

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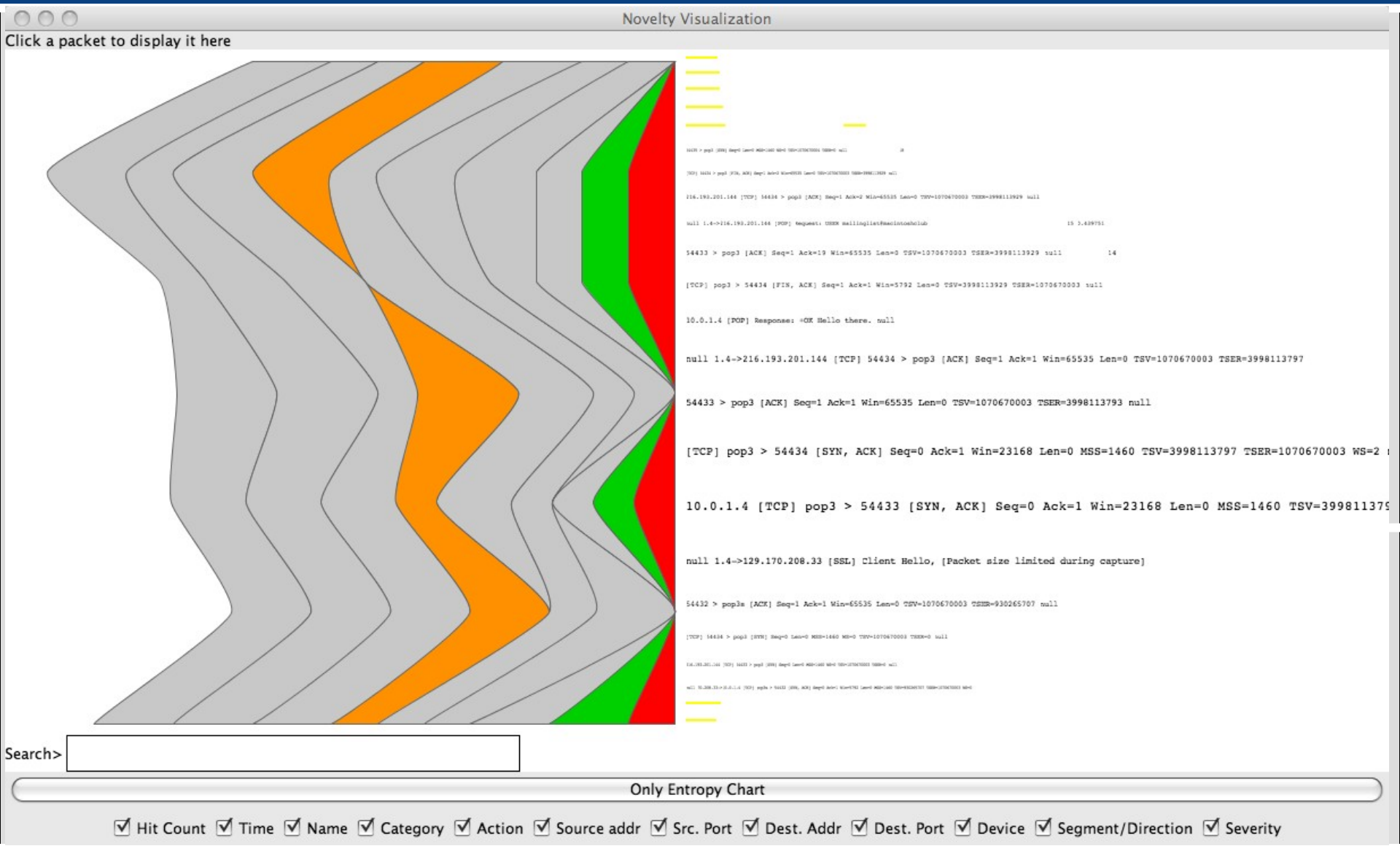

“Packet fall” + search

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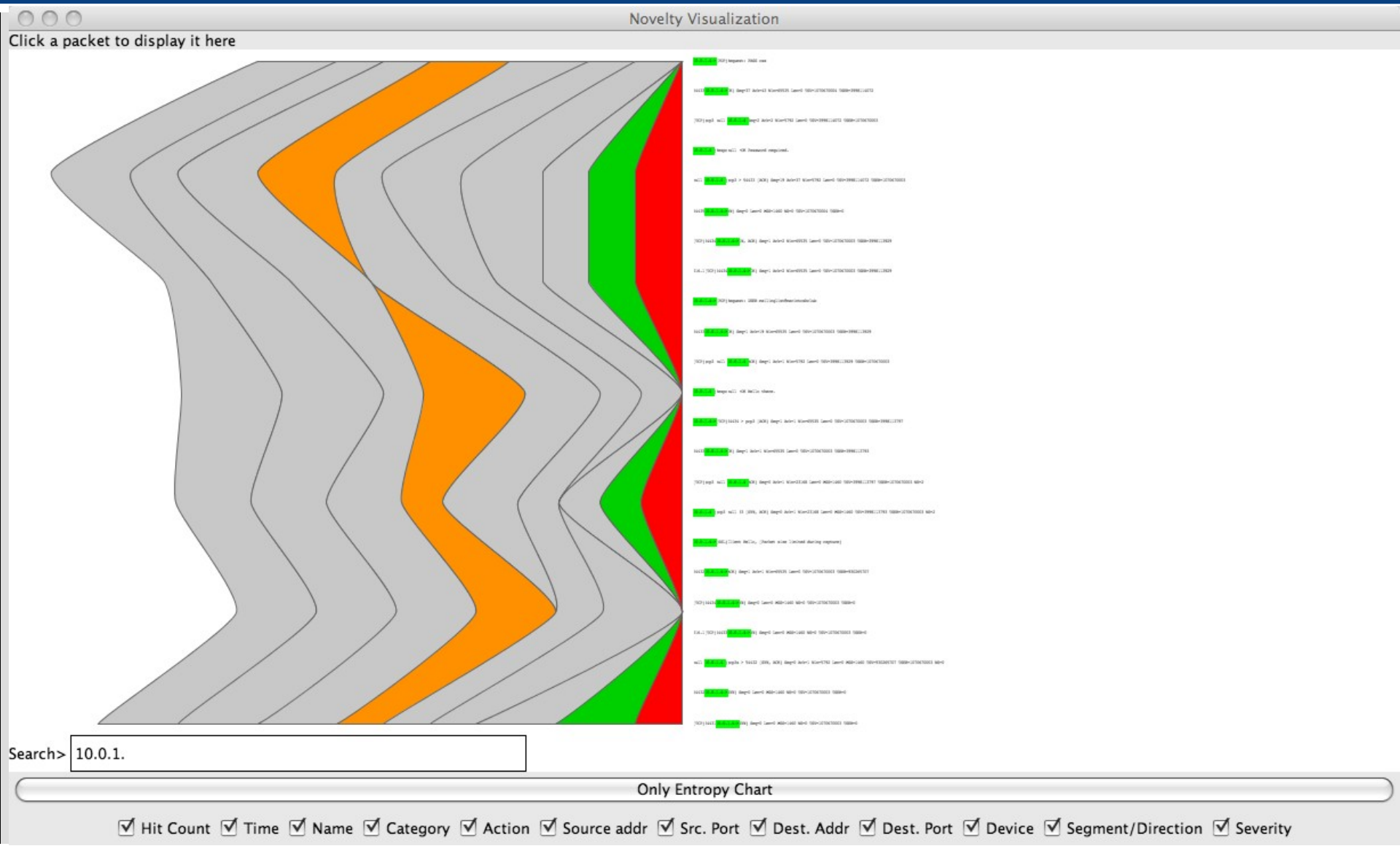

Search + fish eye

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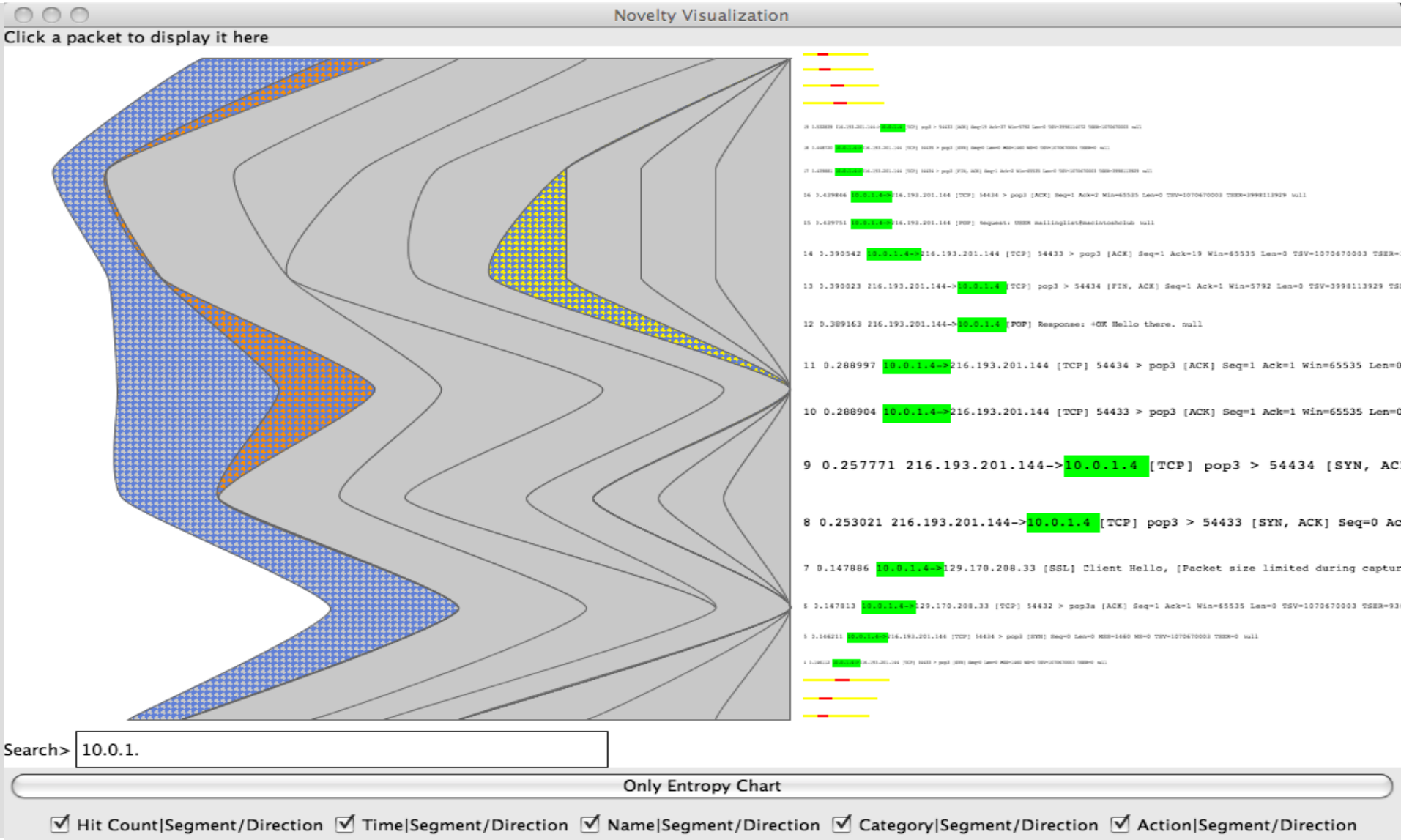

Joint and conditional entropy

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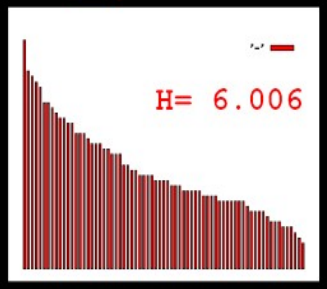
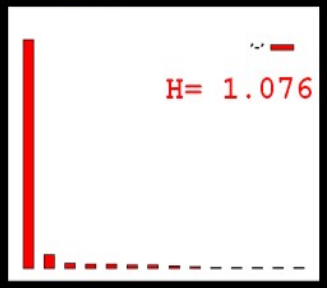
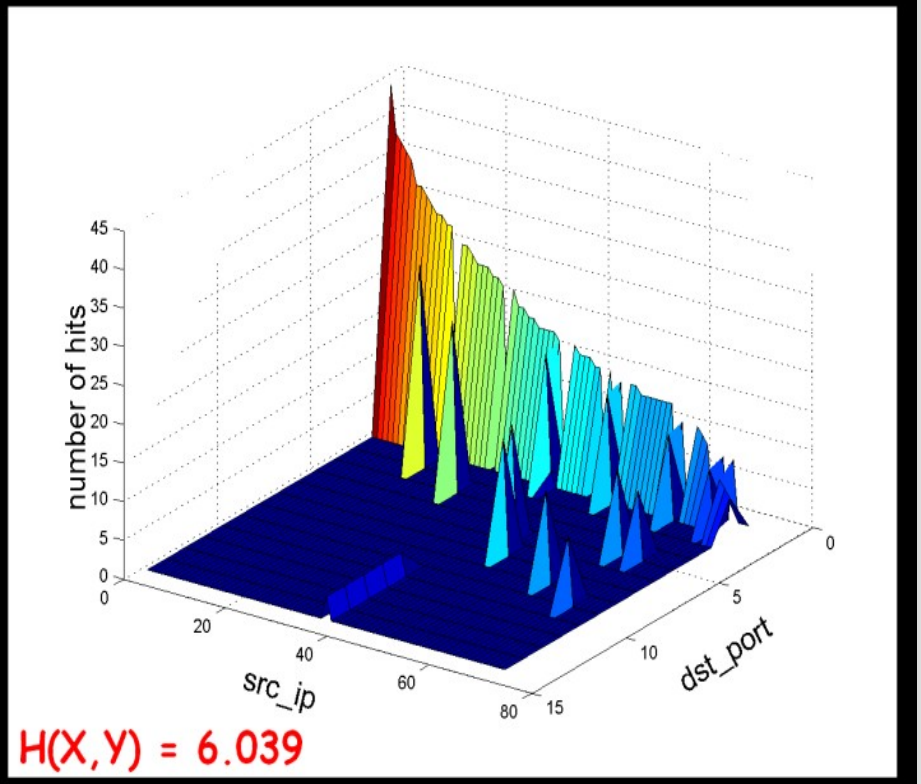
$$H(X, Y) <= H(X) + H(Y)$$

src_ip

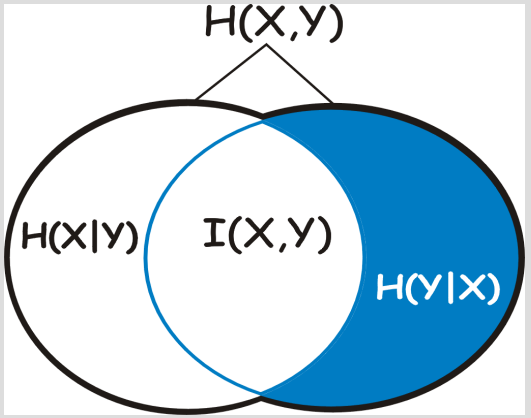


dst_port

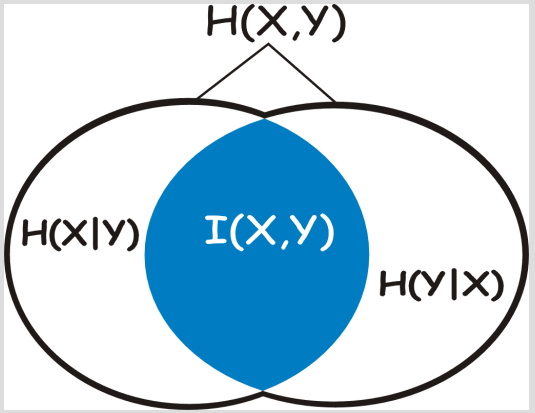




$$I(X; Y) := H(X) + H(Y) - H(X, Y)$$



Conditional entropy



Mutual information

Joint and conditional entropy

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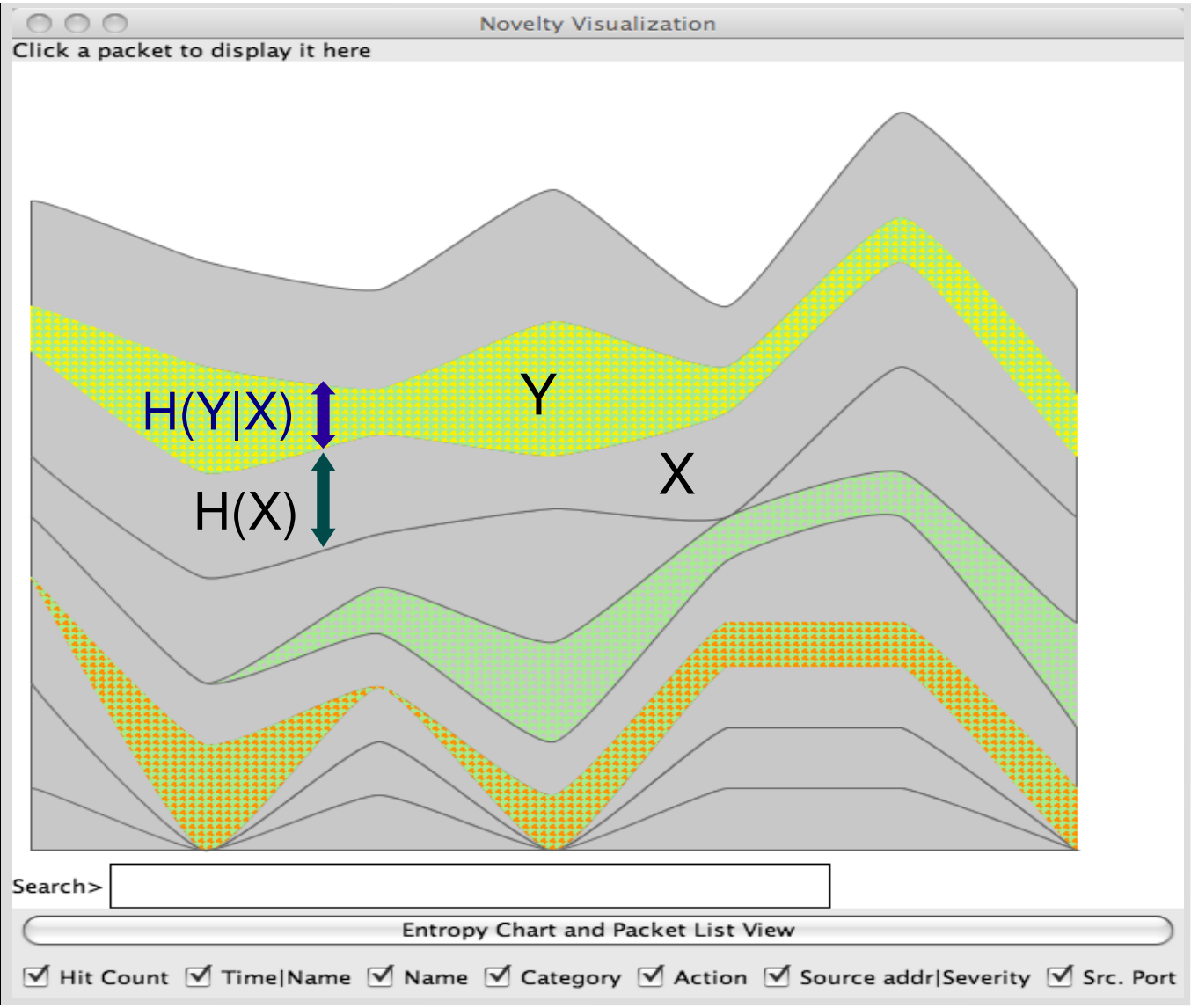

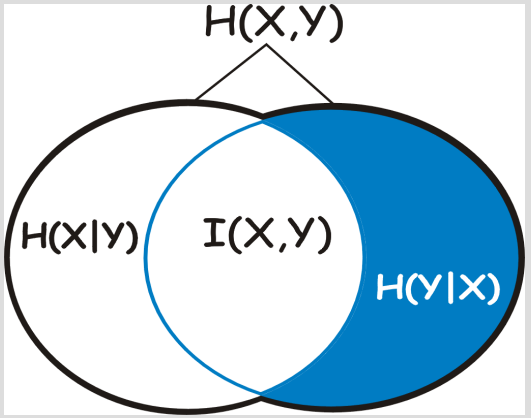

$H(Y|X)=H(X,Y) - H(X)$

H(Y|X) shows how much uncertainty remains about Y once we know X

Use case: “Bluesnarfing”

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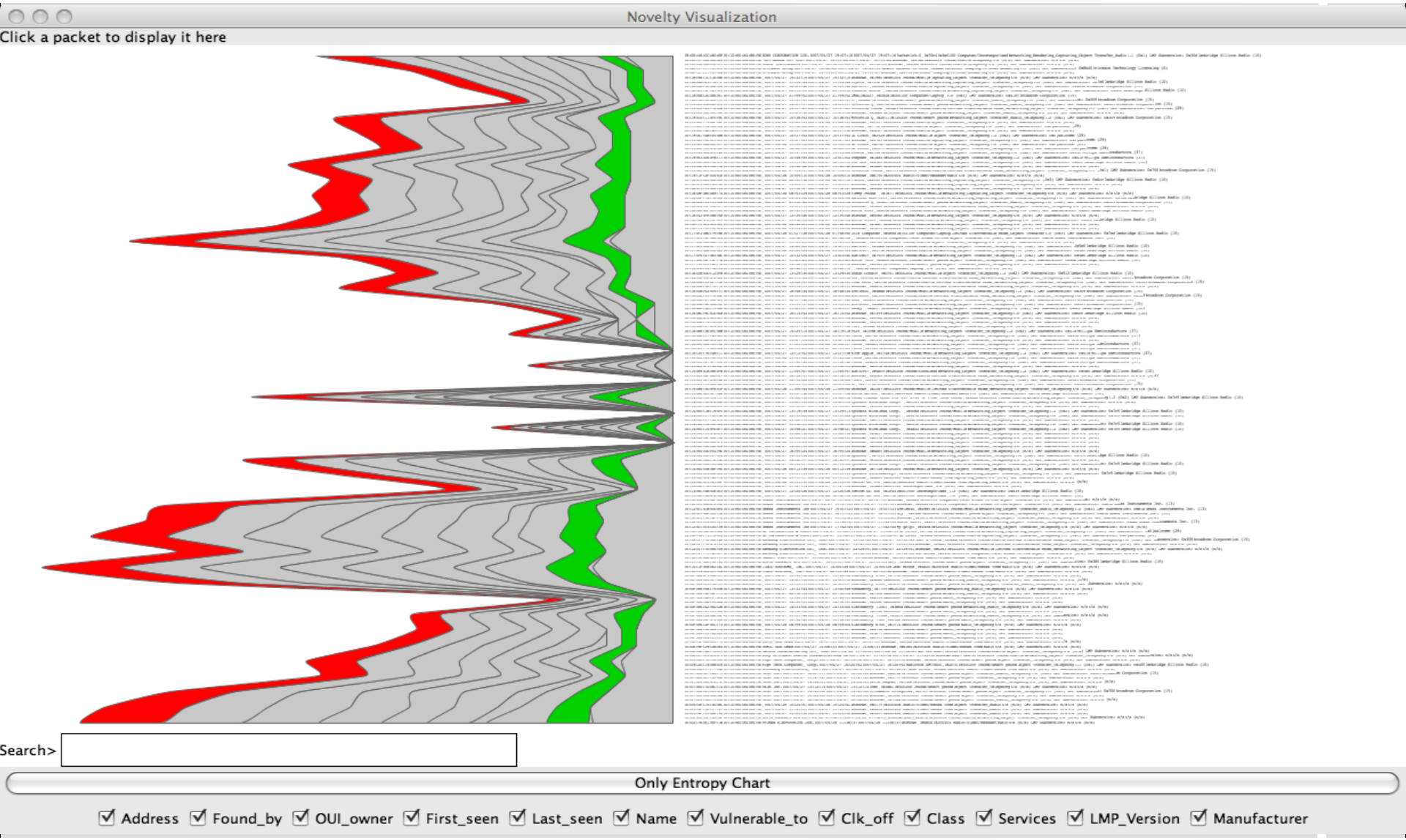

Bluesnarfing, conditioned

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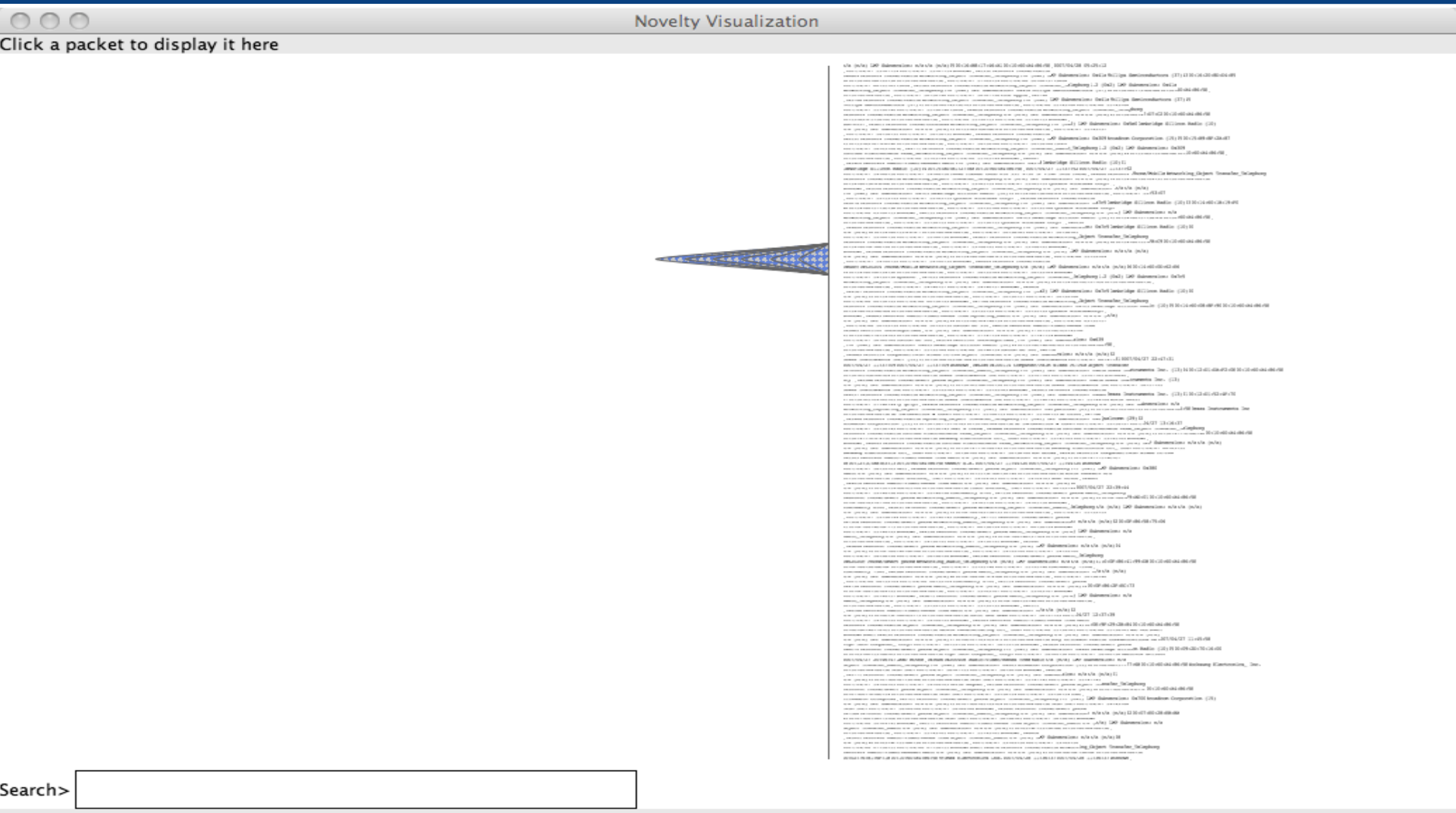

Source & Thanks

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http://kerf.cs.dartmouth.edu/backhoe/

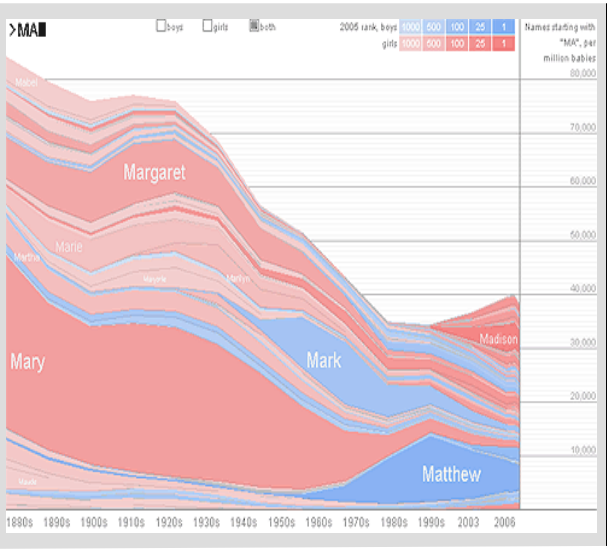
- Java sources will be posted soon

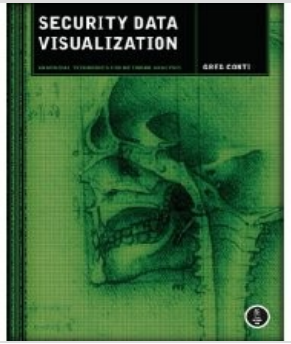
Thanks:

- Jeffrey Heer, *Prefuse* (*prefuse.org*)
- Martin Wattenberg, *NameVoyager*

- Greg Conti, *Rumint* and other security visualisation tools

prefuse





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