

Analysis of the temporal and structural features of threads in a mailing-list

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Summary

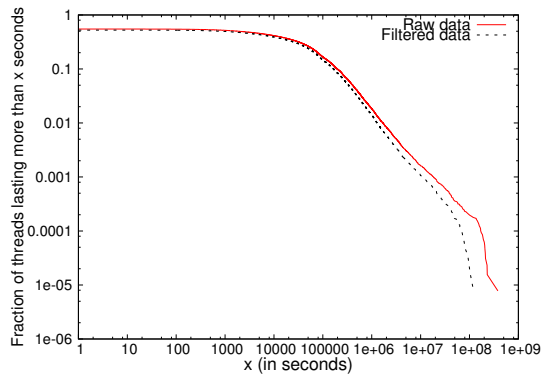
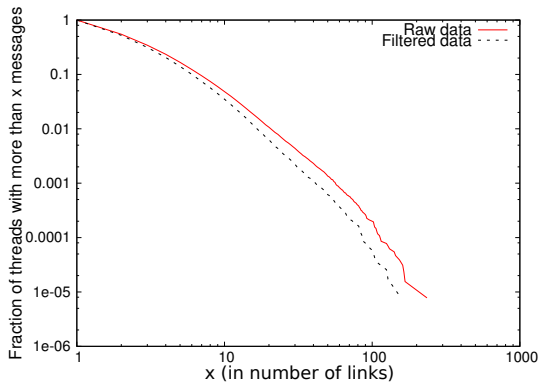
- ① Data set and formalism
- ② Threads as dense structures in a mailing list
- ③ Conclusion and perspectives

Data set

Mailing list of community assistance and support for Debian users:

t1; Alice; Bob; thread1	$t \in [1994, 2014]$
t2; Carol; Bob; thread2	35000 authors
t3; Dave; Alice; thread1	550000 emails
...	117000 threads

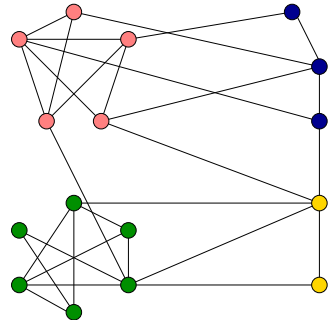
Data set



Data set

t1; Alice; Bob; thread1
 t2; Carol; Bob; thread2
 t3; Dave; Alice; thread1
 ...

Graph:
 V nodes set and $E \subseteq V \times V$ set of links.

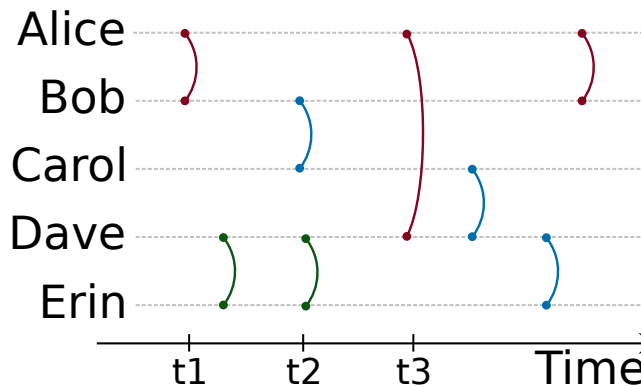


Temporal information is lost

Link stream

Aim: Model temporal interactions

$T = [\alpha, \omega]$ a time interval, V nodes set and $E \subseteq T \times V \times V$ set of links.
 $(t, u, v) \in E \Rightarrow (u, v)$ are linked at time t .



What is the threads structure?

Communities are dense sub graph:

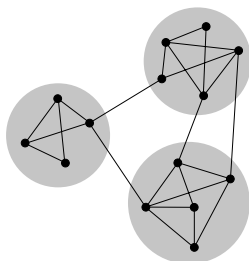
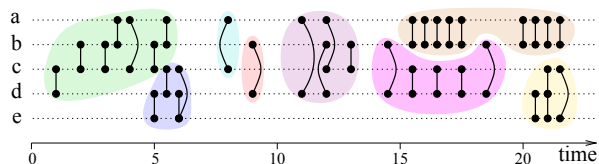


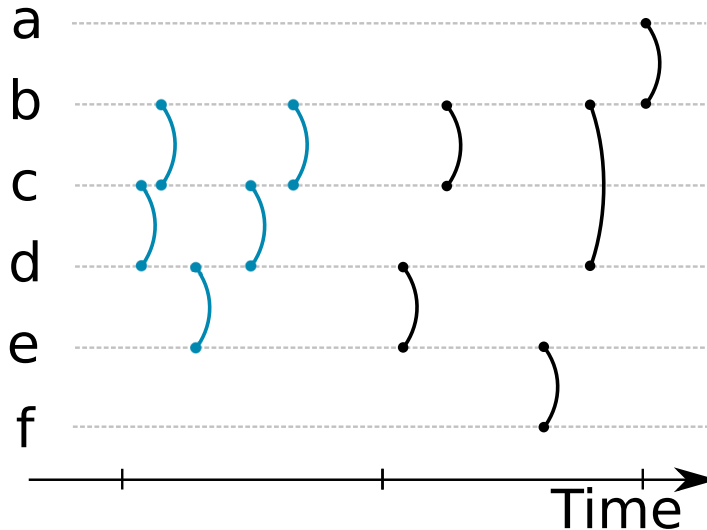
Illustration from Wikipedia

Could threads be communities in the link stream?

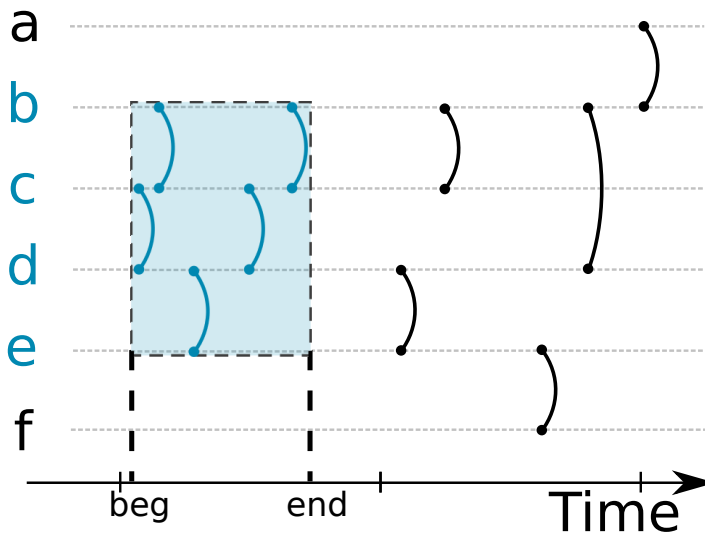


Density of threads in a mailing list

Threads as dense structures in a mailing list



Threads as dense structures in a mailing list

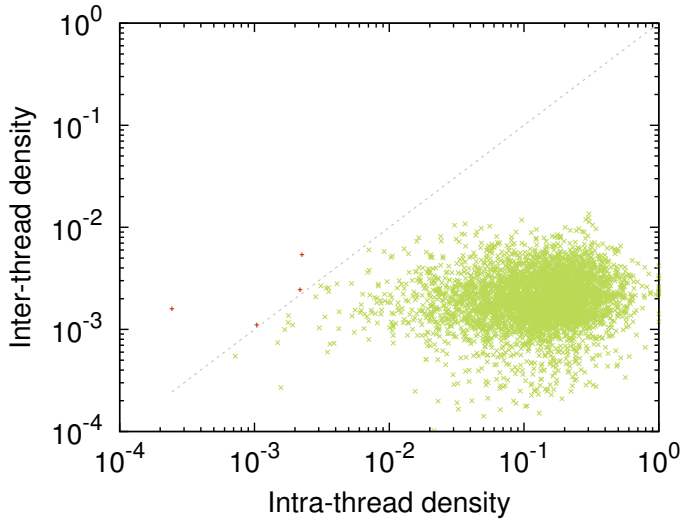


$d_{\Delta}(V', beg, end) = \text{probability that a link exists between two random nodes in } [beg, end].$

Results

Threads are **denser** than the link stream.

Threads are **denser** inside than outside:



Conclusion and perspectives

To sum up:

- Link streams are a temporal generalisation of graphs.
- We extended density and quotient to link streams.
- Threads in mailing-list are denser than the link stream.

Perspectives:

- Extend other metrics such as the *modularity* to link streams.
- Automatically find dense groups of links in a link stream.