

You are the way you (structurally) talk: Structural-temporal neighbourhoods of posts to characterize users in online forums

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Overview

Introduction

- The data

- The graph representations of the data

Structures of conversations

- Basic idea

- Triadic structures

- Neighbourhood structures

- Comparing neighbourhoods

Conversation-based clustering

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The data

Reddit. A forum of forums



Download monthly dumps from:

<http://couch.whatbox.ca:36975/reddit/comments/monthly/>

Extract forum of interest:

www.reddit.com/r/science

www.reddit.com/r/france

www.reddit.com/r/sociology

www.reddit.com/r/complexsystems

www.reddit.com/r/gameofthrones ← in this presentation

www.reddit.com/r/podemos ← in this presentation

...

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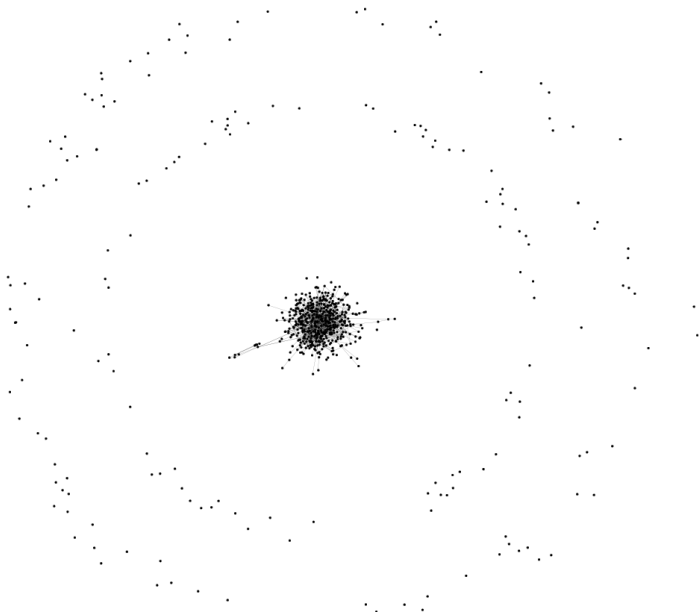
Comparing neighbourhoods

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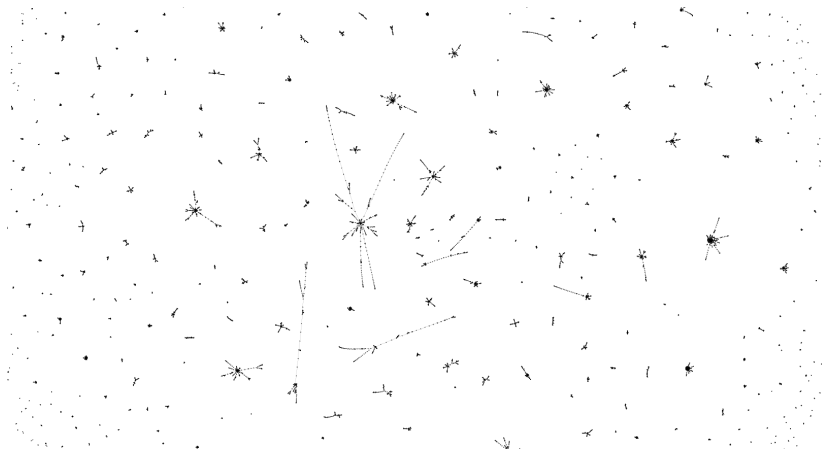
Graph representations

Graph of user interactions (a social network)



Graph representations

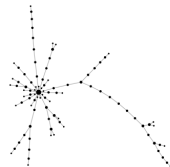
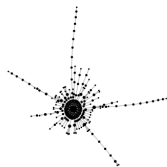
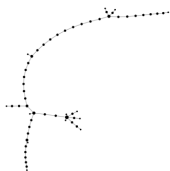
Trees of posts



Graph representations

Conversations are trees

- ▶ Explicit structure.
- ▶ Dynamic (order, time)



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Intuition

Hypothesis: different individuals have tendency towards different types of conversations and these types are reflected in the structure of their interactions.

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



Comparing neighbourhoods

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Triadic structures

Triads are not enough

Motif															
Motif ID			36	164	12	14	6	78	38	174	166	46	238	102	140

Triads in **trees of posts**:

- ▶ Only 3 possible triads (dyad, chain and star)

Triads in **social graph**:

- ▶ Order (therefore dynamic) is missing.

We need something richer that captures the dynamics of conversations.

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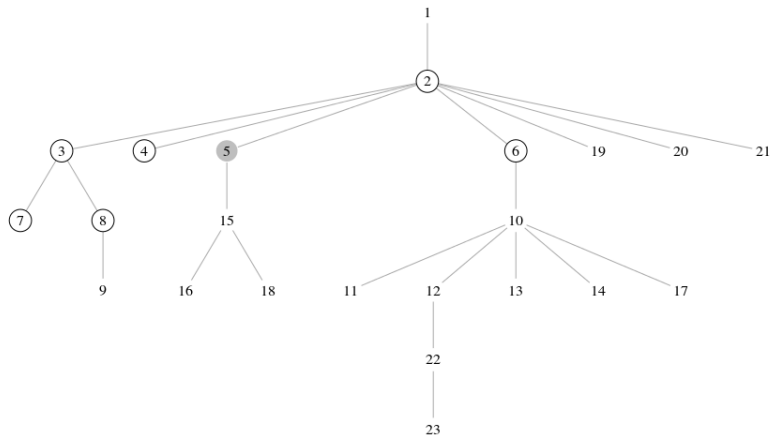
Conversation-based clustering

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Order-based neighbourhoods

Definition

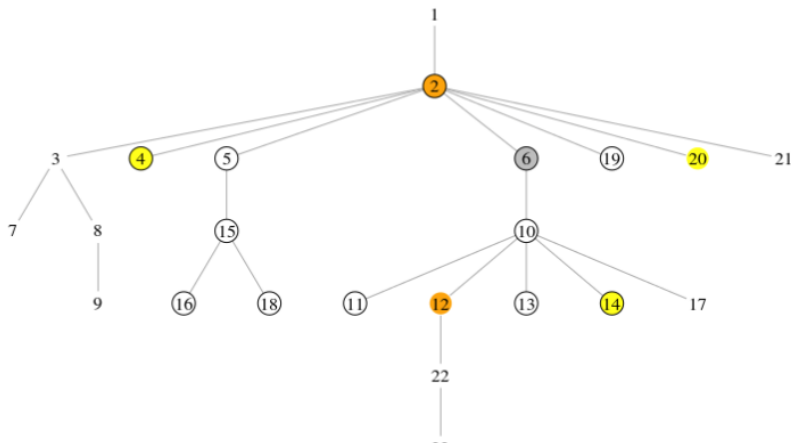
- ▶ 1. Extract neighbourhood of post i with radius r .
- ▶ 2. Keep only the n posts that are closest (in time) to post i .



Time-based neighbourhoods

Definition

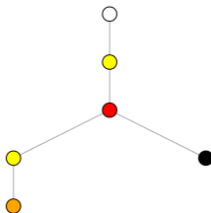
- ▶ 1. Extract neighbourhood of post i with radius r .
- ▶ 2. Detect changes of speed (vertical/horizontal *changepoints*) (PELT algo)
- ▶ 3. From i , get the posts around until a changepoint is found.



Colouring

Label special nodes:

- ▶ Red: ego.
- ▶ Yellow: parent of ego (and posts of same author)
- ▶ Orange: other posts by ego author
- ▶ White: root



Some frequent neighbourhoods

1



2



3



4



5



6



7



8



9



10



11



12



13



14



15



Some frequent neighbourhoods

16



17



18



19



20



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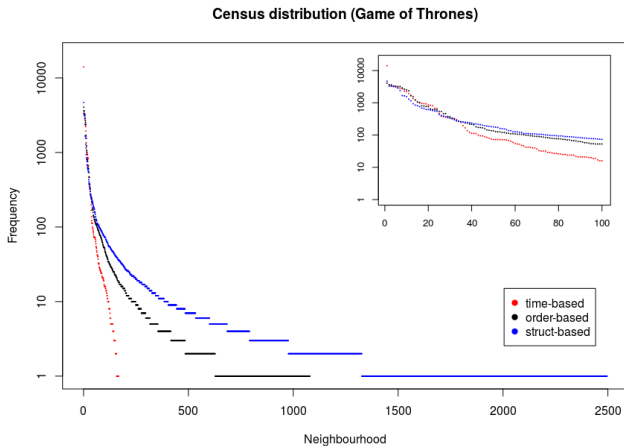
Neighbourhood structures

Comparing neighbourhoods

Conversation-based clustering

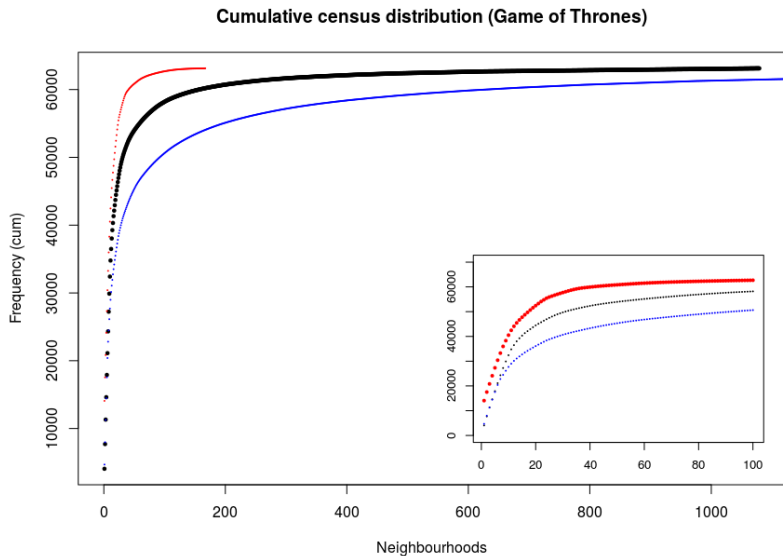
Conclusions

Frequency distribution



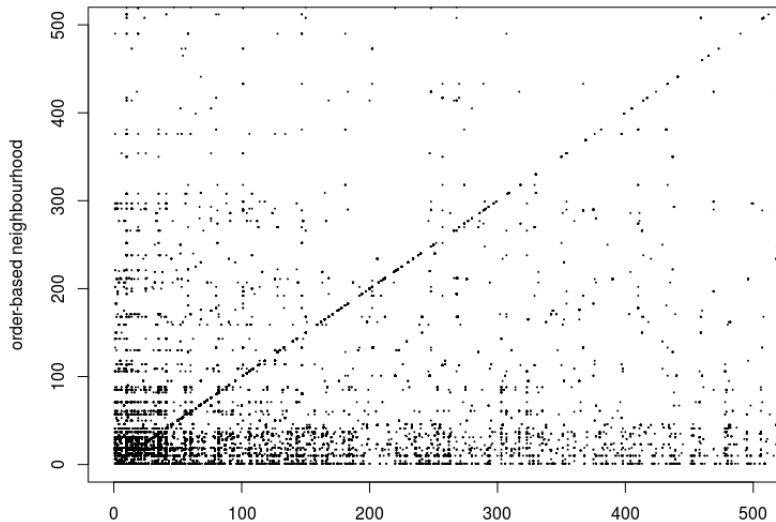
Time-based (black) reduces the space w.r.t structure-based (blue)

Frequency distribution



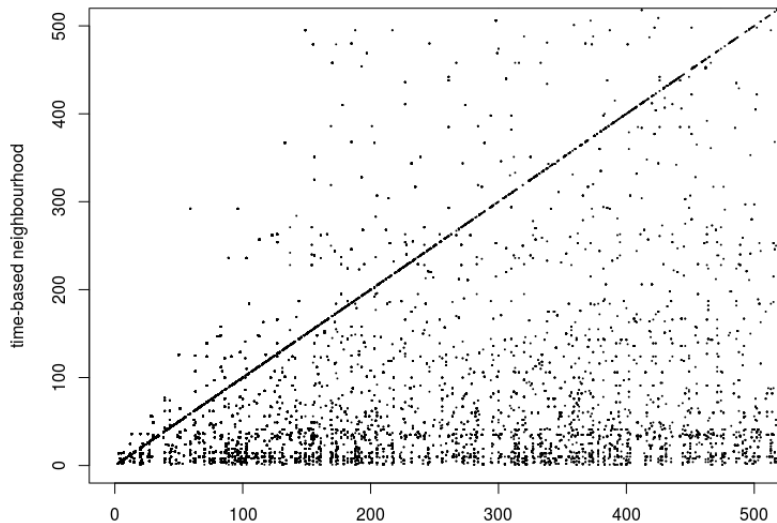
Discrepancies

Time-based vs Order-based neighbourhood



Discrepancies

Basic neighbourhood vs Time-based neighbourhood



Structure-based vs Order-based vs Time-based

Structure-based:

- ▶ too big (and too many) neighbourhoods.

Order-based:

- ▶ Dominance of monoid hides richer conversational structures.

Time-based:

- ▶ Space more reduced than simple structure-based.
- ▶ Criteria to choose radius dynamically (r = until conversation slows down)

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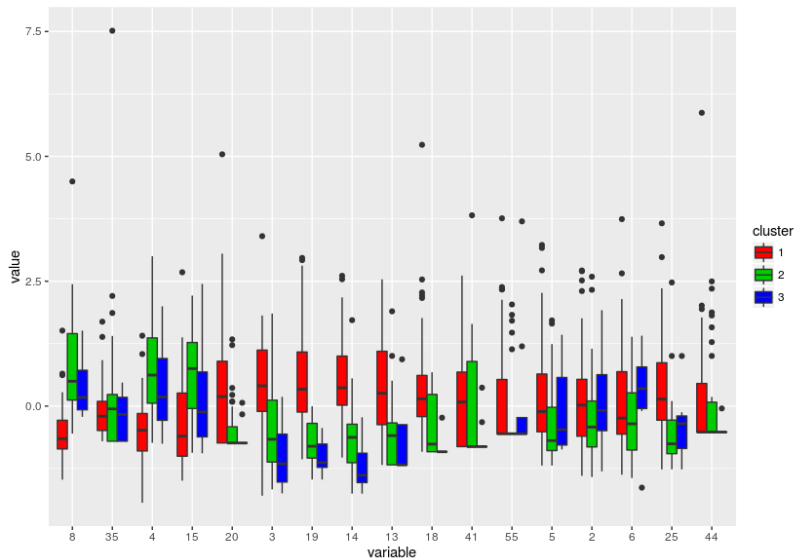
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Methodology

- ▶ Create a user \times neighborhood matrix of counts.
- ▶ Z-normalize (users characterized by their deviation from the mean)
- ▶ Cluster!

Conversation-based clustering

Time-based



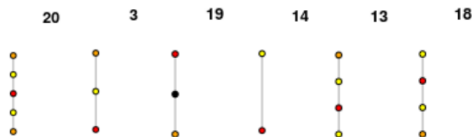
Conversation-based clustering

Interpretation

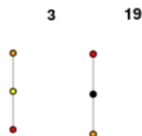
Greens:



Reds:



Blues (avoid these motifs):



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- ▶ **Q: Can we use graph structure to characterise users?**
- ▶ A: Yes!
- ▶ **Q: By using triads?**
- ▶ A: No. They are not useful in trees.
- ▶ **Q: So, what kind of structure?**
- ▶ A: Posts neighbourhoods that are time/order sensitive.
- ▶ **Q: What about language?**
- ▶ A: It's ok, but structure is more directly linked to thread dynamics (future work)

Merci !

