Some Thoughts on Computational Narratology

Dynamic Evolution and Compositional Change in Literature

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outline

1. Automated micro-analysis
   - DH Revisited
   - Narrative
2. Narrative Coherence
   - Dynamic evolution of sentiment
   - Story arc
   - Hurst estimation
   - Global coherence
   - Local coherence
   - Proposal
   - Towards scalability
3. Narrative Change
   - Compositional change detection
   - Lexical change detection
   - Topical distances
   - Model dynamics

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dh revisited

Learning to walk before we run

"In humanities research, the use of Big Data analytics and High Performance Computing is advanced under the banners of 'distant reading' and 'macroanalysis'. These technologies are supposed to give us entirely new insights that have previously been unobtainable. The results however often resembles technical demonstrations rather than solutions to research problems. In order to benefit from analytics and HPC, we first need to *operationalize* and *automate* microanalysis."

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narrative

- A *narrative* is a sequence of intentionally dependent events ('objects bounded in time') directed at some goal-state

- [example] An action (perception of) has a narrative structure, the success of which depends on the (causal) coherence between the sub-actions and intended goal

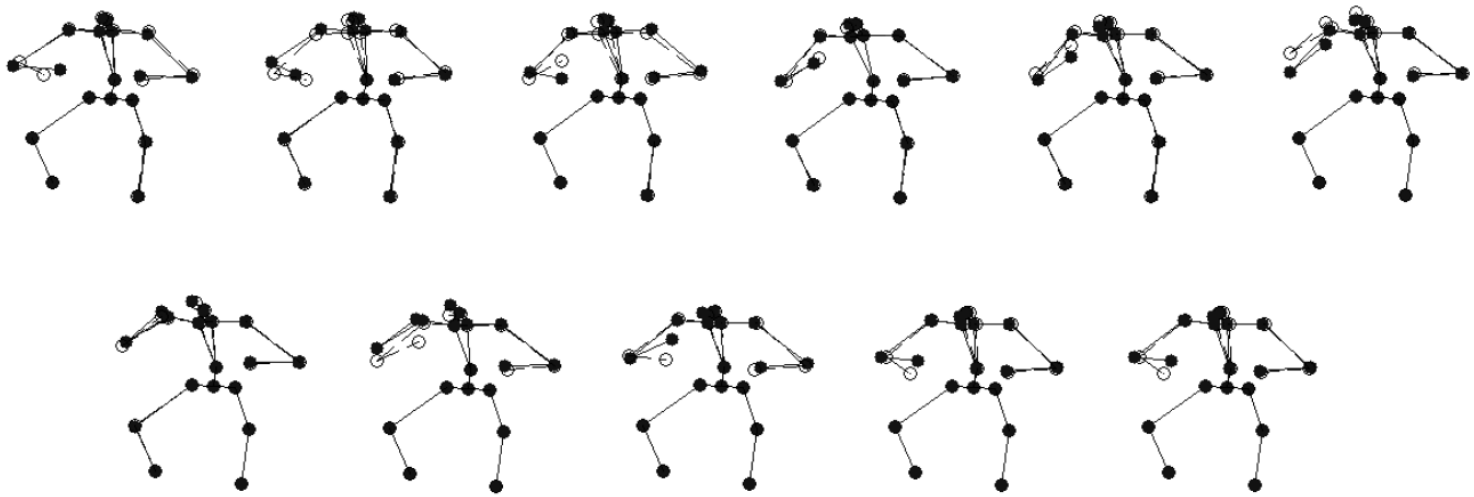

Figure 1: Partonomy of 'drinking beer'

Capture evolution of and abrupt change in narratives (percetion of) by combining affective computing and latent variable models with fractal theory and change detection

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Data

- Kazuo Ishiguro's Nobel-prize winning *Never Let Me Go* (2005) which is driven by a "great emotional force"
- Sentence-level sentiment estimation based on the *Syuzhet* lexicon

Problem

- Psychological/affective experience of a narrative
- Aesthetics optimality for literary fiction

Hu, Q., Liu, B. Thomsen, M.R., Gao, J. & Nielbo, K.L. (*in review*). Dynamic evolution of sentiments in *Never Let Me Go*: Insights from multifractal theory and its implications for literary analysis.

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filtered story arc

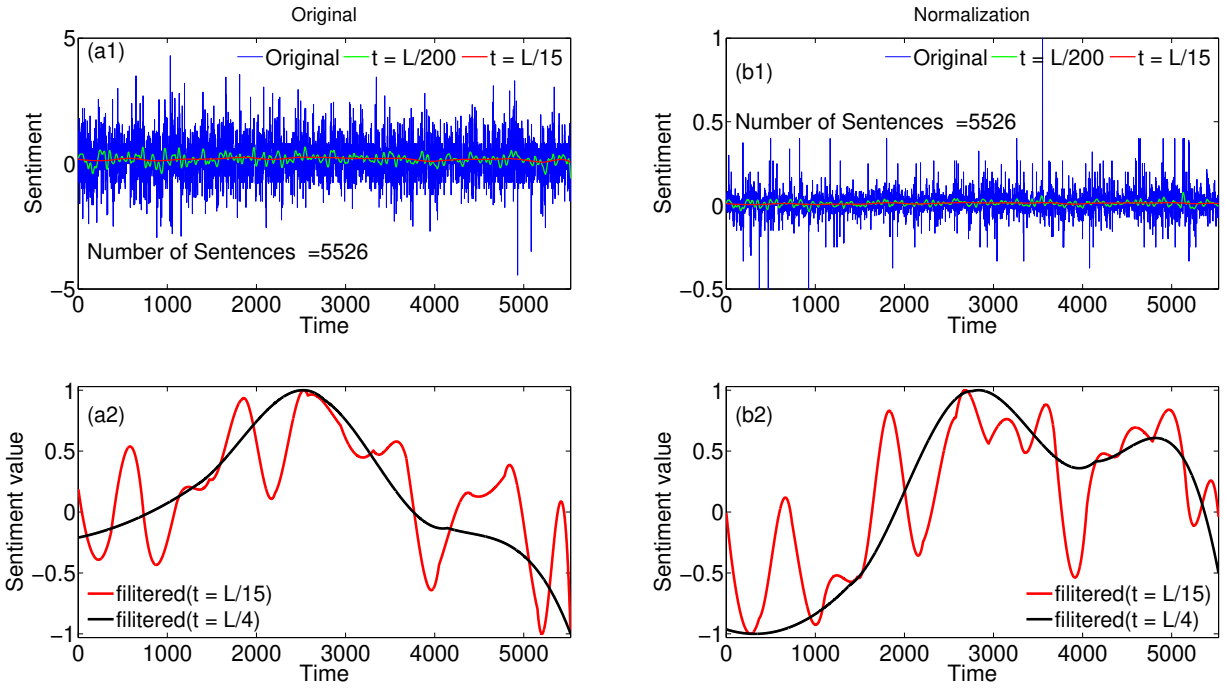

Figure 2: Sentiment time series of *Never Let Me Go*

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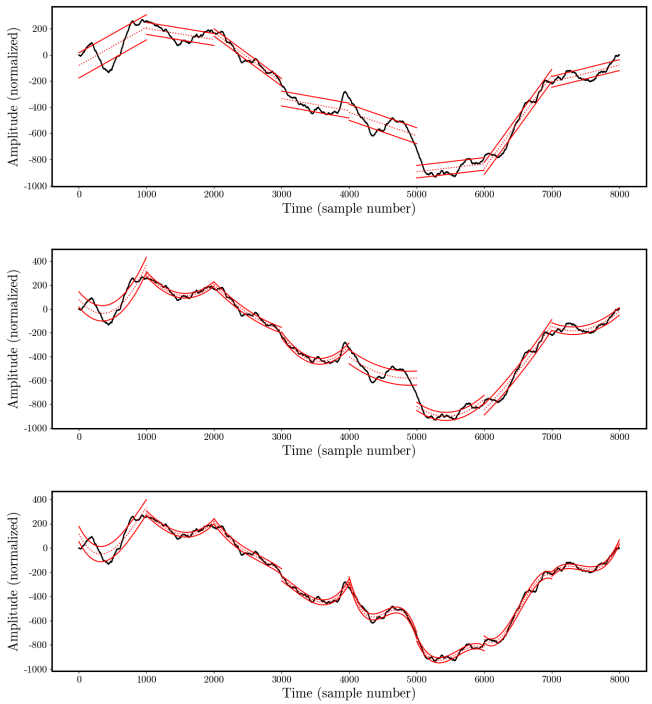

Figure 3: Computation of local fluctuations around linear, quadratic, and cubic trends

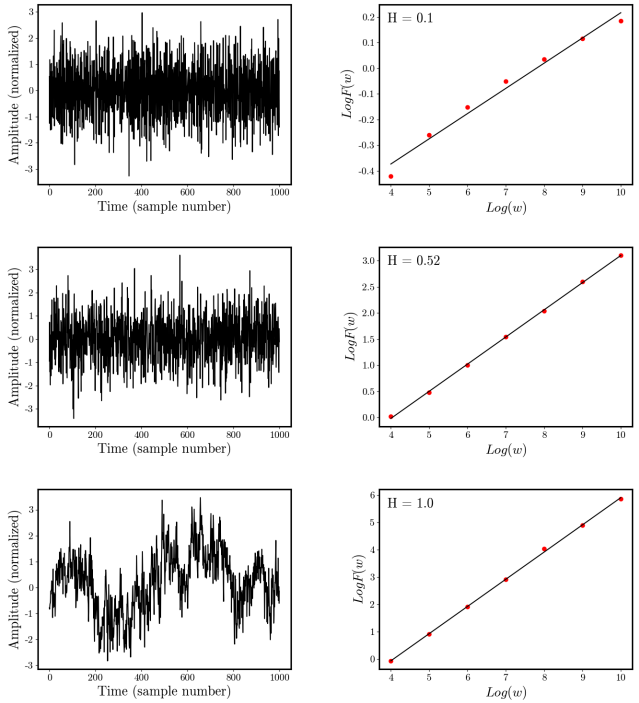

Figure 4: Estimation of Hurst parameter

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global coherence

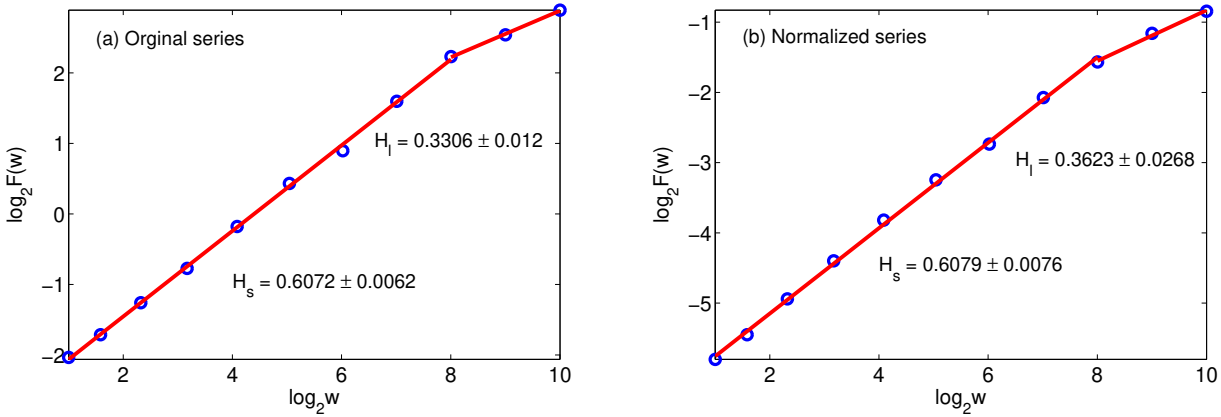

Figure 5: The Hurst parameters of original and normalization sentiment time series of *Never Let Me Go*

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local coherence

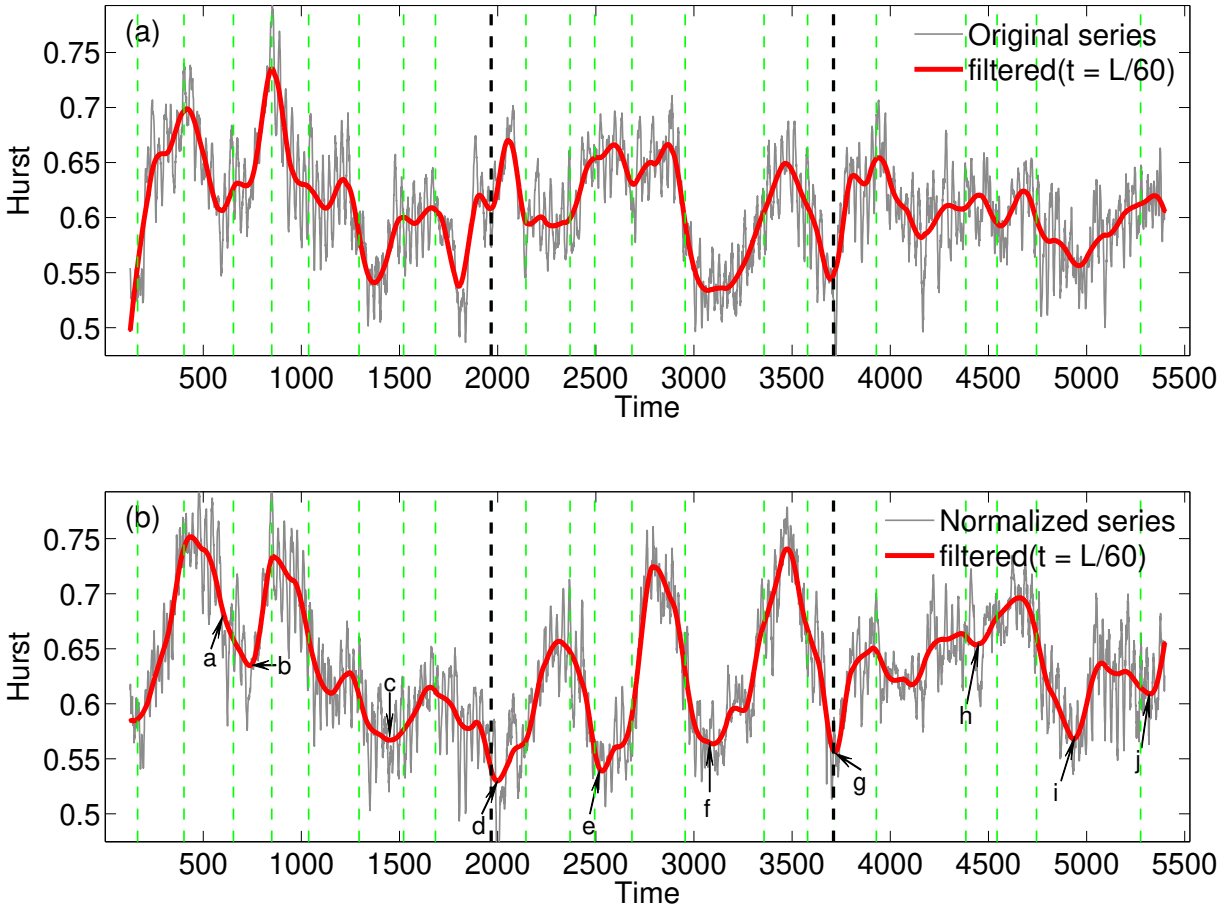

Figure 6: The evolution of Hurst under 256 window size of original and normalized sentiment time series

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- The (global) Hurst exponent of a novel's sentiment story arc provides an index of a novel's narrative coherence. This index can be used as an evaluation metric of how the novel's moods, feelings and attitudes will be perceived by a reader.
- As an evaluation metric, the Hurst exponent of a novel can be interpreted accordingly: $0.5 < H < 1$ indicates a coherent narrative; $H = 0.5$ indicates a narrative that is incoherent, almost random; and $H < 0.5$ indicates a overly rigid and potentially bland narrative.
- the optimal narrative manages the reader's motivation by neither being completely coherent ($H \approx 1$) nor incoherent ($H = 0.5$), but somewhere in between.
- For $H > 0.5$, the (local) time-varying Hurst exponents reflects variation in the novel's plot, such that local minima reflect disruptions or points of narrative change, positive incline reflect continuous (persistent) narrative development, and decline a movement towards disruptions.

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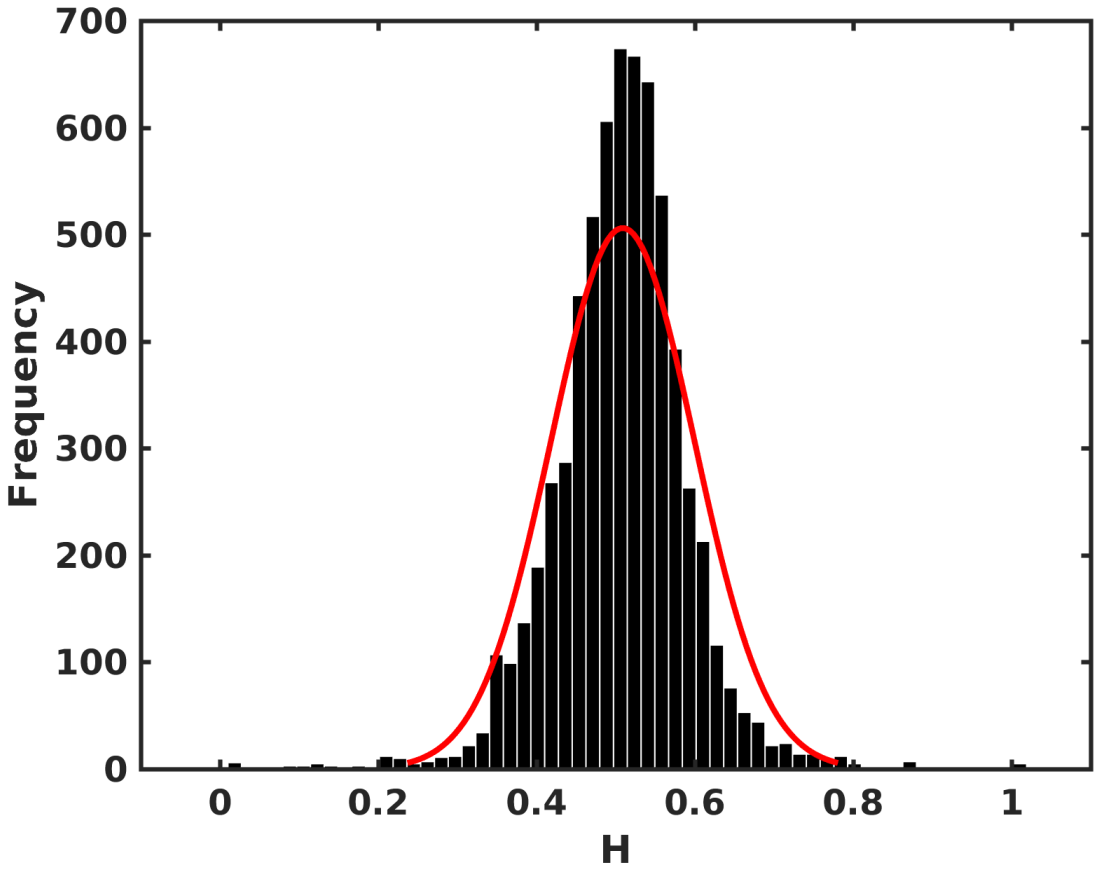

Figure 7: global H for Danish textual cultural heritage

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Data

- Saxo Grammatricus (c. 1160 - post 1208) represents the beginning of the modern day historian in Scandinavia
- *Gesta Danorum* ("Deeds of the Danes") is the single most important written source to Danish history in the 12^{th} century

Problem

- bipartite composition of *Gesta Danorum*
- is the transition between the old mythical and new historical part located in book eight, nine, or ten
- is this transition gradual (continuous) or sudden (point-like)
- qualitative observations and contextual knowledge to argue for a particular change in content and composition

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Nielbo, K.L., Perner, M.L., Larsen, C., Nielsen, J. & Laursen, D. (*in review*). Change Detection in *Gesta Danorum*'s Topical Composition

lexical change detection

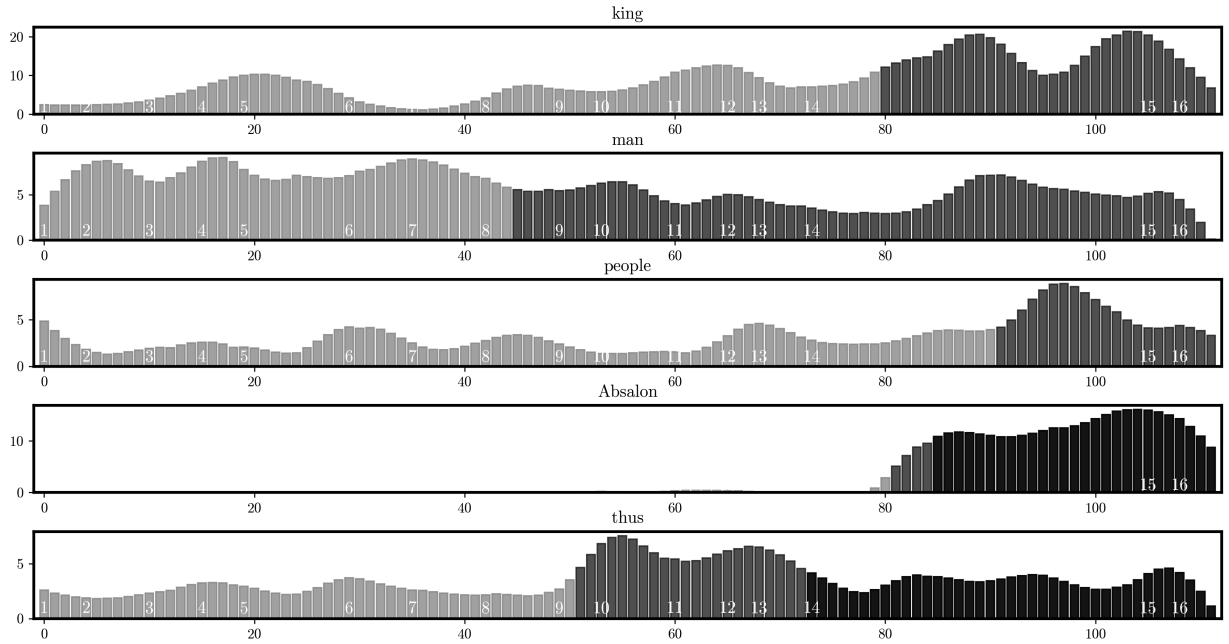

Figure 8: Most frequent keywords and entities in *Gesta Danorum* in windows of 50 sentences

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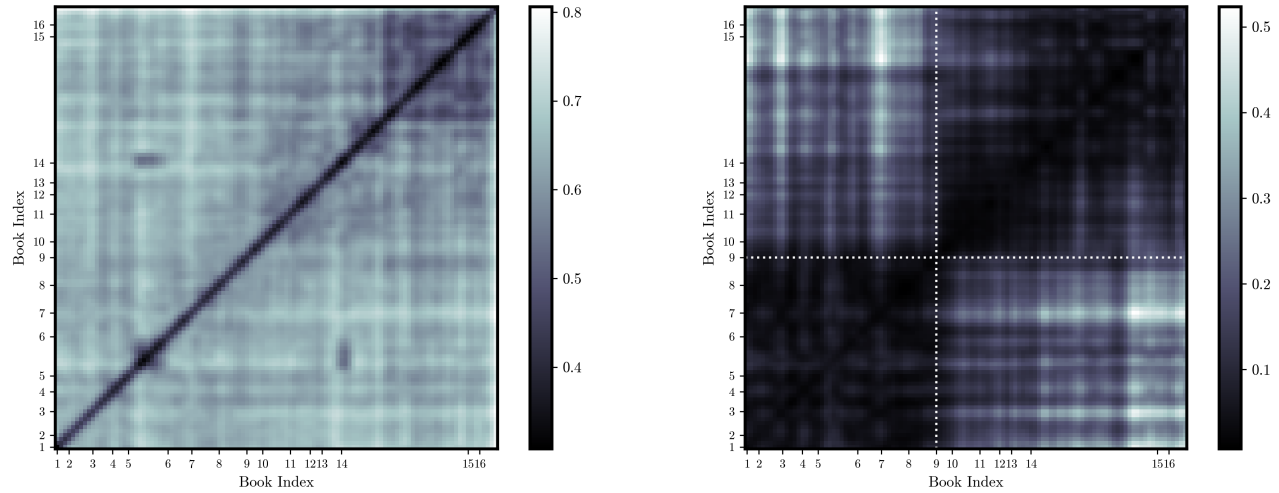

Figure 9: Cosine distance matrix for vector space model and relative entropy between documents in seeded topic model of Saxo

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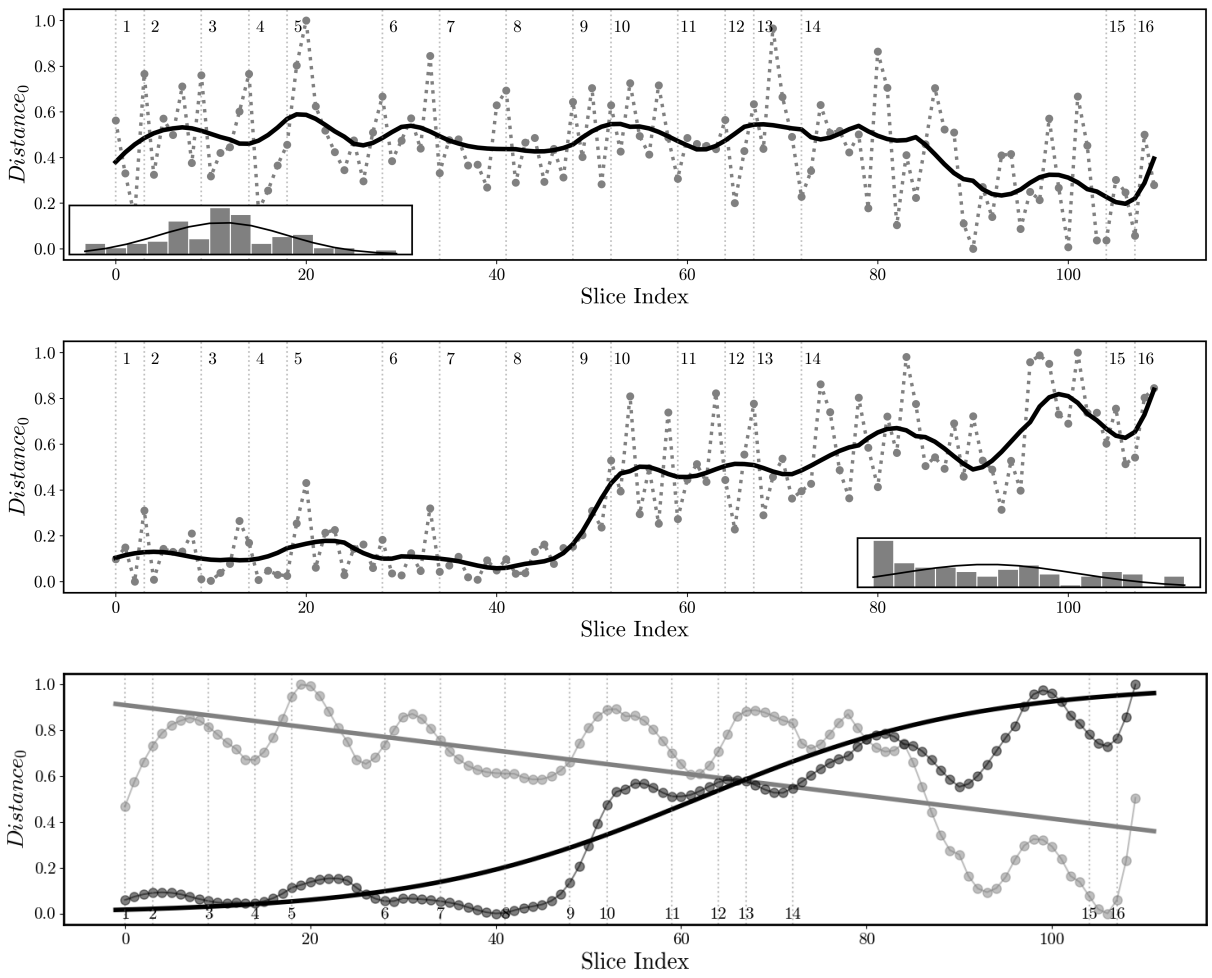

Figure 10: Model dynamics

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summary

- *Gradual* transition that starts in the latter part of *book eight* and ends in book ten
- greatest rate of change in book nine, which explains the point-like position
- using co-occurrence structure of a document show superior results in comparison to classical VS model

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THANK YOU

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slides: http://knielbo.github.io/files/kln_narratology.pdf

& credits to

Qiyue Hu, Bin Liu & Jianbo Gao, Institute of Complexity Science and Big Data, Guangxi University, CHN
Mads Rosendahl Thomsen, Institute for Comparative Literature, Aarhus University, DK
Ditte Laursen, Royal Danish Library, DK

& funding

Danish Agency for Science and Innovation: Calculus of Culture
Andrew Mellon Foundation: Mapping Literary Influences

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