Outline of a Literary Informatics

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Outline

1 Human & Literary Informatics On the role of informatics A need for informatics Workflows

2 Author dynamics

3 Narrative dynamics

4 Compositional dynamics

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A need for Human & Literary Informatics

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Human & Literary Informatics

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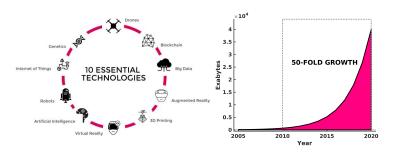
Author dynamics

Narrative dynamics

dynamics



The data deluge



the data deluge is transforming knowledge discovery and understanding in every domain of human inquiry

a large part of these data are soft and unstructured ⇒ to get value from these data, humanities (and social sciences) must utilize automation

human informatics - automatic information processing in the humanities

 \Rightarrow literary informatics \sim use of automation in literary studies



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Humanities need informatics



Figure 1: The increase in research publications & databases alone requires computational literacy. Publications related to Gospel of Marc (KJV) > 50K, \sim 16,500 words in 16 chp. on 11 p.

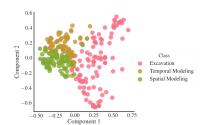


Figure 2: Advanced (human) informatics can merge, aggregate and project hetereogeneous data into lower dimensional spaces that allow visual manipulation

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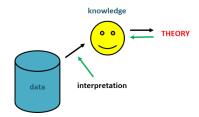
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Default workflow



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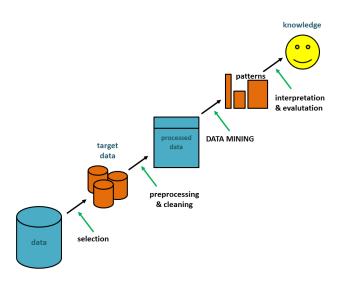
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KDD workflow



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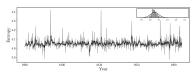
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The appropriate formalism

- profile the creative development of authors
- multiple measures that captures aspects of "text complexity" in terms of syllables, word and sentence length \sim characters and ngrams
- IT offers a range of "well-behaved" measures that capture lexical variability, $\sim H[X]$ as the variability of some term-vectors $X \sim \log$ of the effective number of values it can take



$$H[X] = -\sum_{x} \mathbb{P}(X = x) \log \mathbb{P}(X = x)$$
$$= -\mathbf{E}[\log \mathbb{P}(X)]$$

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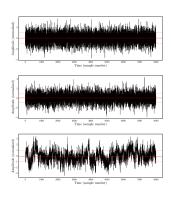
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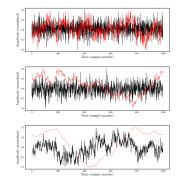
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Competing levels of abstraction



$$F(X) = \left[\frac{1}{N} \sum_{i=1}^{n} (x_n^2)\right]^{1/2}$$



$$u(n) = \sum_{i=1}^{n} (x_i - \overline{x}), \quad n = 1, 2, \dots, N,$$

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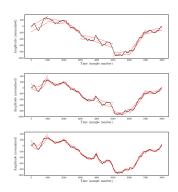
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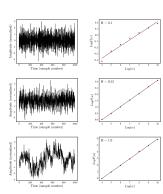
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Noise and fractal properties





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Author change points

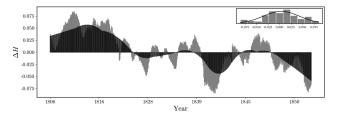


Table 1: Dominant Dynamic in the Phases of N.F.S. Grundtvig's Writings

	Time period	Age of onset	H(X)	Behavior	Profile
_	1806-1826	23	H > 0.5	persistent	theoretician
	1826-1839	43	$H \approx 0.5$	short memory	pragmatic
	1839-1845	56	H < 0.5	anti-persistent	breakthrough
	1845-1848	62	$H \approx 0.5$	short memory	disease
	1849-1872	65	H < 0.5	anti-persistent	politician
	1839-1845 1845-1848	56 62	H < 0.5 $H \approx 0.5$	anti-persistent short memory	breakthrough disease

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Nielbo, K. L., K.F. Baunvig, B. Liu & Gao, J. (in print). A Curious Case of Entropic Decay: Persistent Complexity in Textual Cultural Heritage. Digital Scholarship in the Humanities.

Dynamic author profiling

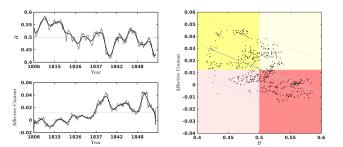


Figure 3: Combining persistent entropic trends with sentiment analysis and causal modeling, we can study "the tormented artist" phenomena in intellectual history.

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Literature and affective computing

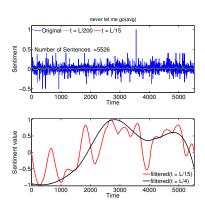


Figure 4: Story arc of Kazuo Ishiguro's 2005 novel *Never let me go*

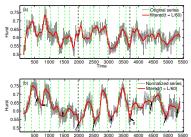


Figure 5: Evolution of the Hurst parameter under 256 window size of original and normalized sentiment time series

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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.

Compositional dynamics

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Danish parsing & change detection

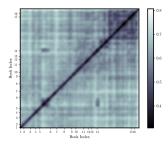


Figure 6: Cosine distance in baseline vector space model shows no evidence of change point.

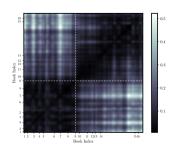


Figure 7: KL-divergence in contrast model indicates a gradual change point in book 9.

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

THANK YOU

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

& credits to

Max R. Echardt and Katrine F. Baunvig, datakube, University of Southern Denmark, DK Mads Rosendahl Thomsen, Comparative Literature, School of Communication and Culture, Aarhus University, DK Jianbo Gao and Bin Liu, Institute of Complexity Science and Big Data, Guangxi University, CHN

Culture Analytics @ Institute of Pure and Applied Mathematics. UCLA. US

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