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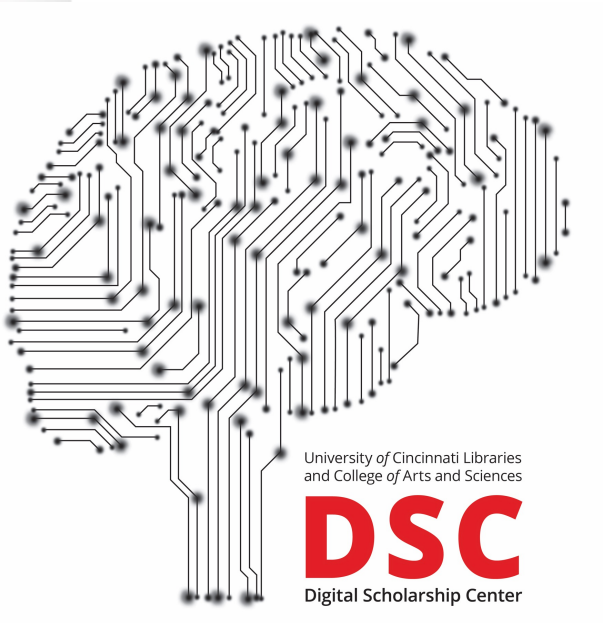
The Digital Scholarship Center: Text Mining across Disciplines



James Lee, PhD
Associate Vice Provost for Digital Scholarship
Associate Dean of Research, University Libraries
Director, Digital Scholarship Center

My Background:
Machine Learning and Historical Archives

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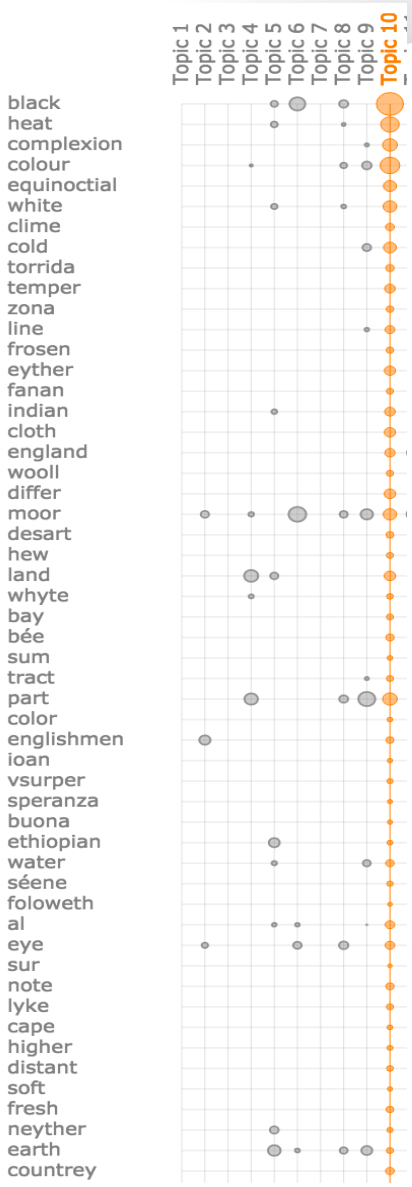

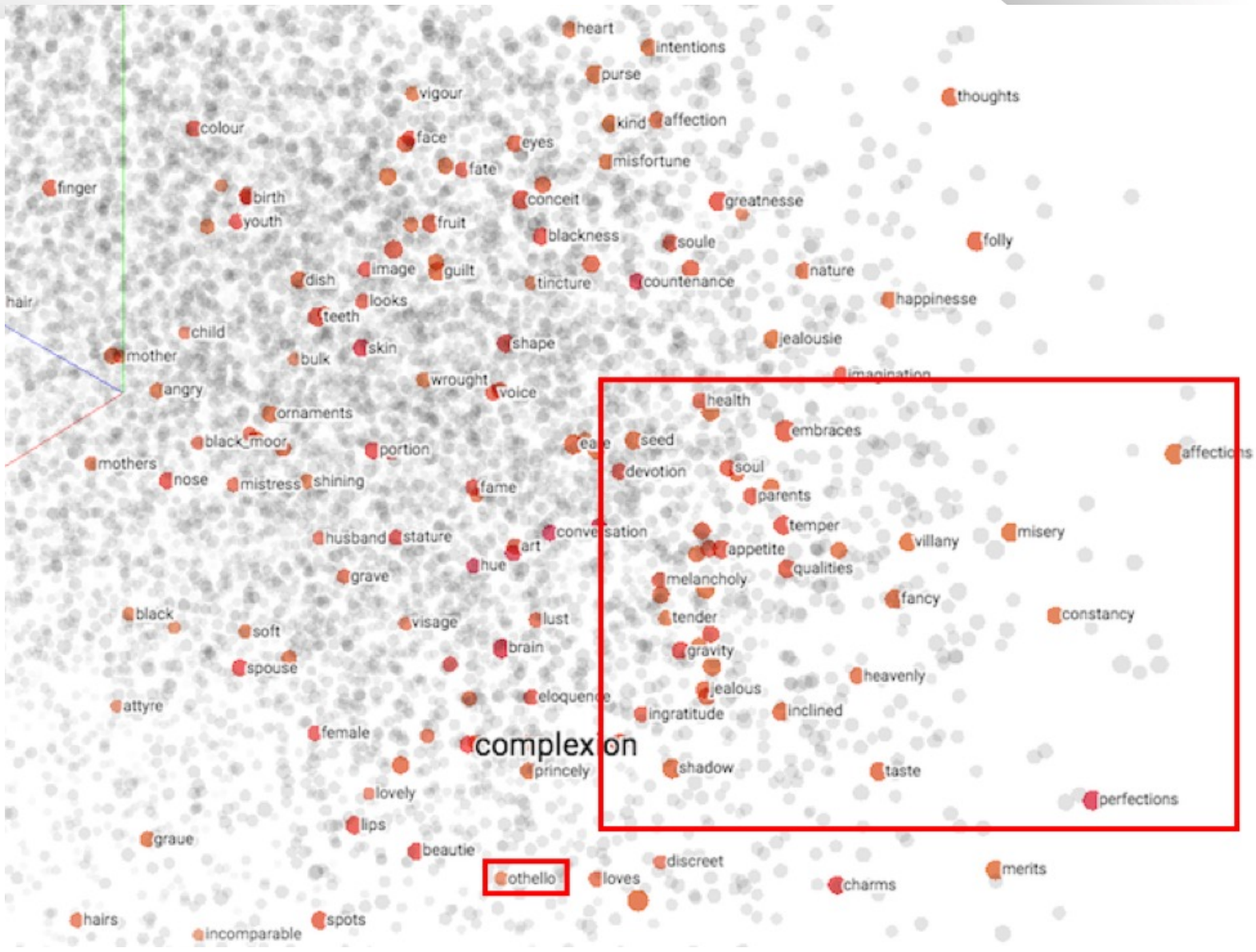

Transdisciplinary Teams in Digital Scholarship

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- What are Digital Scholarship Centers / Studios?
- The DSC has assembled research groups that genuinely span multiple disciplines, with people trained to think very differently about every step in the research process.
- Teams are composed of true partners across entire research lifecycle:
  - Formulation of research questions
  - Pitching grant proposals
  - Dataset cleanup and manipulation
  - Data analysis and visualization
  - Argument formation
  - Publication of findings
- Machine Learning and Data Visualization as discipline-agnostic methods: a “borrowing of techniques”.

Andrew W. Mellon Foundation: Digital Integrator

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- $900,000 over 30 months from the Andrew W. Mellon Foundation.
- Specific goal: Advance our “catalyst” model of Digital Scholarship.
- The long view: Mellon supports culture change.
- Goals:
  - Model new transdisciplinary strategies and practices for translating between disciplines that rarely interact – connect domain experts with technical innovations in machine learning.
  - We provide resources and infrastructure to nurture research questions and collaborations that slip between the cracks of funding agencies.
  - Transdisciplinary computational tools / Human interpretable research products.

Model: Catalyst vs. Concierge

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- Six Digital Centers/Studios supported by Mellon initiative.
  - Leaders defining a new type of “digital integrator” collapsing silos.
  - Peers: UIUC, UConn, Brown, Emory, UC’s DSC, Duke.
  - Spectrum from “concierge” to “catalyst.”
- Digital integrators as hubs in the academic research ecosystem.
- Phase 2:
  - Digital Futures Building
  - $3.1 Million in grant funding
  - Mellon Renewal

Not Just a Feel-Good Story

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- Multiple publications in a range of fields – content area, methodology, popular press.
- Grants from multiple bodies – agencies, foundations, industry.
  - Example: “Iowa Digital Bridges” – Mellon and Gates Foundations, NIH, NSF, NEH, NEA.
- A new perspective on teaching and doctoral training.

Building Bridges: Data Structures

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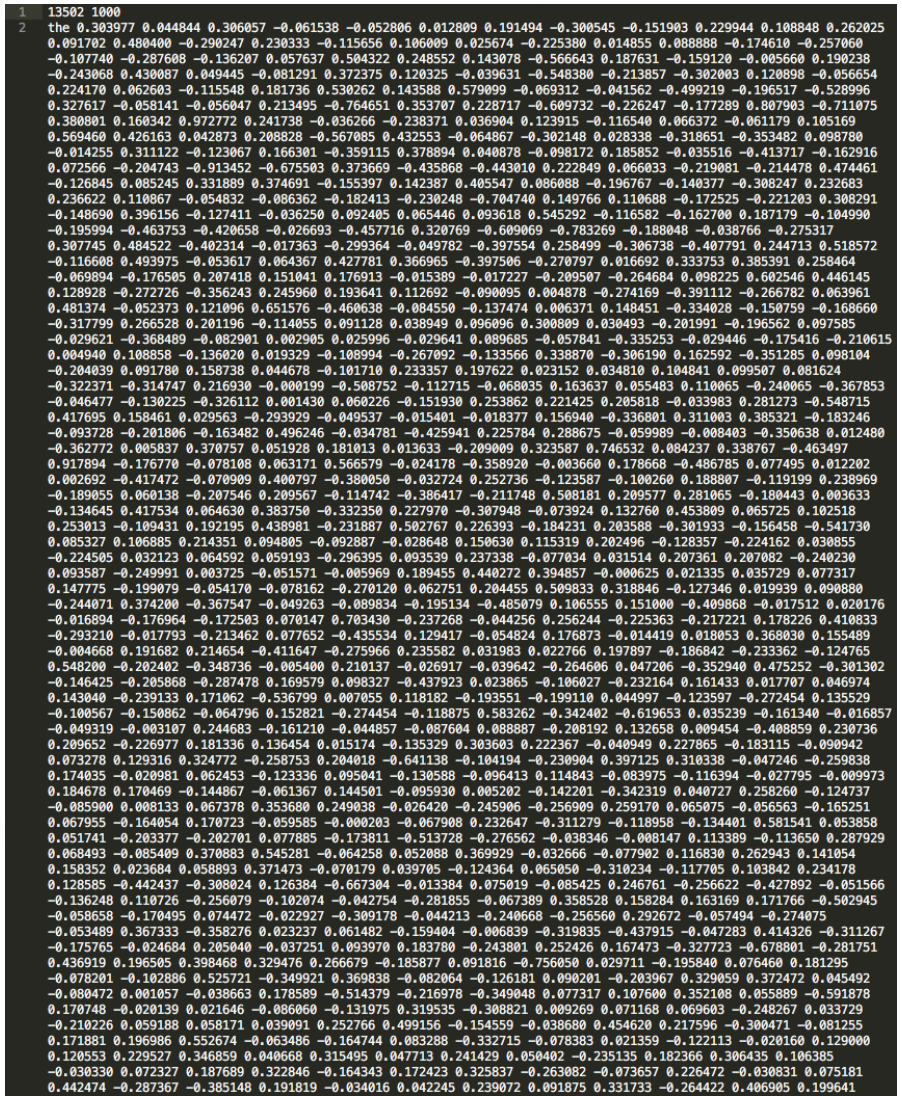
- The Shakespearean and the Astrophysicist.



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Building Bridges: Data Structures

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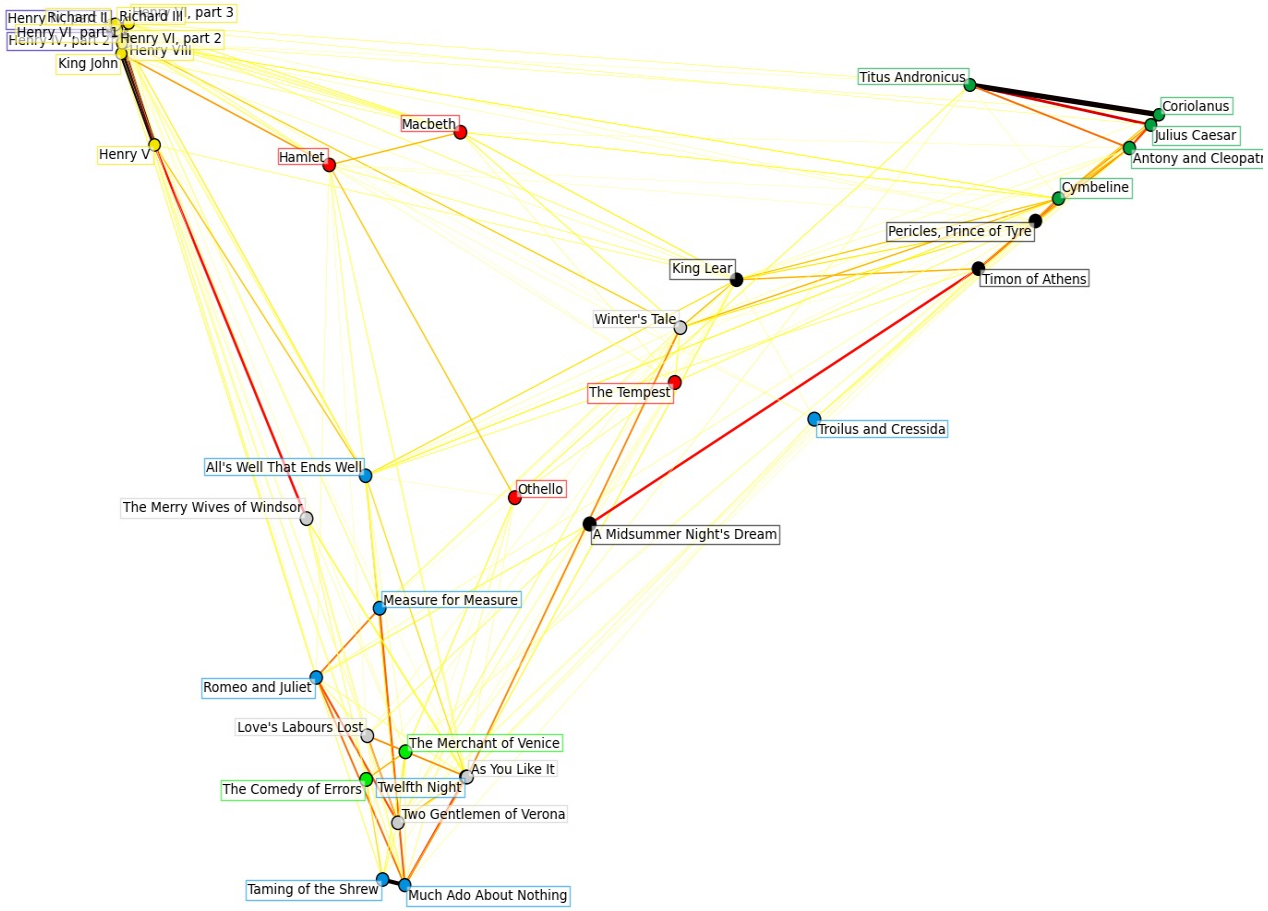

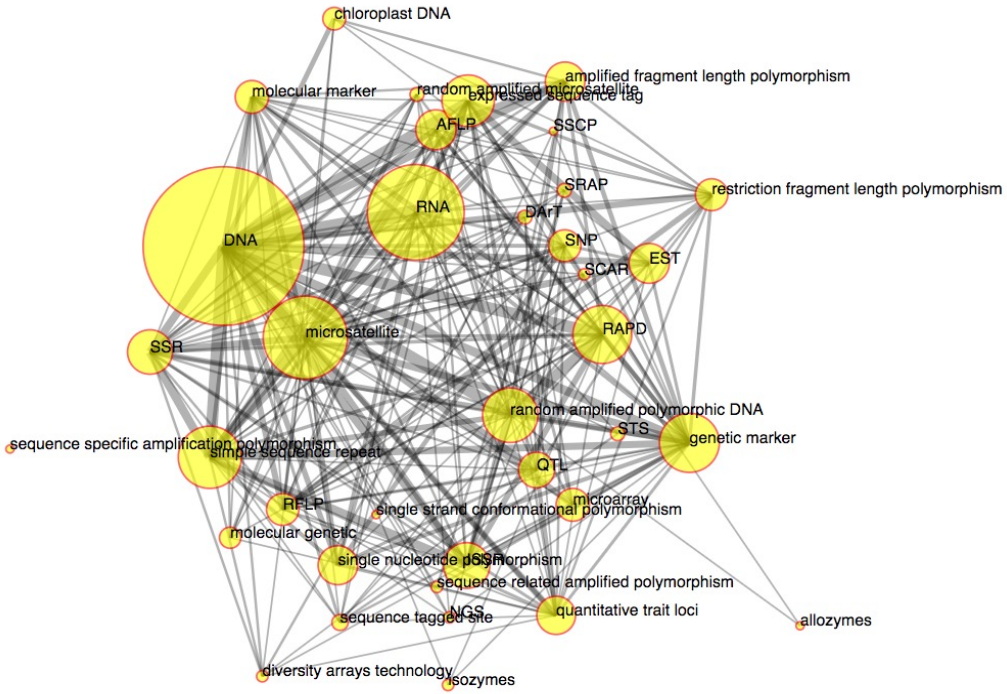

Building Bridges: Data Visualization

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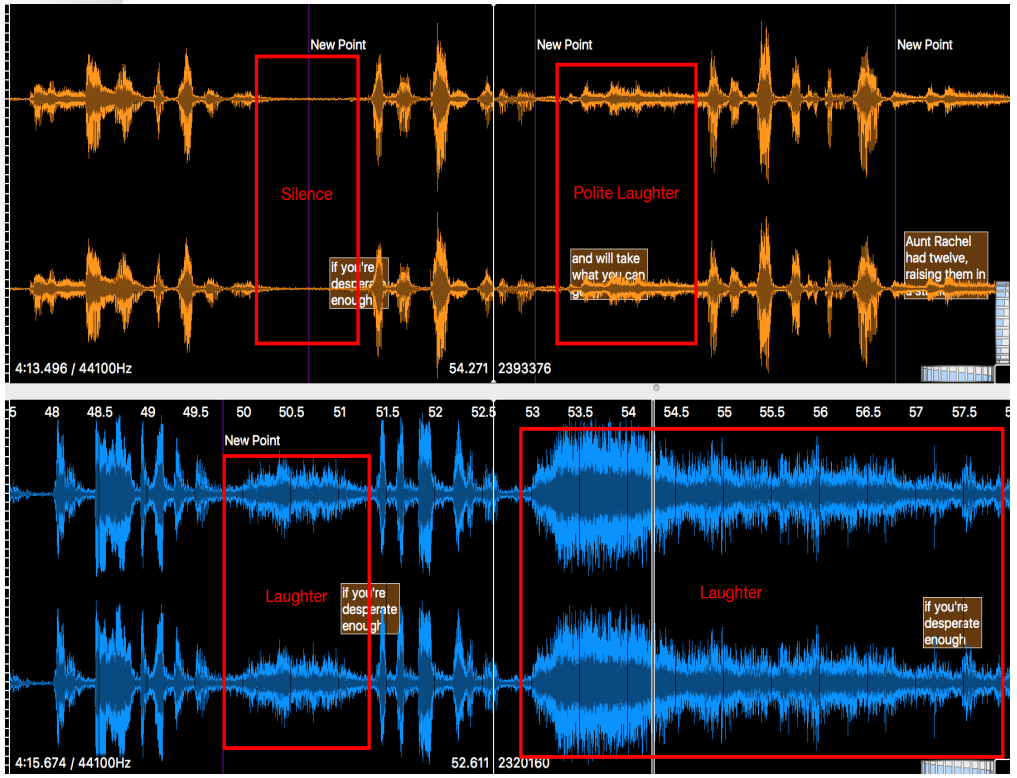
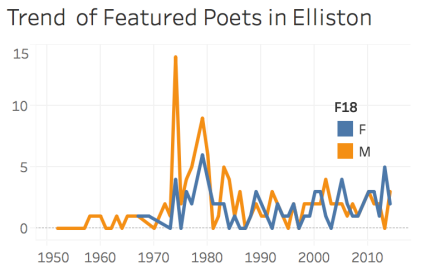
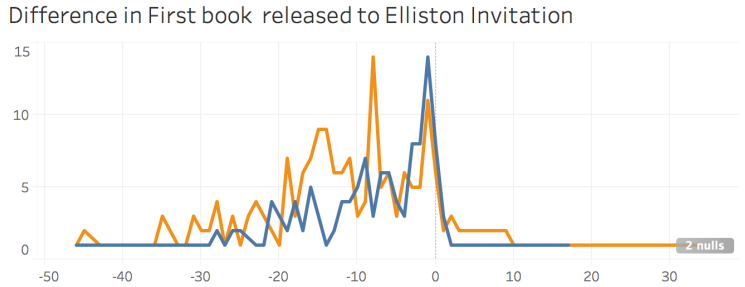
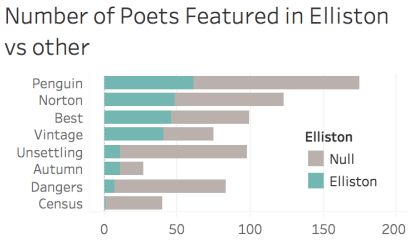
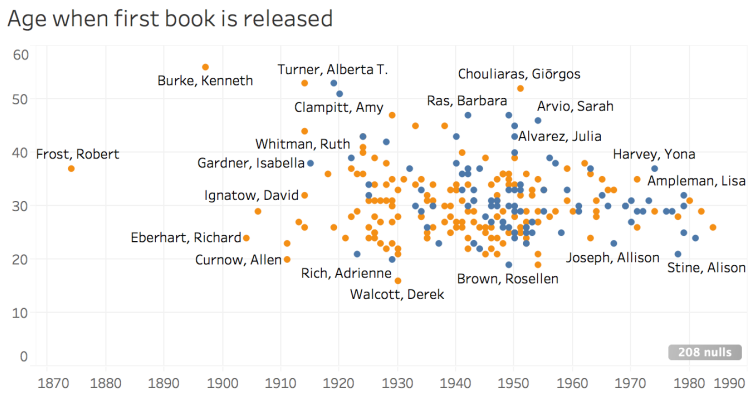
- Different visual frameworks for analysis and interpretability

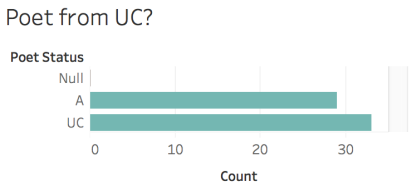












Shared Motivations, Different Languages

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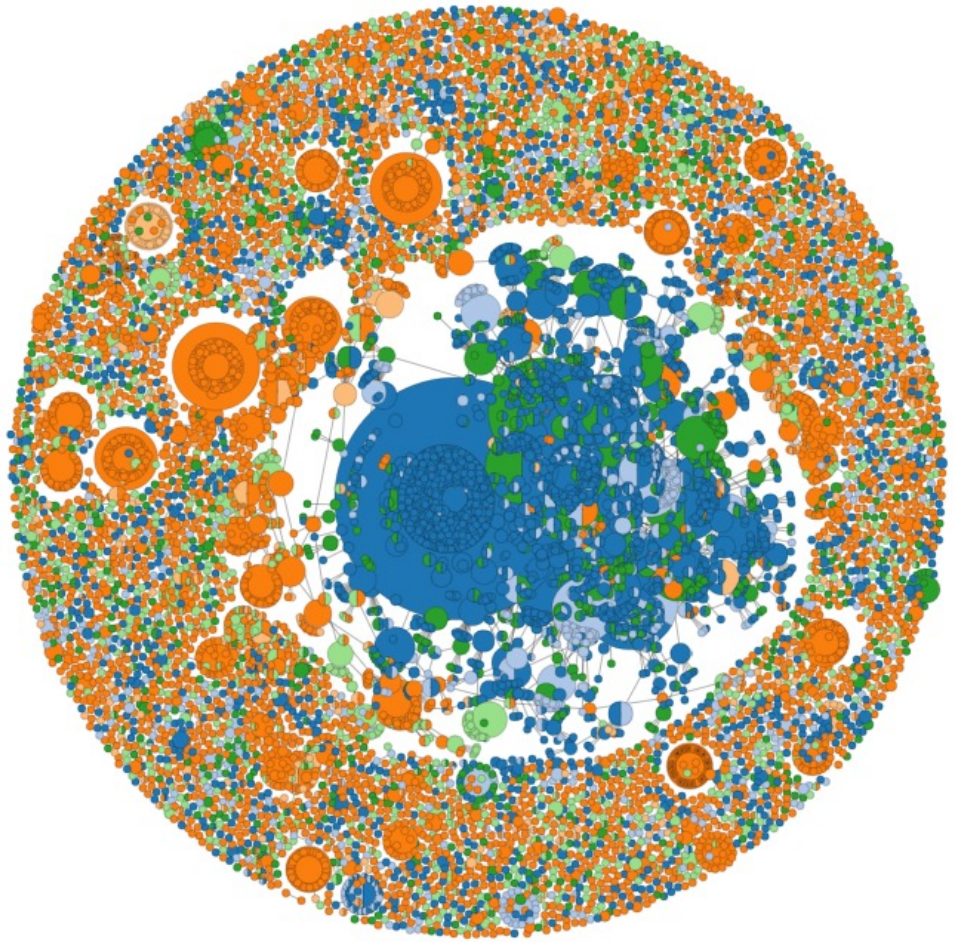
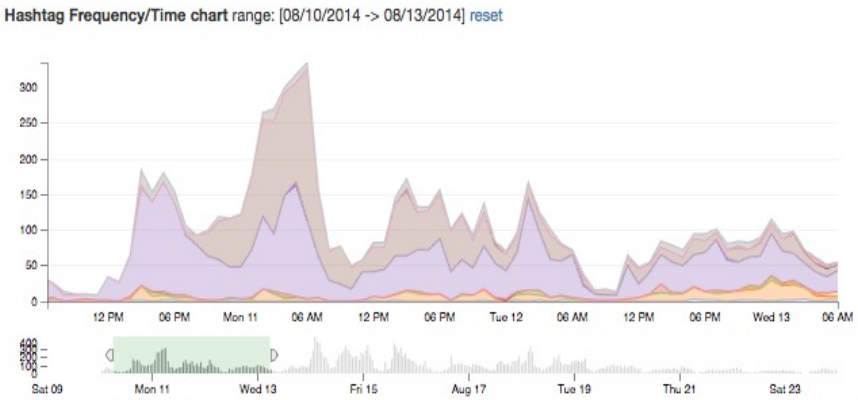
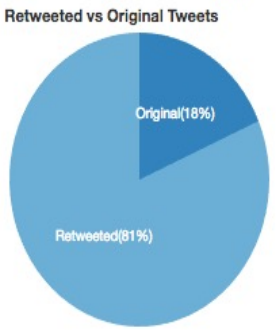
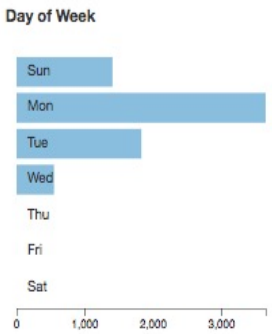
- Social Networks: Social network analysis and visualization.
- Team: DSC, A&S, Law, DAAP, CCHMC, CEAS, CECH.









Shared Motivations, Different Languages

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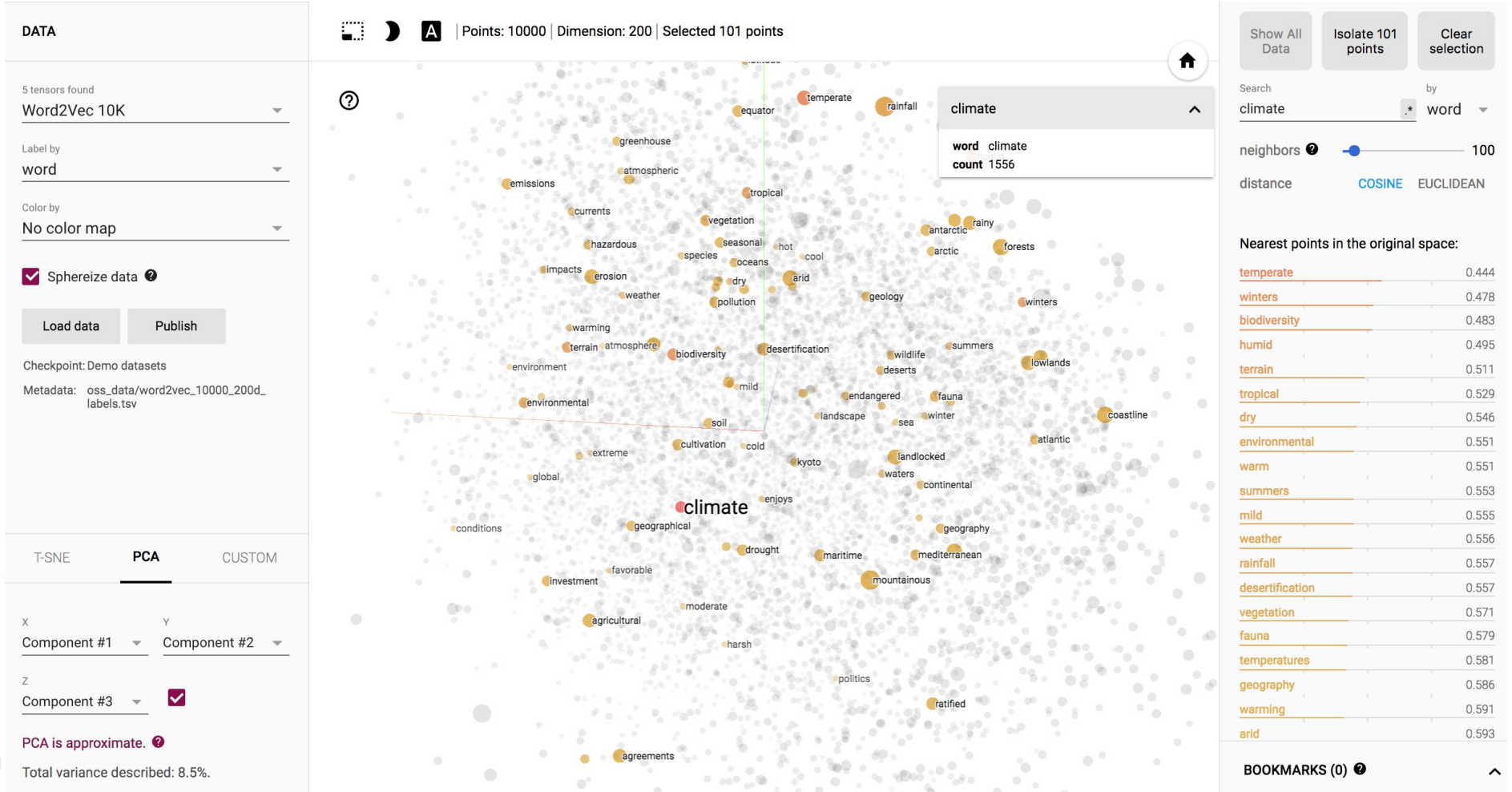
- Using machine learning to extract salient features, cluster, and classify free text in EHR and literature.
- Team: A&S Biological Sciences, UC CoM, CCHMC Hospital Medicine, among others.



Cloud Platform for Collaboration

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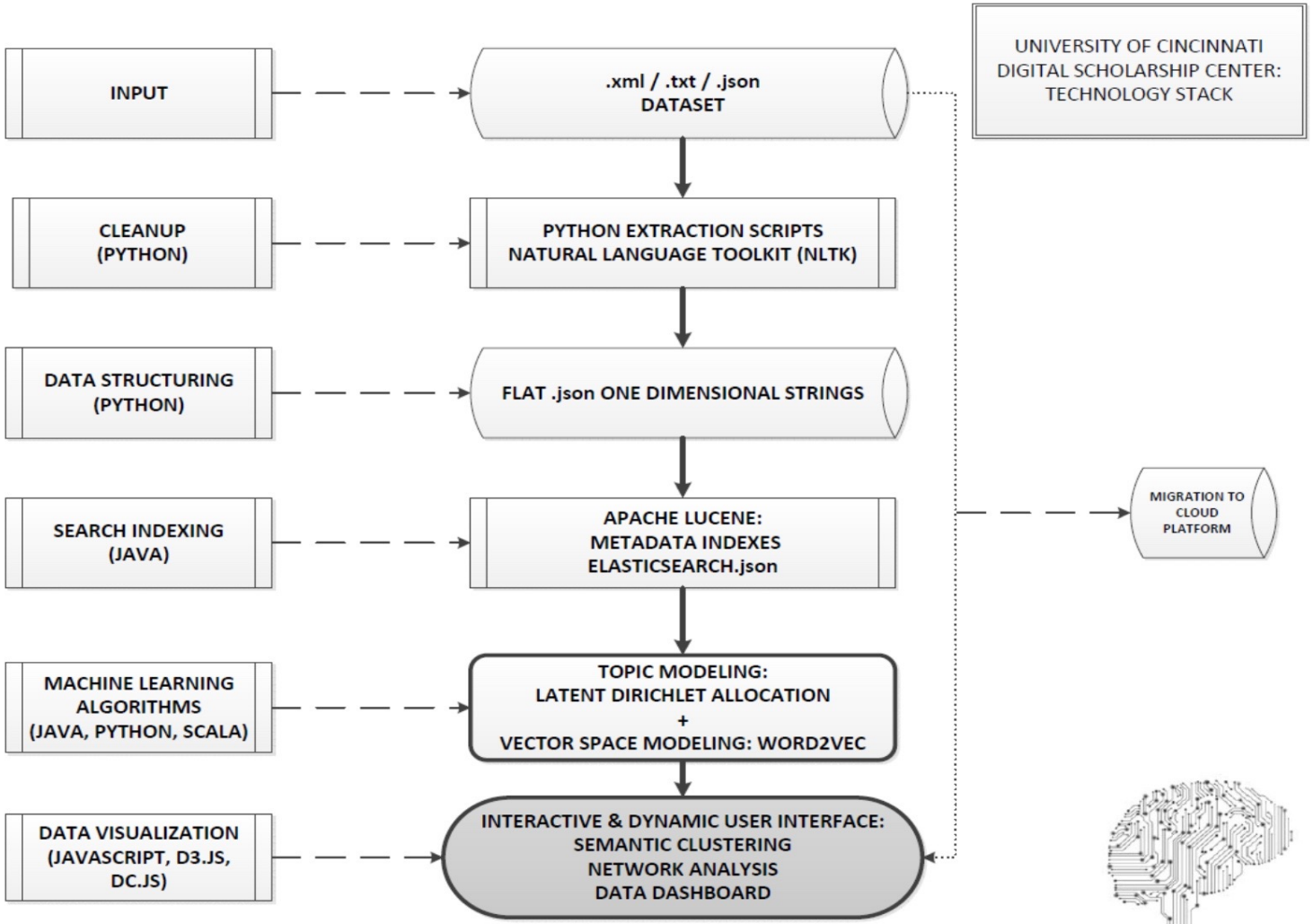
University of Cincinnati Digital Scholarship Center Technology Stack



Topic model: +plant +biodiversity-bow [50t,1 | Term: Check Models

Topic models are trained on selected searches from the Pubmed corpus. Visualization based on the Python port of the LDAvis package.

Select a topic to see the related documents.

Topic 6

[19723248] Phylogenetic origin of Phyllolobium with a further implicati	0.64
[23071663] Genetic diversity and population structure of cucumber (Cucu	0.54
[16622792] Biodiversity of Streptomyces of high-mountainous ecosystems	0.39
[26467618] Phylogeography of Phytophagous Weevils and Plant Species in	0.35
[23962409] Phylogeography sheds light on the central-marginal hypothesi	0.34
[24065181] Contemporary pollen-mediated gene immigration reflects the h	0.31
[17191876] Biologically active ibogan and vallesamine derivatives from	0.30
[18206283] Reduced nitrogen has a greater effect than oxidised nitrogen	0.28
[27886271] Speciation and genetic diversity in Centaurea subsect. Phalo	0.28
[22081412] Establishing the phylogenetic origin, history, and age of th	0.26
[22546007] Phylogeographic analysis reveals significant spatial genetic	0.26
[24498103] Genetic differentiation and genetic diversity of Castanopsis	0.26
[17638329] Topoisomerase-II-inhibitory principles from the stems of Spa	0.25
[20397228] Prenylated benzophenone peroxide derivatives from Hypericum	0.25
[16876446] Linking patterns and processes of species diversification in	0.24
[17509846] Diversity of viruses in Cryphonectria parasitica and C. nits	0.24
[18807258] Ectomycorrhizal characterization of an American chestnut (Ca	0.24
[20854478] Forest refugia revisited: nSSRs and cpDNA sequences support	0.24
[23469278] Effect of degradation intensity on grassland ecosystem servi	0.24
[23478944] Post-Boreotropical dispersals explain the pantropical disjun	0.24
[27974324] The evolutionary history of Eugenia sect. Phyllocalyx (Myrta	0.24
[25072783] Temperate pine barrens and tropical rain forests are both ri	0.23
[22182994] A phylogeny of Delphinieae (Ranunculaceae) shows that Aconit	0.22
[23418542] Phylogeographic evidence for a link of species divergence of	0.22
[24028582] Large-scale pattern of genetic differentiation within Africa	0.22
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[23629053] Diversification of plant species in arid Northwest China: sp	0.21
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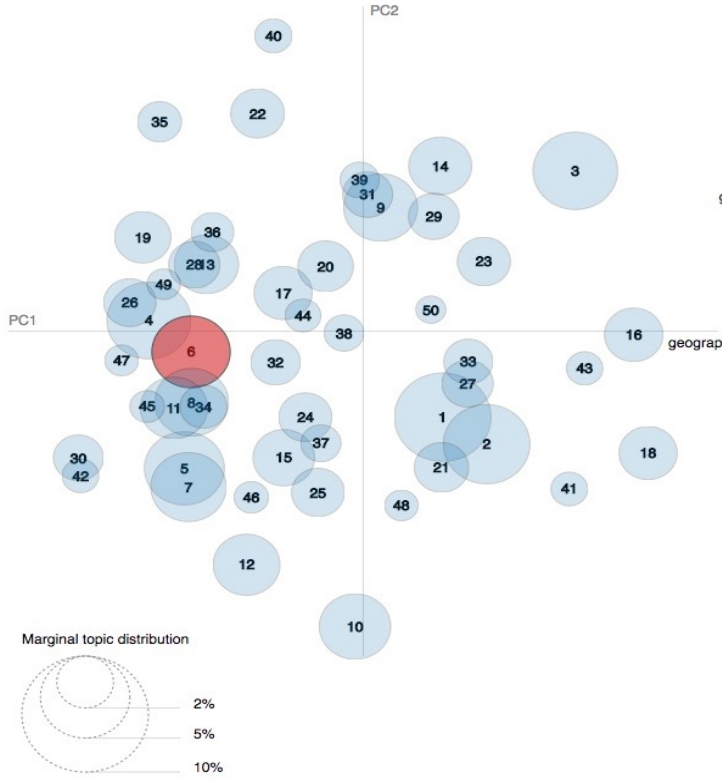
PMID	20854478
Article Title	Forest refugia revisited: nSSRs and cpDNA sequences support historical isolation in a wide-spread African tree with high colonization capacity, Milicia excelsa (Moraceae).
Pub Year	2010
Mesh Headings	Africa [D000349] Bayes Theorem [D001499] Cluster Analysis [D016000] DNA, Chloroplast [D018742] genetics [Q000235] DNA, Plant [D018744] genetics [Q000235] Evolution, Molecular [D019143] Gene Flow [D051456] Gene Pool [D005788] Genetics, Population [D005828] Microsatellite Repeats [D018895] Models, Genetic [D008957] Moraceae [D029586] genetics [Q000235] Pollen [D011058]

+plant +biodiversity-bow [50t,100p,2017-08-05,03.18.18] (7036 articles)

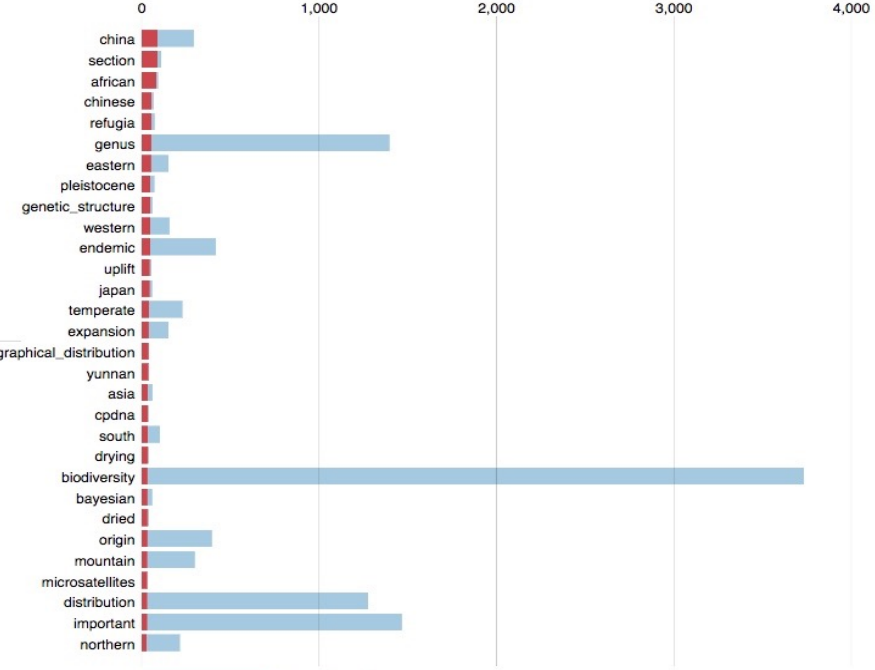
Selected Topic: 6 Previous Topic Next Topic Clear Topic

Slide to adjust relevance metric:(2) λ = 1 0.0 0.2 0.4 0.6 0.8 1.0

Intertopic Distance Map (via multidimensional scaling)



Top-30 Most Relevant Terms for Topic 6 (3.8% of tokens)



1. saliency(term w) = frequency(w) * [sum_t p(t | w) * log(p(t | w)/p(t))] for topics t; see Chuang et. al (2012)
2. relevance(term w | topic t) = λ * p(w | t) + (1 - λ) * p(w | t)/p(w); see Sievert & Shirley (2014)

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enter a search term

table cloud timeline json moors:china moors:turks america:china america othello china moors moor

1570	1580	1590	1600	1610	1620	1630	1640	1650	1660	1670	1680
turks 100%	turks 100%	moors 100%	turks 100%	turks 100%	moors 100%	turks 100%	saracens 64%, 68%	moors 100%, 69%	moors 100%, 75%	moors 100%, 69%	turks 71%, 100%
turkes 74%	turkes 80%	turks 100%	moors 100%	moors 100%	turks 100%	moors 100%	parthians 59%, 59%	turks 69%, 100%	turks 75%, 100%	turks 69%, 100%	moors 100%, 71%
saracens 70%	saracens 71%	turkes 78%	turkes 91%	turkes 81%	turkes 79%	turkes 79%	moors 100%	saracens 73%, 75%	tartars 69%, 74%	tartars 70%, 71%	spaniards 72%, 81%
assyrians 65%	persians 69%	tartars 68%	spaniards 69%	saracens 70%	saracens 71%	barbarians 72%	turks 100%	tartars 69%, 77%	spaniards 66%, 72%	saracens 67%, 71%	saracens 74%, 72%
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saracenes 63%	assyrians 64%	spaniards 65%	barbarians 66%	tartars 64%	parthians 61%	scythians 67%	gothes 67%	turkes 83%	portugals 68%, 61%	arabians 63%, 64%	persians 65%, 72%
tartarians 61%	egyptians 62%	dalmatians 64%	tartars 65%	arabians 64%	vandales 59%	persians 64%	infidels 67%	moores 78%	muscovites 62%, 64%	tartarians 61%, 65%	germans 68%, 68%
arabians 61%	arabians 61%	nomades 64%	sarazins 65%	barbarians 64%	portugals 59%	romans 63%	tartars 65%	sarmatians 72%	hungarians 70%	armenians 67%	venetians 73%
spanyards 60%	infidels 61%	persians 63%	moores 65%	infidels 64%	visigothes 59%	tartarians 62%	persians 63%	pagans 70%	moores 67%	mahometans 67%	imperialists 68%
gothes 60%	gothes 61%	gaules 62%	sicilians 63%	armenians 63%	pagans 58%	danes 61%	moores 63%	huns 69%	carthaginians 66%	scythians 66%	hungarians 67%
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		sacrata 60%	mahumetists 52%	epire 58%	tartars 58%	spartan 54%	tartarians 60%	goths 67%	germans 63%	goths 63%	cossacks 65%
		florentia 60%	perspicua 51%	benin 57%	goths 57%	patricians 54%	scythians 59%	persians 67%	pyrates 63%	portugals 62%	numidians 64%
		aider 60%	longi 50%	aria 57%	infidels 57%	scithians 53%	turkish 59%	turk 67%	mamalukes 63%	spaniards 61%	swedes 64%
		celtiberians 60%	bramas 50%	abassia 57%	herules 57%	libyan 53%	goths 59%	barbary 66%	arabians 63%	chineses 60%	gauls 64%

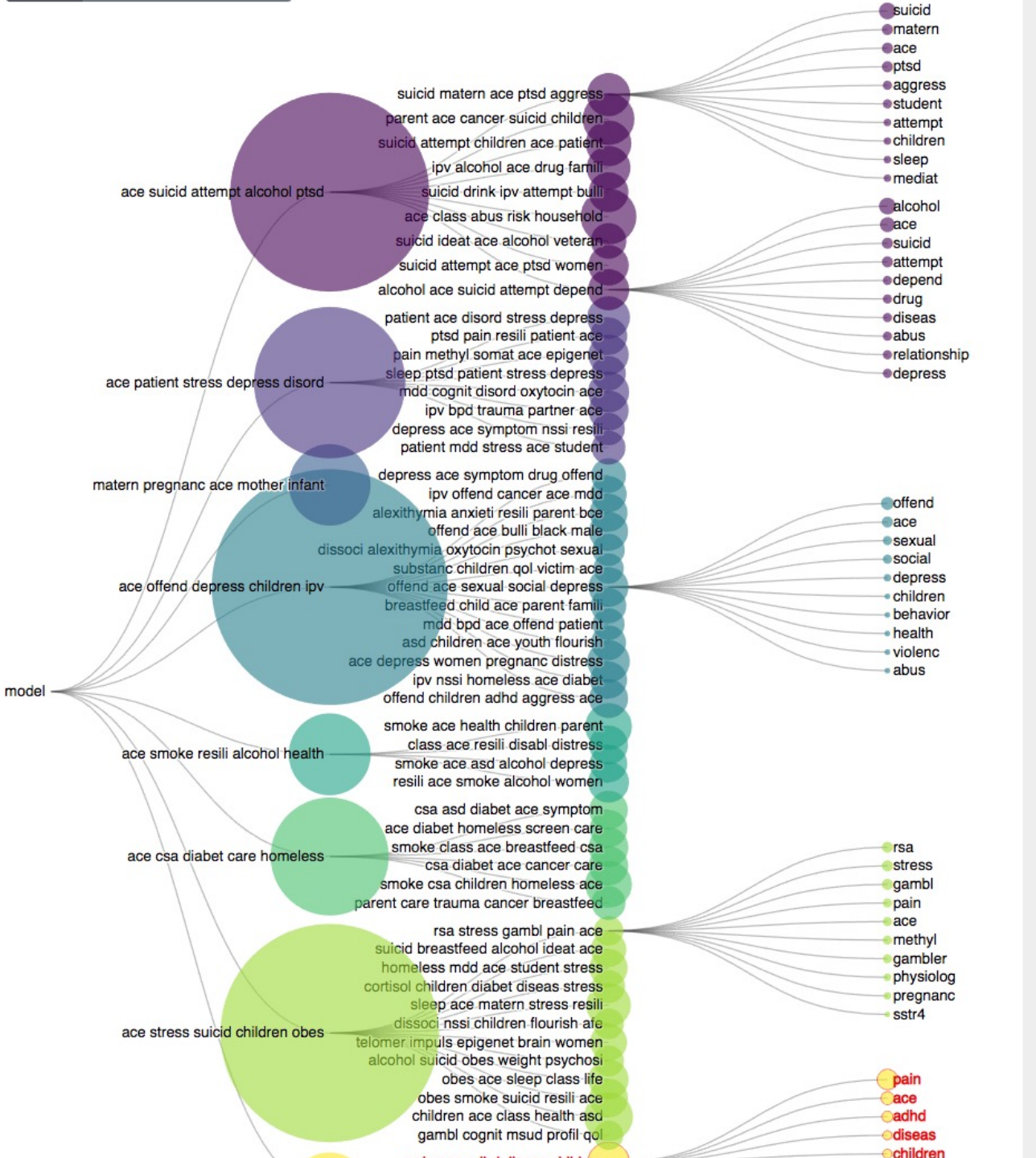
topic	over time	top words	proportion of corpus
Topic 1		increas given breath decreas secret apn cbg patient chang rate prn retract desatur morn rr thick	7.4%
Topic 2		secret patient suction note cloudi thick will frequent continu desatur progress requir see window amount monitor stabl thin	27.7%
Topic 3		secret stabl cloudi suction set thin will small vent current moder no desatur toler thick	54.2%
Topic 4		vital suction axillari resp secret temp will desatur puls bp file hc height tempsrc weight	4.3%
Topic 5		trach patient today mom rt secret care cuff rn back dad suction bag educ leak	6.3%

topic	over time	top words	proportion of corpus
Topic 10		stabl no patient desatur current set will remain vent note toler ventil issu overnight night	23.3%
Topic 5		desatur stabl patient will suction current vent one overnight recov set increas breath agit remain	15.7%
Topic 6		secret cloudi suction small thin desatur stabl will vent set clear no toler well moder thick	15.4%
Topic 9		patient desatur see note progress increas expect bag recov suction wean back requir rn bradi satur ventil will	9.4%
Topic 8		vital axillari stabl resp puls bp file temp tempsrc weight hc height night will desatur	8.6%
Topic 7		window no mom today desatur min trach dad hour well patient place toler parent room time	7.9%
Topic 2		desatur increas night patient breath suction rr time retract apn given decreas frequent no awar morn	6.8%
Topic 4		note monitor sx frequent desatur cloudi vent distress suction time close continu thin will requir	5.7%
Topic 3		cuff desatur leak trach volum low no chang ml high breath increas alarm place post time	4.4%

Title	Score
Associations between adverse events in childhood and chronic widespread pain in adulthood: are they	0.995311439037323
Adverse Childhood Experiences and Psychological Distress in Juvenile Offenders: The Protective Influ	0.9952369332313538
Dying to be famous: retrospective cohort study of rock and pop star mortality and its association wi	0.9951603412628174
Impact of early personal-history characteristics on the Pace of Aging: implications for clinical tri	0.9951075911521912
The relationship between childhood adversity and food insecurity: 'It's like a bird nesting in your	0.9950807690620422
Enhanced startle reflexivity during presentation of visual nurture cues in young adults who experien	0.9949988722801208
The evidence base for routine enquiry into adverse childhood experiences: A scoping review.	0.9949987530708313
On Becoming Trauma-Informed: Role of the Adverse Childhood Experiences Survey in Tertiary Child and	0.99470454454422
Screening for Toxic Stress Risk Factors at Well-Child Visits: The Addressing Social Key Questions fo	0.99470454454422

The transgenerational transmission of maternal adverse childhood experiences (ACEs): Insights from placental aging and infant autonomic nervous system reactivity.

<PubmedArticle>OBJECTIVE: To test alterations in placental cellular aging as one pathway by which maternal early adversity influences physiologic development in her offspring. METHODS: Maternal report of her adverse childhood experiences (ACE) was obtained prenatally along with measures of prenatal stress and demographic information. Placentas (N = 67) were collected at birth and telomere length (TL) was measured in four separate fetally-derived placental tissues: amnion, chorion, villus, and umbilical cord. At four months of age, infants completed the still-face paradigm (SFP)



cluster	#para, #docs	# topics	terms
3	2106,0	13	ace offend depress children ipv
6	1873,0	12	ace stress suicid children obes
0	2309,0	9	ace suicid attempt alcohol ptsd
1	1258,0	8	ace patient stress depress disord
5	1159,0	6	ace csa diabet care homeless
2	744,0	4	matern pregnanc ace mother infant
4	1082,0	4	ace smoke resili alcohol health
7	778,0	4	pain ace disabl adhd diseas

Term : Adverse_childhood_experiences | # Topics : 10 | tfidf : True | Passes : 20

Documents

Title	Score
Disadvantage of Social Sensitivity: Interaction of Oxytocin Receptor Genotype and Child Maltreatment	0.9948852062225342
Early adversity and 5-HTT/BDNF genes: new evidence of gene-environment interactions on depressive sy	0.9948559403419495
Parental care moderates the influence of MAOA-uVNTR genotype and childhood stressors on trait impuls	0.9948260188102722
Anterior cingulate cortex grey matter volume abnormalities in adolescents with PTSD after childhood	0.9945440292358398
Translation and validation of the Chinese ICD-11 International Trauma Questionnaire (ITQ) for the As	0.9945108294487
Association of Adverse Childhood Experiences and Food Addiction to Bariatric Surgery Completion and	0.9944427609443665
Adverse Childhood Experiences Ontology for Mental Health Surveillance, Research, and Evaluation: Adv	0.9942294359207153
A simulation and video-based training program to address adverse childhood experiences.	0.9941542744636536
Nondermatomal somatosensory deficits in chronic pain patients: are they really hysterical?	0.9940776824951172
Psychosocial predictors of weight loss after bariatric surgery.	0.9940382838249207

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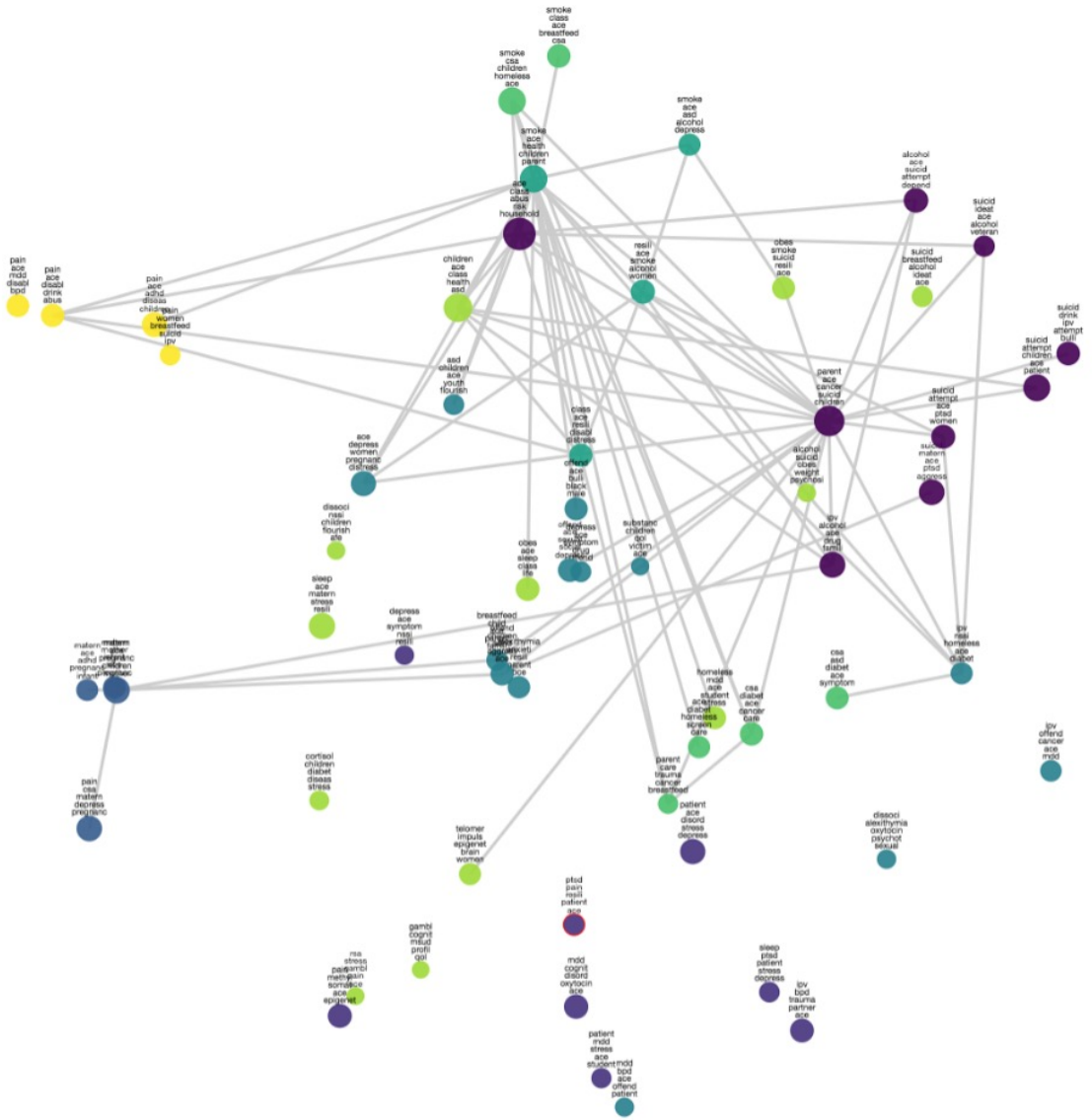
Tree | Circle | Network

KL limit:0.63

Circle – Paragraph Level/Square – Article Level



Clusters

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