Machine Learning for Complex Social Processes

Hanna Wallach

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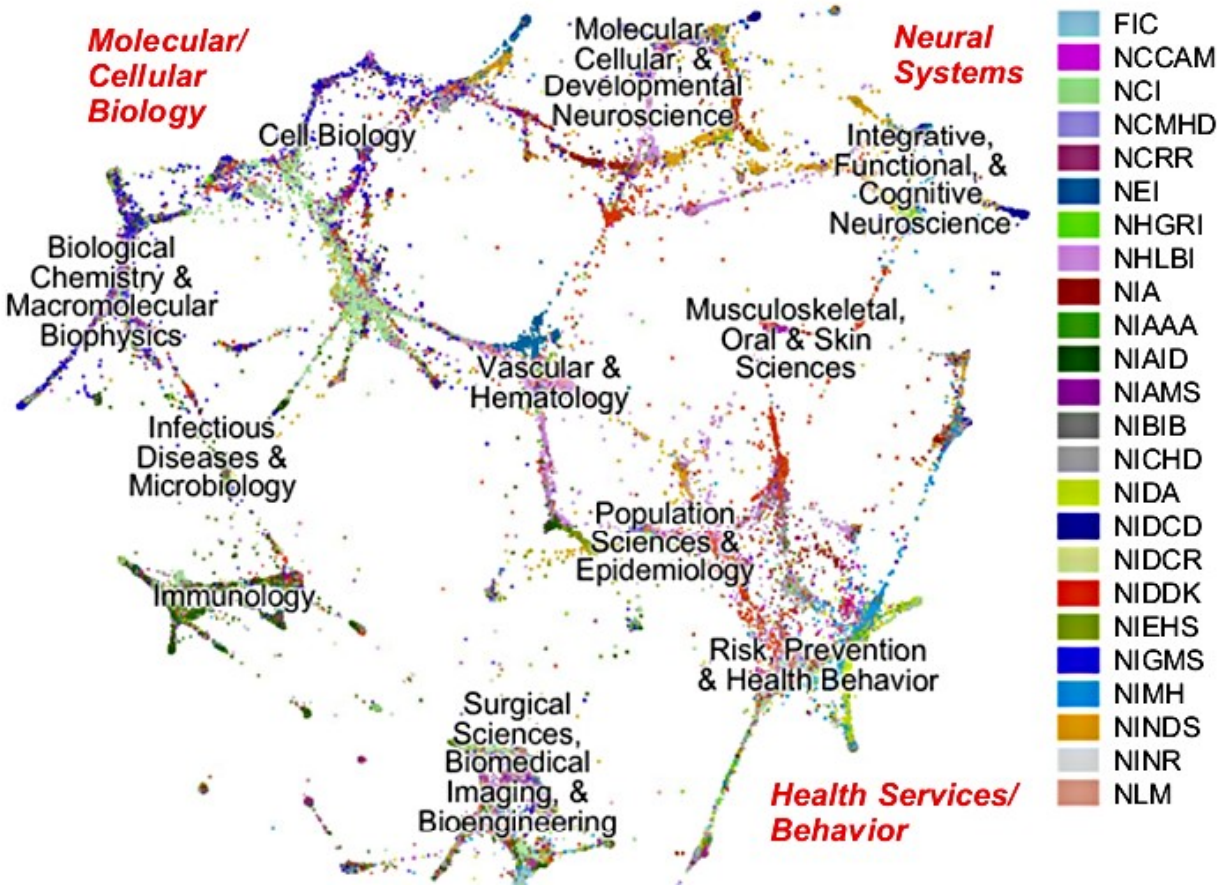
Complex Social Processes

National Institutes of Health



United States Patent System

(12) **United States Design Patent** (10) **Patent No.:** **US D478,999 S**
Jobs et al. (45) **Date of Patent:** ** **Aug. 26, 2003**

(54) **STAIRCASE**

(75) Inventors: **Steve Jobs**, Palo Alto, CA (US); **Karl Backus**, Emeryville, CA (US); **Rosa Sheng**, Emeryville, CA (US); **Ben McDonald**, San Francisco, CA (US); **Michael Waltner**, Berkeley, CA (US); **Colleen Caulliez**, San Francisco, CA (US); **James O'Callaghan**, New York, NY (US); **Graham Coult**, London (GB); **Damian Rogan**, New York, NY (US); **Scott Nelson**, Cirencester (GB)

(73) Assignee: **Apple Computer, Inc.**, Cupertino, CA (US)

(**) Term: **14 Years**

(21) Appl. No.: **29/164,077**

(22) Filed: **Jul. 15, 2002**

(51) **LOC (7) Cl.** **25-04**
(52) **U.S. Cl.** **D25/62**
(58) **Field of Search** D25/62, 69; 52/182, 52/184, 188, 190, 191

(56) **References Cited**

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Primary Examiner—Doris Clark
(74) *Attorney, Agent, or Firm*—Beyer Weaver & Thomas, LLP

(57) **CLAIM**

We claim the ornamental design for a staircase, substantially as shown and described.

DESCRIPTION

FIG. **1** is a perspective view of a staircase in accordance with the present design. The staircase has a transparent character.
FIG. **2** is a front view for the staircase shown in FIG. **1**.
FIG. **3** is a rear view for the staircase shown in FIG. **1**.
FIG. **4** is a left side view for the staircase shown in FIG. **1**.
FIG. **5** is a right side view for the staircase shown in FIG. **1**.
FIG. **6** is a top view for the staircase shown in FIG. **1**; and,
FIG. **7** is a bottom view for the staircase shown in FIG. **1**.

1 Claim, 7 Drawing Sheets

Representatives and Constituents

NEWS

Pelosi Statement on Two Year Anniversary of Student Aid and Fiscal Responsibility Act

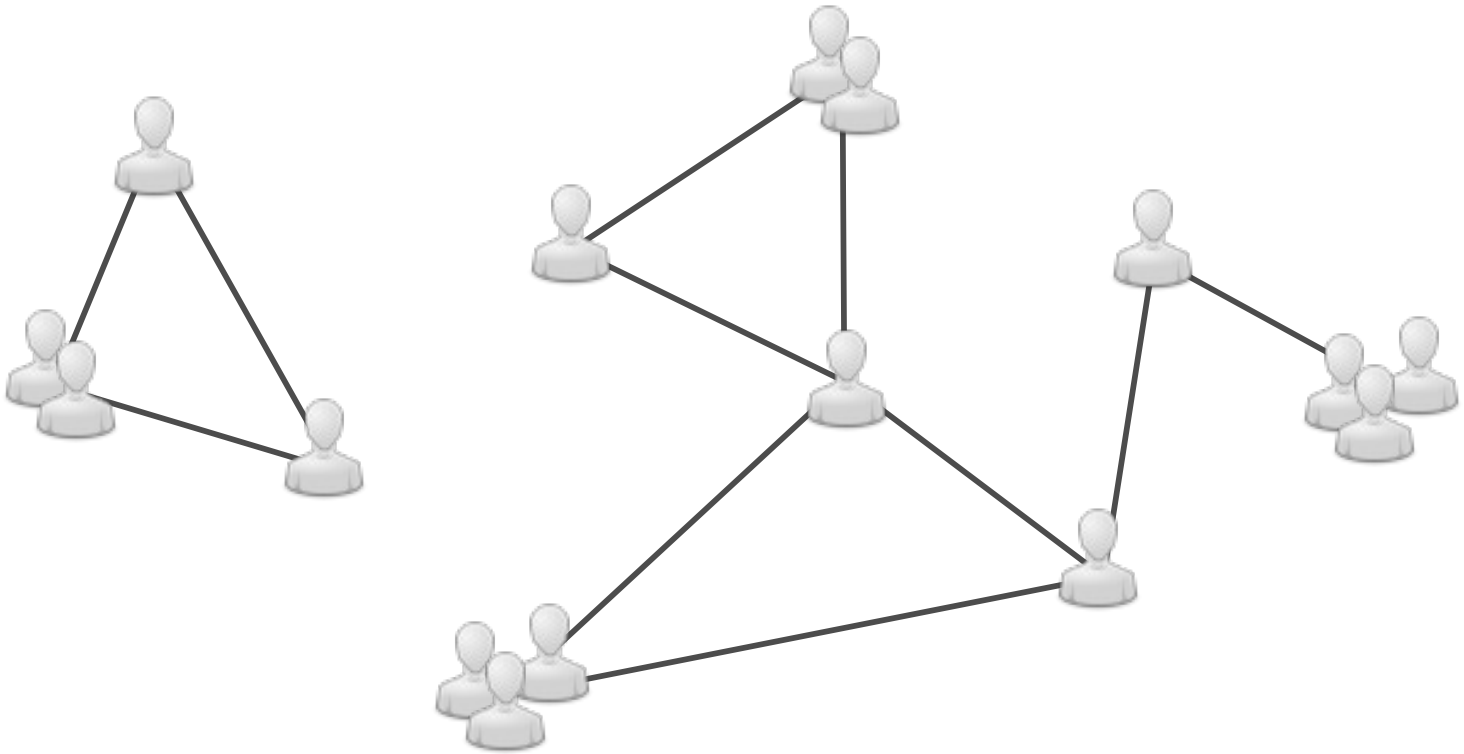
March 30, 2012
Contact: Nadeam Elshami/Drew Hammill, 202-226-7616

Washington, D.C. – Democratic Leader Nancy Pelosi released the following statement today in commemoration of the second anniversary of the Student Aid and Fiscal Responsibility Act, which represents the single largest investment in college aid in our nation's history:

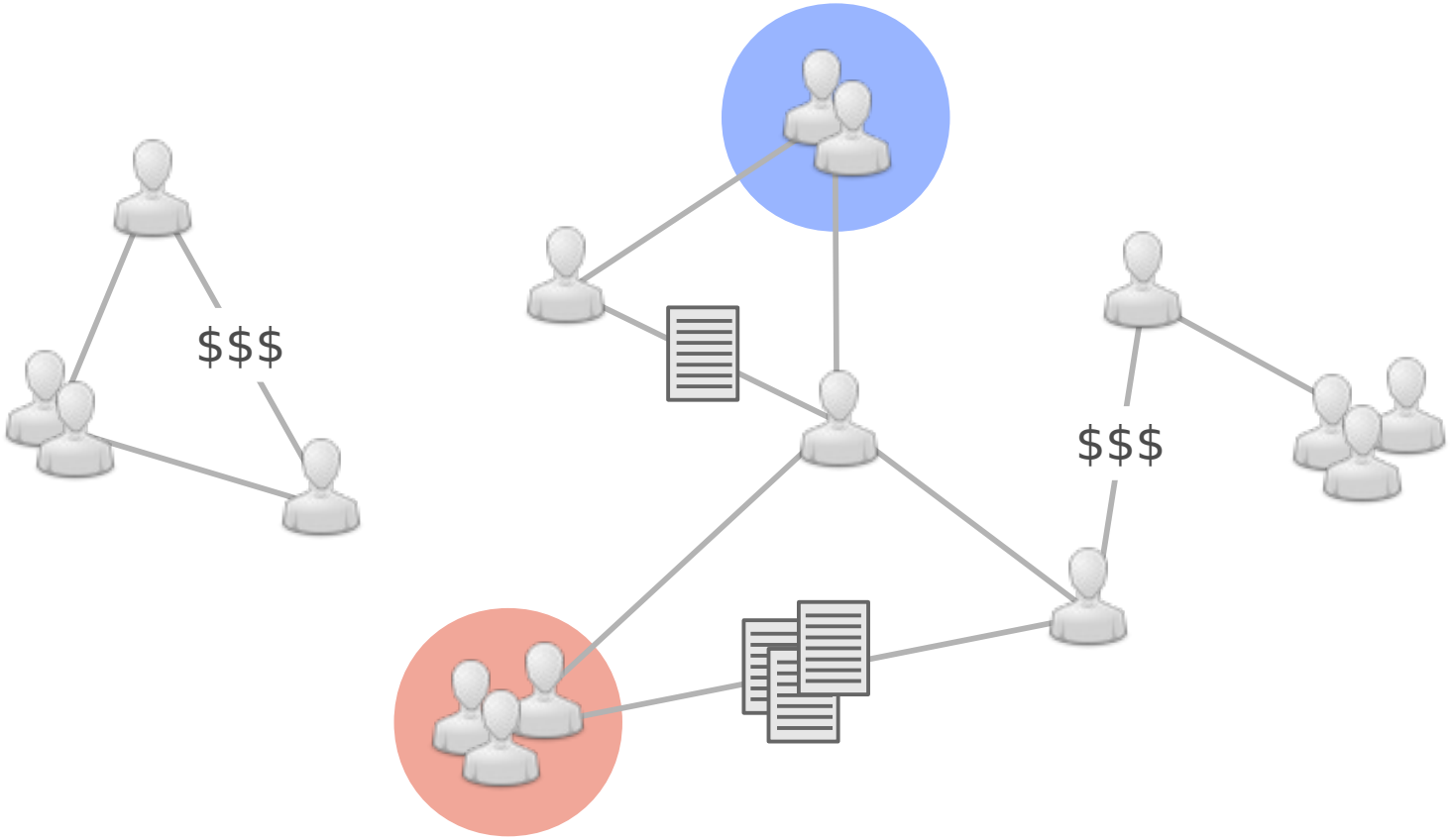
"Two years ago, Democrats were proud to lead the way in passing the single largest investment in college aid in our nation's history. With the Student Aid and Fiscal Responsibility Act, we lowered the cost of student loans, strengthened community colleges, increased the maximum Pell Grant, and invested in Historically Black Colleges and Universities and Minority Serving Institutions.

"Education is the best investment parents can make in their children, individuals can make in themselves, and a nation can make in its future. That's why the budget passed by House Republicans this week is so distressing. Instead of reigniting the American dream, it makes it more difficult for student to afford higher education: allowing interest rates on some students loans to double and cutting hundreds of thousands of students from the Pell Grant program.

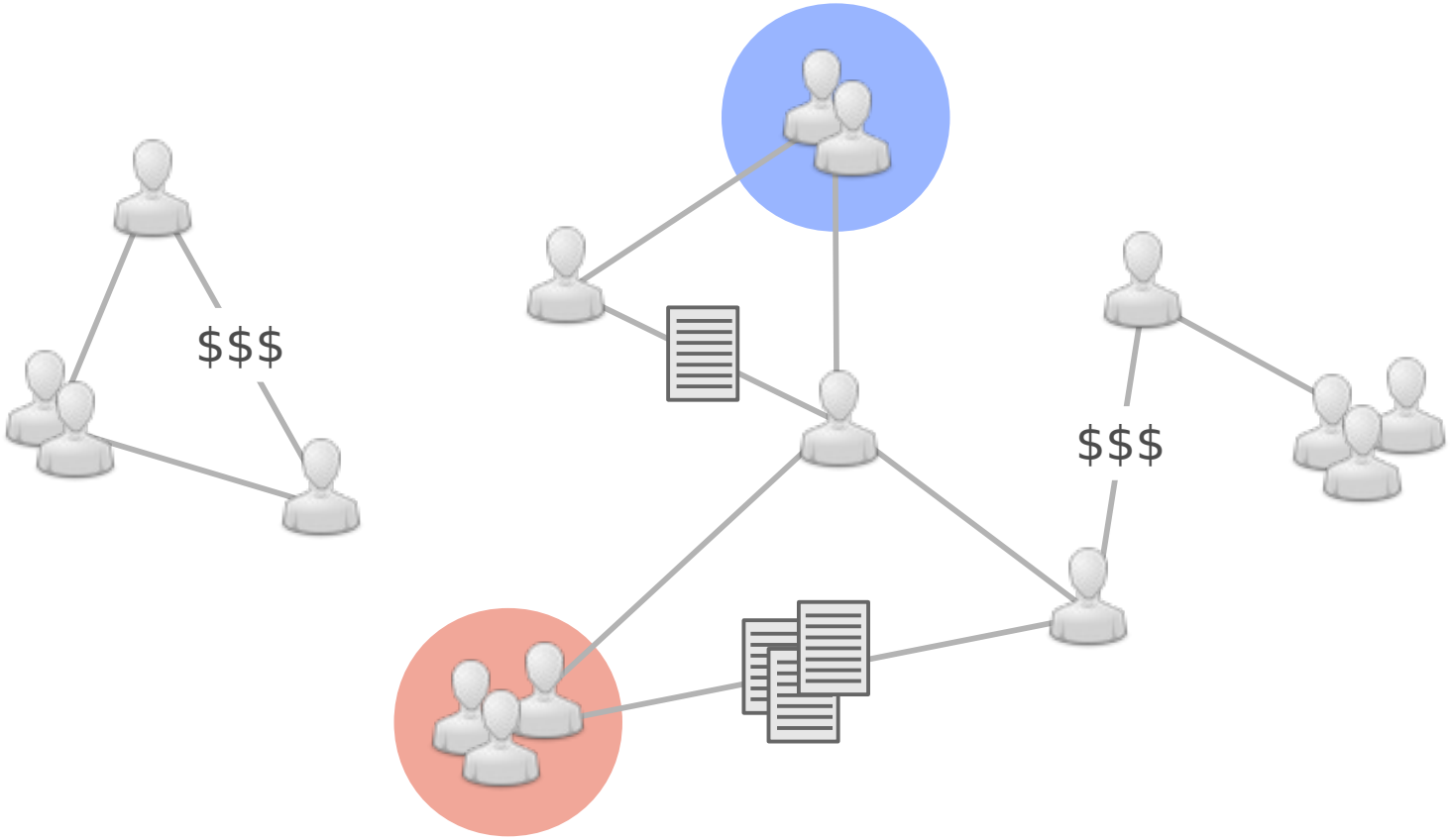
Social Processes: Structure



Social Processes: Content



Social Processes: Dynamics



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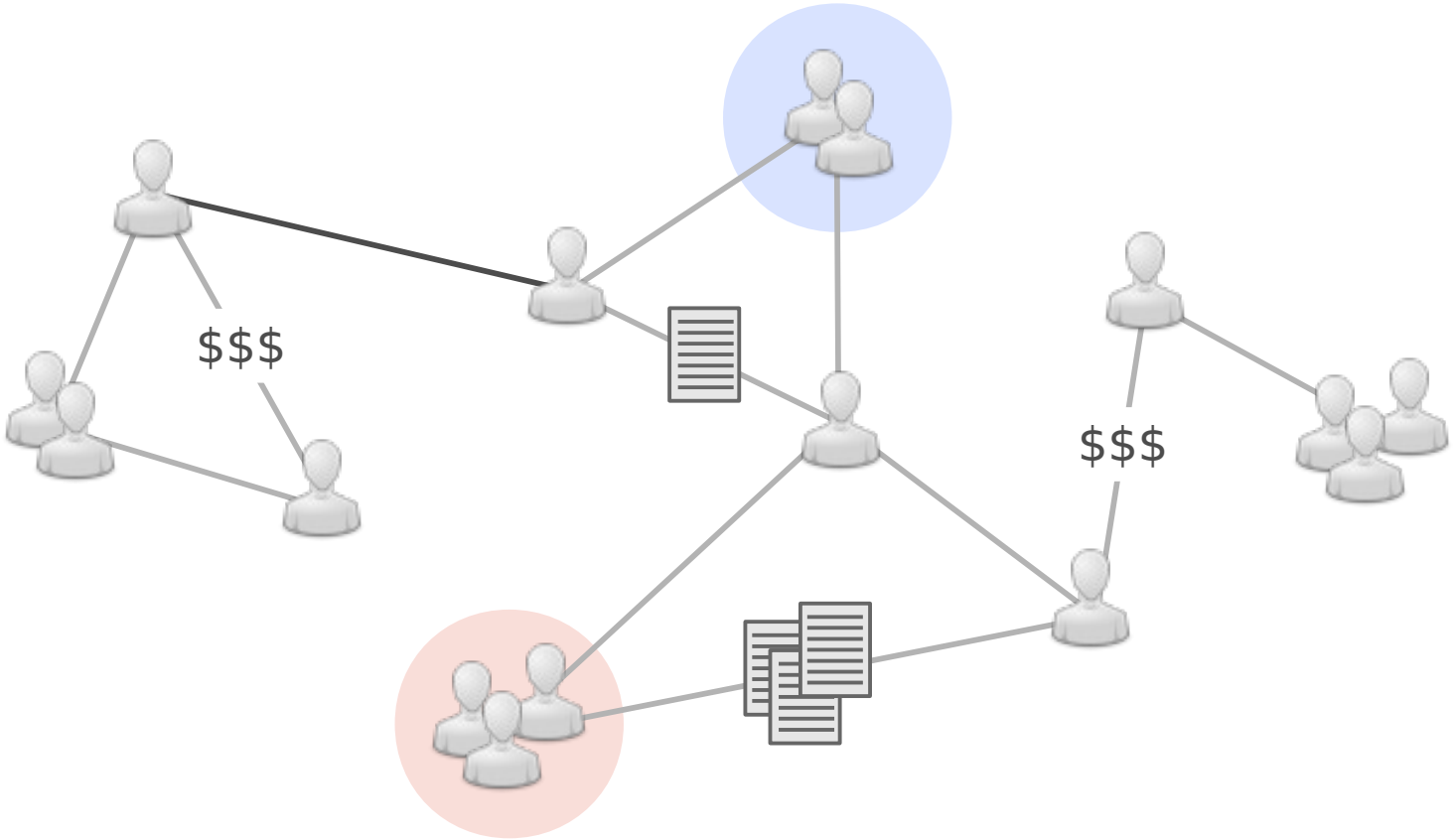

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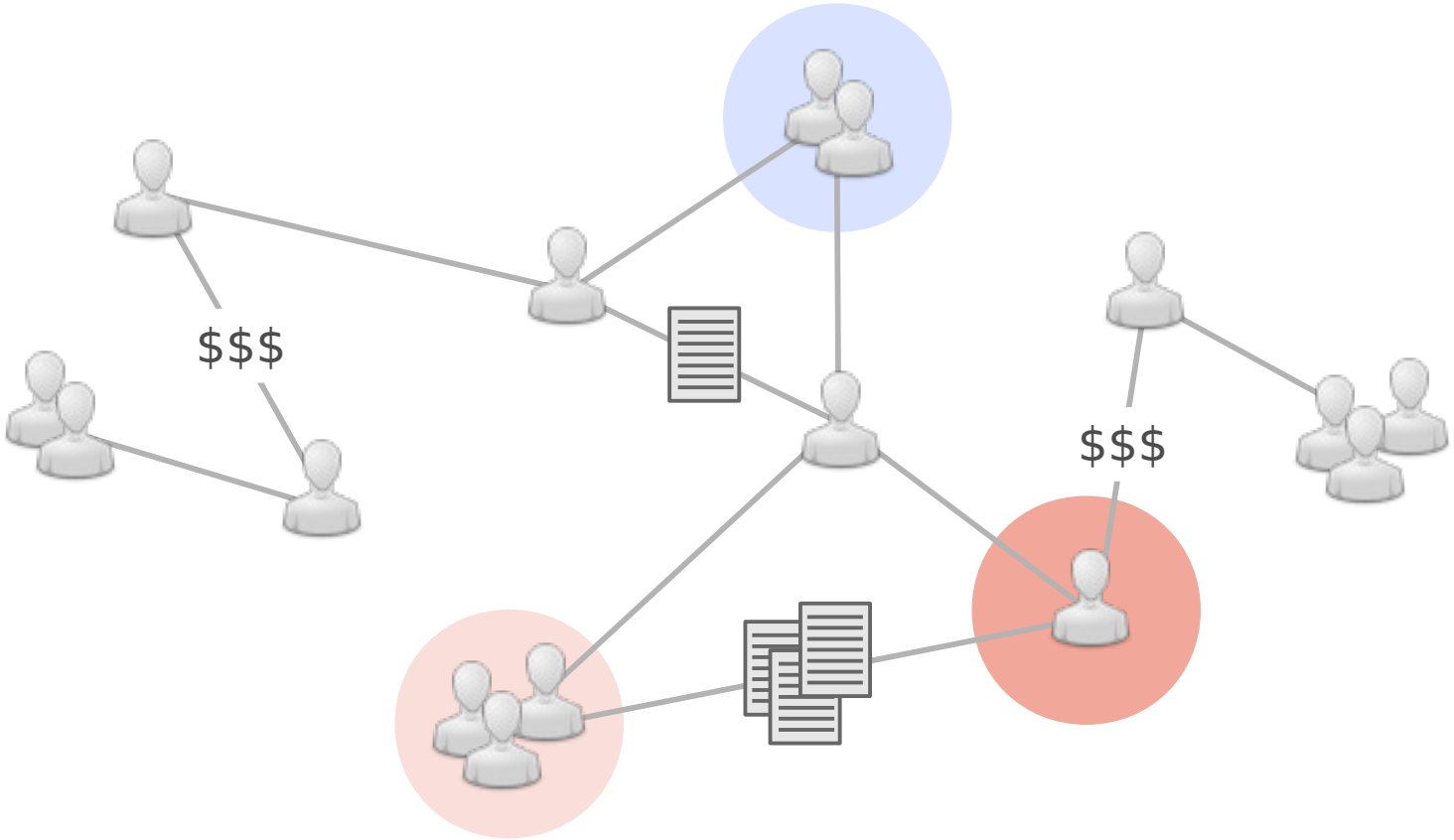

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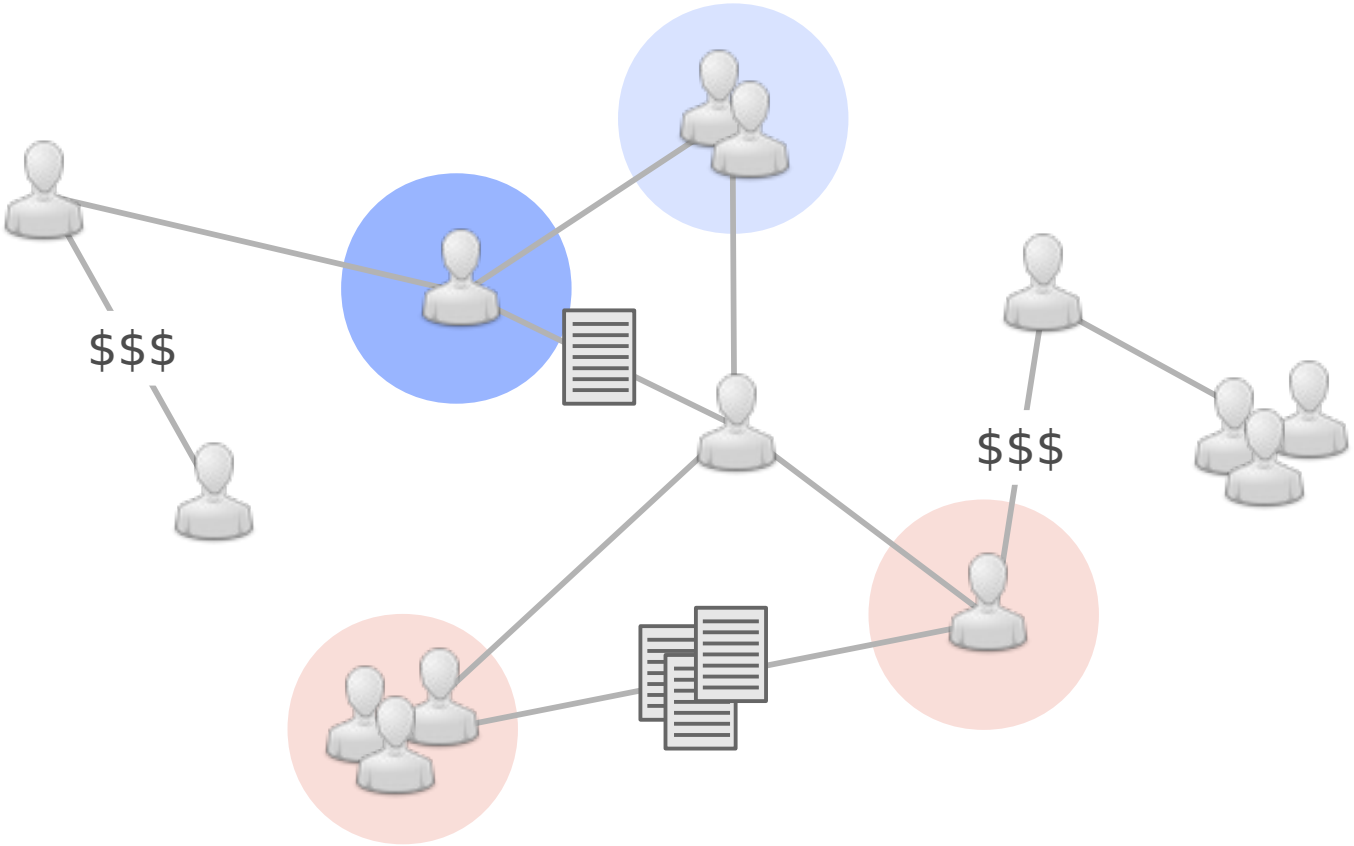
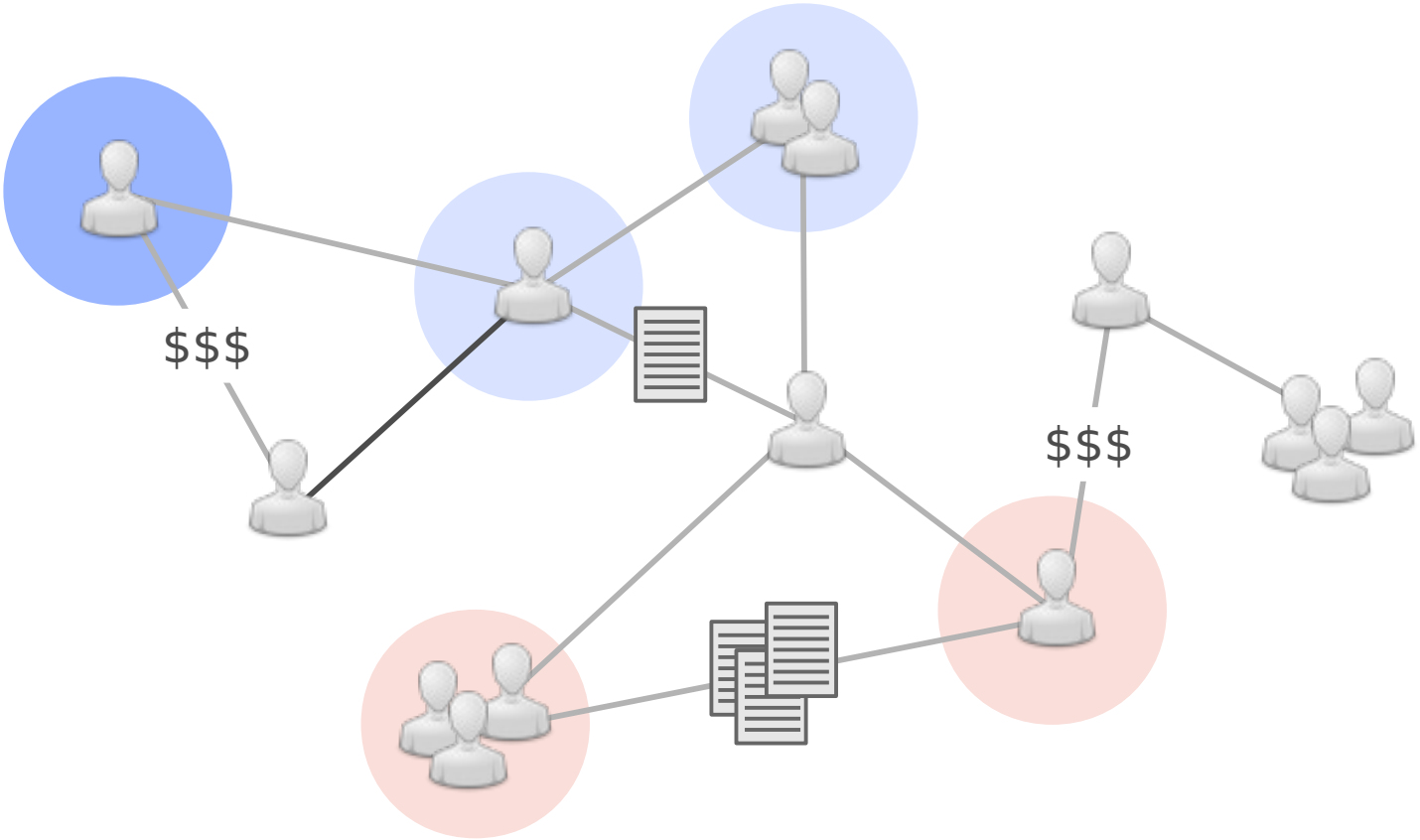


Social Processes: Dynamics

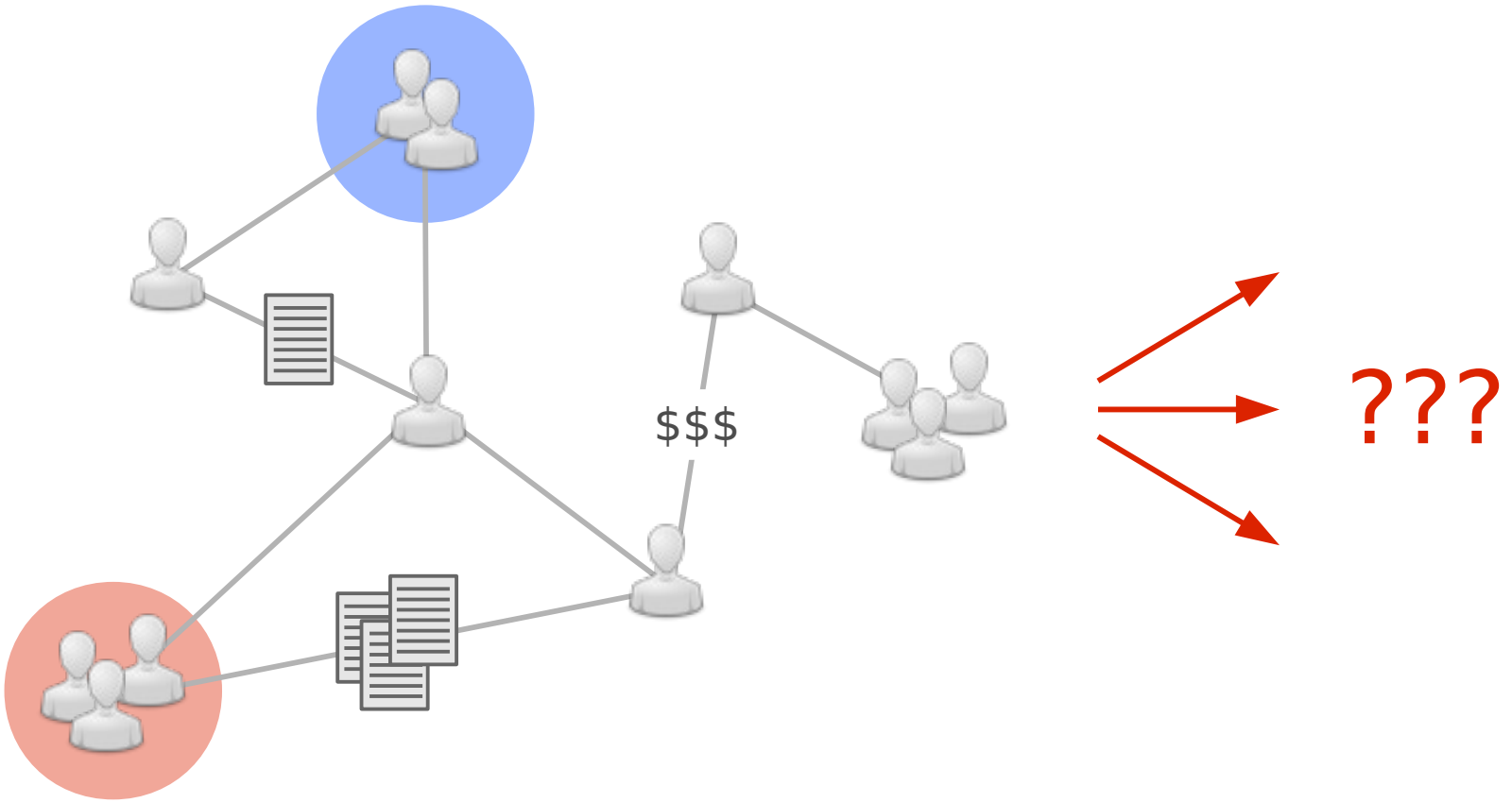


Modeling Social Processes

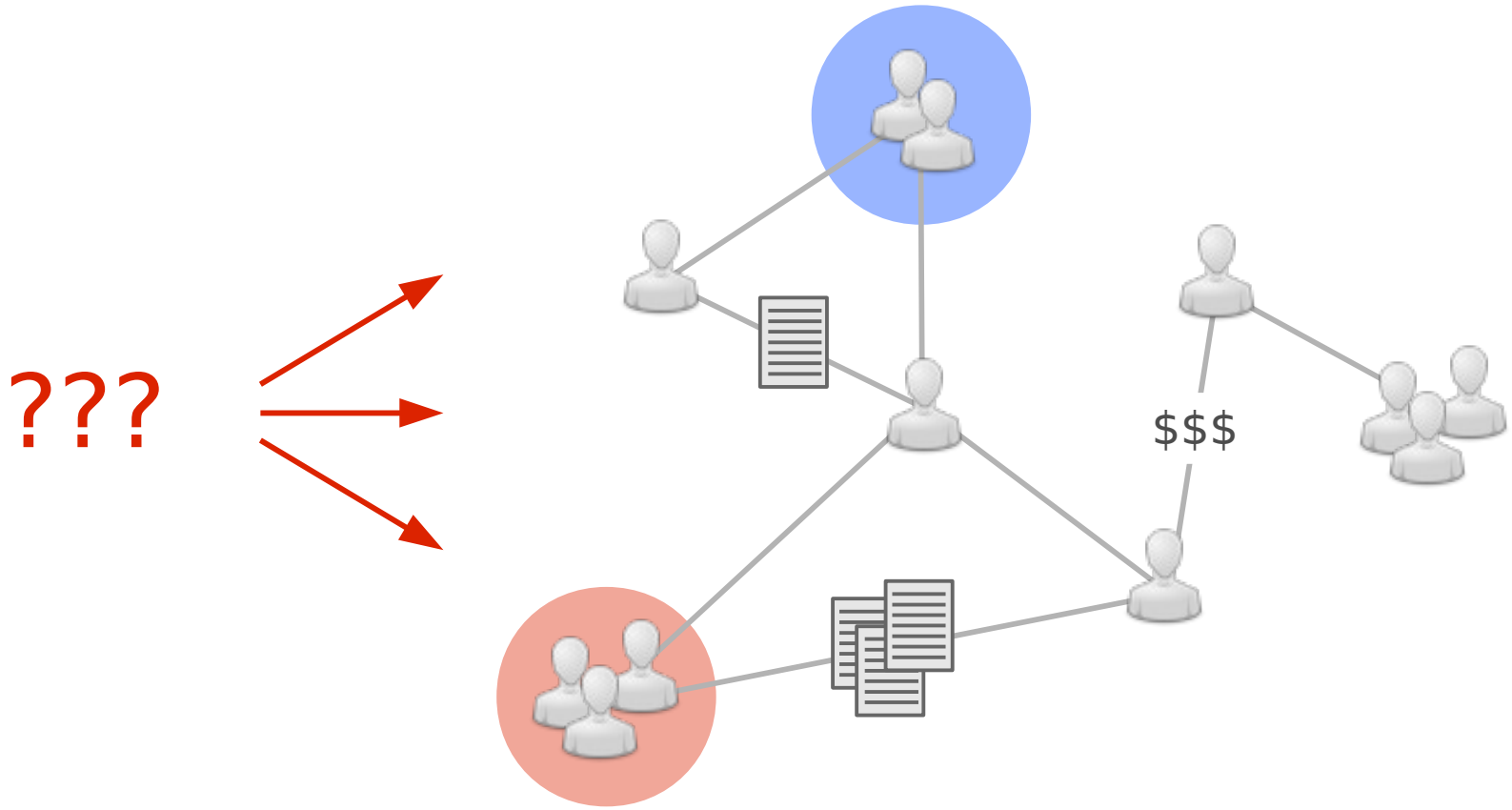
“Policy-makers or computer scientists may be interested in finding the needle in the haystack (such as a potential terrorist threat or the right web page to display from a search), but social scientists are more commonly interested in characterizing the haystack.”

— King & Hopkins, 2010

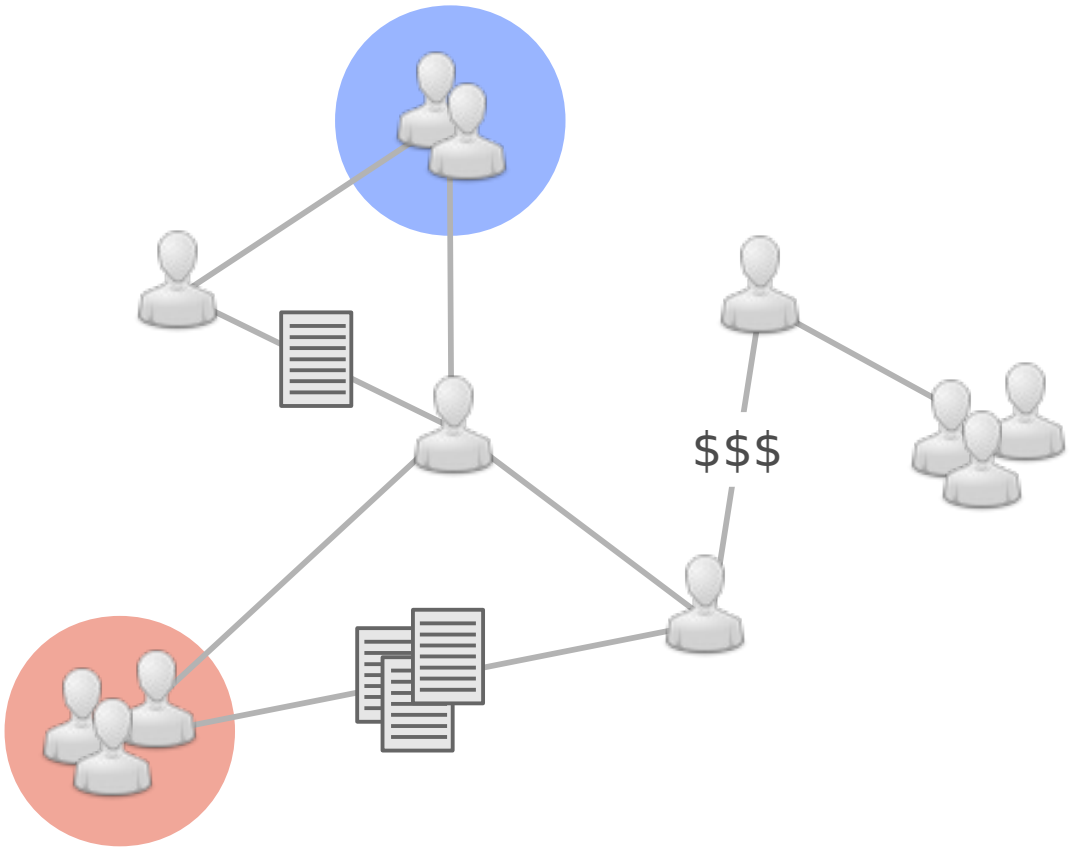
Predictive Analyses



Explanatory Analyses



Exploratory Analyses



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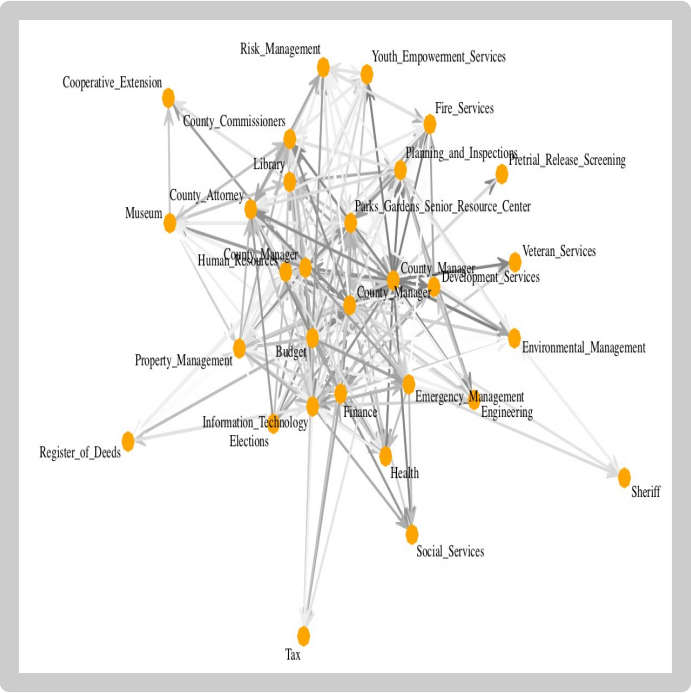
Bayesian Latent Variable Models

- Modeling challenges:
  - Aggregating and representing large data sets
  - Handling data from sources with disparate emphases
  - Efficiently reasoning under uncertain information
- Bayesian latent (i.e., hidden) variable models:
  - Appropriate for prediction, explanation, and exploration
  - Interpretable structure, not “black-box” models
  - Powerful, flexible, widely applicable...

This Talk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Youth_Empowerment_Services
Cooperative_Extension
Fire_Services
County_Commissioners
Planning_and_Inspections
Pretrial_Release_Screening
Library
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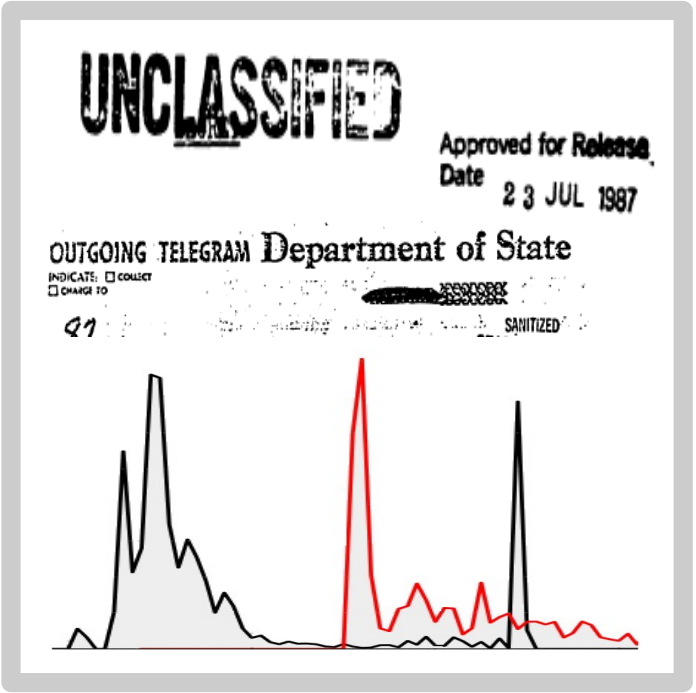
Parks_Gardens_Senior_Resource_Center
Veteran_Services
County_Manager
Human_Resources
County_Manager
Development_Services
County_Manager
Environmental_Management
Property_Management
Budget
Emergency_Management
Engineering
Finance
Information_Technology
Elections
Register_of_Deeds
Health
Sheriff
Social_Services
Tax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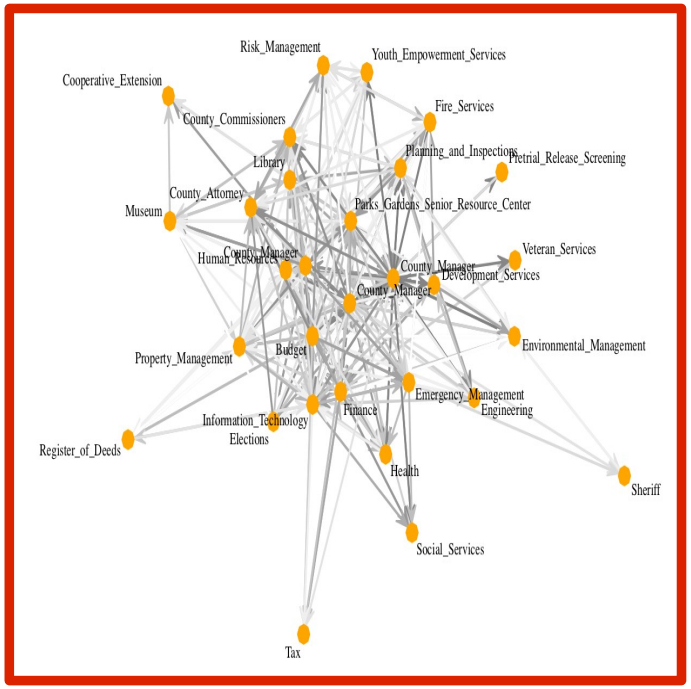
This Talk


Risk_Management
Youth_Empowerment_Services
Cooperative_Extension
Fire_Services
County_Commissioners
Planning_and_Inspections
Pretrial_Release_Screening
Library
County_Attorney
Museum
Parks_Gardens_Senior_Resource_Center
Veteran_Services
County_Manager
Human_Resources
County_Manager
Development_Services
County_Manager
Environmental_Management
Property_Management
Budget
Emergency_Management
Engineering
Finance
Information_Technology
Elections
Register_of_Deeds
Health
Sheriff
Social_Services
Tax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Date
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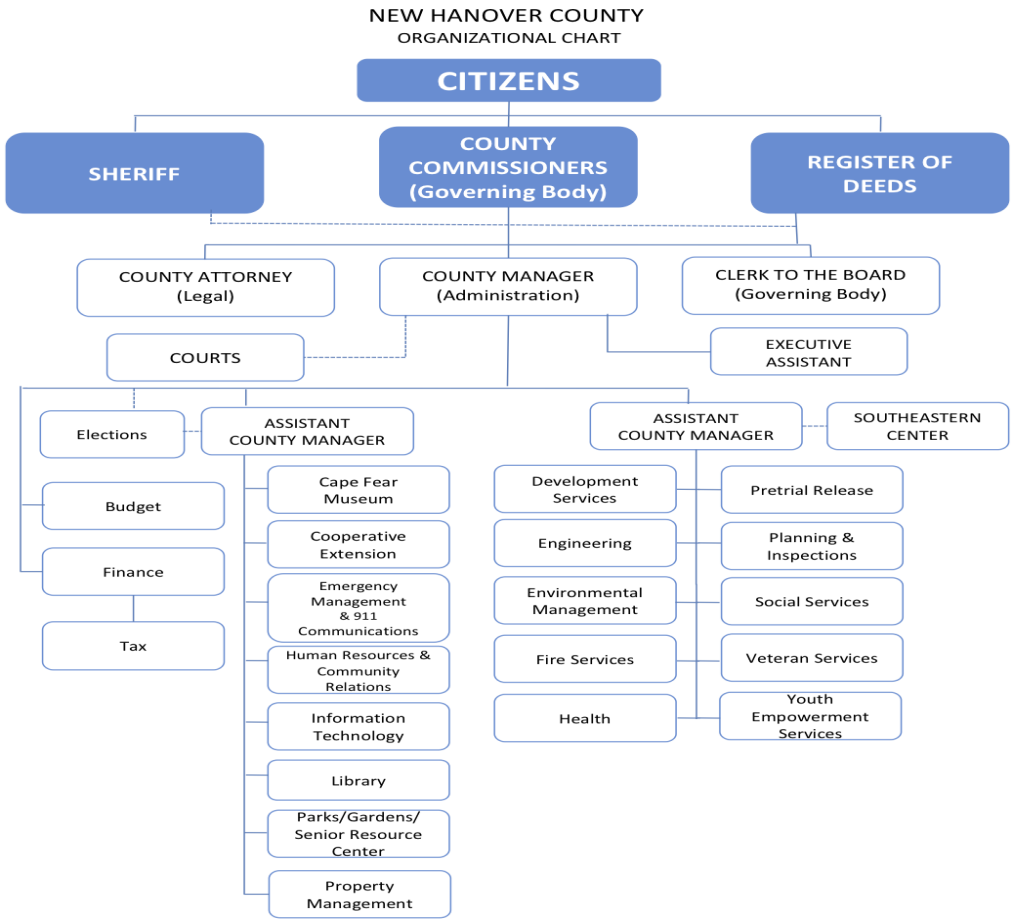
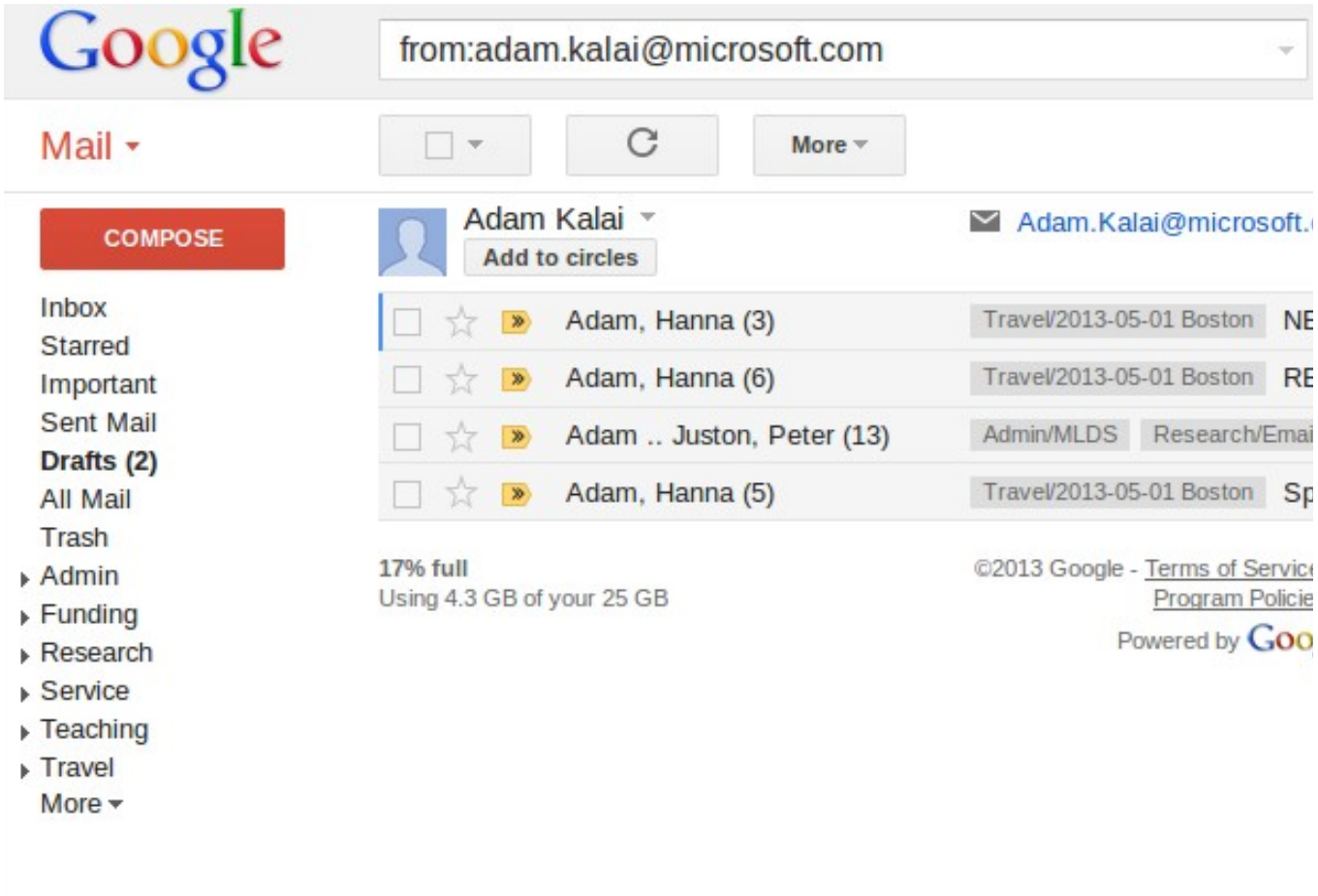
Communication Networks

Communication Networks

Communication Networks



Observing Communication Networks

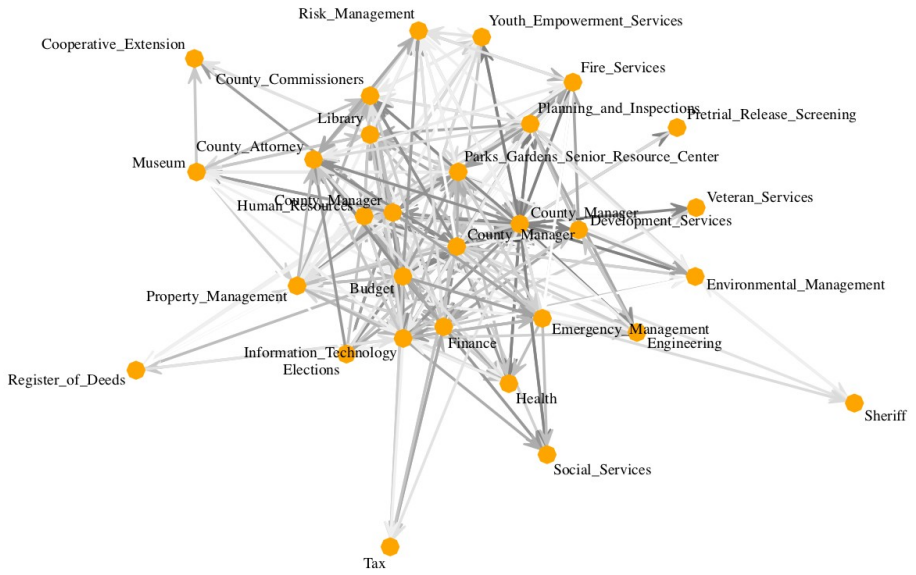


Structure and Content

Subject: New Hanover County Public Safety Talk Groups
From: “Lee, Warren” <WLee@nhcgov.com>
To: “Pope, Troy W.” <twpope@ncshp.org>
Cc: ...

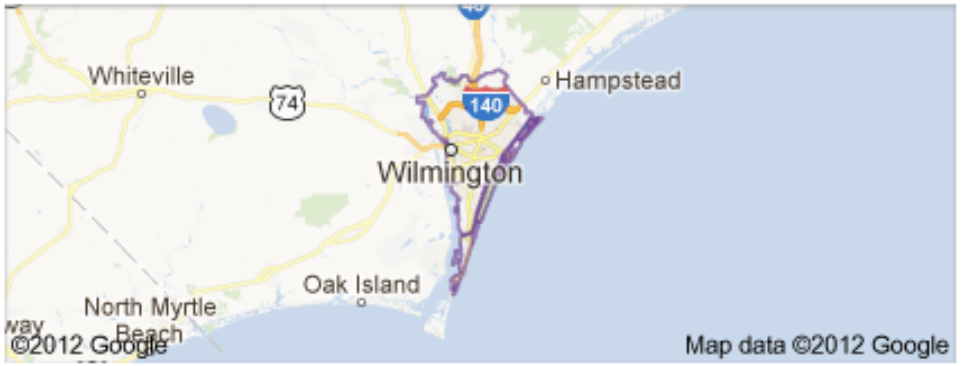
Troy,

I wanted to give you an update on our progress in moving towards a fully digital public safety radio system in New Hanover County...



New Hanover County, NC

New Hanover County
North Carolina



New Hanover County is one of 100 counties located in the U.S. state of North Carolina. Though second smallest in area, it is one of the most populous as its county seat, Wilmington, is one of the state's largest cities. Wikipedia

Area: 328 sq miles (849.5 km²)

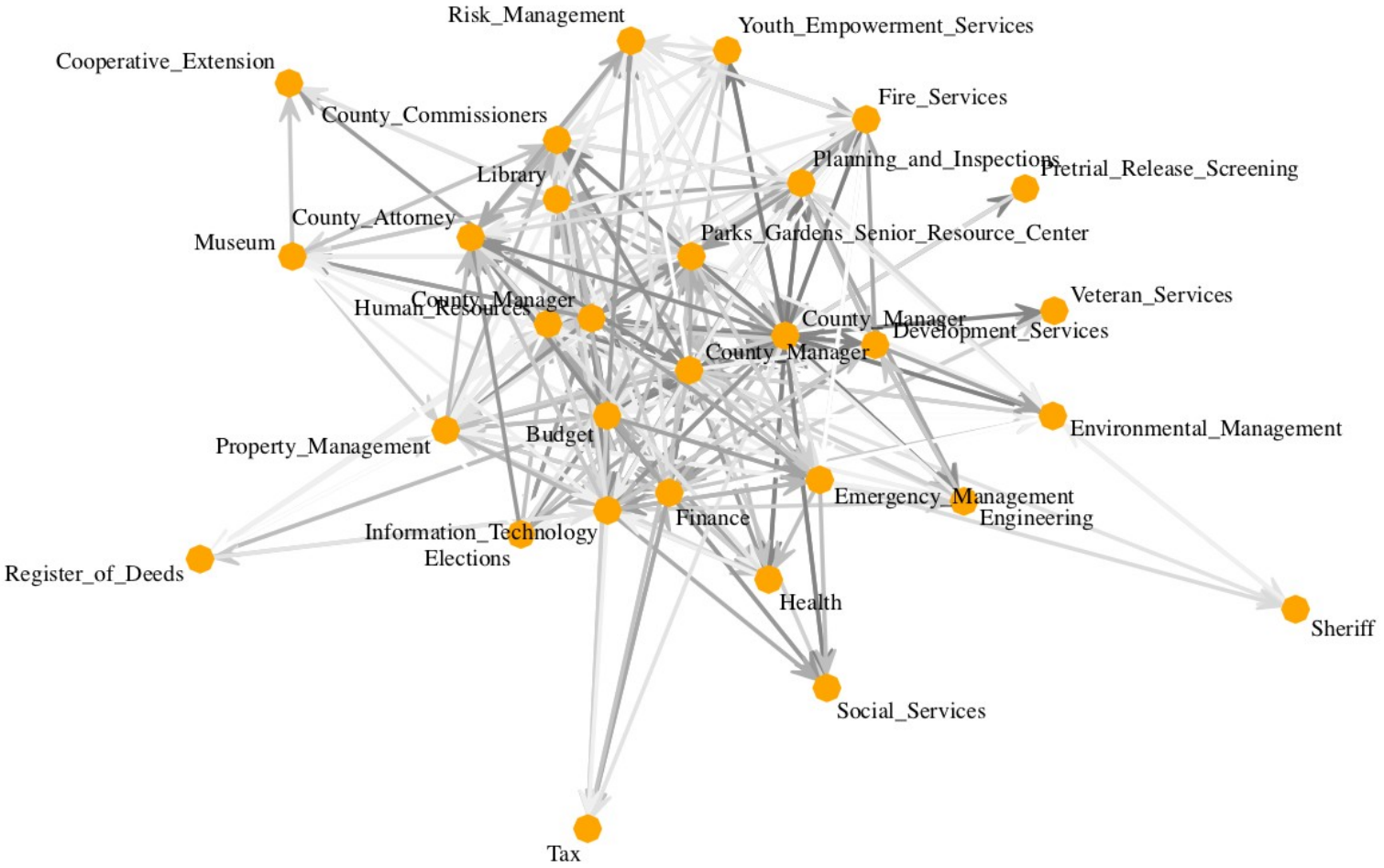
Founded: 1729

Population: 206,189 (2011)

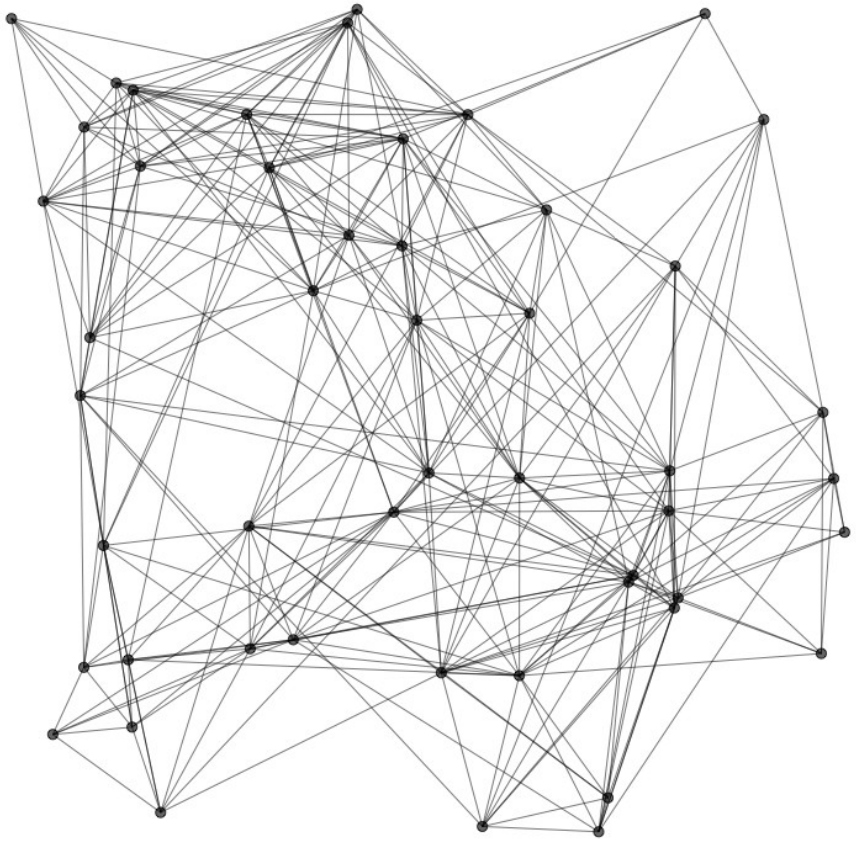
County seat: Wilmington

Feedback

NHC Email Network



Levels of Granularity



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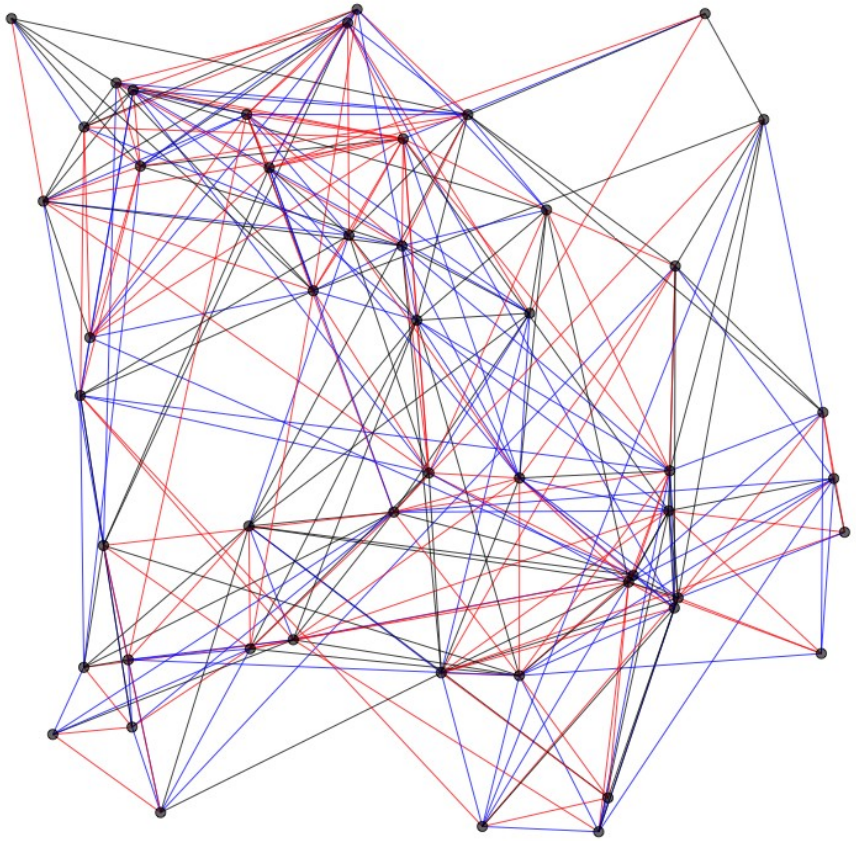
Levels of Granularity



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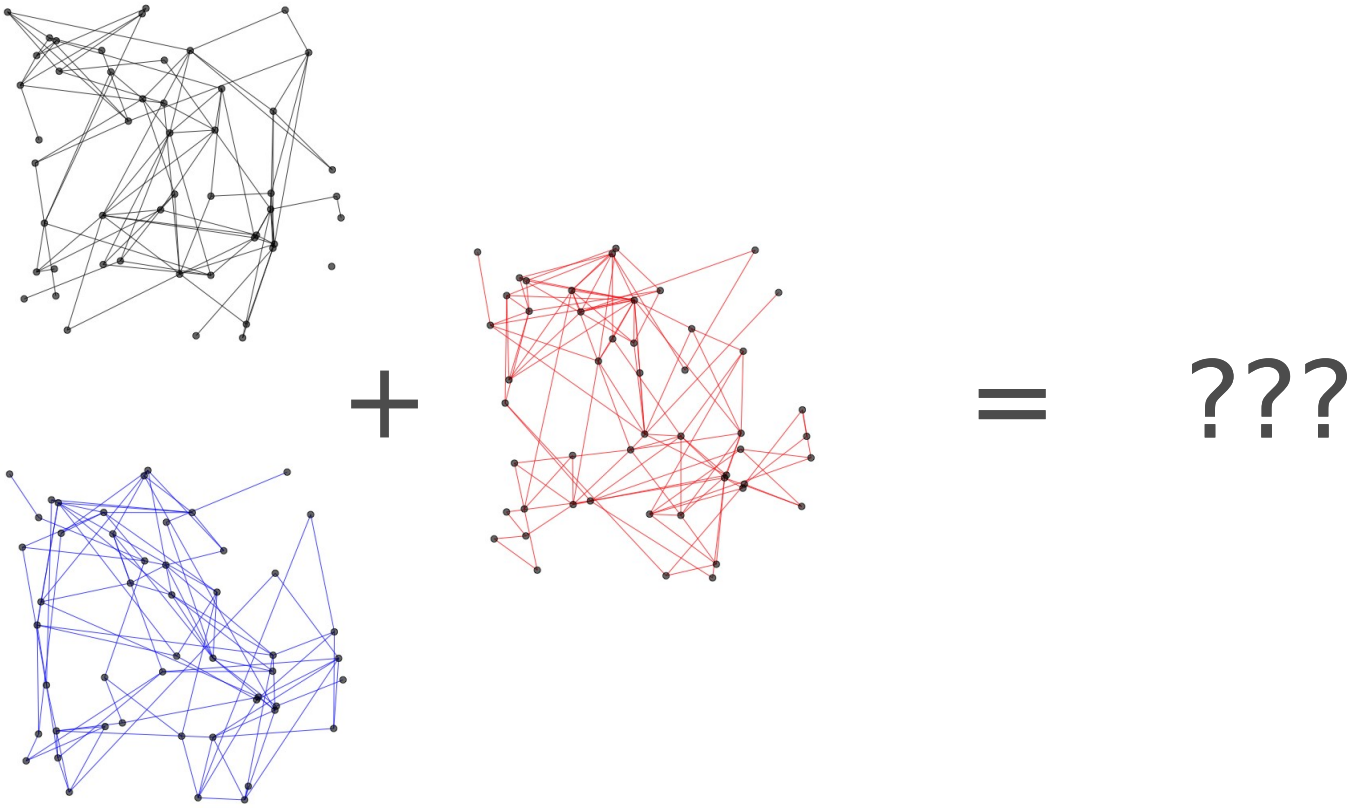
Levels of Granularity



Principled Visualization

- Common workflow:
  - Construct a statistical model of observed data
  - Perform post-hoc visualization to draw conclusions about the model and its relationship to the data
- Problem: visualization algorithms can produce visual artifacts that may be misleading
- Solution: visualizations should be directly interpretable in terms of the model and its relationship to the data

Exploring Structure and Content

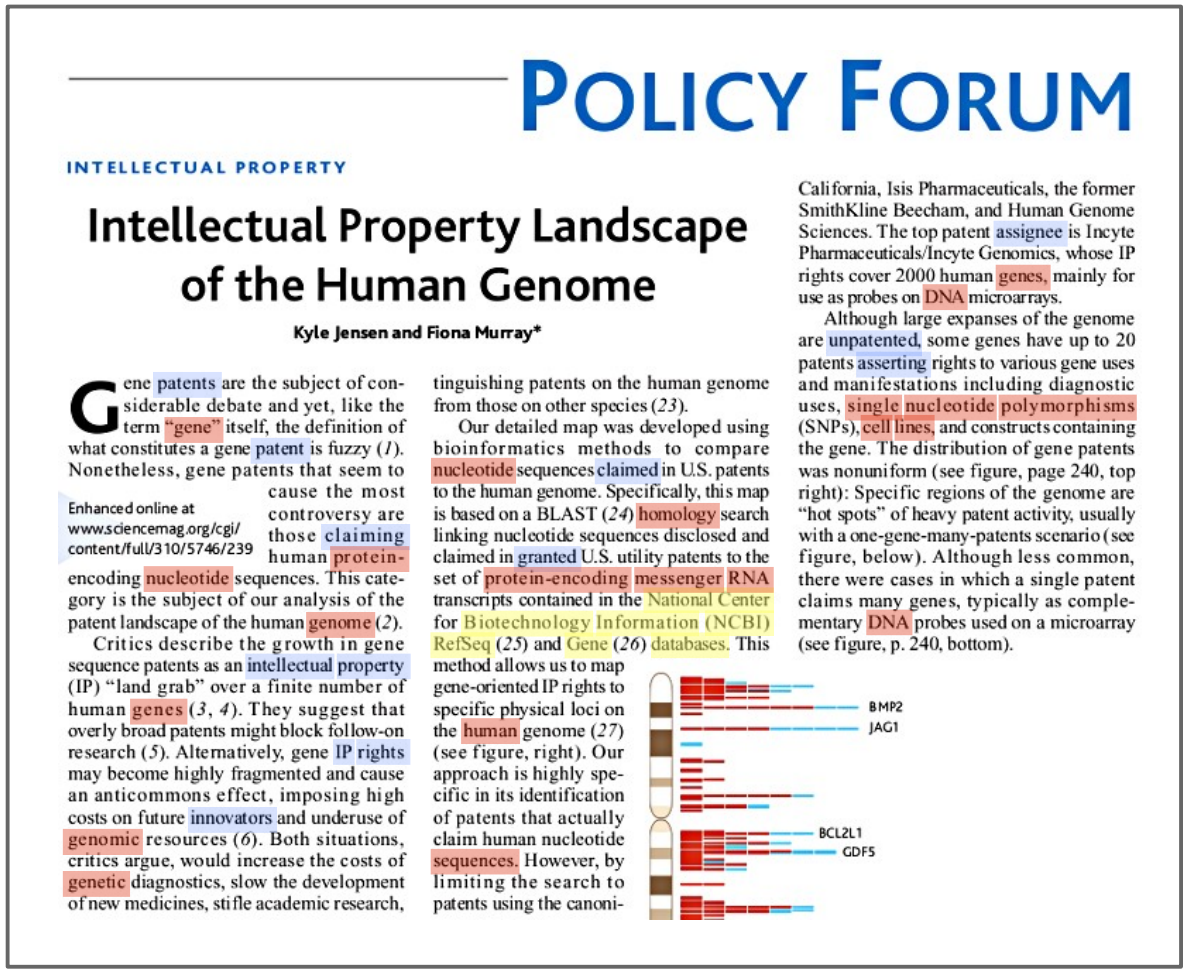
- Facilitate exploratory analysis of topic-specific communication patterns by learning
  - Topics of communication
  - Topic-specific communication subnetworks
  - Principled visualizations of topic-sepcific subnetwork
- Draw upon ideas from two well-known frameworks:
  - Statistical topic modeling
  - Latent space network modeling

Topics and Words

probability

gene	ncbi	computer	patent
genome	national	modeling	patenting
dna	information	data	claims
genetic	technology	algorithm	intellectual
genes	database	analyses	property
sequence	molecular	method	rights
human	biology	model	ip
protein	genbank	information	innovation
rna	pubmed	efficient	claim
genomic	references	complexity	claiming
...	...	...	...

Documents and Topics



POLICY FORUM

INTELLECTUAL PROPERTY

Intellectual Property Landscape of the Human Genome

Kyle Jensen and Fiona Murray*

Gene patents are the subject of considerable debate and yet, like the term "gene" itself, the definition of what constitutes a gene patent is fuzzy (*1*). Nonetheless, gene patents that seem to cause the most controversy are those claiming human protein-encoding nucleotide sequences. This category is the subject of our analysis of the patent landscape of the human genome (*2*).

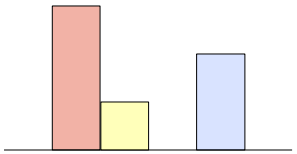
Enhanced online at www.sciencemag.org/cgi/content/full/310/5746/239

Critics describe the growth in gene sequence patents as an intellectual property (IP) "land grab" over a finite number of human genes (*3*, *4*). They suggest that overly broad patents might block follow-on research (*5*). Alternatively, gene IP rights may become highly fragmented and cause an anticommons effect, imposing high costs on future innovators and underuse of genomic resources (*6*). Both situations, critics argue, would increase the costs of genetic diagnostics, slow the development of new medicines, stifle academic research, tinguishing patents on the human genome from those on other species (*23*).

Our detailed map was developed using bioinformatics methods to compare nucleotide sequences claimed in U.S. patents to the human genome. Specifically, this map is based on a BLAST (*24*) homology search linking nucleotide sequences disclosed and claimed in granted U.S. utility patents to the set of protein-encoding messenger RNA transcripts contained in the National Center for Biotechnology Information (NCBI) RefSeq (*25*) and Gene (*26*) databases. This method allows us to map gene-oriented IP rights to specific physical loci on the human genome (*27*) (see figure, right). Our approach is highly specific in its identification of patents that actually claim human nucleotide sequences. However, by limiting the search to patents using the canoni-

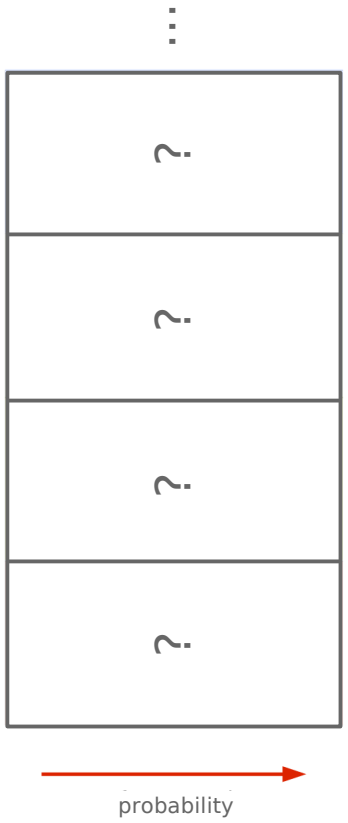
California, Isis Pharmaceuticals, the former SmithKline Beecham, and Human Genome Sciences. The top patent assignee is Incyte Pharmaceuticals/Incyte Genomics, whose IP rights cover 2000 human genes, mainly for use as probes on DNA microarrays.

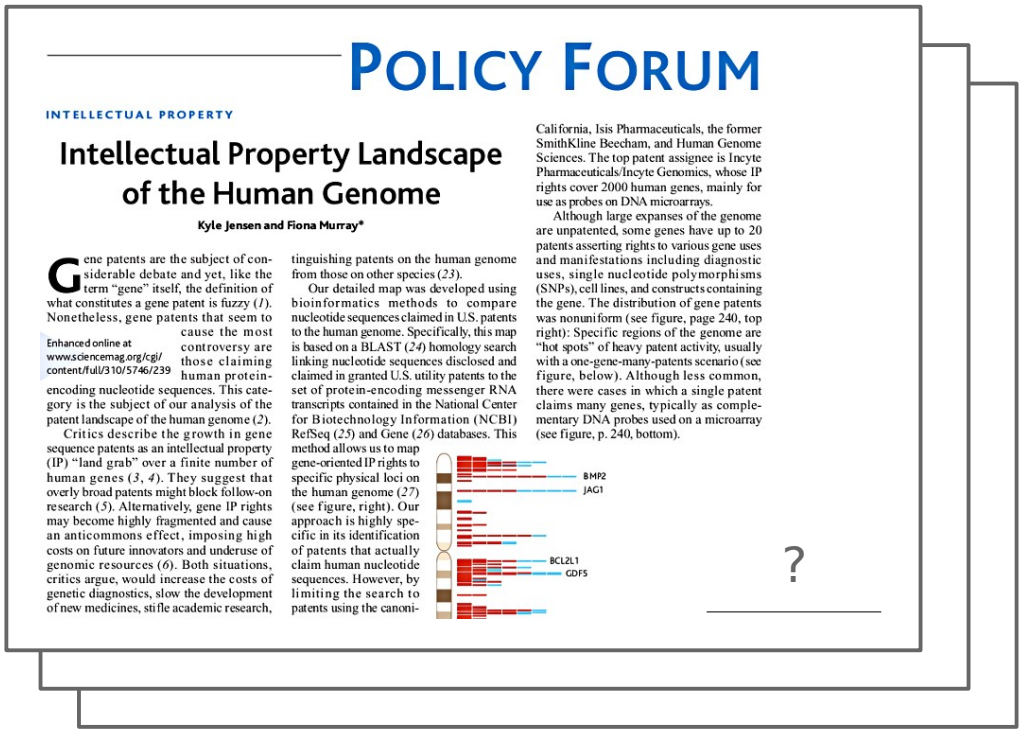
Although large expanses of the genome are unpatented, some genes have up to 20 patents asserting rights to various gene uses and manifestations including diagnostic uses, single nucleotide polymorphisms (SNPs), cell lines, and constructs containing the gene. The distribution of gene patents was nonuniform (see figure, page 240, top right): Specific regions of the genome are "hot spots" of heavy patent activity, usually with a one-gene-many-patents scenario (see figure, below). Although less common, there were cases in which a single patent claims many genes, typically as complementary DNA probes used on a microarray (see figure, p. 240, bottom).



Latent Dirichlet Allocation

[Blei, Ng & Jordan, '03]





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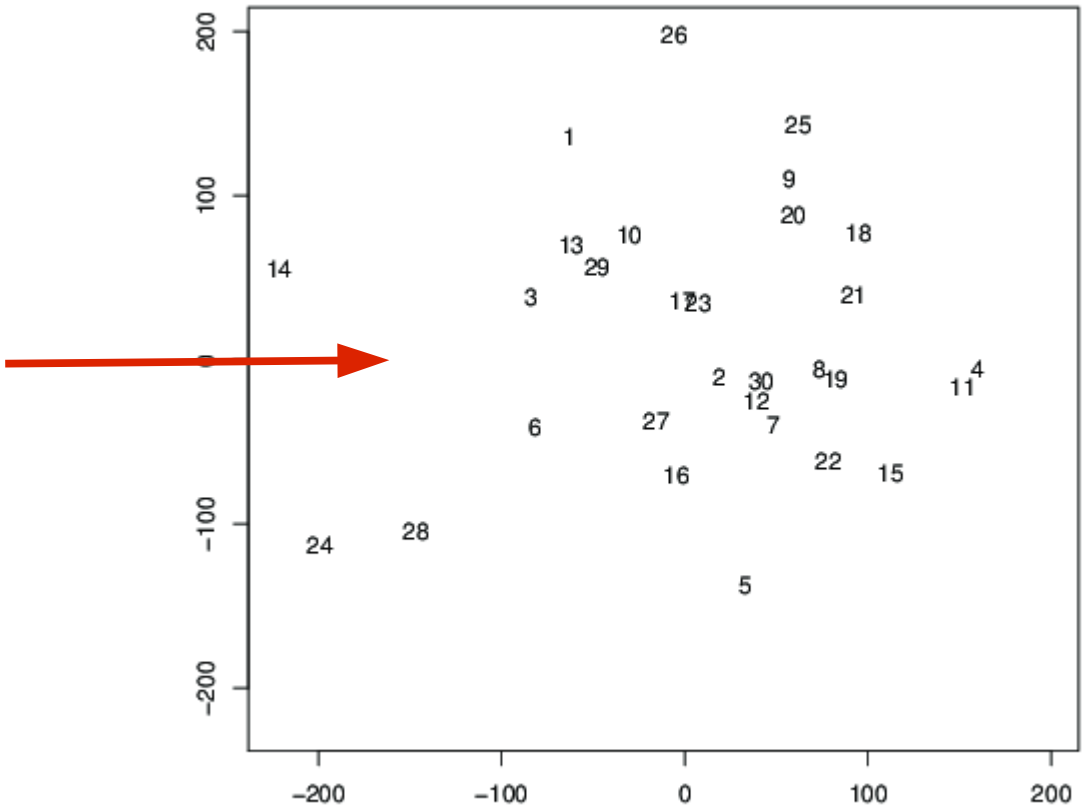
BMP2
JAG1
BCL2L1
GDF5

?

Individuals and Latent Spaces

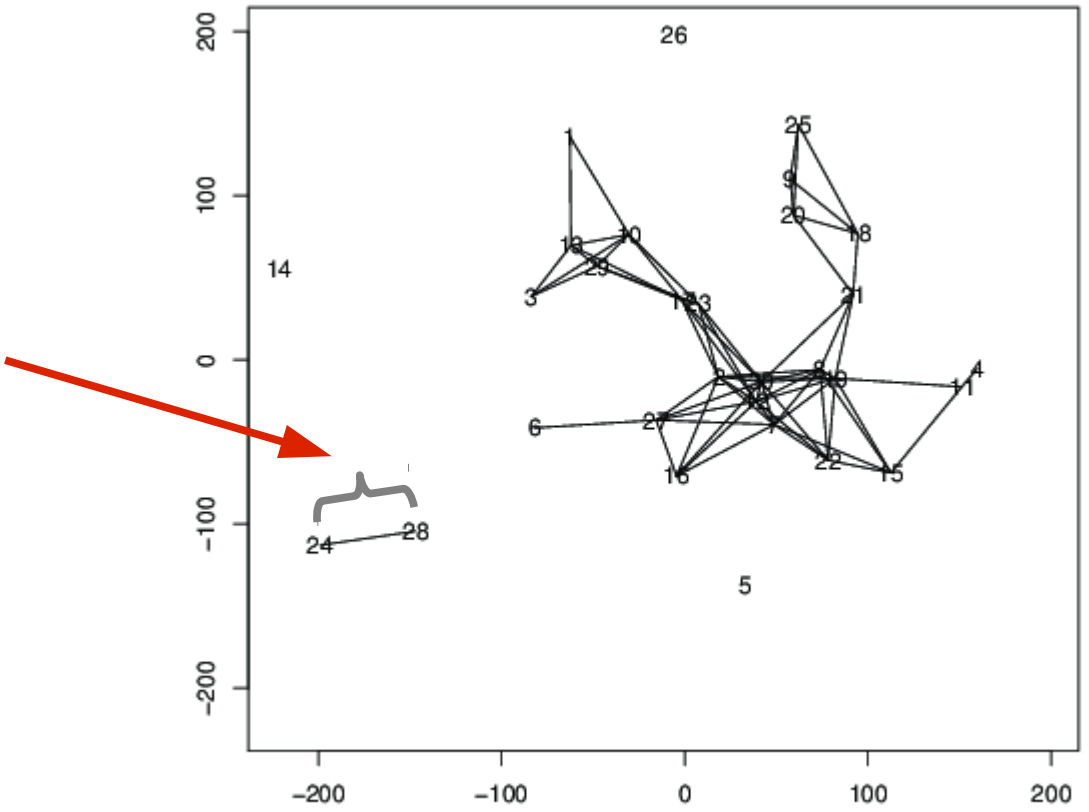
every individual is associated with a position in latent space



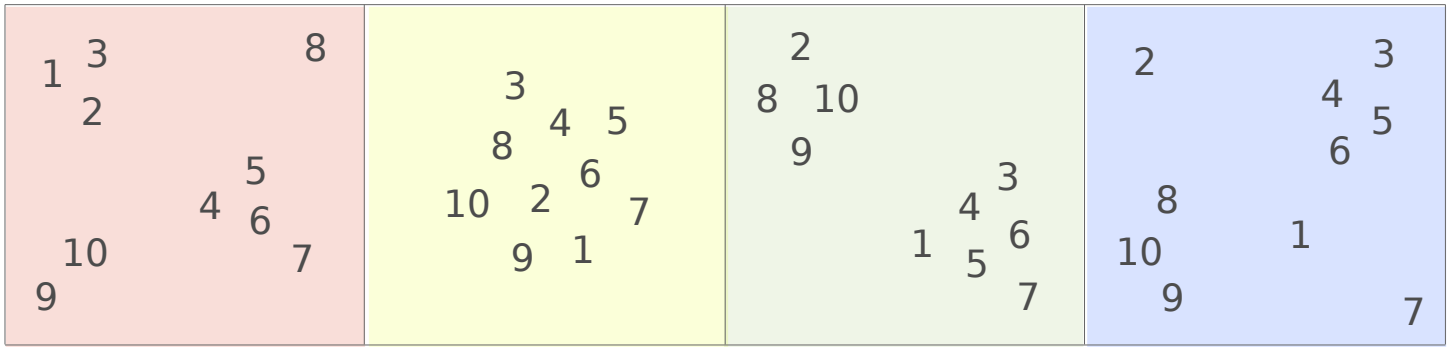
Latent Space Network Model

[Hoff et al., '02]

probability of communication depends on distance in latent space



Topics and Spaces



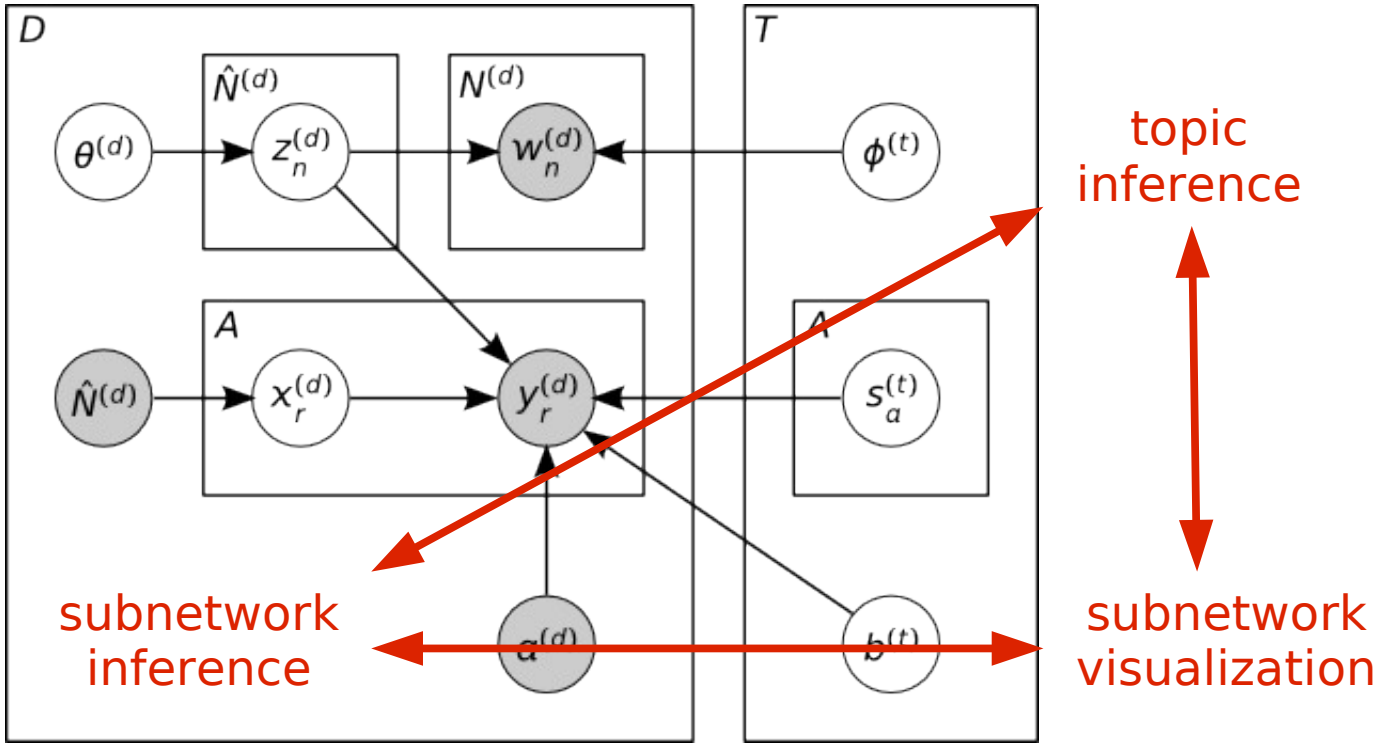
gene	ncbi	computer	patent
genome	national	modeling	patenting
dna	information	data	claims
genetic	technology	algorithm	intellectual
...	...	...	...

A New Model...

[Krafft et al., '12]

- Model email content using LDA
- Model recipients using topic-specific latent spaces
- Generative process:
  - Generate topics and topic-specific latent spaces
  - Generate document-specific topic distributions
  - Generate recipients using latent spaces
  - Generate words using topics

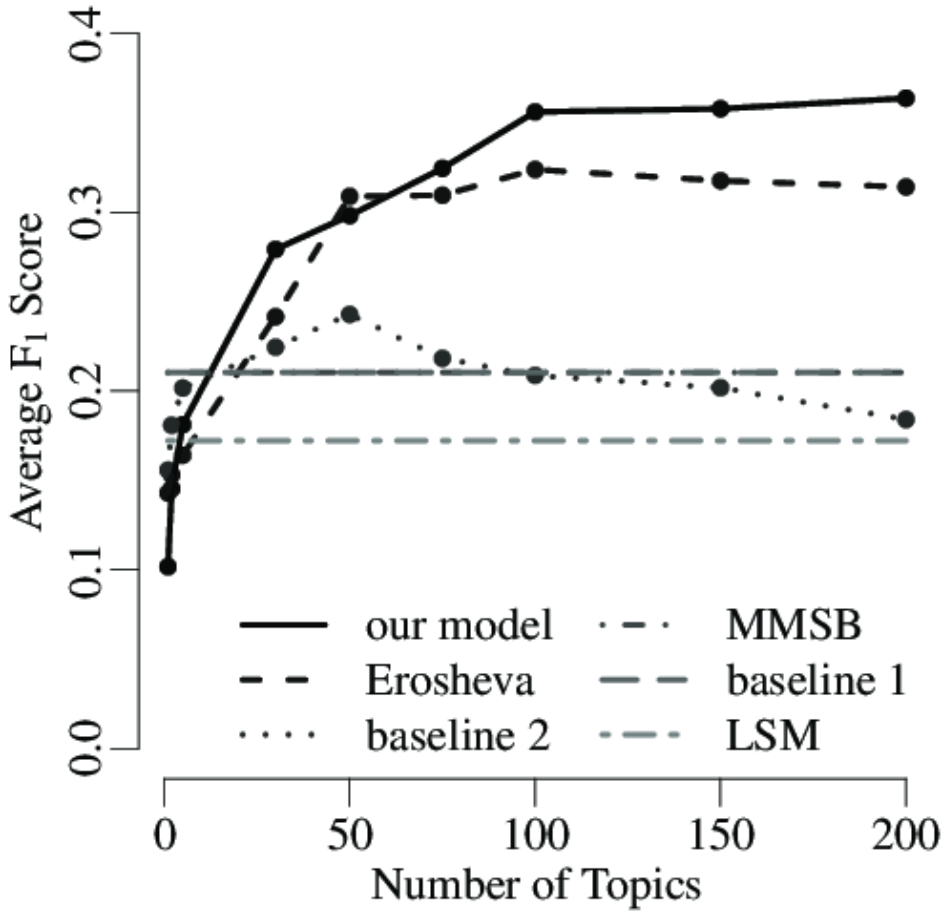
Graphical Model



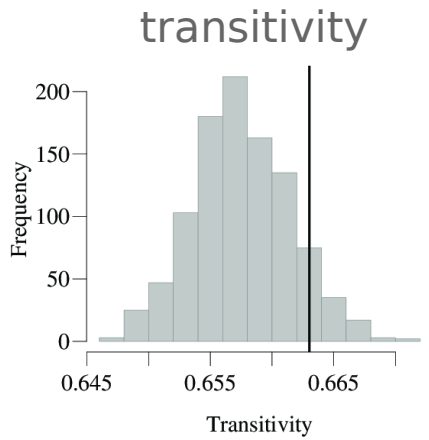
Experimental Evaluation

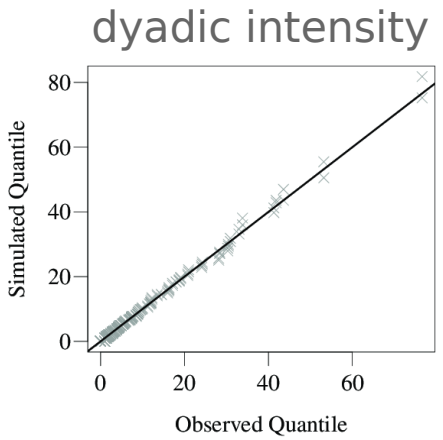
- Quantitative model validation:
  - Link prediction performance vs. baselines
  - Posterior predictive checks
  - Topic coherence vs. LDA
- Exploratory analysis:
  - Modularity: disconnected components
  - Assortativity: components of a single “type”

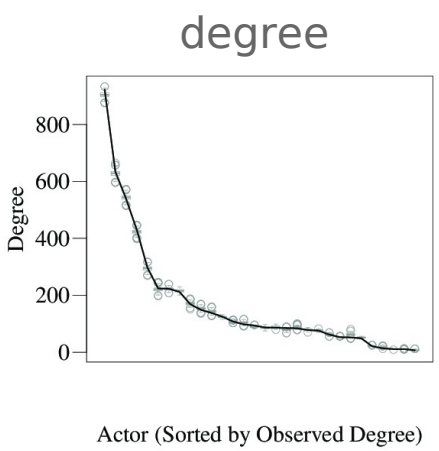
Link Prediction

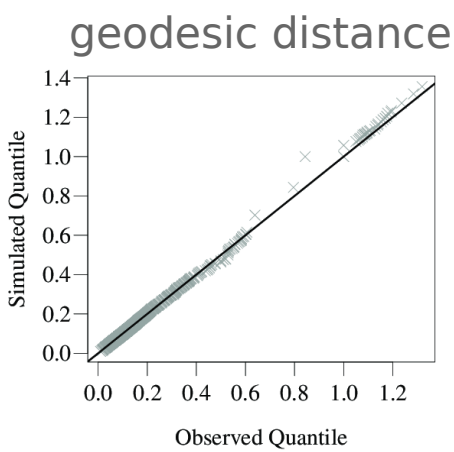


Posterior Predictive Checks



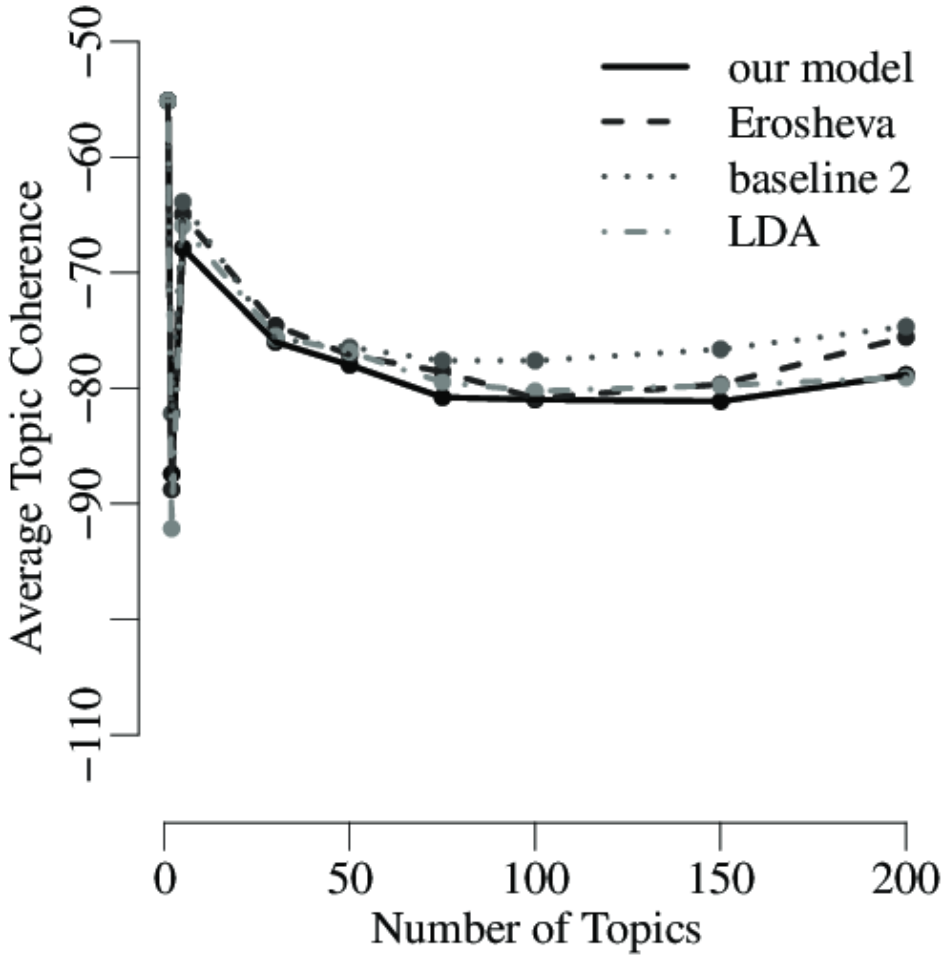




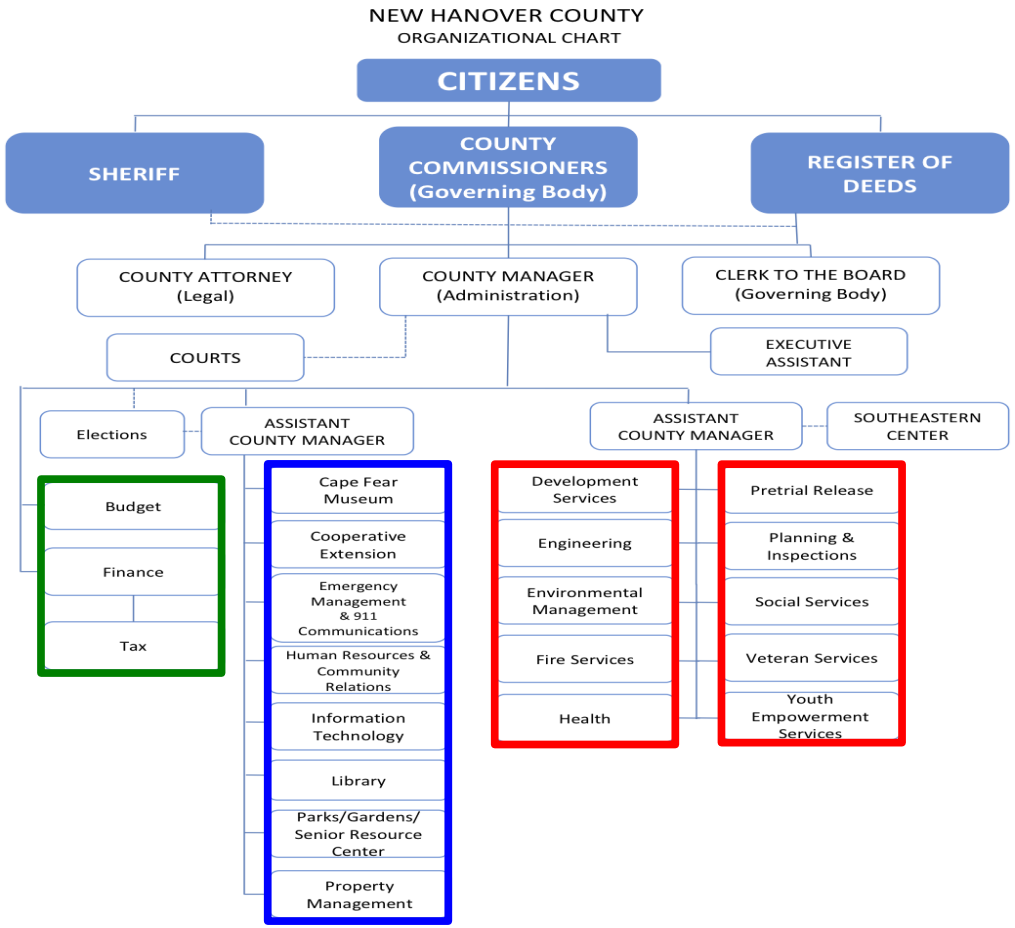


Topic Coherence

[Mimno et al., '11]



Organization Structure

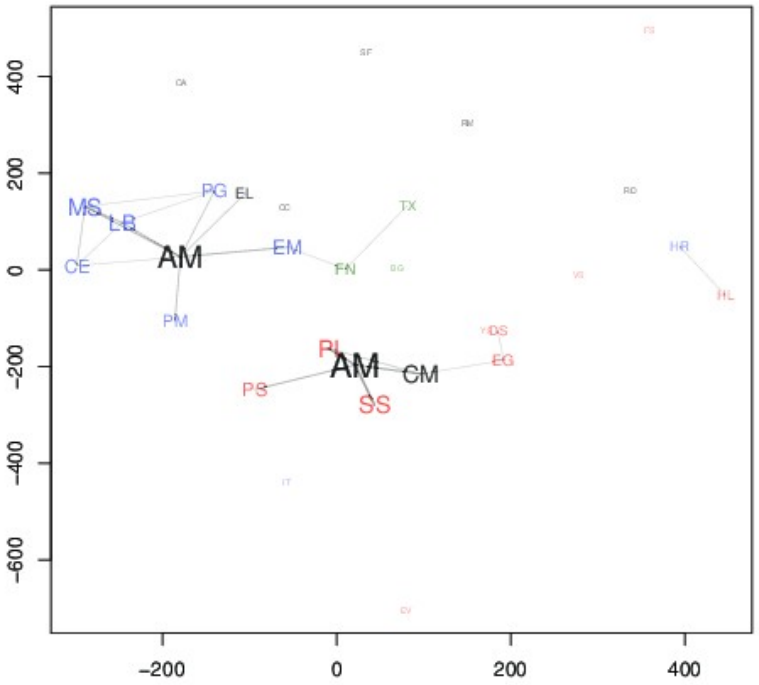


High Modularity, High Assortativity

Assistant County Manager	AM
Budget	BG
Cooperative Extension	CE
County Attorney	CA
County Commissioners	CC
County Manager	CM
Development Services	DS
Elections	EL
Emergency Management	EM
Engineering	EG
Environmental Management	EV
Finance	FN
Fire Services	FS
Health	HL
Human Resources	HR
Information Technology	IT
Library	LB
Museum	MS
Parks and Gardens	PG
Planning and Inspections	PI
Pretrial Release Screening	PS
Property Management	PM
Register of Deeds	RD
Risk Management	RM
Sheriff	SF
Social Services	SS
Tax	TX
Veteran Services	VS
Youth Empowerment Services	YS

Meeting Scheduling

meeting march board agenda week



High Modularity, Low Assortativity

Assistant County Manager	AM
Budget	BG
Cooperative Extension	CE
County Attorney	CA
County Commissioners	CC
County Manager	CM
Development Services	DS
Elections	EL
Emergency Management	EM
Engineering	EG
Environmental Management	EV
Finance	FN
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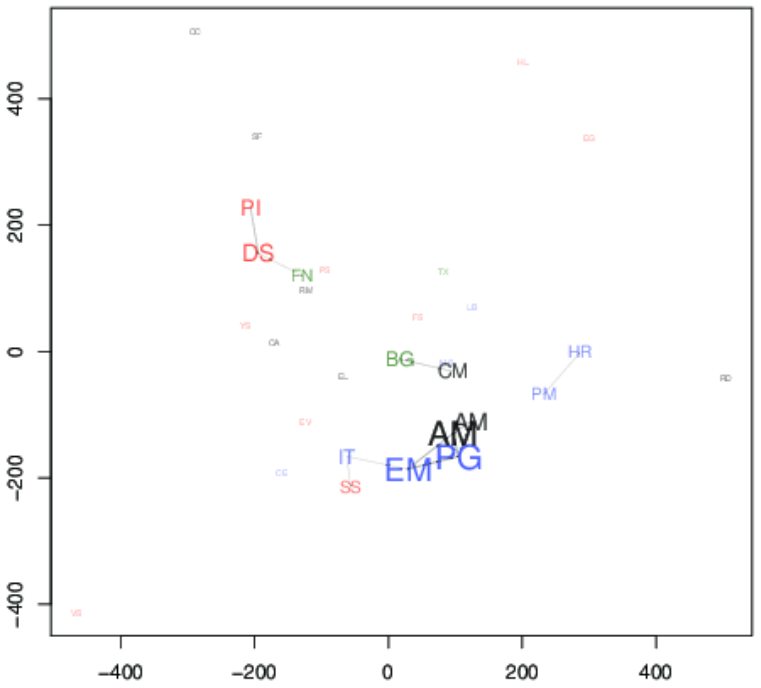
Property Management	PM
Register of Deeds	RD
Risk Management	RM
Sheriff	SF
Social Services	SS
Tax	TX
Veteran Services	VS
Youth Empowerment Services	YS

Public Signage

change signs sign process ordinance



Low Modularity, Low Assortativity

Assistant County Manager	AM
Budget	BG
Cooperative Extension	CE
County Attorney	CA
County Commissioners	CC
County Manager	CM
Development Services	DS
Elections	EL
Emergency Management	EM
Engineering	EG
Environmental Management	EV
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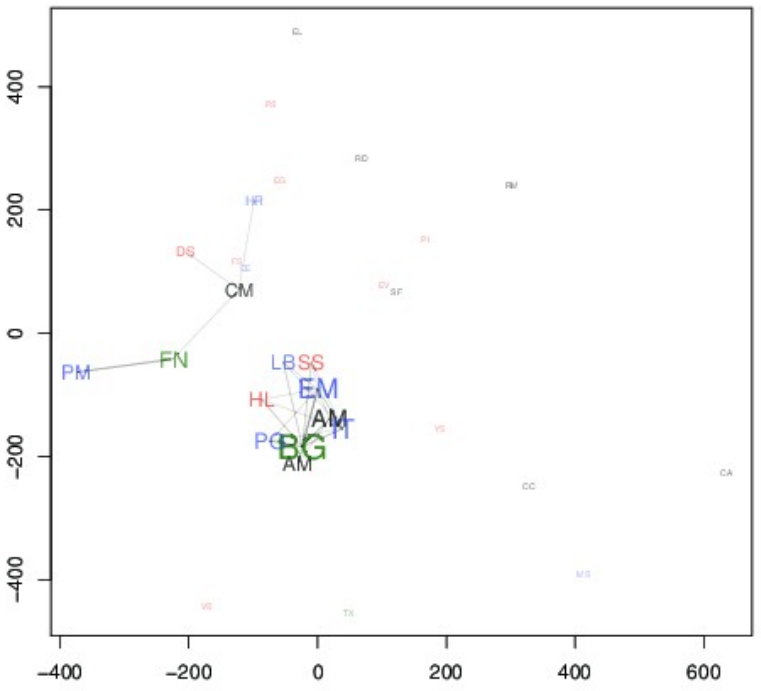
Risk Management	RM
Sheriff	SF
Social Services	SS
Tax	TX
Veteran Services	VS
Youth Empowerment Services	YS

Public Relations
city breakdown information give



Low Modularity, High Assortativity

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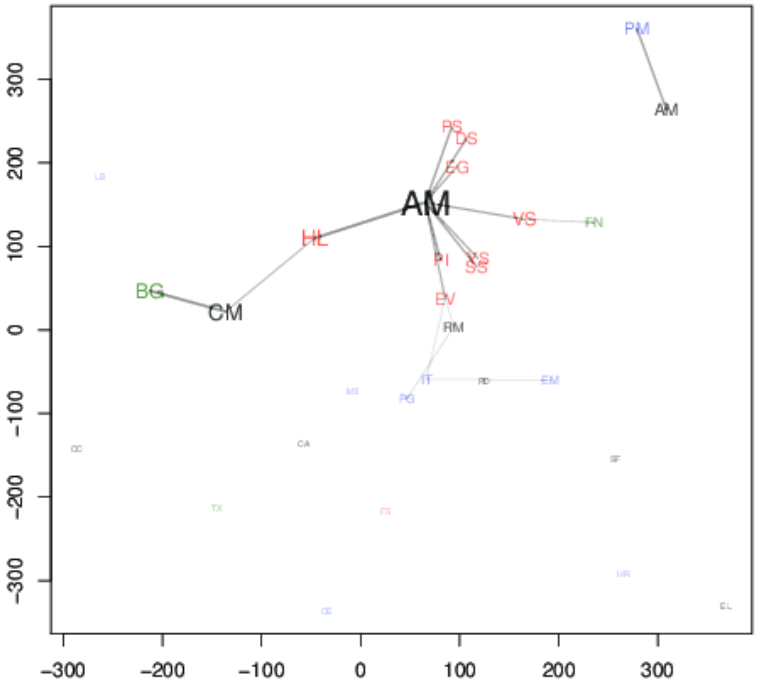
Youth Empowerment Services	YS

Broadcast Messages

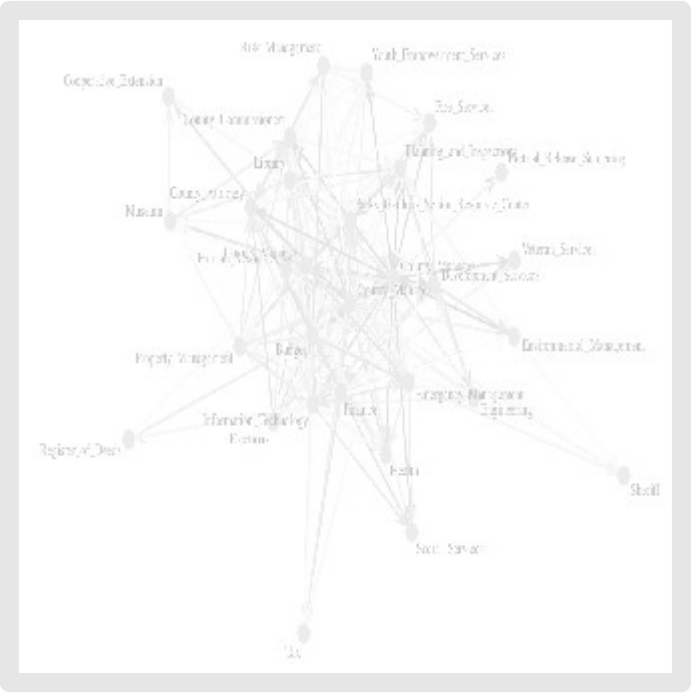
fw fyi bulletin summary week

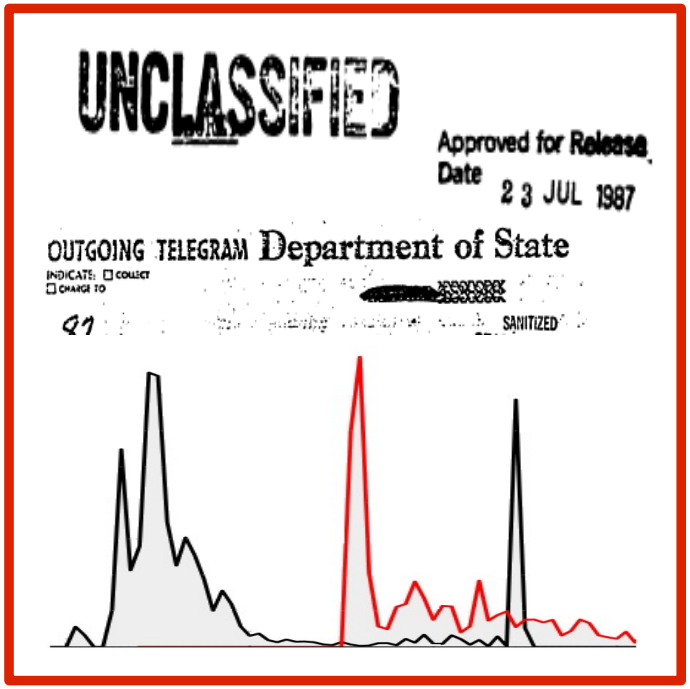


Take Away Message

- Explanatory and exploratory analyses matter
- Communication networks are important:
  - Critical to all kinds of collaborative problem solving
  - … but can be hard to directly observe
- Topic-partitioned multinetwork embedding:
  - Good model of structure and content
  - Emphasizes principled visualization

This Talk




UNCLASSIFIED
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Date
2 3 JUL 1987
OUTGOING TELEGRAM Department of State
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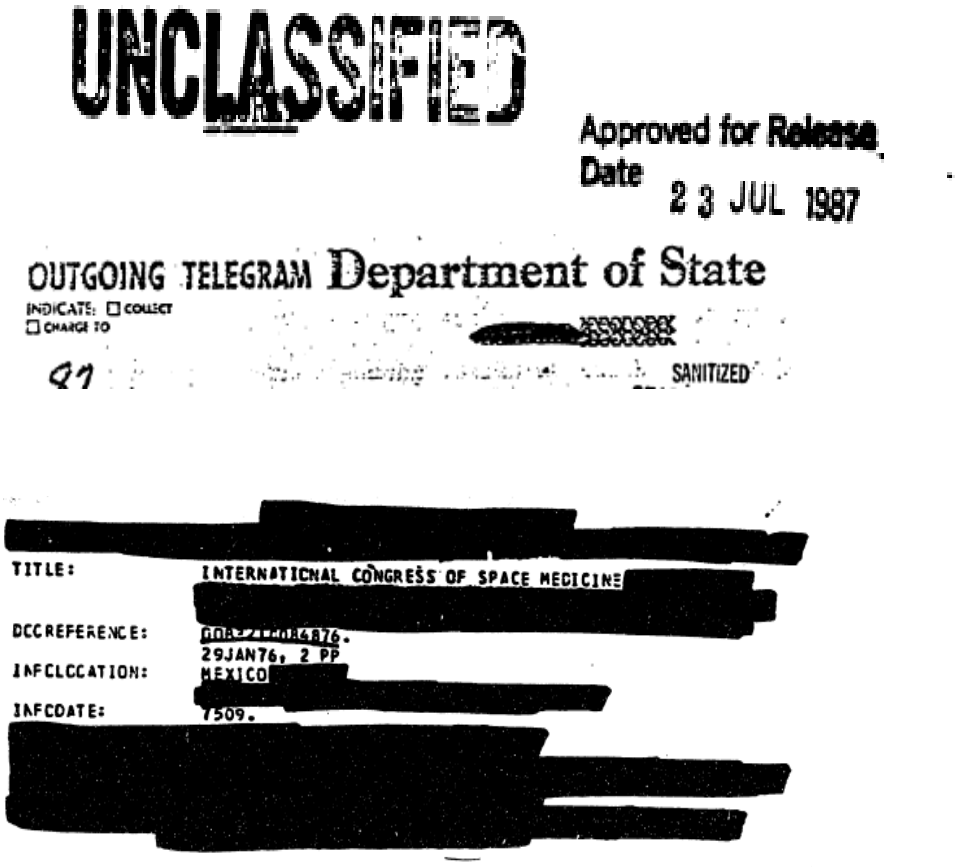
☐ CHARGE TO
SANITIZED

Transparency in the US

[ISOO, 2011]


UNCLASSIFIED

Approved for Release
Date 23 JUL 1987

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TITLE: INTERNATIONAL CONGRESS OF SPACE MEDICINE

DOCREFERENCE: 29JAN76, 2 PP

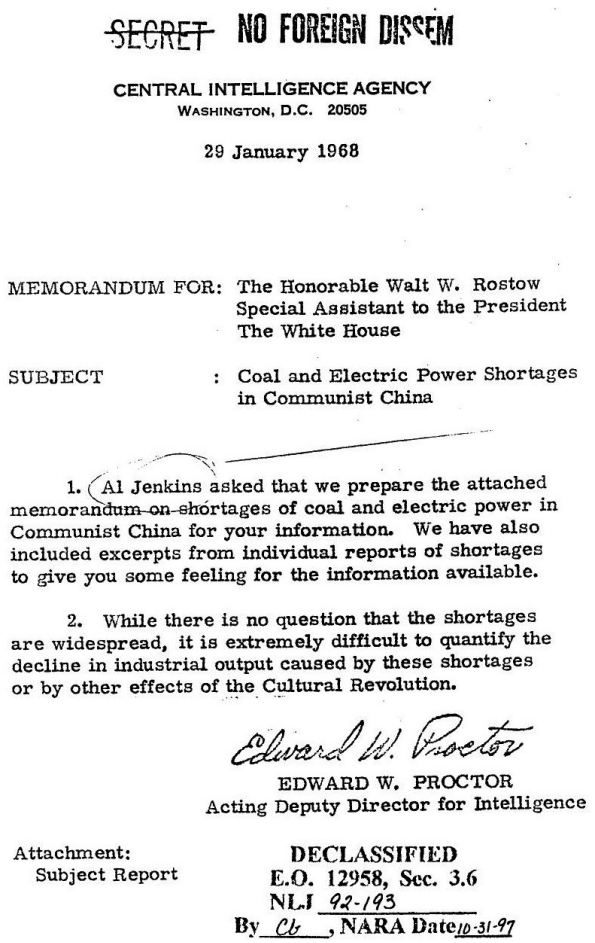
INFLOCATION: MEXICO

INFODATE: 7509.

- 52.8 million pages reviewed for declassification
- 26.7 million pages declassified
- $11.36 billion spent on administration of the US government classification system

Declassified Documents

[Gale, 2012]



~~SECRET~~ NO FOREIGN DISSEM

CENTRAL INTELLIGENCE AGENCY
WASHINGTON, D.C. 20505

29 January 1968

MEMORANDUM FOR: The Honorable Walt W. Rostow
Special Assistant to the President
The White House

SUBJECT : Coal and Electric Power Shortages
in Communist China

1. Al Jenkins asked that we prepare the attached memorandum on shortages of coal and electric power in Communist China for your information. We have also included excerpts from individual reports of shortages to give you some feeling for the information available.

2. While there is no question that the shortages are widespread, it is extremely difficult to quantify the decline in industrial output caused by these shortages or by other effects of the Cultural Revolution.

Edward W. Proctor

EDWARD W. PROCTOR
Acting Deputy Director for Intelligence

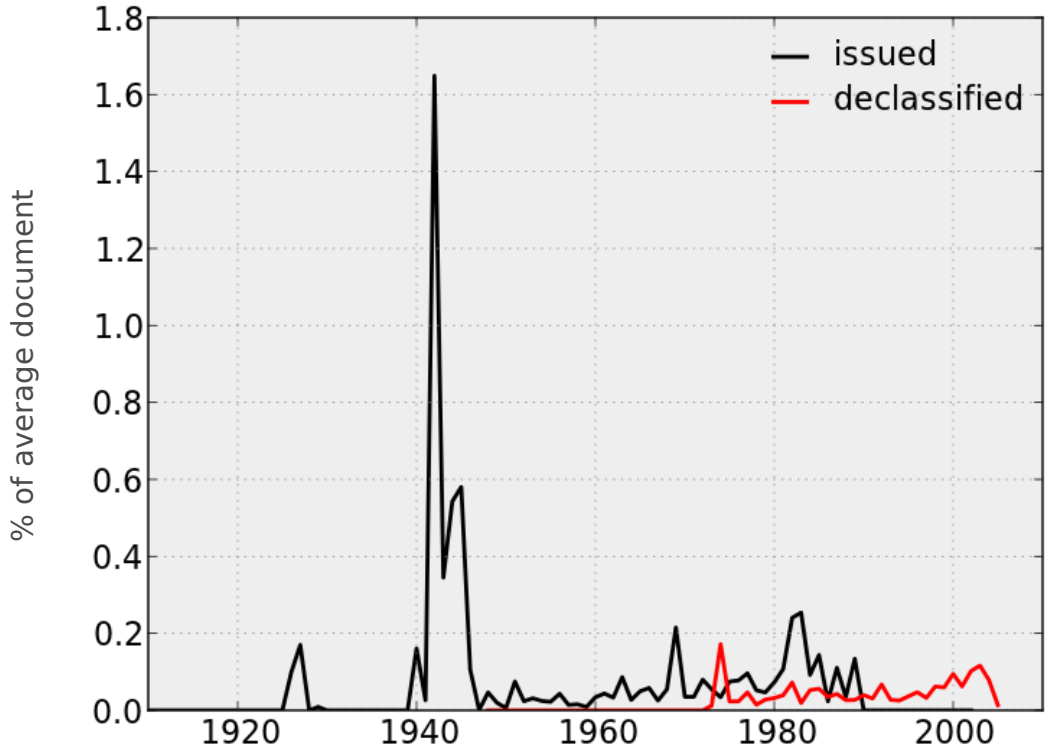
Attachment:
Subject Report

DECLASSIFIED
E.O. 12958, Sec. 3.6
NLJ 92-193
By Cb , NARA Date 10-31-97

- Date issued
- Date declassified
- Document type
- Source institution
- Classification level
- Document text

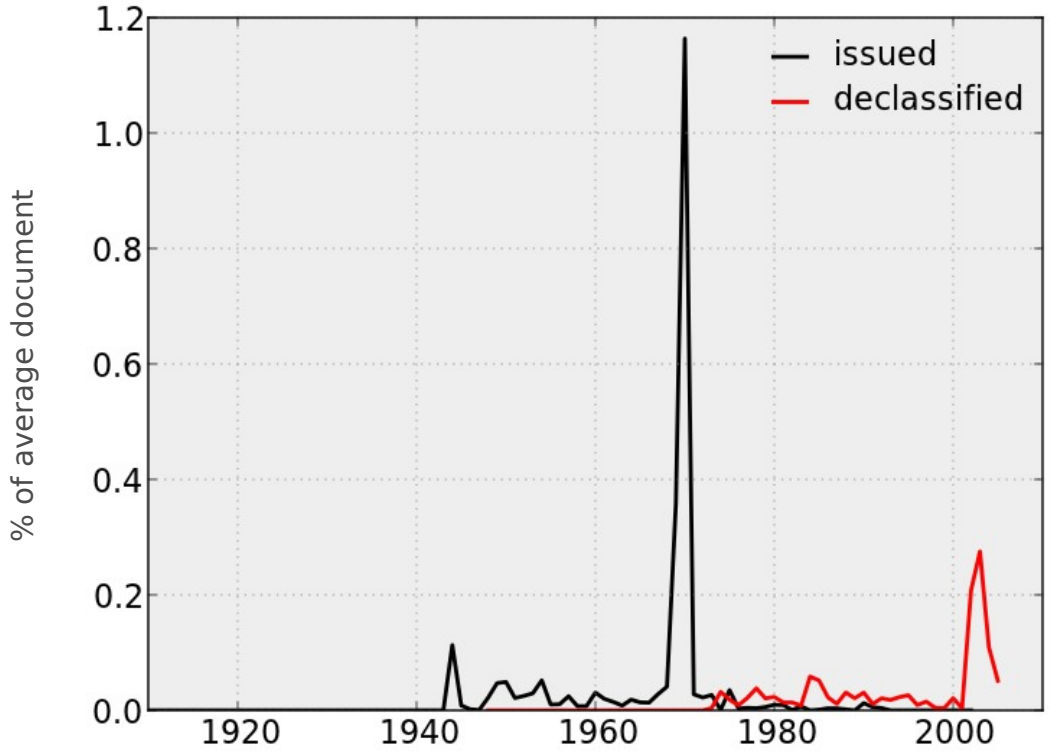
Inferred Topics

church
catholic
pope
vatican
religious
bishop
cardinal
archbishop
priests
paul
...



Inferred Topics

draft
service
manpower
volunteer
selective
age
calls
volunteers
deferments
pay
...



Inferred Topics

atomic
weapon
bomb
bombs
weapon
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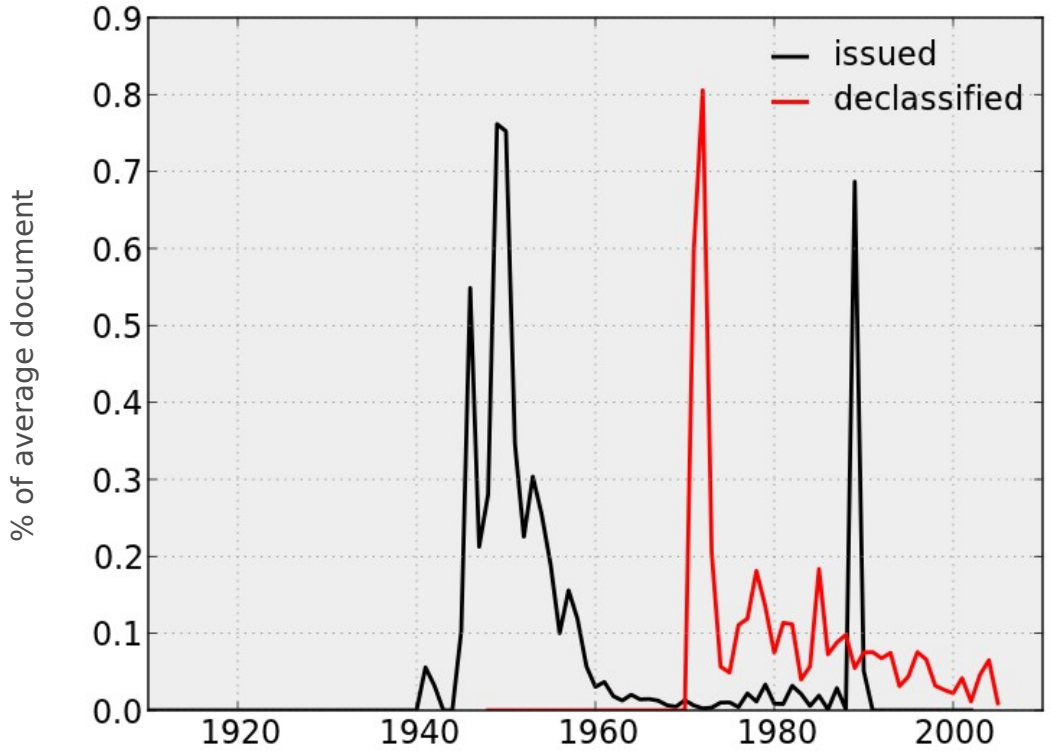
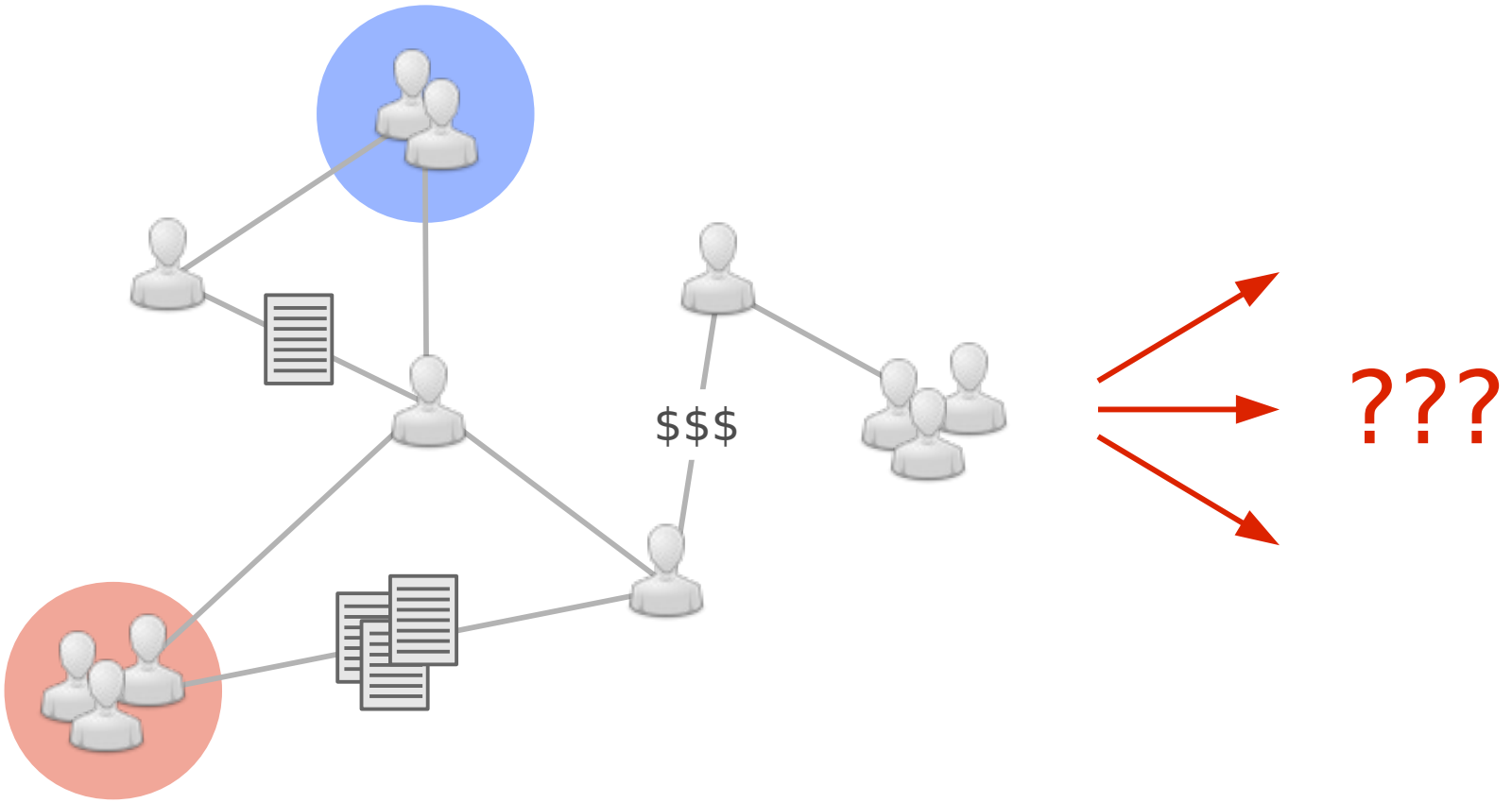
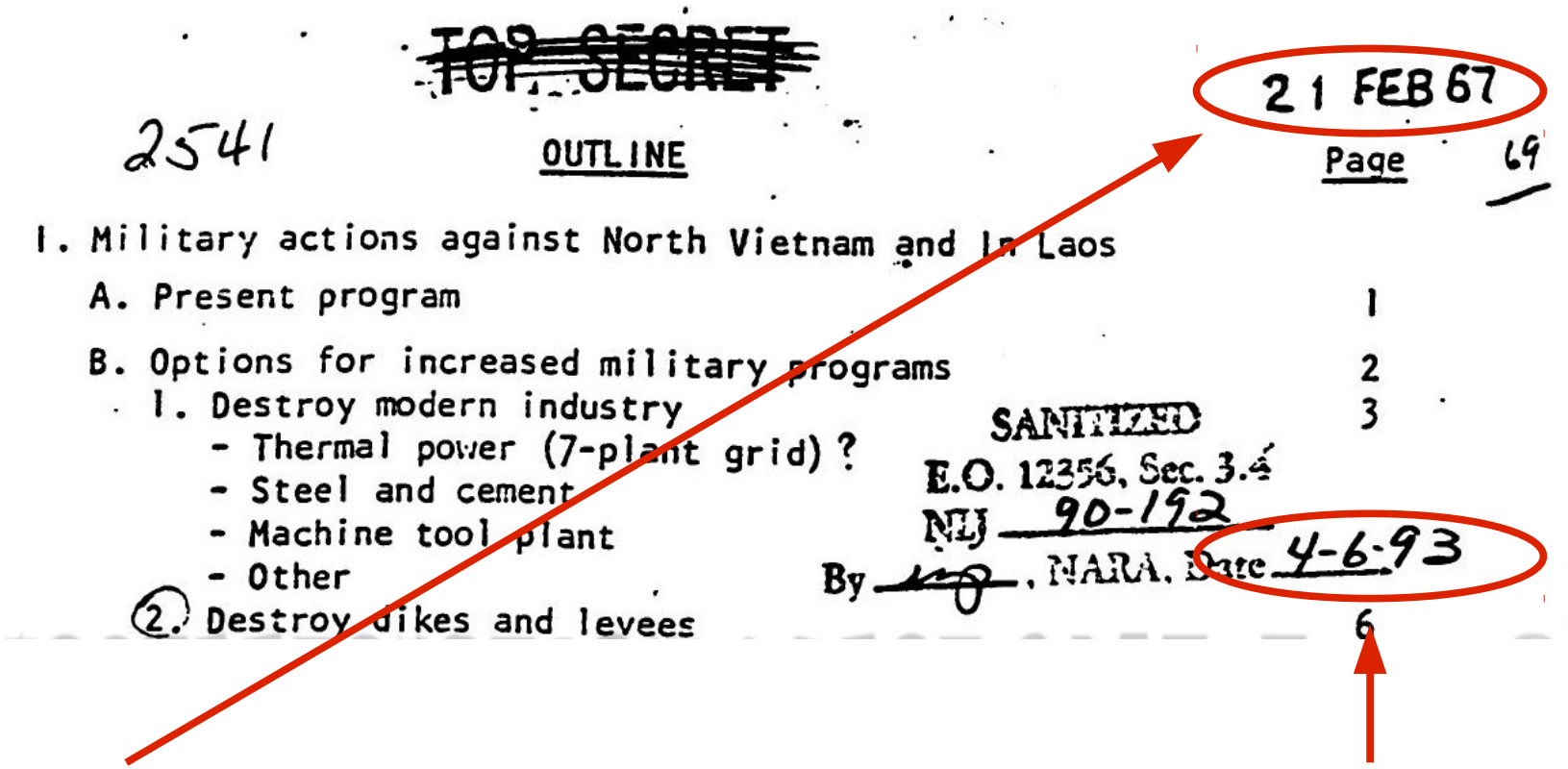
thermonuclear
development
hydrogen
stockpile
...



Predictive Analyses



Classification Duration



~~TOP SECRET~~

2541

OUTLINE

21 FEB 67

Page 69

I. Military actions against North Vietnam and In Laos

A. Present program 1

B. Options for increased military programs 2

1. Destroy modern industry 3
   - Thermal power (7-plant grid)?
   - Steel and cement
   - Machine tool plant
   - Other

2. Destroy dikes and levees 6

SANITIZED
E.O. 12356, Sec. 3.4
NLJ 90-192
By ___, NARA, Date 4-6-93

creation date
2/21/67

26 years

declassification date
4/6/93

Survival Analysis

- Statistical methods for modeling durations:
  - Biology/medicine: organism death
  - Engineering: component failure
  - Social sciences: event durations (e.g., recidivism)
- Goal: model effect on survival time of covariates, e.g.,
  - Vaccine treatments
  - Temperature differences
  - Job placement or education programs

Duration and Content

HIS APPROACH WAS, "WELL, OF COURSE, WE KNOW THERE ISN'T ANYTHING TO THIS ALLEGED PHENOMENON (FLYING SAUCERS), BUT ON THE OTHER HAND". DURING HIS TALK SHKLOVSKIY AND OTHER SOVIETS JOKED AND LAUGHED AND OBVIOUSLY DID NOT TAKE THE SPEAKER'S REMARKS SERIOUSLY.

14 years

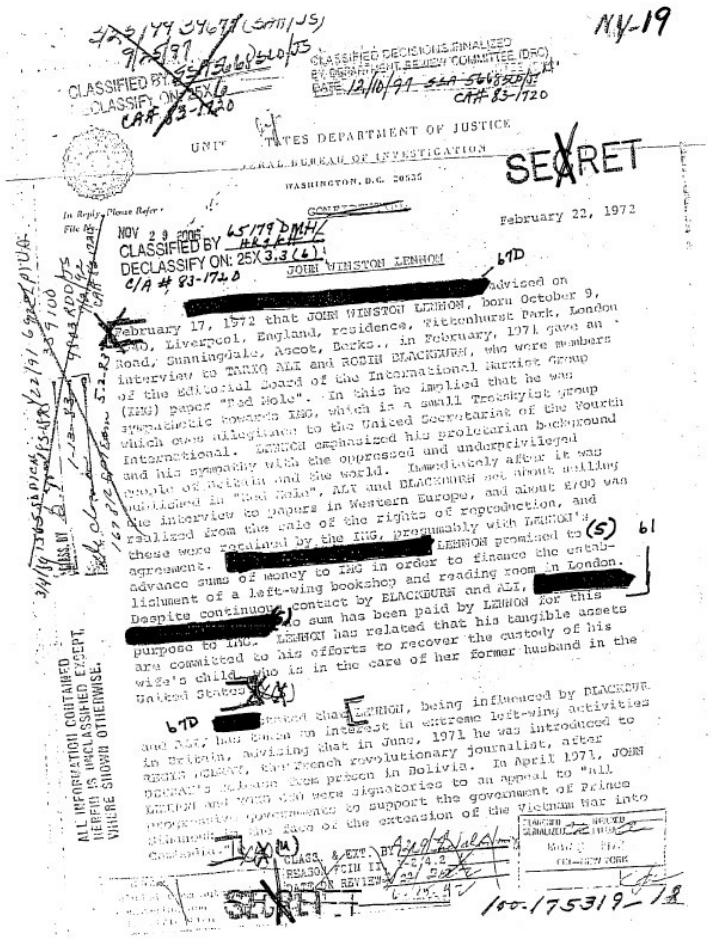
57 years

CENTRAL INTELLIGENCE GROUP

SOVIET CAPABILITIES FOR THE DEVELOPMENT AND PRODUCTION OF CERTAIN TYPES OF WEAPONS AND EQUIPMENT

1. Herein is presented an estimate of Soviet capabilities in the development and production, during the next ten years, of certain weapons and equipment, as follows:

Modeling Text and Duration



- Topics provide information about classification durations
- Goal: incorporate durations into the probabilistic model
- Infer latent topics using both textual and temporal information

To Conclude...





Thanks!

Acknowledgements: P. Krafft, J. Moore, B. Desmarais, R. Shorey

wallach@cs.umass.edu
http://www.cs.umass.edu/~wallach/