# Enhancing User Experience By Employing Collective Intelligence

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# Meet the Presenter

- Education
  - M.S. Computer Science and Application, Virginia Tech
  - Thesis: Activity-based Knowledge Management Tool Design for Educators

- Work Experience
  - Companies large and small
  - Currently User Experience consultant

# Presentation Overview

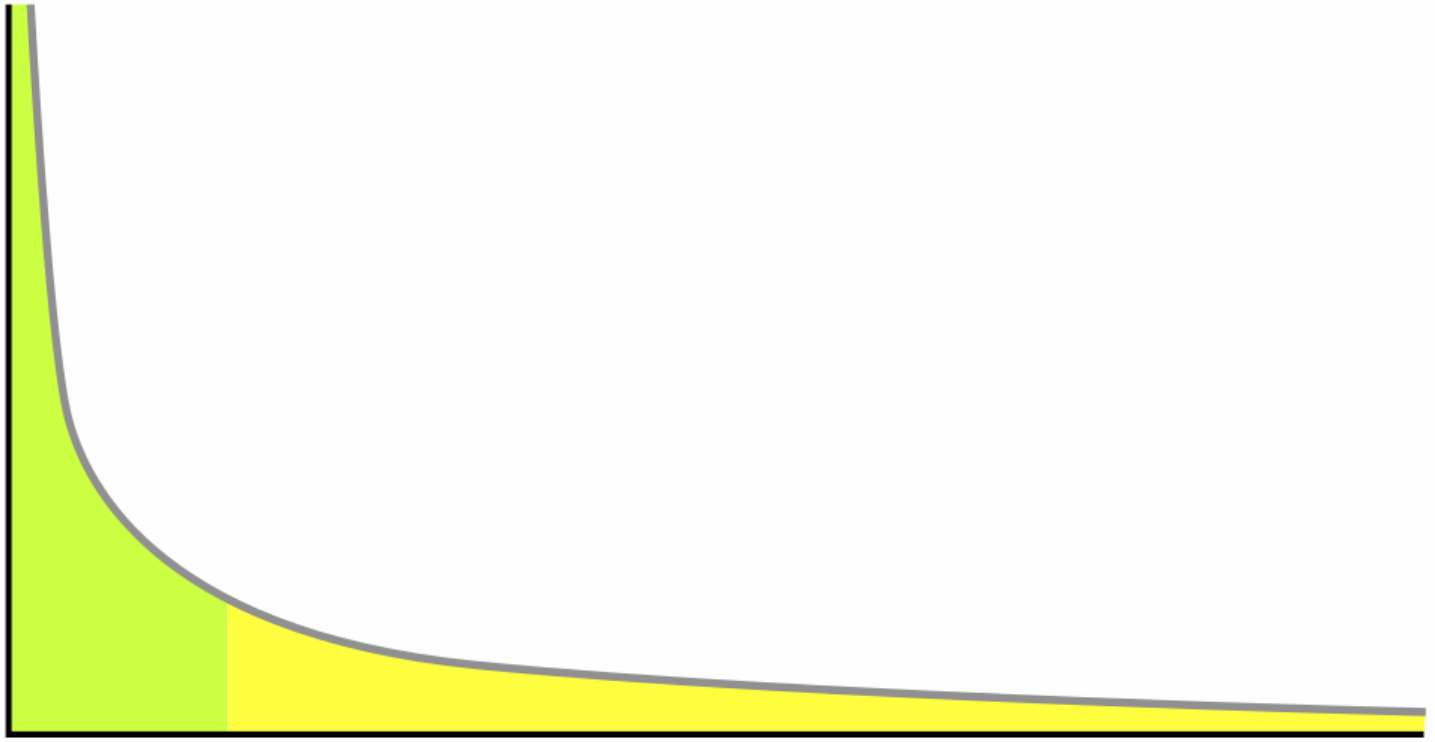
- Background
- Examples of Collective Intelligence
- Implementing Collective Intelligence
- Applications in Current L3D Research

# What is Collective Intelligence?

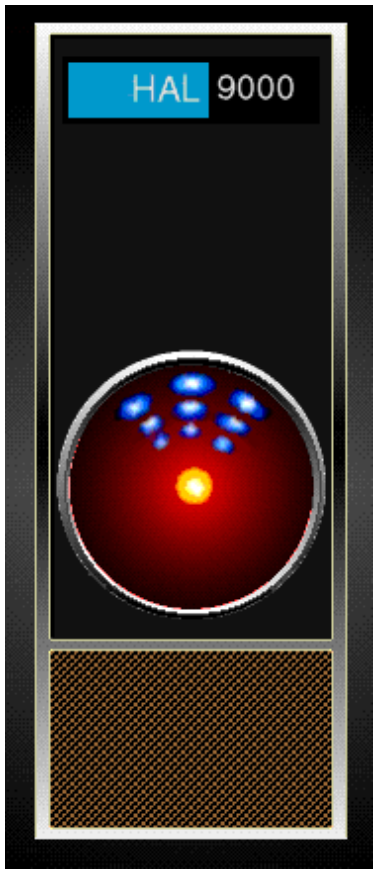
- Collective intelligence is a form of intelligence that emerges from the collaboration and competition of many individuals. (Wikipedia)
- Necessary Ingredients from Participants:
  - Appropriate mind-set
  - Willingness to share
  - Openness to the value of distributed intelligence for the common good

# Why Do We Care About Collective Intelligence on the Web?

- Signal vs. Noise in the Long Tail

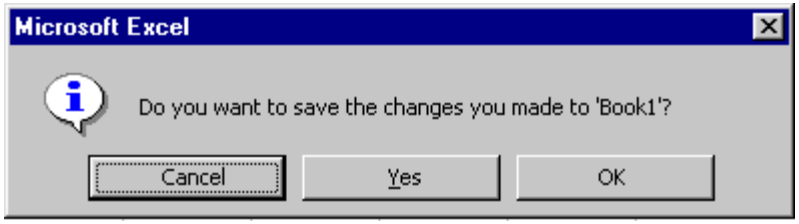


# Why Do We Care About Collective Intelligence Now?

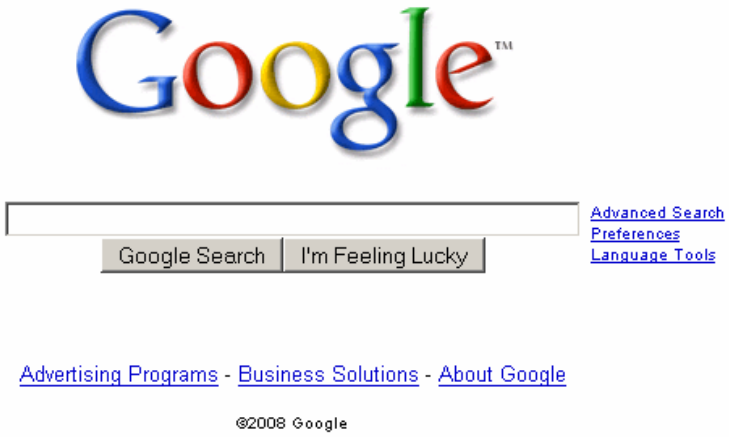


# What Is User Experience?

# Why Do We Care About UX?


# Why Do We Care About UX?




# Why Is UX Important to Collective Intelligence (and vice versa)?



- Utility = Value / Effort
- "Reservoir of Goodwill" (Krug)

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# Explicit vs. Implicit Activities

- Implicit
  - Insight achieved inherently with no *extra* work from the user
- Explicit
  - Insight requires specific activity from user

# Common Computer-based Collective Intelligence Applications

- Social Networks
- Discussion Forums
- Mailing Lists
- Rating Systems
- Tags

# Google

- Google Search
  - A giant recommendation system
  - Condor (Gloor)

- Google Trends
  - Asks: “What are people searching for?”
  - Takes Google Search a step further

# Amazon

- System Activity
  - Home page recommendations
  - “People who bought this also purchased…”
  - “Buy this with this and get an additional 5% off”
- User Activity
  - Item Viewing
  - Purchasing
  - “I Own It” Control (Yes/No)
  - Rating System (1-5 Scale)
  - Was this review helpful? (Yes/No)
  - Tags

# Netflix

- Recommendations and the Netflix Prize
  - $1,000,000 to entrant scoring 10% better than Netflix's Cinematch recommendation system
  - Began as a crowdsourcing endeavor but became a source of collective intelligence
    - 12/2006 – Third place entrant posted complete algorithm online
    - Netflix has incorporated ideas from current leader into Cinematch
    - Just a Guy in a Garage

# flickr

All time most popular tags

# flickr

## Hot tags

**In the last 24 hours**

**macro365**, **day105**, **hotgame**, **threesixtyfive**, **year2**, **sechseläuten**, oneobject365daysproject, bewegung, macromondays, iruña, publicenemies, silvio, crafting365, project3662008, pcgame, sinistra, berlusconi, project3651, monday, diabetes365

**Over the last week**

**londonmarathon2008**, **reconnect**, **notovideos**, **rsgmeetup20080412**, **popsugar**, **thainewyear**, sunnfun, bfm0408, flickrvideo, novideos, novideosonflickr, notovideo, notovideosonflickr, novideoonflickr, yurisnight, mw2008, victoriabaths, seedsofcompassion, bobmas, operationreconnect

# Other Examples

- Open Source Software
- del.icio.us – Social bookmarking via tagging
- Wikipedia – When crowdsourcing becomes collective intelligence
- Digg Visualizations – Was UX ignored?

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# User Experience Tasks

- Requirements Gathering
- Task Flows/Wireframing/Prototyping
- Testing
- Evaluation

# Programming Collective Intelligence

- Using Tags
  - Identification
  - Searching
  - Tag Clouds
- Not Using Tags
  - UX Consideration

# Programming Collective Intelligence

- Making Recommendations
  - Similarity Coefficients
    - Euclidean Distance
    - Pearson Correlation
    - Tanimoto Similarity Score
    - Others (Jaccard, Manhattan, et cetera)
  - Cognitive Biases

# Euclidean Distance

- Used in ratings systems
- Straight-line distance between two points

$$\sqrt{(p_1 - q_1)^2 + (p_2 - q_2)^2}$$

- Can be used to measure difference in ratings by two people
- To get a similarity score between two people, calculate

$$\frac{1}{(1 + \sqrt{\sum_{i=1}^{n} (p_i - q_i)^2})}$$

which yields a number between 0 and 1, where 1 means that the two people rated all of the items identically

# Pearson Similarity Coefficient

- Measure of how well two sets of data fit on a straight line

$$\frac{\sum XY - \frac{\sum X \sum Y}{N}}{\sqrt{(\sum X^2 - \frac{(\sum X)^2}{N})(\sum Y^2 - \frac{(\sum Y)^2}{N})}}$$

- Correlation of 1 means ratings were identical

# Tanimoto Similarity Score

$$1 - \frac{N_C}{N_A + N_B - N_C}$$

- Where
  - $N_A$: Total items in A
  - $N_B$: Total items in B
  - $N_C$: Total items in both A and B
- Tanimoto Similarity Score is the ratio of the intersection set to the union set

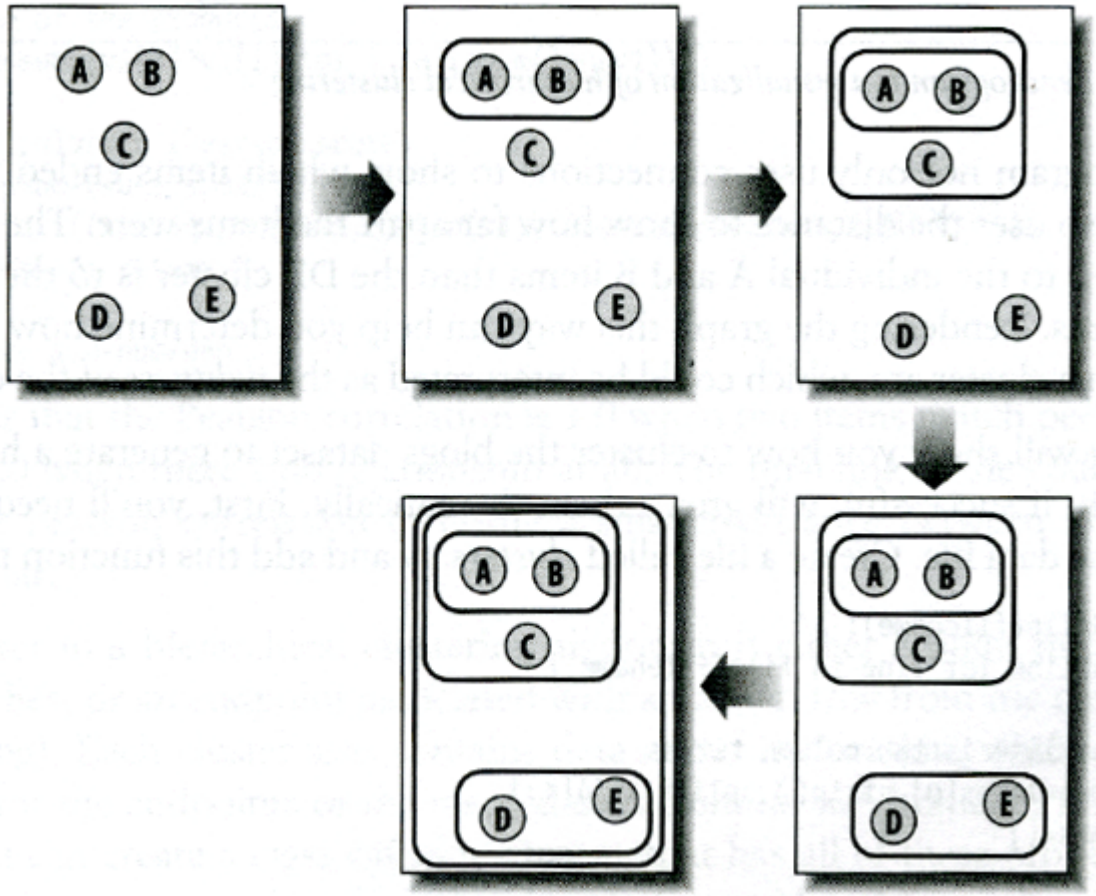
# Cognitive Biases

- Psychological Effects That Can Skew Data
  - Example: Anchoring in Netflix ratings

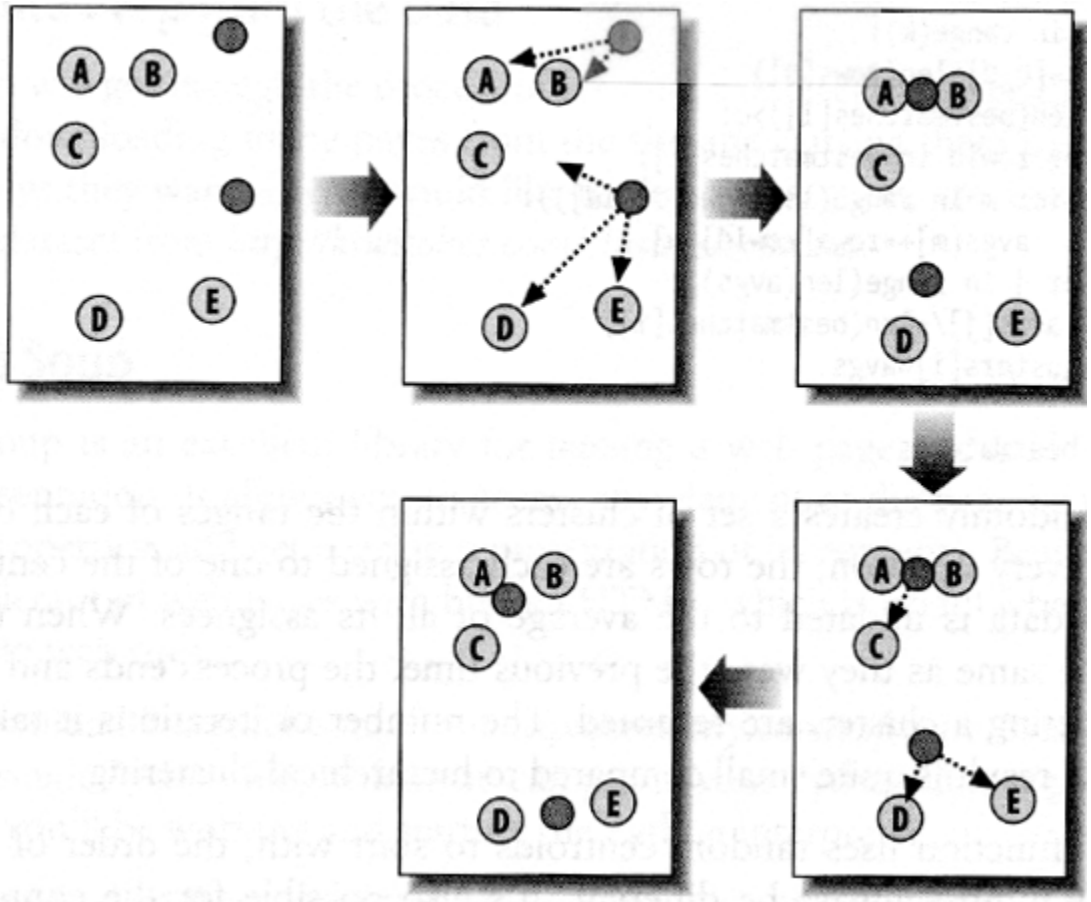
# Clustering

- Prepare data using common set of numerical attributes used to compare items
- Choose clustering method
  - Hierarchical Clustering
  - K-Means Clustering

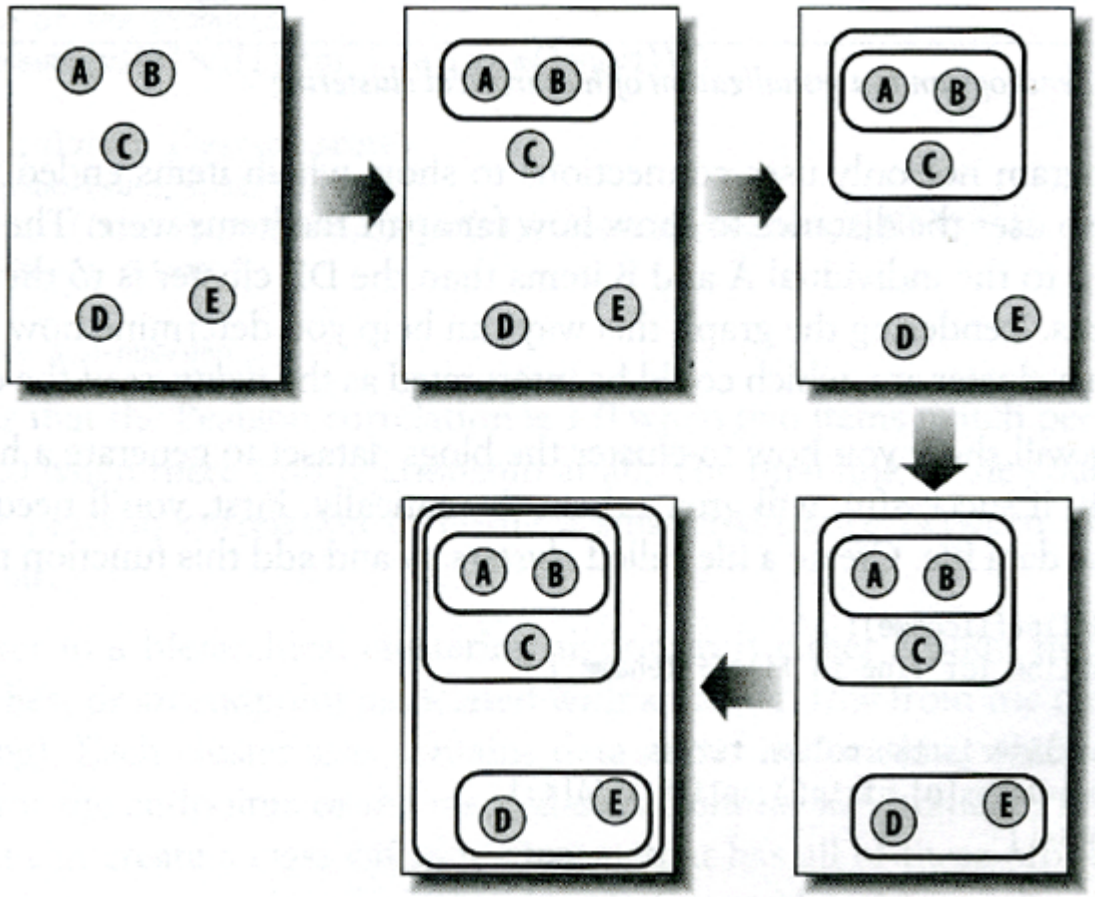
# Hierarchical Clustering



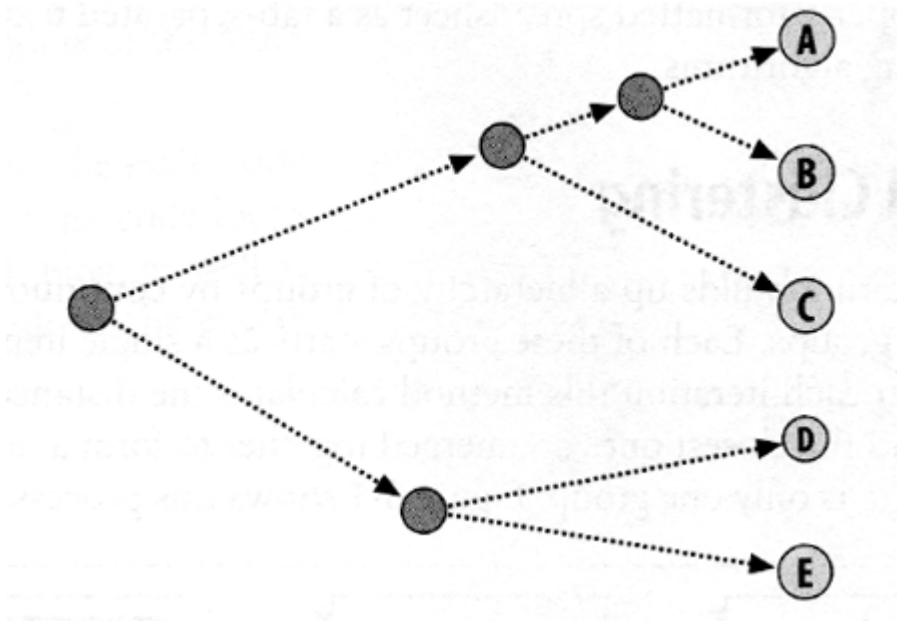
# K-Means Clustering



# Clustering Blogs with Hierarchical Clustering



# Visualizing Clusters - Dendograms



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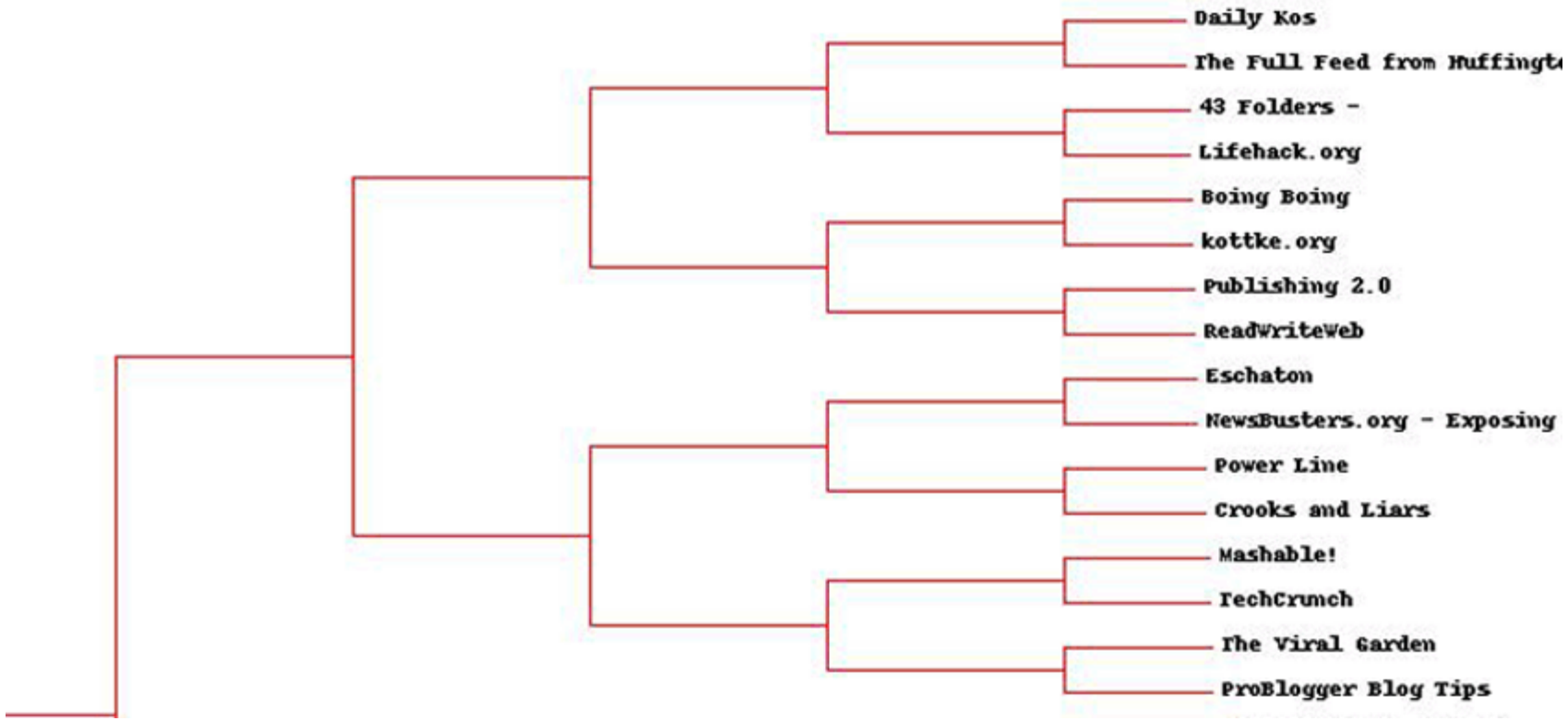
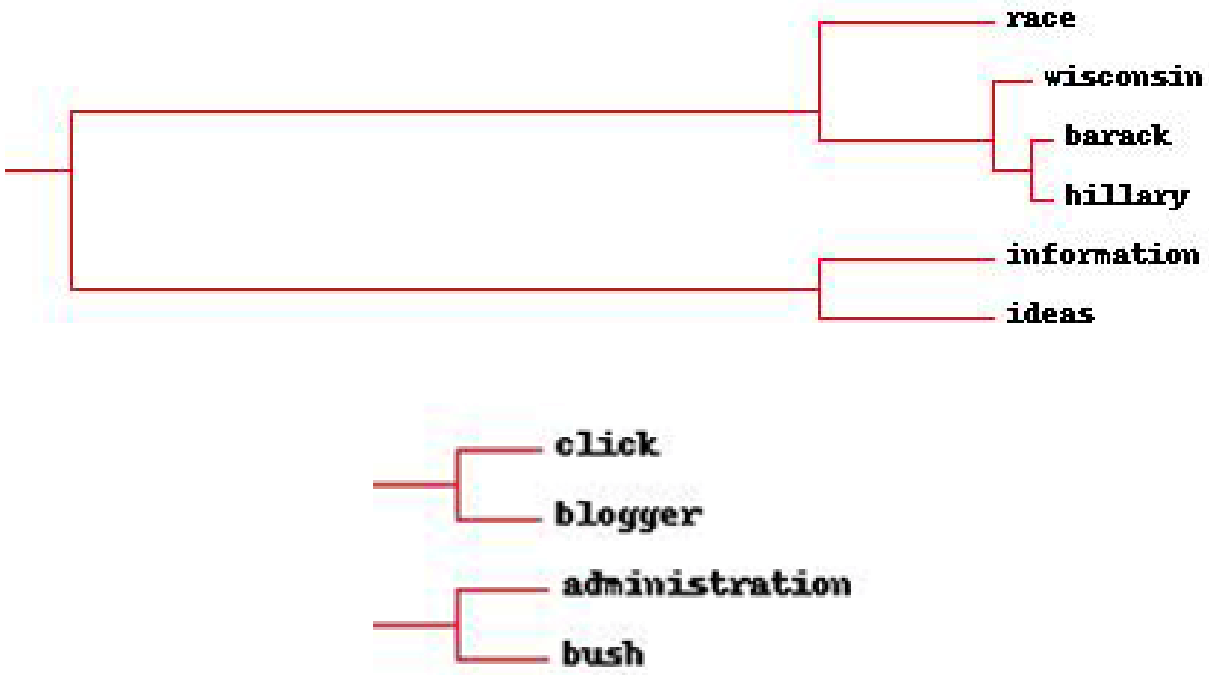


# Clustering Words within Blogs with Hierarchical Clustering



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# Applications to Meta-Design

- Meta-Design Explores Personally Meaningful Activities
  - Output of collective intelligence applications must be relevant to participants
- Meta-Design Requires Active Contributors
  - Collective intelligence applications allow for a wide range of activity, from implicit to very explicit contributions
- Meta-Design Raises Research Problems, Including Collaboration and Motivation
  - Collective intelligence applications can enable implicit collaboration
  - Collective intelligence applications can yield results otherwise not seen by participants, thus increasing utility and positively influencing motivation

# Applications in ‘Transformative Models of Learning…’

- Why attempt to improve UX through Collective Intelligence in this research?
  - As the size of a VO scales upwards, the ability to easily identify connections among members and find relevant information decreases
  - Aiming to Create a VO of Active Contributors
  - Utility = Value / Effort

# Applications in ‘Transformative Models of Learning…’

- Link Members of VO
  - Activity: Members of VO tag themselves
    - Tags – Skills they have, skills they lack (but have use for), research interests
    - Use Tanimoto score to match members with similar research interests
    - Use Tanimoto score to match members who lack a skill with members who have that skill

# Applications in ‘Transformative Models of Learning…’

- Discover Relevant Areas of Study
  - Activity: Rate coursework taken
    - System stores previous coursework of all participants
    - Students can rate this coursework according to how much they liked the subject
    - System uses ratings to suggest other areas of study which may be interesting to student

# Applications in ‘Transformative Models of Learning…’

- Explore Relevant Content
  - Activity: Cluster content within VO
    - Allow members of VO to explore relevant content in clusters using visualizations such as dendograms

# Applications in "…Using and Evolving Software Products"

- Increase Utility of SAP Message Boards
  - Cluster related messages and allow users to explore the messages via an interactive dendogram
  - Make recommendations of threads users may be interested in reading

# Suggested Readings

- Blog of Collective Intelligence (Pór)
- Programming Collective Intelligence (Segaran)
- Peter Morville on User Experience Design
- Elements of User Experience (Garrett)
- The Machine is Us/ing Us