
Three Lessons of Ancient & Modern Philosophy for Creative Human-Centered Computation

David E. Goldberg

Industrial & Enterprise Systems Engineering
University of Illinois at Urbana-Champaign
Urbana, Illinois 61801

deg@uiuc.edu

Data Mining and Creative Times

- The world is flat.
- Returns to creativity are high.
- Data mining grows out of statistics, databases, and ML → analytically creative activities.
- Category creation requires analytical & tabula rasa creativity.
- What qualitative thinking skills do we need to use & teach to create next generation of category creators?

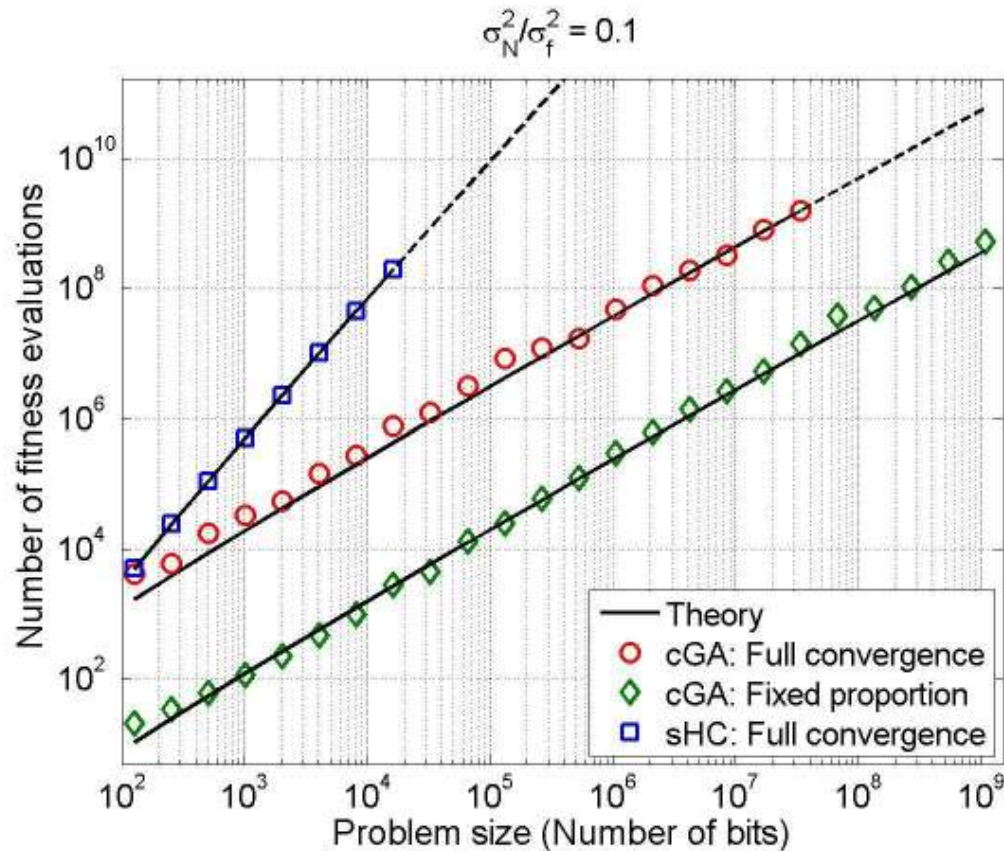
Roadmap

- 3 things I won't be discussing.
- Cold war mindset in an Internet world.
- How I changed my mind.
- 3 lessons from modern & ancient philosophy.
 - Searle and the construction of social reality.
 - Socrates/Plato and the importance of dialectic.
 - Aristotelian data mining and its application to social networks.
- People-centered design at the center of this creativity revolution.

3 Things I Won't Talk About

- I absolutely positively won't talk about the following three things:
 - ❑ GA scalability.
 - ❑ Human & computer agency and the 4-quads.
 - ❑ DISCUS, SAiNT & all that.

GA Scalability & Efficiency

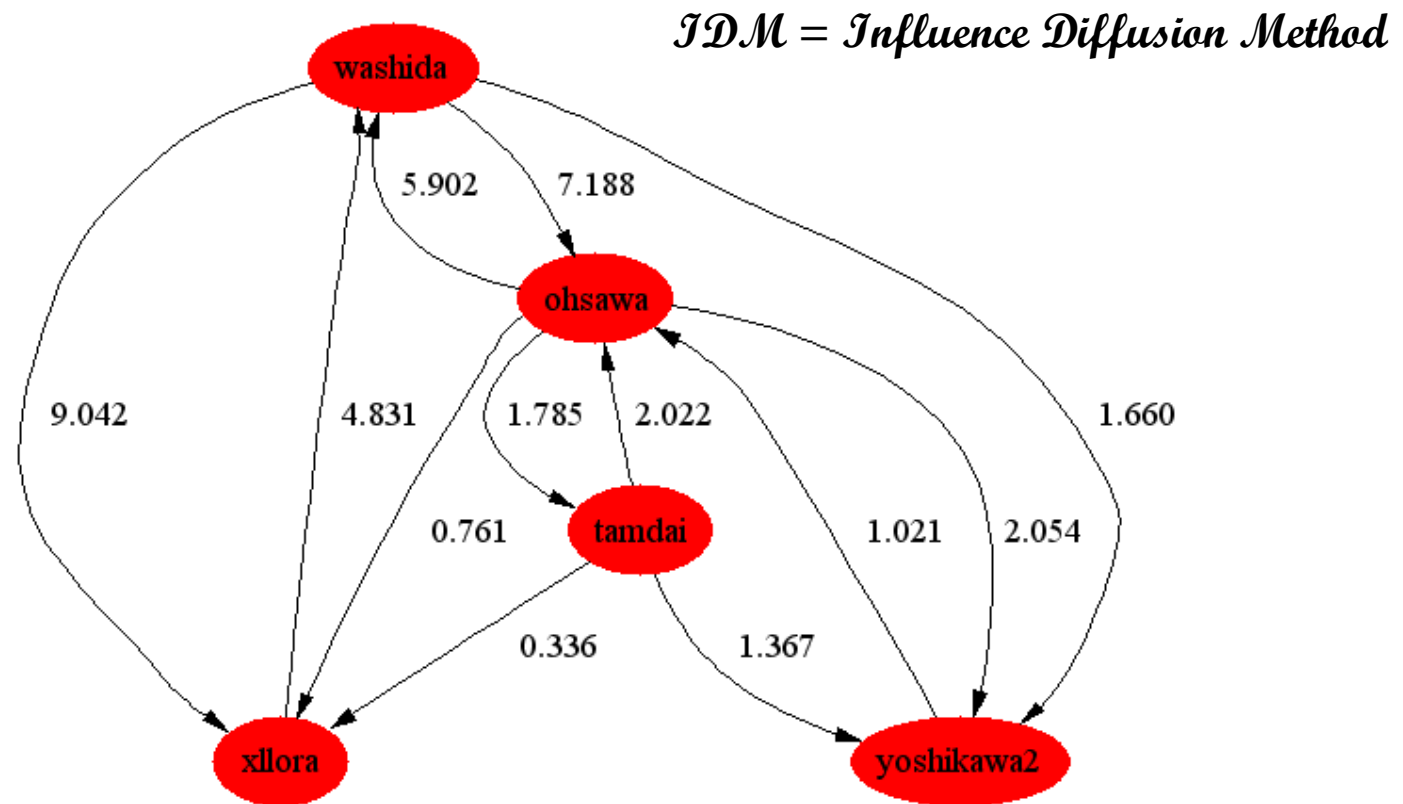


H-C Agency in 4 Quadrants

Inventive agent	<i>computational</i>	Standard Genetic Algorithms	Interactive Genetic Algorithms
	<i>human</i>	Computer Aided Design (CAD)	Human Based Genetic Algorithms
		<i>computational</i>	<i>human</i>

Selective agent

DISCUS Combines Semantic, Social & Machine Reflection



Cold War Mindset, Internet World

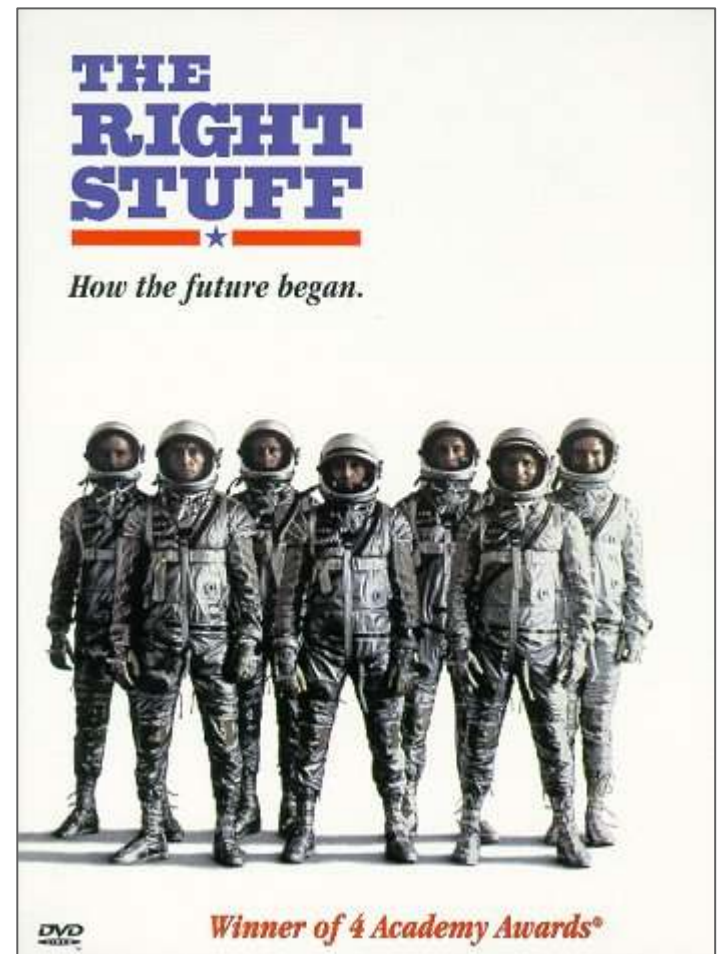
- Large, centralized corporations, governments, and institutions (including universities).
- Revolutions in 20th century in transportation & communications give us radically different world because of transaction costs & network returns.
- Neo-human-centered systems shaped by these forces.



Ronald H. Coase (b. 1910)

Humans as Error in the Loop

- During the Cold War, humans were an obstacle to the proper functioning of a system.
- Tom Wolfe's, *The Right Stuff*, plot: tension between pilots and techies who would eliminate them.
- Cold War view: Humans are error in the loop, and error is to be eliminated.



Postmodern: Humans are the Loop

- Internet, human beings integral part of the system.
- Google as human preference engine. No humans, no Google.
- Brute facts of physics not dominant in postmodern systems.
- Examples:
 - What are the “physics” for Ebay?
 - What equations of motion govern Google?
 - What constitutive relations for MSOffice.

Lost in Space

- How do we design such systems?
- Engineers, scientists & mathematicians lost.
- No physics, what are the constraints?
- How do we model when all our models are gone.
- Data mining answer: collect and analyze data.



3 Lessons from Philosophy

- Creative Modeling for Tech Vision
 - Covers qualitative and quantitative modeling appropriate to new category creation.
 - 3 Lessons:
 - Dialectic in creative modeling.
 - Aristotelian data mining in creative modeling.
 - The construction of engineering reality.
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Tabula Rasa: Curse & Blessing of Category Creator

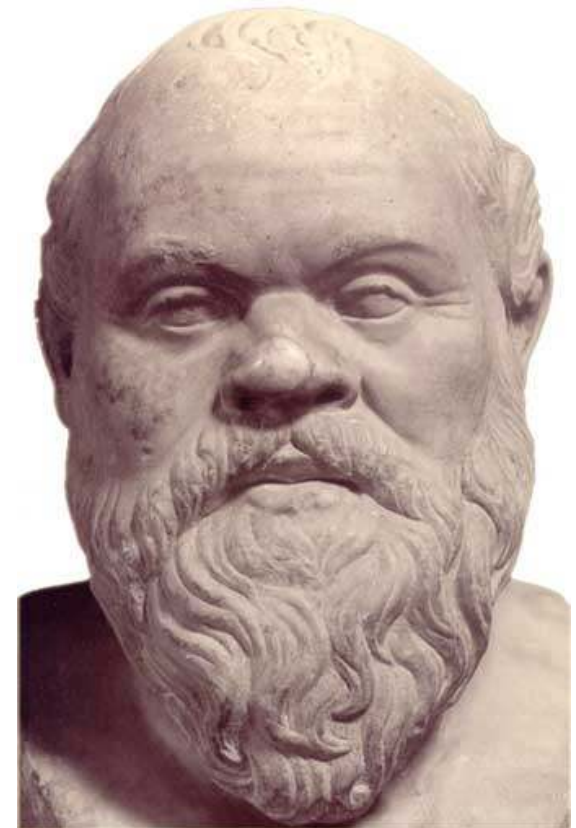
- How do we design when we don't know how to talk about what we are designing?
- Let's start at the human beginnings of conceptual clarity.
- Let's start at the beginning of formal philosophy.
- Let's start with two key techniques from Athens.

What Examples of New Thought?

- Clearest examples are from philosophy.
- Presocratic → Socrates → Plato → Aristotle.
- Mechanisms of the new thought:
 - Socratic dialectic
 - Aristotelian data mining

Socrates and Dialectic

- Socrates was a pain in the neck.
- Walked around Athens asking everyone impossible questions.
- Then proved their answers were wrong, but rarely gave an answer himself.
- Nonetheless, Socrates's method was useful.
- Conversation trying to probe what things really are (or might be).
- Questions were the rights ones. Whitehead's famous remark.



Socrates (470-399 BCE)

The Probing of Dialectic

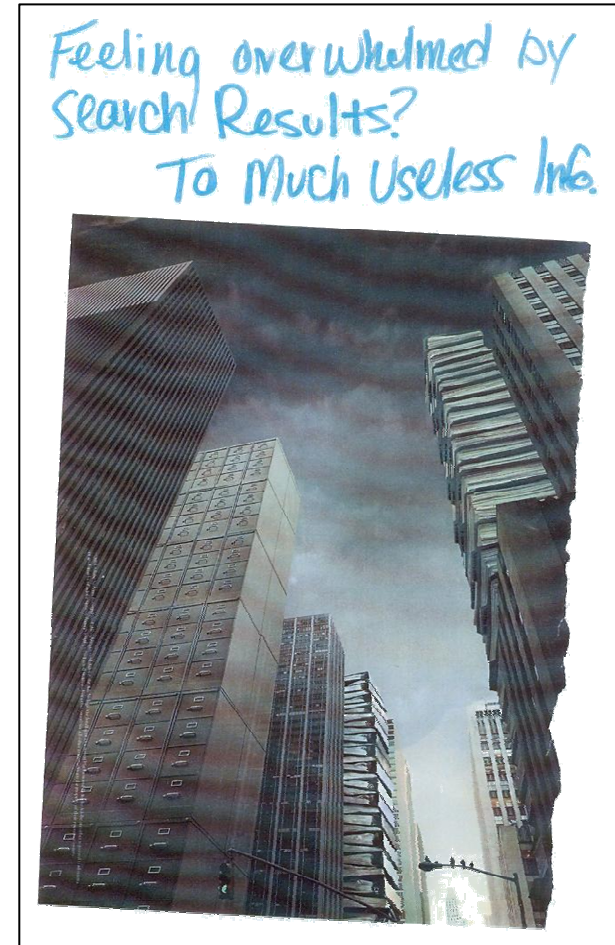
- Questions directed at the essence of things.
- What is the meaning of a common phrase?
“What is virtue?”
- Answers often betray our lack of knowledge and understanding.
- Examine answers critically, often with more questions.
- Ask penetrating questions about the answers.

What's This Got to Do with Products?

- Questions & conversation is at roots of all new products.
- Research on tech visionaries shows that problem finding is the main activity of successful TVs
- Spark of insight may come as flash, but dialectic necessary in new product creation.
- Three roles of questions:
 - Probe customers.
 - Probe organizational hurdles.
 - Probe product developers.

Probing Customers

- Focus groups are immensely powerful.
- Can be informal conversations with potential customers.
- Can be formal focus groups behind the one-way mirror or over web.
- The surprise of Nextumi: Search not solved problem.



Aristotelian Data Mining

- Called *The Philosopher* by some.
- Amazing range and scope of work.
- Created many of basic categories of college curriculum.
- Founded a school the Lyceum.
- We have 1/3 his output (2000 pages in 30 books).
- *Categories* and *Metaphysics*.
- Method very modern:
 - Empirical search for data.
 - Considered attributes, which he named.
 - Classified data according to his attributes.
- Can we break this down?



Aristotle (384-322 BCE)

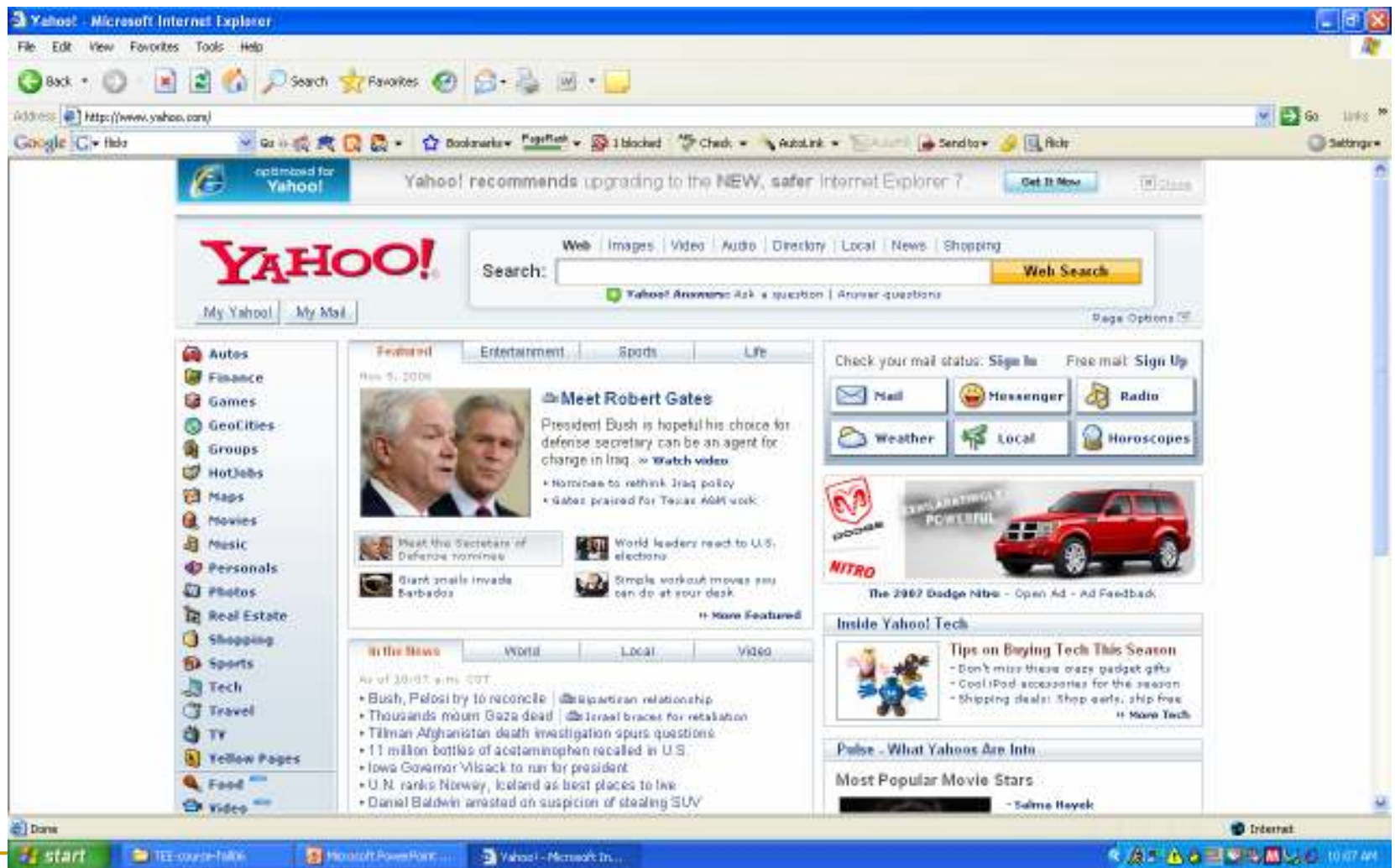
A Hierarchy of Things

- In Aristotelian data mining we seek list of essential qualities that delineate products or services.
- Notion of genus and species comes from Aristotle.
- Things divided into groups of like *kinds*.
- Can be subdivided further.
- At the bottom are *particulars* or *substances*.
- 10 categories: substance, quantity, quality, relation, place, time, position, state, action, and passion.

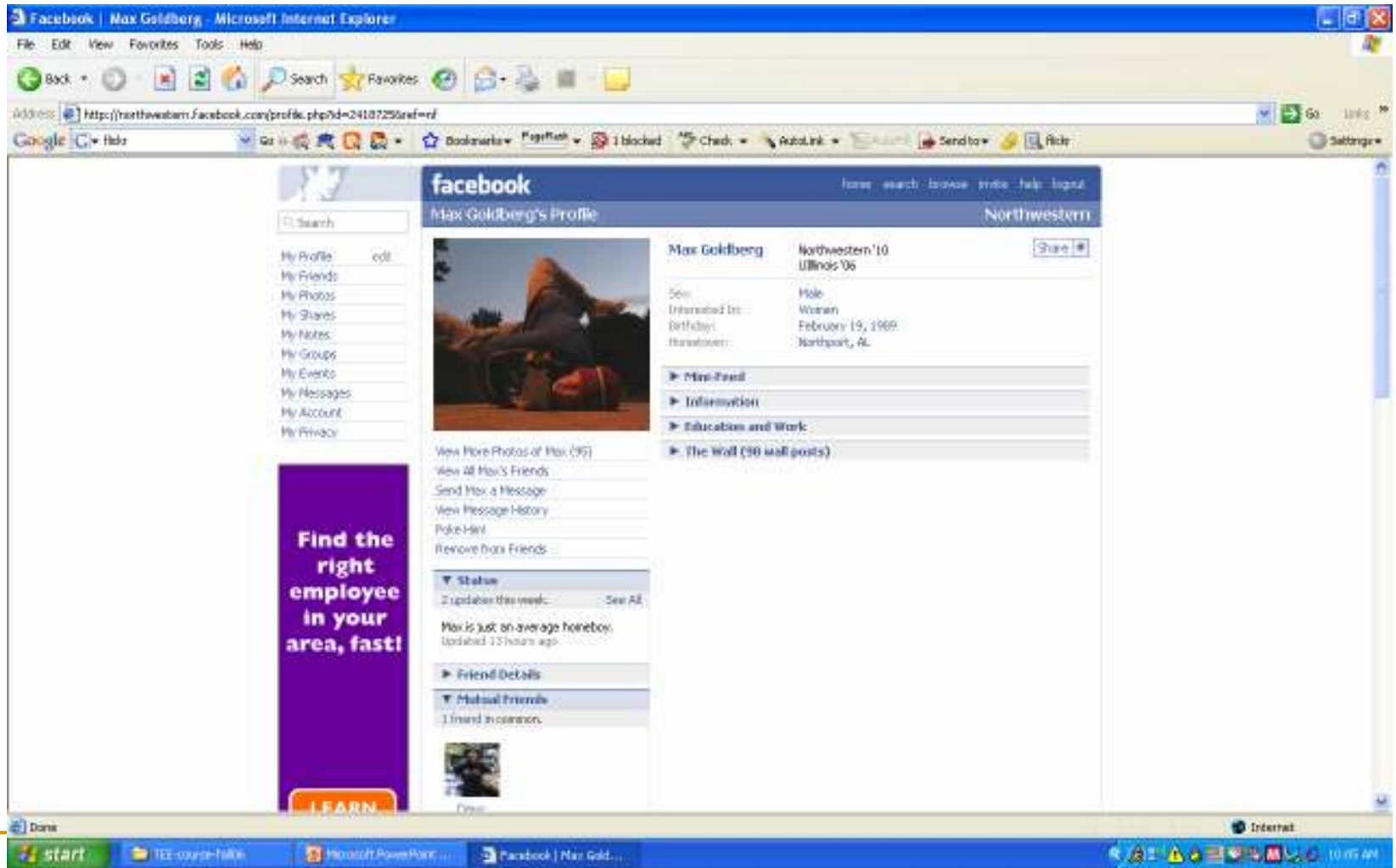
Aristotelian Product Spaces

- Consider space of existing products that are related or similar.
- Look for different exemplars that represent different types of products.
- Taking viewpoint of the customer here.
- May need separate decomposition for design.
- Consider, for example, social networking space.

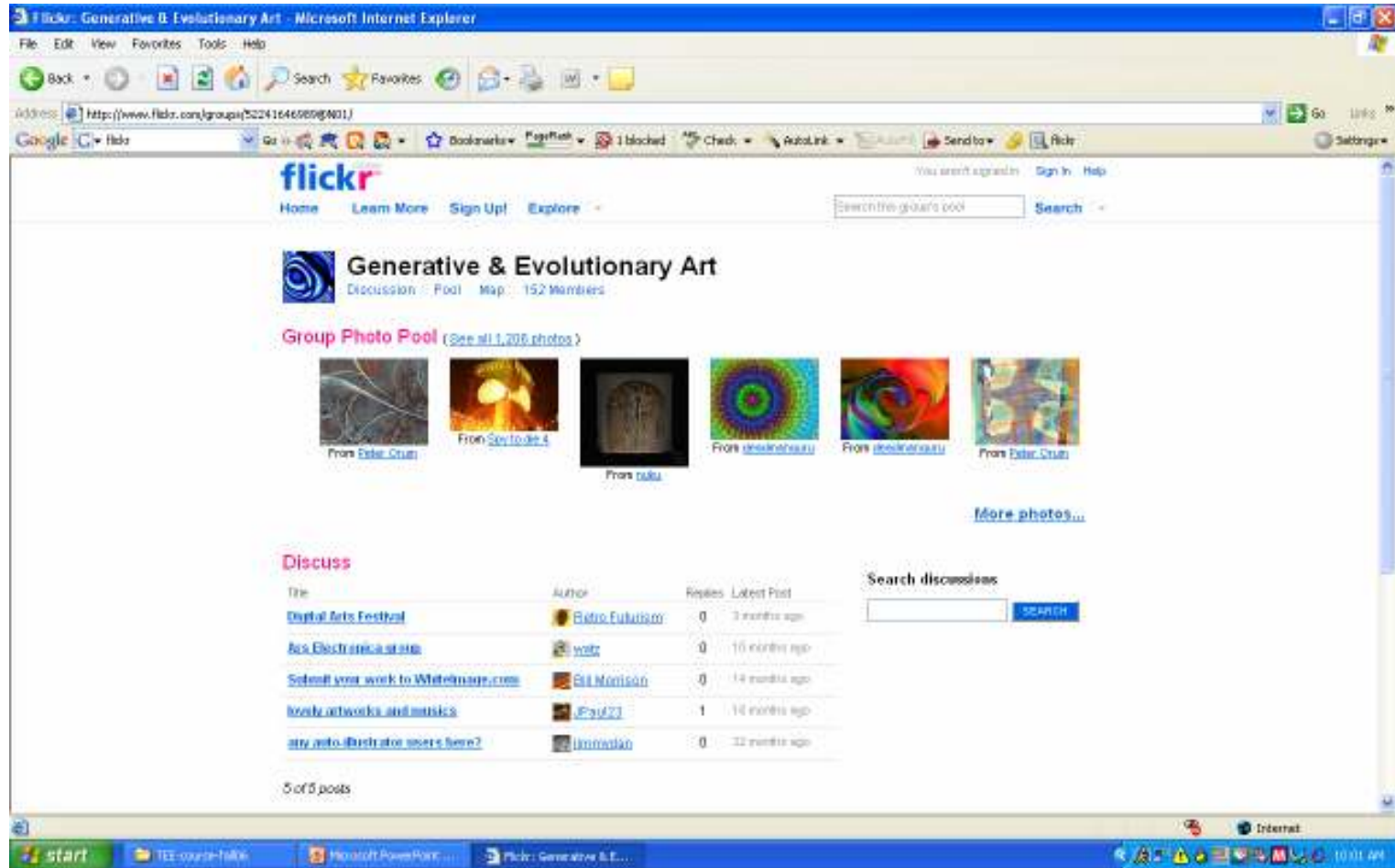
Yahoo



Facebook



Flickr



What Common? What Different?

- Can we make a list of attributes that separate the space?
- Can use J. S. Mills methods or methods of modern data mining.
- Attributes:
 - ❑ Mode of communication (email-IM-mobile-wall)
 - ❑ Sense of community (ind-group-friends)
 - ❑ Gate to community (edu filter-anybody)
 - ❑ What shared (text-docs-photos)

Some Techniques with Attributes

- Dimensionalization of spaces very helpful to high-level thought.
- Listen to discussions and try to dimensionalize quickly.
- 3 techniques that come to mind:
 - Cartesian products
 - Expert systems
 - Hypertrophy of the dimensions

Dimension Hypertrophy

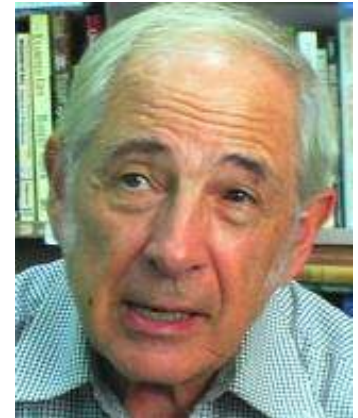
- Are there missing categories on the dimensions?
- Did we capture all the modes of things shared?
- Example, text-photos-docs: What about videos?
- Is that a good idea?

YouTube & \$1.65 Billion Buyout



Construction of Engineering Reality

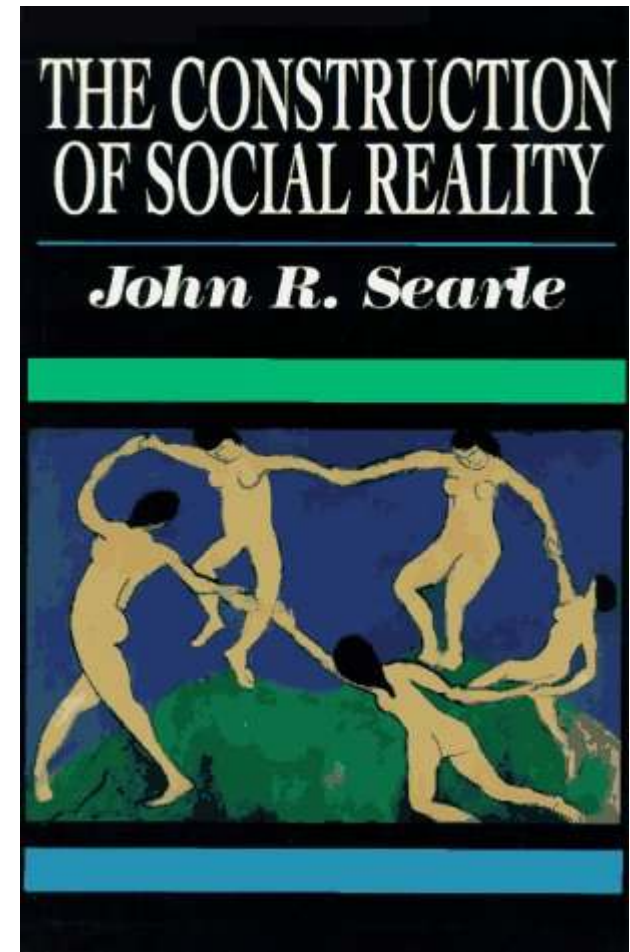
- Mill Prof of Philosophy of Berkeley.
- Philosopher of language and mind.
- Early work took off from Austin's work on speech acts.
- What does language have to do with it?
- His book, *The Construction of Social Reality* (Free Press, 1995), critical to our study.
- Helps us understand social and institutional facts, separate physics from the social.



John R. Searle (b. 1932)

Objectivity versus Subjectivity

- Have existence versus knowing, as well as objective versus subjective.
- Examples:
 - Mountain: existence → objective
 - Pain in toe: existence → subjective
 - Pain in toe: knowledge → objective
- Ontological subjectivity does not prevent epistemological objectivity.



Structure of Social Universe

- Mind creates an objective social reality.
- Example, money:
 - Trivial physics: money not money because of material existence.
 - Money, money because of our intentions.
- Other examples: language, government, universities.
- Object fits description because we think it does.
- What is ontology of the social and the institutional?



Building Blocks of Social Reality

- Need 3 new elements:
 - Collective intentionality: we intend.
 - Assignment of function: function is never intrinsic, always observer relative.
 - Constitutive rules.

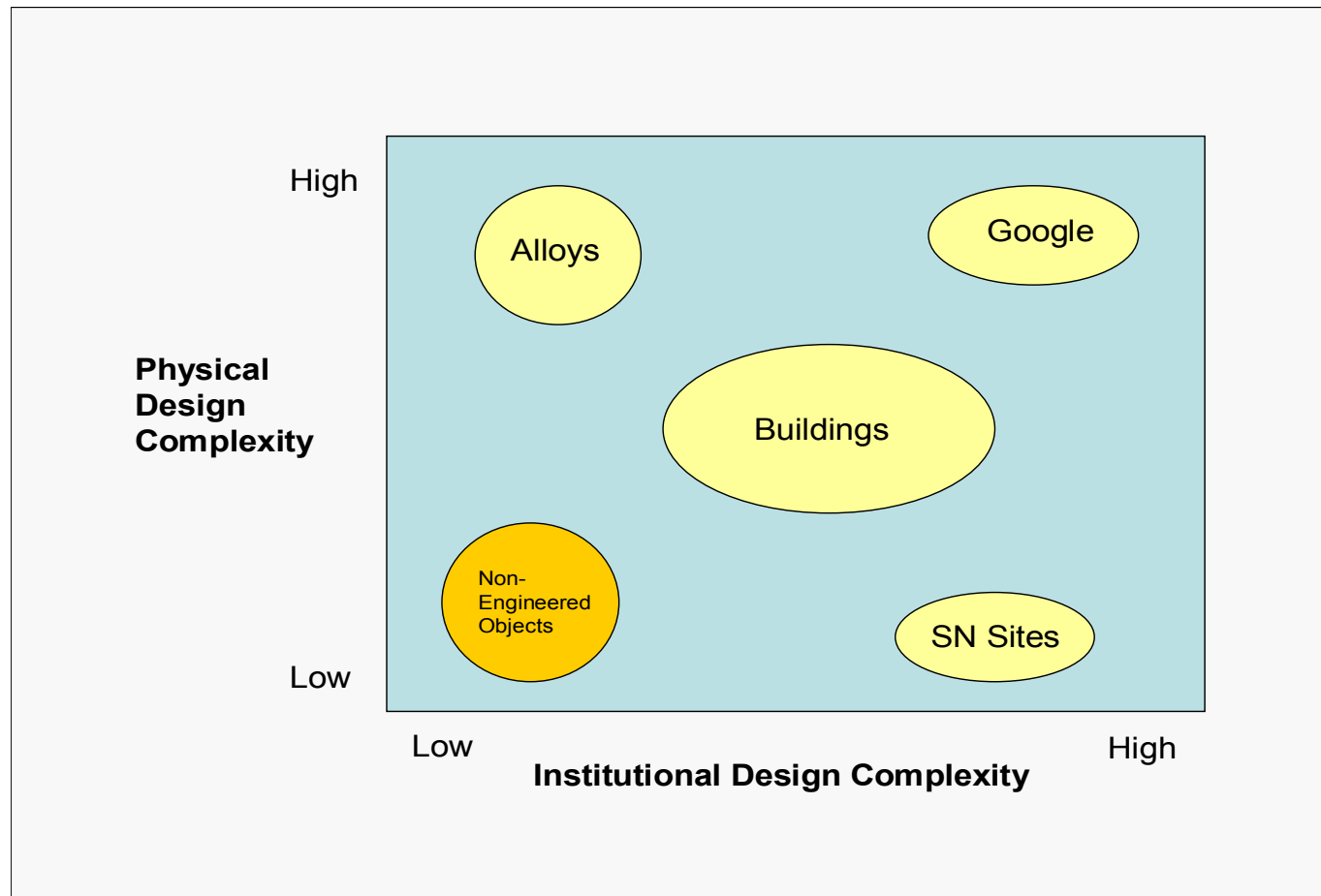
Constitutive Rules

- How to distinguish between brute facts and institutional facts.
- Types of rules:
 - Some rules regulate: “Drive on rleft side of road.”
 - Some rules regulate and constitute: Rules of chess both regulate conduct of game and create it.
- Constitutive rules form: X counts as Y in C.
- “Move two and over one” counts as a knight’s move in chess.”

Web Life: Institutional Complexity

- Go on Google, search for online book seller, sign in to Amazon.com using account ID, order a book, using a credit card, get recommendations from recommender system & order some of those books, too.
- Get confirmation message via e-mail account, and books delivered by FedEx.
- Refers to string of institutional facts.

Institutional/Physical Landscape



Matters to People-Centered Design

- The web has changed a lot.
- Interconnected, software reconfigurable systems enable brave new world of institutional facts:
 - Easily constructed.
 - Easily propagated (viral marketing).
 - Easily iterated (systems upon systems).
- Forms basis for discipline of “postmodern systems engineering.”

Bottom Line

- Data mining rooted in analytical creativity.
- Category creation requires tabula rasa creativity.
- Beginnings of systematic qualitative modeling in Athens.
- Distinguish brute, social & institutional world with Searle.
- Better human-centered computation via new discipline of postmodern systems design.

More Information

- *TEE*, the book.
<http://eu.wiley.com/WileyCDA/WileyTitle/productCd-0470007230.html>
- *TEE*, the blog.
www.entrepreneurialengineer.blogspot.com
- *TEE*, the course.
<http://online.engr.uiuc.edu/webcourses/ge498tee/index.html>
- *MTV*, the course.
<http://online.engr.uiuc.edu/webcourses/ge498tv/index.html>
- *Engineering and Technology Studies at Illinois* (ETSI)
<http://www-illigal.ge.uiuc.edu/ETSI>.
- 2007 Workshop on Philosophy & Engineering (WPE)
<http://www-illigal.ge.uiuc.edu/wpe>
- Illinois Genetic Algorithms Lab
<http://www-illigal.ge.uiuc.edu/>

