Large Scale Social Phenomena

1590 (Graduate) / 4400 (Honors Undergraduate) / 4400 (Undergraduate)
Informatics West, Room 107 / Mondays and Wednesdays, 4:00–5:15 PM
Professor Simon DeDeo / simon.dedeo@gmail.com / http://bit.ly/lssp2014
Associate Instructor (AI) Artemy Kolchinsky / akolchin@indiana.edu
[version: 13 January 2014]
Office Hours
Simon DeDeo: Fridays, 3–5 PM; Informatics East, Room 302.
Artemy Kolchinsky: Mondays, 9:30 AM—11:30 AM; after class; and by appointment.

Prerequisites
Programming skills and initiative sufficient to work with real-world data (sample question: what is the variance in the end-of-day S&P 500 for 2005). Basic understanding of probabilities (conditional, joint). Strong interest in the topic.
[From the original announcement]

Sample Question
One of our tasks is to get your programming skills to a point where you can work fluently with real-world data. You may use any language you like; we recommend Python. Monday, January 27th, Artemy will lead a class on programming methods and debugging. Otherwise, we do not devote significant lecture time to programming skills.

To help you assess your level of programming skill, we have provided a sample question in the original course material, and reproduce it here: what is the variance in the end-of-day S&P 500 for 2005?

The S&P (“Standard & Poor’s”) 500 is the sum of 500 stock prices weighted by size and used as a barometer of the business economy.

You should attempt to answer this question by writing code to process the data downloaded from the Internet. If you are having trouble with this question, visit Artemy during his office hours. Artemy serves as the primary point of contact throughout the semester for developing your programming skills.

Requirements
Graduate students: problems for discussion (one per week).
Graduate students & honors undergraduates: one in-class presentation.
All students: one joint mid-term hackathon; one final paper.

The goal of this course is to prepare you to work at the research frontier. The primary method of feedback is via verbal and written evaluations at (1) mid-term and (2) final day.

To provide an additional source of feedback on your own understanding of the material, we will have a short quiz at the beginning of each class. These will not be graded. We (Artemy and I) will use these solely for planning purposes.

The class workload is “heavy in the middle”. On-schedule progress will mean a higher workload around the middle of term, with significantly reduced work compared to a normal class at semester end.

Readings, and problems for discussion, for each meeting are listed, day by day, below.

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Readings and Problems for Discussion

You are expected to come prepared to class having done all the readings and having thought deeply about the problems for discussion. *I recommend you spread a reading out over two days: this aids both retention and exploration.*

All students should attempt the problems for discussion. Most are open ended, and designed to spark discussion, debate, and dissent. All require initiative and creative thinking—feel free to adjust the problem if you think you can make it better, deeper, or more interesting.

Graduate students *must* submit, each Wednesday, a solution or attempted solution to one of that week’s problems for discussion (PFD). This is to encourage you to attempt scientific problems outside of your usual comfort range, and will be graded pass/fail on a very easy scale; any honest and thoughtful attempt will receive a passing grade. As a guideline, your weekly PFD should include at least one graph (for data-analysis problems) or calculation (for theory) or paragraph (for conceptual work). You are excused from a PFD on the week you do your in-class.

Presentation

Starting on the second week, Monday’s class will include a thirty-minute presentation by graduate students and honors-track undergraduates. You may use the whiteboard, photocopied handouts and the projector. Please test the projector beforehand!

Because your fellow students will be relying on you to explain and develop the material, good preparation is essential. You *must* practice your presentation before coming to class. Artemy and I are more than happy to do a run-through of your presentation, or to brainstorm with you, during our office hours.

Your presentation should (1) cover the basics of the reading, and (2) attempt the problem for discussion. I will attempt to demonstrate good form by doing the first student presentation, on Day Two, myself.

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1. Except for the week of Martin Luther King day (January 20th), when Monday class is cancelled; February 24th, when we will have a Monday guest lecture from Ryan James; and March 24th and April 2nd because otherwise disaster would ensue. These four times, the presentation will be on Wednesday.
**Mid-Term Hackathon**

We replace our mid-term exam with a collaborative hackathon. Participants will work in groups of three or four to solve a single question; each group will receive a different question.

In addition to intellectual development, an explicit goal of the hackathon is to develop your collaborative skills, and your ability to rapid prototype—to follow a good idea on a whim.

Graduate students are encouraged to work in groups of three. Artemy and I explicitly solicit potential questions for the Hackathon to supplement the ones we have on file. Please e-mail them to me (Simon) at sdedeo@indiana.edu. On Day Eight, you can either (1) tell us the (approved) question your group has chosen, or (2) receive one at random.

The time-limit is 117 hours (5:15 PM March 5th to 4 PM March 10th, not counting a 45 minute half-time), with solutions presented in a 15 minute talk at one of the subsequent two classes. Provisional ratings will be informed by the fixed-point of a recursive trust algorithm, using ratings submitted by fellow students.

Your 117 hours will likely have three phases, and at least three meetings. The first phase involves brainstorming an approach, or set of approaches to the question, and (self-)assigning analytical and numerical tasks. The second phase involves critically re-directing the joint program given shared task outcomes. The final phase is to consolidate results, to assess the group’s findings, and to plan and rehearse the final presentation.

**Final Paper**

A serious but brief research paper, of between three and five pages (excluding figures; 1,000 words or more), presenting novel results and clearly demonstrating grasp of the (1) conceptual, (2) mathematical, and (3) data-analytic goals of the course. Ideally based on the participant's presentation and hackathon.

Figures (but not text) may be shared between participants (with proper credit in caption). Final grades will involve assessment of both quality and quantity of original work.

Groups including at least one graduate student (or by explicit written permission) may submit a joint three-author paper, formatted and intended for submission to a particular peer-reviewed journal or conference. Contributions from all three authors must be sufficient for the paper to include “these three authors contributed equally to the paper” in the acknowledgements/footnotes. The paper will receive a grade and peer review from Artemy and I. You will have an opportunity to respond to our report, and grades may be adjusted.
Grading & Policy
Students are expected to do all readings, participate vigorously and in a collegial spirit, and attend all meetings unless excused, in writing, more than 24 hours prior.

Because class participation and face-to-face engagement is essential to both your development and the development of other students, please close all laptops and tablets at the beginning of class. Turn off all cellphones and ringers completely (no vibrate mode).

Graduate & honors students: there are three assignments: an in-class presentation; a mid-term hackathon; a final paper. These are given 25%-25%-25% weight. Class participation, weekly PFDs, and engagement amount to an additional 25%; it is impossible to achieve an A without a strong showing in this fourth category.

Non-honors: there are two assignments: a mid-term hackathon; a final paper. These are given 30%-40% weight. Class participation and engagement amount to an additional 30%; it is impossible to achieve an A without a strong showing in this third category.

Any of the following will result in a zero for that portion of the grade weight: (1) failing to attend class on the day of your presentation; (2) failing to attend meetings of your group’s hackathon and/or final presentation; (3) failing to submit your final paper on April 30th. Exceptional circumstances (medical emergency, &c.) require written confirmation from an official source. If you anticipate having difficulties with this paragraph, you should not take this class.

Changing Requirements
As in many popular video games, you may adjust the difficulty of this course. As in some religious orders, however, you may only adjust the difficulty upwards. Artemy and I are happy for students to take on additional requirements, with written permission. This decision is non-revocable and you will be graded and assessed at the level you initially request. Upon successful completion of the course, I am happy to write an informal e-mail to someone writing your recommendation letters noting your additional effort.

A Note on Personal Development
Successful science requires not only intellectual and technical abilities, but also collaborative skills and disciplined habits of mind. Where appropriate, we’ll address some common strategies for mental self-regulation and conflict resolution. Links are also available at http://bit.ly/lssp2014, and Artemy and I are happy to brainstorm with you offline.
Book List

*Game Theory and Economic Modeling*, David Kreps  
*A Cooperative Species*, Sam Bowles & Herb Gintis  
*Why We Cooperate*, Michael Tomasello et al.  
*Language, Consciousness, Culture: Essays on Mental Structure*, Ray Jackendoff

[links at http://bit.ly/lssp2014; total Amazon price $90.09; list price $108.85]
Syllabus

Days with particularly “conceptual” readings are marked with a [C]; with a strong quantitative angle are marked with a [Q]. Weeks with a [*] are student presentation weeks. Links to readings, and books, are at http://bit.ly/lssp2014.

Week One: The Reverend Bayes looks out the window
Monday, January 13th
Introduction

Goals of the course. Self-assessments. Faculty presentation. Discussion.

Wednesday, January 15th
Reverse Engineering the Angel—Probabilities and Bayes’ Rule

Note: Instructor presentation today.

Assigned readings
Lecture Two, “Plausible Reasoning”
Lecture Three, “Laplace’s Model of Common Sense”
Lecture Four, “Bayes’ Theorem and Maximum Likelihood”
“An Intuitive Explanation of Bayes' Theorem”, Eliezer Yudkowsky
http://yudkowsky.net/rational/bayes/

Problem for discussion
The doctors who misadvise their patients are acting in a non-Bayesian fashion (given the priors Eliezer specifies).
(1) reverse-engineer the (implicit) priors that the doctors hold, given their stated beliefs (and, presumably, their behaviors) following a positive mammogram. Are there ways these priors might be justified?
(2) find an example of non-Bayesian behavior in the real world, and present it in mathematical form. Can you formulate an alternate set of (untrue) beliefs that would make the behavior rational again? The example should involve both prior beliefs, the receipt of a signal (the making of an observation), and a new and updated belief in response.
[\textit{\textbf{[*] Week Two: Claude Shannon pays a visit}}]

\textit{Monday, January 20th.}
[no class—MLK day]

\textit{Wednesday, January 22nd.}
Information Theory, or, Claude Shannon is my Co-Pilot

\textit{Assigned reading}
http://cm.bell-labs.com/cm/ms/what/shannonday/shannon1948.pdf

\textit{Problem for discussion}
Many classic texts of English literature are now online (see, e.g., the Gutenberg project and example text http://www.gutenberg.org/files/144/144-o.txt). Has the entropy (at the word level, say) of individual texts changed over the last 500 years? Compute the entropy for (at least) a few texts, or a few chapters. Give a cool Shannon-esque interpretation of your finding.

We will cover more detailed methods for estimating the entropy of a real-world phenomenon on Day Four. For now, you can estimate the probability, \( p_i \), of an event of type \( i \), by \( n_i/N \), where \( n_i \) is the number of times you see the event of type \( i \), and \( N \) is the number of times you looked. e.g., if you see the word “cat” ten times in a text that had five hundred words, \( p_{\text{cat}} \) would be \( 1/50 \), or 0.02. Then just use those \( p_i \)s in the Shannon formula.

Because of the diversity of the English lexicon, you may want to consider only the top 100 words found in the full text (consider all other words “non-events”, not contributing to \( N \)). Otherwise, you will have lots of words with only one or two hits.

You may also wish to work with parts of speech (e.g., “noun”, “verb”, “conjunction”, etc.); a sentence can be transformed into its parts of speech using Natural Language Processing software such as the NLTK toolkit, http://nltk.org. The thing you want is a “Parts of Speech Tagger”. In this way, your probability distributions for the texts can be over a small number (~20) of categories, rather than all 60,000+ words in the English language.
**Week Three: Bayes and Shannon go for a walk**

**Monday, January 27th.**

Case Study: Information flows in the Afghanistan Insurgency, 2004-2010; Decision-making at London’s Old Bailey, 1674-1913.

*Note:* our Associate Instructor, Artemy, will present this week. Bring your laptops! Open them! Get your Python interpreter up and running! Do not check Facebook!

**Assigned reading**

http://www.mdpi.com/1099-4300/15/6/2246


**Problem for discussion**

Using bootstrap methods (e.g., THOTH, http://thoth.org) determine the distinguishability of William Shakespeare and Christopher Marlowe, based on hearing a single word from one of their plays. Bonus: do this for word pairs, triplets, &c. Double bonus: make a network of Renaissance playwrights with edges weighted by Jensen-Shannon divergence. As in the case of the Day Three assignment, you may find it most useful to (1) truncate to the most common words, or (2) work with just parts of speech; this will allow you to consider the pair, triplet, &c. cases much more easily.

You are more than welcome to take a different pair of authors, including cross-genre pairs such as Jane Austen and Jack London. The adventurous might consider trying different newspapers (scrape the *New York Times* and *Wall Street Journal*?) or other textual datasets of interest.

**Wednesday, January 29th.**

Bayesian Surprise, or, Claude Shannon meets Reverend Bayes

**Assigned reading**

[*] **Week Four: They are joined by Johnny Von Neumann**
Monday, February 3rd.
Game Theory, Sport of Kings (and Presidents)

**Assigned reading**
Ch. 3, “Basic notions of non-cooperative game theory”
from *Game Theory and Economic Modeling*, David Kreps

**Notes for presenter**
Game Theory is an essential part of the Informatician’s toolkit. The most important concept within game theory itself is that of the Nash equilibrium. Make sure you know (and that your presentation clearly states) what a Nash equilibrium is in both the pure and mixed case.

**Problem for discussion**
Take a social phenomenon of interest to you (e.g., crossing the street, going to a party, casual dating, sharing a secret, forming a hackathon group) and construct a reasonable account of it in an extensive form game. How many players are there? What are the information sets? What actions are possible?

Redescribe it in normal form. What do the strategies look like? How do the actions of the extensive form case transform?

Analyse its Nash equilibria. Are these equilibria predictive? (Do people actually behave this way?) Can you adjust the extensive form description? Note that three-person (and higher) games can be tricky to notate.

**Wednesday, February 5th.**

**Assigned reading**
Ch. 4, “The successes of game theory”

**Optional reading**
Ch. 5, “The failures of game theory”
from *Game Theory and Economic Modeling*, David Kreps
[*] Week Five: They encounter the Ghost of Lenin and Hear a Folk Theorem
Monday, February 10th.
Collective Cognition: Who is thinking? [C]

Assigned readings
http://bit.ly/18QkBA
Ch. 14, “Economic Governance: Markets, States and Communities”
from Microeconomics: Behavior, Institutions, and Evolution, Sam Bowles (2004).

Problem for discussion
Return to the non-Bayesian doctor, for whom a change of priors was sufficient to make him rational again. Now assume he begins with the correct priors, but still acts the same.

Develop a story of institutional incentives or beliefs that can explain his behavior as the outcome of a (self- or other-) regarding preference. Consider a “preference” to be a map from actions and outcomes to a real number, which you can measure in dollars or “utils”.

Develop a mathematical model of the preferences you asserted for the doctor, and show how his behavior is rational again. Can you imagine ways to test this model against that of Day Two? How might we distinguish individual beliefs from institutional ones?

Wednesday, February 12th.
“The Folk Theorem of Games”

Assigned readings
“Cooperative Homo economicus”, Ch. 5
from A Cooperative Species, Sam Bowles and Herb Gintis (2011).
**[*] Week Six: They Contemplate the Animals**

Monday, February 17th.

Case Study: timescales of decision making in a primate social group [Q]

**Assigned reading**


http://rsif.royalsocietypublishing.org/content/early/2011/02/09/rsif.2010.0687.abstract


http://www.mdpi.com/1099-4300/15/11/4932

**Notes for presenter**

This is a “methods” day, to give you a new tool—null hierarchies—for examining social data. Make sure that your presentation of the (totally fascinating) questions in animal and human behavior highlight the methods of scrambling and shuffling data in the way described.

**Problem for discussion**

Consider three tech stocks, AAPL, IBM and DELL (or as you please) over the last thirty years. How strongly correlated are they on a day to day basis? Measure this using the Pearson cross-correlation for all three pairs, using the end of day prices. How does that cross-correlation change over time, say, decade by decade?

Now, use null models of varying strength to test this against baseline expectations: for example, consider (1) sampling with replacement from the whole decade; (2) sampling with replacement year-by-year; (3) sampling with replacement from a larger set of tech stocks; (4) sampling with replacement from the full set of NASDAQ stocks. Say something clever (or deflate an idea that seemed plausible at the time).

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**Wednesday, February 19th**

Case study: local actions & emergent phenomena

**Assigned reading**

“From aggression to dominance: the hidden logic of missing links”

preprint, distributed by hand

Elizabeth Hobson & SD
[*] Week Seven: They turn from the Animals to regard the Children
February 24th: Guest Lecturer, Dr. Ryan James

February 26th: Why do we cooperate? [C]

Assigned reading
Optional: responses (remainder of book)

Problem for discussion
This is (along with Day Five) the most conceptual of the readings we have had so far; it is also the first to introduce both explicit evidence from the developmental and evolutionary literature. The challenge here is (1) to pick some of the best arguments to present, and (2) to tie what you have read to some of the more mathematical approaches that we have seen on other days.

Choose one of the examples from either Tomasello or his interlocutors, and produce a relevant mathematical model that includes probabilistic or information theoretic concepts.

Note: You should now come to agreement on your group for the Hackathon! If you have not come to agreement on a group by Monday, March 3rd, please contact Artemy and I by e-mail before class.
[*] Week Eight: They play at dice
Monday, March 3rd.
Markov Chain Gang

Assigned readings
Markov Chains
from The Chance Course

Optional Reading
“First Links in the Markov Chain”, Brian Hayes

Notes for presenter
Some caution and care is very useful in presenting this material; make sure you’ve kept your notation consistent (e.g., is $P_{ij}$ the probability of being in $j$, conditional upon being in $i$ just previously? Or is it the joint probability of being in $i$ at time $t$ and $j$ at time $t+1$?)

Problem for discussion
Take a time-series (or set of time-series) of interest; for example, sheet music from the Baroque, text from your spam folder. Determine the transition matrix (see Week Two to remind yourself how to estimate probabilities “naively”), and analyse the basic properties of the system, considered as a first-order Markov process. Simulate! Try a second order process. Does the output seem more “realistic”?

Find the stationary distribution (add in a small redistribution probability in the unlikely case that the final network is not irreducible and make sure things stay normalized). Beware of left- vs. right-eigenvectors, and make sure your matrix is the right way around!

Discuss the relationship between a sample time series and the stationary distribution.

Wednesday, March 5th
Collaboration Skills, Hackathon Discussion

Assigned readings
None.

Note: Questions Distributed; Hackathon begins Wednesday, March 5th, 5:15 pm.
Week Nine: Bayes, Shannon, and Johnny Von Neumann go to the fair
Monday, March 10th & Wednesday, March 12th

Midterm Hackathon Presentations

[note that Spring Break starts Friday]
[*] Week Ten: Returning from Spring Break, they meet Noam Chomsky
Monday, March 24th
Formal Languages

Assigned readings
“Lecture notes on automata, languages, and grammars”, Cris Moore (2012).
http://tuvalu.santafe.edu/~moore/automata-notes.pdf

Note: this week’s presentation is on Wednesday.

Wednesday, March 26th
Cultural Grammars [C]

Assigned readings
Ch. 4, “Shaking Hands and Making Coffee”
in Language, Consciousness, Culture: Essays on Mental Structure, Ray Jackendoff (2009)

Note: Ray is awesome, but he’s a linguist and his notation gets pretty messy and ad hoc at times. To get you started, here are a set of production rules that recognize his Figure (2) (pg. 117). I have written non-terminals as capitals (sometime with primes) and terminals as lowercase.

S → PHC
P → P’ H’
C → P” H”
H → shake
P’ → reach
H’ → grasp
P” → ungrasp
H” → withdraw

In Figure (3) he deletes the rule H → shake, and gives some new rules,

H → H” C”
H” → H’
H” → h l
C” → n

Problem for discussion
Review Section 6 from this Monday’s readings. Produce a stochastic non-regular grammar for a cultural phenomenon of interest; such a grammar chooses to implement one of the (valid) production rules probabilistically. Justify your production rules. Simulate it!
[1] Week Eleven: They Melt, Boil, and Sublime (and take up Karate)
Monday, March 31st
Phase transitions & the Ising Model

Assigned readings
Chapter One from *Phase Transitions*, Ricard Solé

Note: presentation is on Wednesday this week.

Wednesday, April 2nd
Feynman Diagrams, Spin Glasses, Universality, oh my!

Assigned readings
Emergent Phenomena Practical
http://tuvalu.santafe.edu/~simon/practical.pdf

Problem for discussion
Simulate the 2D Ising Model using Glauber Dynamics (or any other dynamics you please).
Find the critical point. Do you agree with theory?


How easy is it for different subsets of the network to “hold opposing beliefs” (i.e., in the language of the Ising model, how easy is it for one subset of nodes to be in the +1 state, the other in the -1 state? How long does this metastable state last depending on which subgroups you choose? How long does the president/sensei split last?)
[*] Week Twelve: Shannon gets Steampunk
Monday, April 7th.
Maximum Entropy [Q]

Assigned readings
“Information Theory and Statistical Mechanics”, E.T. Jaynes
*Physical Review* (1957)
“Statistical Mechanics of the US Supreme Court”, Eddie Lee et al.
*arXiv* (2013)

Note to presenter
Despite its short length, this is a both mathematically and conceptually challenging reading. Take some time to think it through! This is an ideal presentation for a physics-minded person.

Problem for discussion
Everyone loves the Gaussian. But why? Explain how to understand the Gaussian distribution through the lens of the Jaynesian Max-Ent methods. Is there a simpler distribution (hint: yes)? Describe it (there are a few possibilities here).

Pick a system you know and enjoy, choose some quantities of interest in the data, and write down the max-ent model for an ensemble whose expectation values are constrained to fit them.

For example, you might model a subset of the stock market by constraining the mean, variance, and cross-correlations of three stocks of interest; you might model a set of English-language sentences from Jane Austen by the frequency and cross-correlations of the parts of speech (so that you constrain the average number of nouns, verbs, and adjectives, as well as the average number of adjacent noun-verb pairs, etc.)

Oftentimes, figuring out the Lagrange multipliers you need requires some heaving lifting in the machine learning department. If you keep the numbers small, however, you can often do pretty well using simple off-the-shelf techniques. Eddie and the gang are able to find the $J_i$s for the the Rehnquist court (Eq. C1) using a standard numerical solver.

Wednesday, April 9th.
Maximum Entropy continued

Assigned readings
“On the entropy function in sociotechnical systems”, Elliot Montroll
http://www.pnas.org/content/78/12/7839.full.pdf
“Ising Models for Networks of Real Neurons”, Tkacik et al.
http://adsabs.harvard.edu/abs/2006q.bio....11072T
[*] Week Thirteen:
**Bayes, Shannon, and Von Neumann in the Land of Big Data**

**Monday, April 14th.**
Revolutions in the Ancient Mediterranean, 650-259 BCE; government shutdowns in contemporary America, 1976-2013; 9/11 to the Arab Spring in Egypt, Tunisia, Yemen and Libya, 2000-2012.

*Assigned reading*
None; reduced data sets to be made available
GDELT at http://gdelt.utdallas.edu
CAMEO codes (for event types and countries) see http://cameocodes.wikispaces.com/EventCodes

*Problem for discussion*
Relate your use of some selection of these data sets to any of the other lectures. Be sure to reference explicitly which tools (and which weeks) you are drawing on in your presentation. You are more than welcome to use this opportunity as a way to show the shortcomings of methods we've learned!

**Wednesday, April 16th.**
Optimal Portfolio Theory, Game Theory, & Wikipedia

*Assigned reading*
“The Failure of the Copernican Principle in Social Reasoning”
SD, Seth Lloyd, Drew Cabaniss
(preprint, distributed by hand)
[*] Week Fourteen: They hold a Caucus Race
Monday, April 21st
Arrow’s Impossibility Theorem

Assigned reading
Ch. 23, “Voting”
from Networks, Crowds, Markets (Easley & Kleinberg)

Note to presenter
Arrow’s Impossibility Theorem is a crucial and counter-intuitive fact about the world. Make sure you understand the proof itself (23.11) and can sketch the outlines of the argument for your colleagues. Presenting proofs is very different from presenting empirical data or conceptual material; you should imagine yourself interrogating a recalcitrant witness (the proof’s claim) and trying to find holes.

Problem for discussion
The authors go into detail about why unanimous decision-making may be a flawed means of learning the truth. Do you find their account of jury behavior plausible? If not, why not? Can you describe a different set of beliefs that jurors might hold? If you do find it plausible, can you explain why real juries sometimes fail to convict?

Construct a Bayesian model for jury behavior, in the style of Ch. 23 (i.e., referring both to a juror’s state of knowledge, and their beliefs about others), and predict conviction rate.

Note: for reference, the conviction rate for juries in the British system, from 1674 to 1913, is shown below (figure credit: Galen Harrison & SD, 2013).

FIG. 1: The conviction rate is shown for 1674-1913. The spike in 1705 is due to there only being one record for the year. The spike in 1791 is due to the censorship of not guilty verdicts.

Wednesday, April 23rd
Information Aggregation

Assigned reading
Week Fifteen

Assigned reading
http://santafe.edu/~simon/nautilus_print.pdf

Optional reading
Ch. 5, “Cognition of Society and Culture”
in Language, Consciousness, Culture: Essays on Mental Structure, Ray Jackendoff (2009)
Note: fun, easy reading; no presenter this week.

April 30th: Connecting the dots. Final discussions. Final papers due.
Note: return of Day One self-assessments.
Envoi

Nature is a temple where living pillars
Let escape sometimes confused words;
Man traverses it through forests of symbols
That observe him with familiar glances.

Correspondences, from *Fleurs de mal* (Charles Baudelaire, 1857)