

Introduction to Informatics

Lecture 1



"No, this is the afterlife.
Cyberspace is over there."

Introduction to Informatics

Spring 2007: Section 11595

■ Instructor

■ Prof. Luis M. Rocha

- Office Hours: Tuesdays: 10:30am – 12:30pm, Eigenmann Hall, Room #905



■ Associate Instructors

■ Christian Beck, Bharat Dravid, Mira Han

- Office Hours: TBA



■ Resources

- Web page: <http://informatics.indiana.edu/rocha/i101>
- Blog: <http://infoport.blogspot.com/>
- OnCourse.iu.edu





Introduction to Informatics

- **Overview**

- The course deals with foundational Informatics concepts such as Information, Knowledge, Modeling, and Uncertainty. We introduce all the conceptual building blocks necessary to understand the basics of Information Theory. We introduce those building blocks hand in hand with the practical dimension of Informatics, which focuses on solving real problems with information technology. We present informatics tools in various human domains, and discuss their implications for the practice of science, engineering, art, and society in general.

- **Aims**

- Students will be introduced to fundamental topics in Informatics while developing a basic understanding of Information Theory. They will build up their proficiency in Information Technology as detailed in the course syllabus, emphasizing its use in the modeling of nature and technology



Syllabus

- Introduction to Informatics (6 lectures)
- Modeling and Problem Solving (2 lectures)
- Data and Knowledge Representation (3 lectures)
- Deductive Model Building (2 Lectures)
- Inductive Model Building (4 lecture)
- Information and Uncertainty (3 lectures)
- Storing Data (2 lectures)
- Computing Models: Algorithms (4 lectures)

At the end of each section review exercises (as can be expected in exams) will be presented.

Course Evaluation

- *Participation: 5%.*
 - Based upon attendance and participation (in class and online).
- *Continuous Evaluation: 30%*
 - Comprised of two semester-long projects, an individual and a group one. Projects are designed to be tackled with different tools and concepts as they are presented in class.
 - Participation is **essential** for continuous evaluation success!!
- *Laboratories: 20%*
 - Designed to present and familiarize students with various informatics tools. Several tasks are assigned to be completed by the following lab.
- *Mid-term Exam : 15%*
 - Cumulative.
- *Final Exam: 30%*
 - Cumulative.



Continuous Evaluation Agenda

■ Individual Project

- First Installment: By the end of section 2 (last week of January)
- Second Installment: By the end of section 3 (Valentine's week)
- Third Installment: By the end of section 5 (After Spring Break)
- Fourth Installment: By the end of section 7 (End of March)

■ Group Project

- First Installment: (end of February)
- Second Installment: By the end of section 5 (After Spring Break)
- Third Installment: During section 8 (mid-April)





Laboratories

- Weekly

- First Lab: January 11th and 12th

- Topic: Blogs
- Read: What are blogs? @ <http://infoport.blogspot.com/>
- Details @ course's web page: <http://informatics.indiana.edu/rocha/i101>

- Deliverables due by the following lab

- 1 week



Lab Time Changes

- Section 15230
 - F - 09:05A-09:55A, I109
 - To sections 11596 and 15231



Course Materials

- Lecture notes

- Posted online @ <http://informatics.indiana.edu/rocha/i101> and @ *infoport*

- Course package

- Von Baeyer, H.C. [2004]. *Information: The New Language of Science*. Harvard University Press.
 - Chapters 1, 4, 10
- Clark, A. [2003]. *Natural-Born Cyborgs: Minds, technologies and the Future of Human Intelligence*. Oxford University Press
 - Chapters 2 and 6
- Englander, I [2003]. *The Architecture of Computer Hardware and Systems Hardware*. Wiley.
 - Chapters 2 and 3
- Klir, J.G., U. St. Clair, and B.Yuan [1997]. *Fuzzy Set Theory: foundations and Applications*. Prentice Hall.
 - Chapters 2 and 3
- Norman, G.R. and D.L. Streinrt [2000]. *Biostatistics: The Bare Essentials*.
 - Chapters 1-5 and 13.
- Igor Aleksander, "Understanding Information Bit by Bit"
- Ellen Ullman, "Dining with Robots"

Class expectations

■ Attendance and demeanor

- Students will approach the course as a professional environment
 - Just like a job
 - Attend every class
 - No attendance is recorded but indispensable for succeeding
 - Behave appropriately
 - No sleeping, no reading newspapers, no cell phones, no laptops in class

■ Academic Integrity

- As with other aspects of professionalism in this course, you are expected to abide by the proper standards of professional ethics and personal conduct. This includes the usual standards on acknowledgment of joint work and other aspects of the Indiana University Code of Student Rights, Responsibilities, and Conduct. Cases of academic dishonesty will be reported to the Office of Student Ethics, a branch of the Office of the Dean of Students.



Policies

Incomplete Grade

An incomplete (I) final grade will be given only by prior arrangement in exceptional circumstances conforming to university and departmental policy which requires, among other things, that the student must have completed the bulk of the work required for the course with a passing grade, and that the remaining work can be made up within 30 days after the end of the semester.

Definition of Grades

A+	98-100%	<i>Excellent Work.</i> Student performance demonstrates thorough knowledge of the course materials and exceeds course expectations by completing all requirements in a superior manner.
A	93-97	
A-	90-92	
B+	85-89	<i>Very Good Work.</i> Student performance demonstrates above-average comprehension of the course materials and exceeds course expectations on all tasks as defined in the course syllabus.
B	80-84	
B	75-79	
C+	70-74	<i>Good Work.</i> Student performance meets designated course expectations and demonstrates understanding of the course materials at an acceptable level.
C	65-69	
C-	60-64	
D+	55-59	<i>Marginal Work.</i> Student performance demonstrates incomplete understanding of course materials.
D	50-54	
D-	45-49	
F	Less than 45	<i>Fail.</i>

The Nature of Information

“Quid est ergo tempus?”

*“Si nemo ex me quaerant, scio;
si quaerent, explicare velim, nescio.”*

St Augustine of Hippo, *Confessions*, 11th Book, Point 239.

"What then is time? if no one asks me, I know what it is.
If I wish to explain it to him who asks me, I do not know."



Nature of Information

- *"Information is that which reduces uncertainty"*. (Claude Shannon)
- *"Information is that which changes us"*. (Gregory Bateson)
- *"Information is a semantic chameleon"*. (Rene Thom)



What is information?

The word **information** derives from the Latin *informare* (*in* + *formare*), meaning to give form, shape, or character to. It is therefore to be the formative principle of, or to imbue with some specific character or quality.

von Baeyer, Chapter 3, pp 20-21.



The Nature of Information

Why are we studying the nature of information?

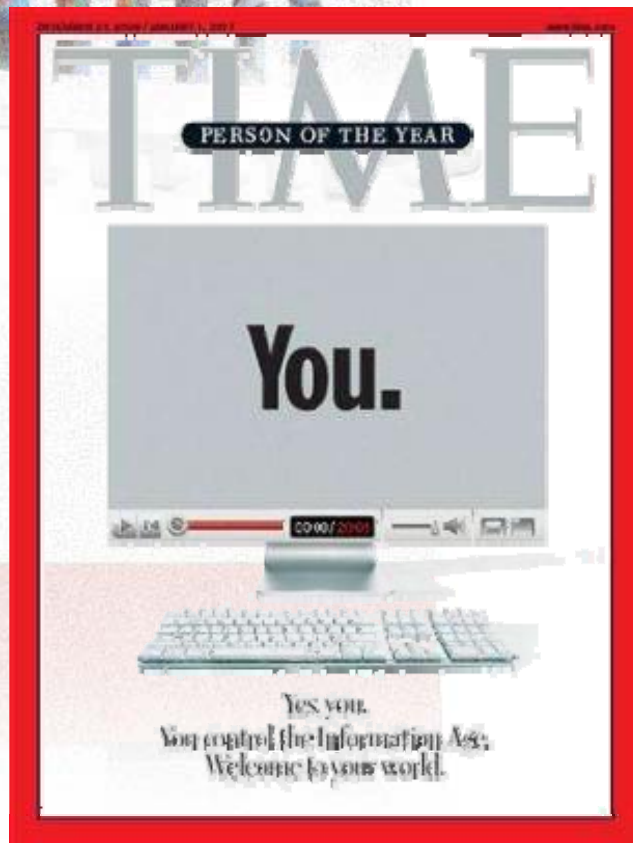
- For hundreds of years, the word *information* has been used to signify *knowledge* and related terms such as meaning, instruction, communication, representation, signs, symbols, etc.
 - “the action of informing; formation or molding of the mind or character, training, instruction, teaching; communication of instructive knowledge”. *Oxford English Dictionary*
- Two of the most outstanding achievements of science in the XX century
 - Invention of Digital Computers and Information Technology
 - Birth of Molecular Biology
 - Resulted in the generation of vast amounts of data and information and new understandings of the concept of information itself
- Modern science is unraveling the nature of information in numerous areas such as communication theory, biology, neuroscience, cognitive science, and education, among others.

The emergence of information

The twentieth century has given us not only the theory of relativity and quantum mechanics, television and motion pictures, DNA and the genetic revolution, space technology, and rock and roll, but also something we call information.

The twenty first century promises to be very different due to information technology.

We are inundated with it, and you live by it!



Information as Representation



- We often presume that such and such information is simply a factual representation of reality
 - but representation of reality to whom?
 - The act of representing something as a piece of knowledge demands the existence of a separation between the thing being represented and the representation of the thing for somebody – between the *known* and the *knower*.
- This is a form of communication:
 - the representation of an object communicates the existence of the (known) object to the knower that recognizes the representation.

The Structure of Information: Signs

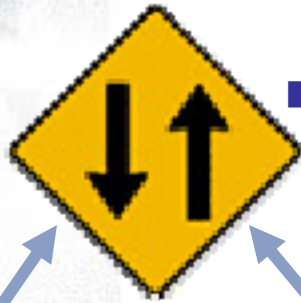
- Signs are objects whose function is to be about other things
 - Objects whose function is reference rather than presence.
 - Do not deliver things but a sense or knowledge of things – a message.
- Example: Road Signs
 - Not a distant thing; but about distant things
- For information to work
 - There has to be a system of signs
 - Recognizable by the relevant group of people (drivers!)



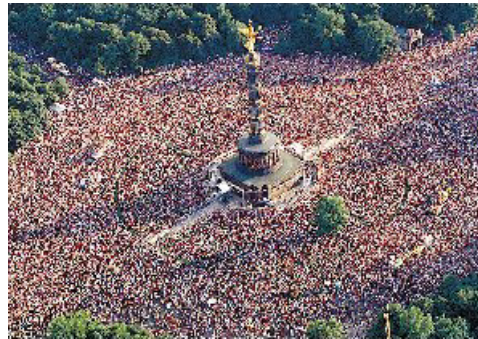
Information is a Relation!

- The central structure of information is a relation
 - among *signs*, *objects or things*, and *agents* capable of understanding (or decoding) the signs.
- Agents are informed by a Sign about some Thing.

Sign



Thing



Agents



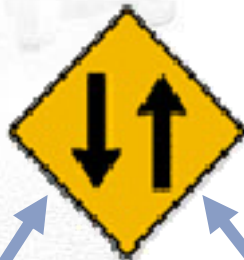
"RUN FOR YOUR LIVES! IT'S AN ASTERISK!!!"

Luis M. Rocha and Santiago Schnell

Sign Systems and Semiotics

- The information relation is a sign system
- Semiotics is the discipline that studies sign systems

Sign



Thing



Agents

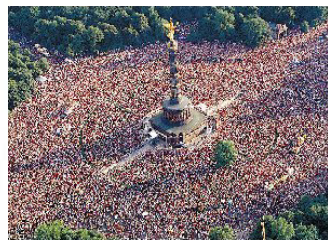


Playing with Sign Systems

- Language and sign systems surround us
 - We are often not aware we use them
- We notice them when an object oscillates between sign and thing
 - Reverts from reference to presence
- Playing with reference in sign systems is common in Art



Thing



Agents



Luis M. Rocha and Santiago Schnell

Play on Signs as Things

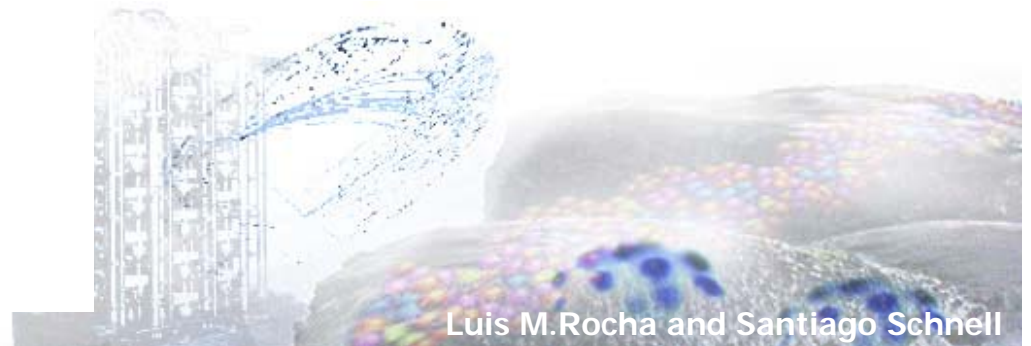
Kitty

O I
am my
own way
of being in
view and yet
invisible at
once Hearing
everything
you see I
see all of
whatever you
can have heard
even inside the
deep silences of
black silhouettes
like these images
of furry surfaces
darkly playing cat
and mouse with your
doubts about whether
other minds can ever
be drawn from hiding
and made to be heard
in inferred language
I can speak only in
your voice Are you
done with my shadow
That thread of dark
word
can
all
run
out
now
and
end
our
tale

Symbols are used as pictorial
objects to draw the picture of
Kitty: *presence*

But within the silhouette of
Kitty there is also a tale of
cats: *reference*

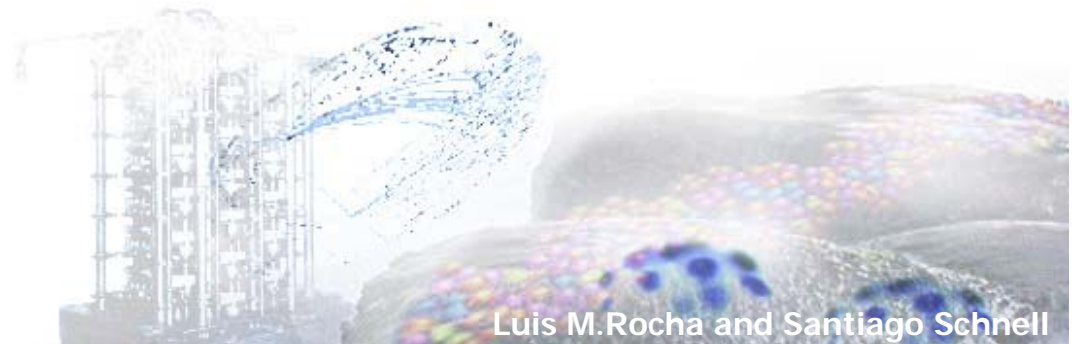
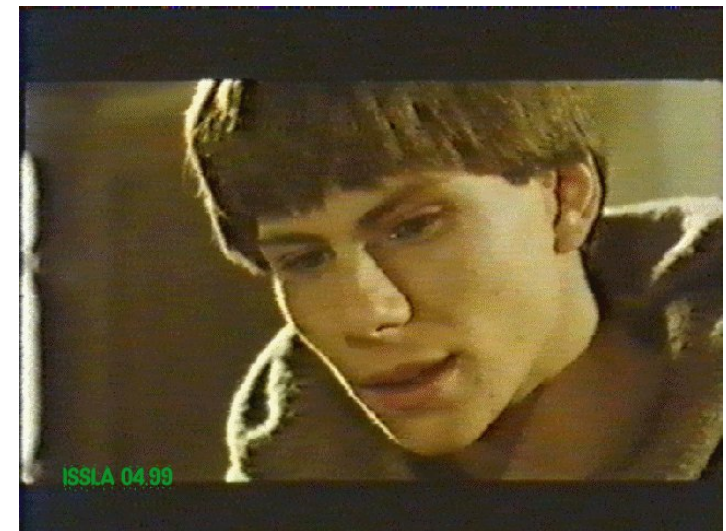
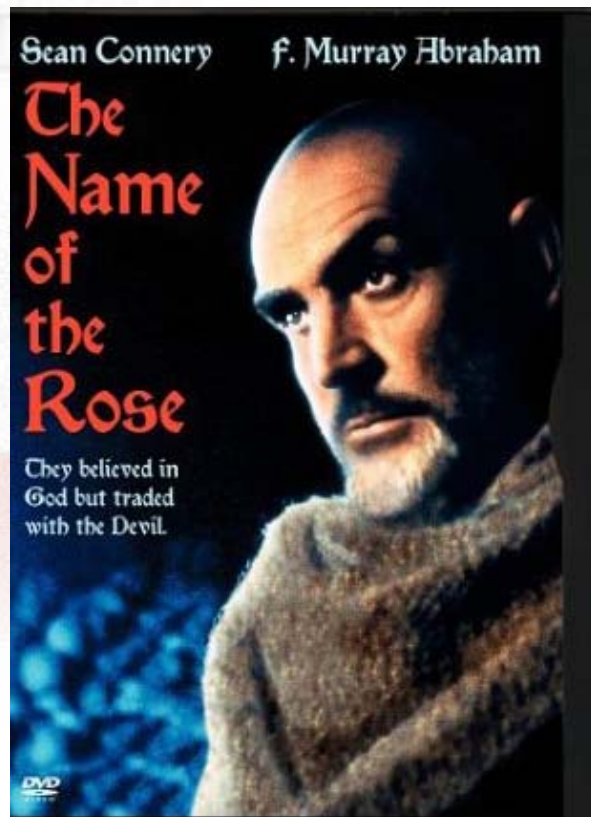
by John Hollander.
*Kitty, Black domestic
shorthair*



Luis M.Rocha and Santiago Schnell

The Name of the Rose

- **Movie version of the Umberto Eco's book**
 - An old manuscript, the message, for being literarily dangerous becomes literally poisonous: reference and presence become very intertwined indeed!
 - [Link at Infoport](#)



Play on Reference

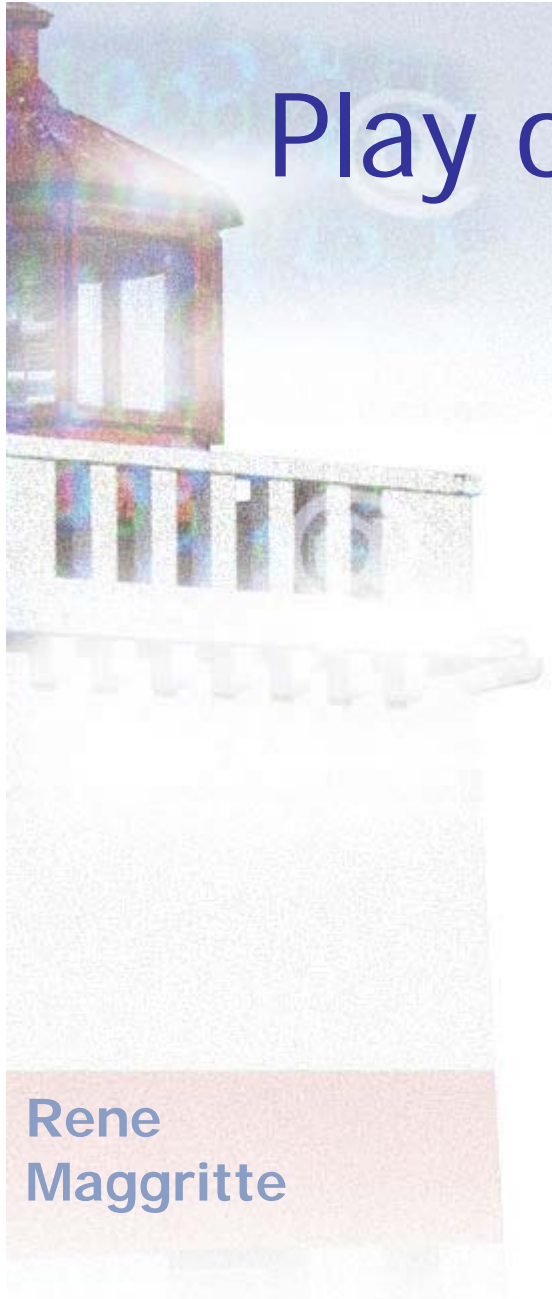
- The accepted meaning of the symbols conflicts with the object
 - Highlights how arbitrary symbols are



The Key of Dreams,
1930, René Magritte

Play on Signs and Reference

When is an object a sign or a thing?



Readings for this week

- Lecture notes

- "The Nature of Information"

- Posted online @ <http://informatics.indiana.edu/rocha/i101> and @ *infoport*

- From course package

- Von Baeyer, H.C. [2004]. *Information: The New Language of Science*. Harvard University Press.
 - Chapters 1, 4

- From Web (see Infoport)

- *The Library of Babel* by Jorge Luis Borges

- http://jubal.westnet.com/hyperdiscordia/library_of_babel.html