



Binghamton University

EngiNet™

State University of New York



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State University of New York**



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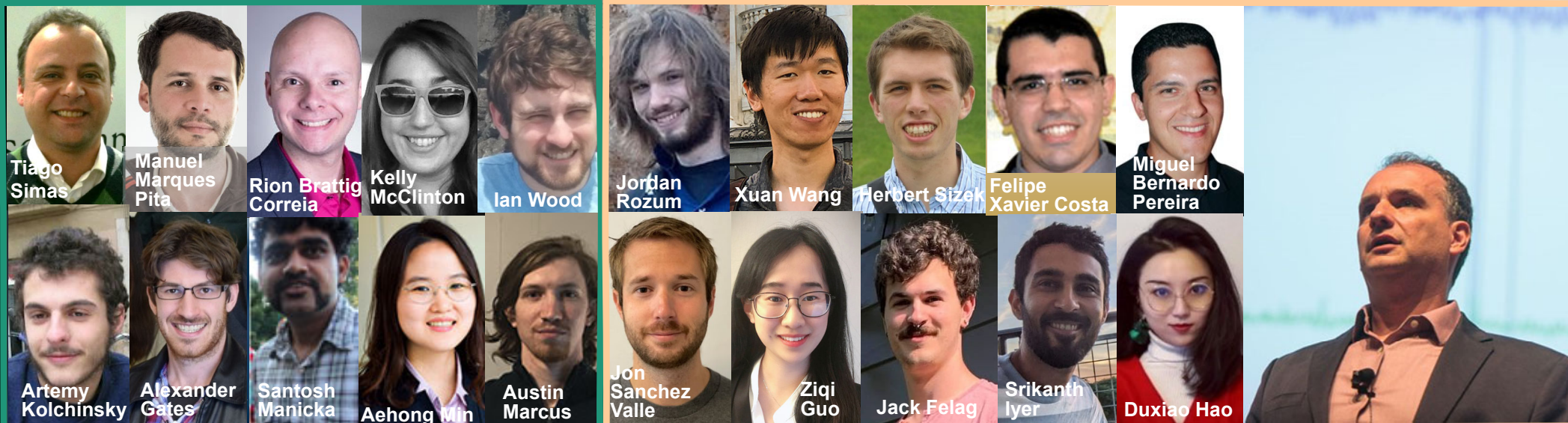
Instructor: Prof. **Luis M. Rocha**

Email: rocha@binghamton.edu

Phone: 607-777-5934

TA: **????**

interdisciplinary science

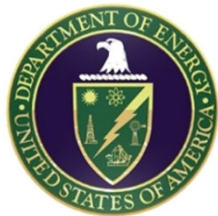


Miguel
Bernardo
Pereira

Duxiao Hao

luis m. rocha

for understanding social and biomedical complexity



PERSISTENT



rocha@binghamton.edu
informatics.indiana.edu/rocha



careerbuilder

Complex adaptive systems and computational intelligence (casci lab)

Resources

- web page
 - casci.binghamton.edu/academics/ssie501
- online class
 - binghamton.zoom.us/j/93351260610
- blog: sciber
 - sciber.blogspot.com
- Brightspace
 - brightspace.binghamton.edu/d2l/home/358842

SSIE-501/ISE-440 - Fall 2024

luis m. rocha



Teaching Assistant

office hours:

Tuesdays: 7:00-8:00pm????

binghamton.zoom.us/my/

office hours:

Tuesdays 9:00- 11:30am

binghamton.zoom.us/my/luismrocha



rocha@binghamton.edu
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BINGHAMTON UNIVERSITY
STATE UNIVERSITY OF NEW YORK



integrating and analyzing multiomics data

social media data pipelines for biomedicine



a

b

X likes

anonymous_user Finally allowed 7 days of meds as opposed to 3 days! Woof! That makes things a bit easier. I'm feeling poorly today (I start of a **suprapubic cath** injection. I hate this!! Silly body. #surpatient #recovery #medication #estrone? #quetiapine #pc #flowers #catheter #injection

Y likes

anonymous_user Toothaches suck!!! I love my Simons cat hot water bottles! I have been truly struggling today. I woke up this morning not wanting to move or be alive. But now I'm ok! Bloody head. #bpd #borderline #low #depressed #depression #suicide #suicidal #moodswings

Add a comment...

c

X likes

anonymous_user Classic I know but I look at it everytime I feel extra lonely in this **addiction** snit hole. #addiction #addictorsreal #anxiety #cocaine

Add a comment...

anonymous_user All that #painmeds just for a wisdom tooth extraction #dental surgery #ibuprofen #oxycodone #amoxicillin #ratemedis #nochoice

Add a comment...

anonymous_user A few months ago I did the self-assessment and got 70/100 for both **anxiety** and **depression**, labeled as "cause for concern" because it was so high (30 is what's considered a "normal" level). Took it again today and am so proud of how far I've come :) #doodogram #anxiety #depression #calaisorain #therapy #selfimprovement #happiness #success #inspiring :)

Y likes

anonymous_user **Gracifruit**, anyone? My **mood stabilizers** have a warning on label that says DO NOT EAT **PINK GRAPEFRUIT**. Here they sit, tempting me on the counter.

Add a comment...

d

Anonymous User @Twitter

To all my followers. If I start making NO sense at all remember I've taken 2 painpills (**Oxycodone 15**) and my 2 sleeping pills (**Ambien 10**)

12:00 pm · 01 Jan 20XX · Twitter Web Client

Anonymous User @Twitter

that **percocet** knocked me out..feeling kind of **woozy** but I'll wait to eat until I take more

12:00 pm · 01 Jan 20XX · Twitter Web Client

Anonymous User @Twitter

I had **valium** for the first time last week: that was nice. it didn't help with **pain** but it made me not care.

12:00 pm · 01 Jan 20XX · Twitter Web Client

Anonymous User @Twitter

maybe **diazepam** can solve my problem though can't cure my illness **backpain**

12:00 pm · 01 Jan 20XX · Twitter Web Client

Anonymous User @Twitter

Ambien is hysterical. [...] Let your Dr know if you're driving while sleeping to go to [...]. #zoinks!

12:00 pm · 01 Jan 20XX · Twitter Web Client

Anonymous User @Twitter

diazepam_valium_tamazepam_lithiumect... how long must I stay on this stuff? please don't give me more.

12:00 pm · 01 Jan 20XX · Twitter Web Client

e

4,000mg Keppra

Topic Medication Issues

I am 23 and have **partial complex seizures** about 4-5 days a week and am currently controlling them with **Zonisamide**, **Vimpat**, **Phenobarbital** and **Keppra**. While I'm reading these forums, I see very low doses of these medications. I would obviously not like to stay on these medications forever and like to think a wean schedule is possible eventually, but I am currently on 2,000mg of **Keppra** twice a day. I just wanted to know if anyone else was on this high of a dose had any issues.

4 Comments

Anonymous User @Twitter

While I do not know how long you have been taking and dosing with **Keppra**, I do know about taking several medications. My questions is: have you asked your neurologist about this issue? I took 3-750 mg **Keppra** along with 2-200 mg **Valium** in morning and at night. [...] I haven't had any issues and your assumption or worrying needs to be looked at realistically. Can as people take the same amount of any medication? [...] Each person is different and their needs are different. Which means that their medications dosages can and do vary. At one time I was taking **Phenobarbital**, **Diazepam** and **Ambien**. The new neurologist I had to get asked me how I woke up in the mornings. His statement was followed by "since you take enough **Keppra** to put the average man to sleep for 24 hours, do so discuss this issue with your neurologist and ask about other medication or procedures that can help control your seizures.

Like · Reply · Share · 2 replies ·

Anonymous User @Twitter

I'm on 1500mg **Keppra**, 200mg **Zonisamide**, 40-80mg **Vimpat** and 2,000mg **Keppra** - all of these twice a day. I've been taking these medications for 4 years. I understand everyone's different, I've just been seeing very low doses on here and didn't know how normal it was for me to be on this much **Keppra**. Let alone this many medications.

Like · Reply · Share · 1 reply ·

Anonymous User @Twitter

each person is different therefore the amount a medication they take can vary. On and I have always needed higher dosages than most people take. If your doses are 2 times a day please make sure the doses are as close to 12 hours apart. That way it keeps the therapeutic levels where they need to be in order to stop break thru **seizures**. Also if your dosage hasn't changed in some time then discuss your issue with your neurologist. They may want to change your meds to newer meds with fewer side effects. Also understand that too much medication is just as bad as too little medication.

Like · Reply · Share

Anonymous User @Twitter

I was allowed on 1 believe 2000 mg of **Keppra** 2x a day a few years ago but didn't take any other meds along with that amount of **Keppra**. I don't remember trying any other the other meds that you mentioned other and I didn't get relief from thousands of **seizures** until a major surgery in May of 2009.

Like · Reply · Share

Min et al [2023]. *CHI* 2023. 32.

Wood, Correia, Miller, & Rocha [2022]. *Epilepsy & Behavior*. 128: 108580.

Correia, Wood, Bollen, & Rocha [2020]. *Annual Review of Biomedical Data Science*, 3:1.

Wood, Varela, Bollen, Rocha & Sá [2017]. *Scientific Reports*. 7: 17973 .

Correia, Li & Rocha [2016]. *PSB*: 21:492-503.

Ciampaglia, et al [2015]. *PLoS ONE*. 10(6): e0128193.

social media data pipelines for biomedicine



1 Social Media for Public Health Monitoring a scientific app.

The knowledge network represents how the terms in the dictionaries co-occur in the timelines. Terms that always occur together will be linked and closer to each other in the network.

project: **Opioids (Fentanyl & Oxycodone)**

network: 7 days

Node & Edge Information:

Node: Warfarin
Type: drug

Source: Phytonadione
Type: drug

Target: Warfarin
Type: drug

Proximity: 0.11764705882352941

DDI ✓ ADR ✗ DI ✗

Timelines contributing to this edge: [View](#)

Visualization:

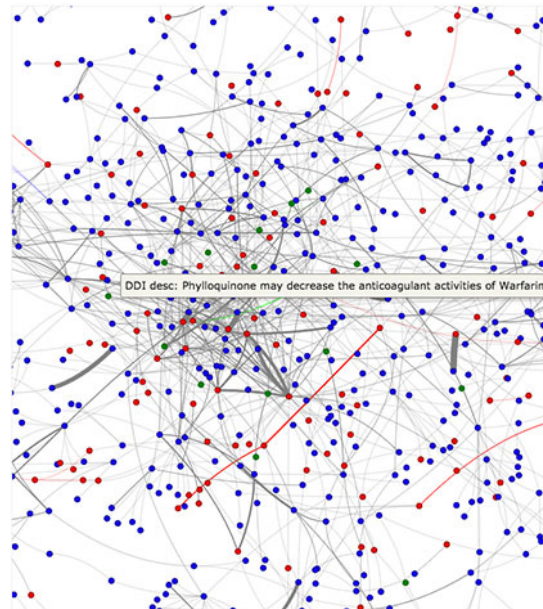
Search: Abasia [Locate](#)

☒ Drugs ☒ Symptoms
☒ Nat. Prod. [Remove orphans](#)

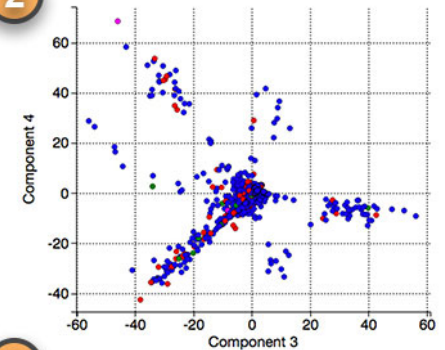
☒ Drug→Drug ☒ Nat. Prod.→Nat. Prod.
☒ Symptom→Symptom
☒ Drug→Symptom ☒ Drug→Nat. Prod.
☒ Nat. Prod.→Symp

Network Layout (simulation) [Run!](#)

Selected nodes: 0

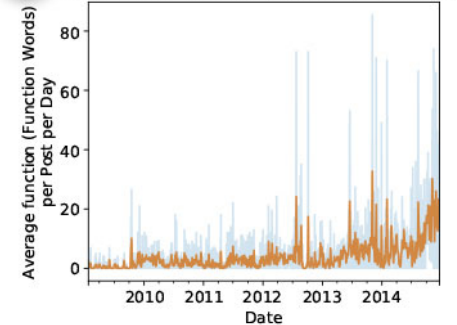


2



3

function (Function Words) for User: subject2



Min et al [2023]. *CHI* 2023. 32.

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Correia, Wood, Bollen, & Rocha [2020]. *Annual Review of Biomedical Data Science*, 3:1.

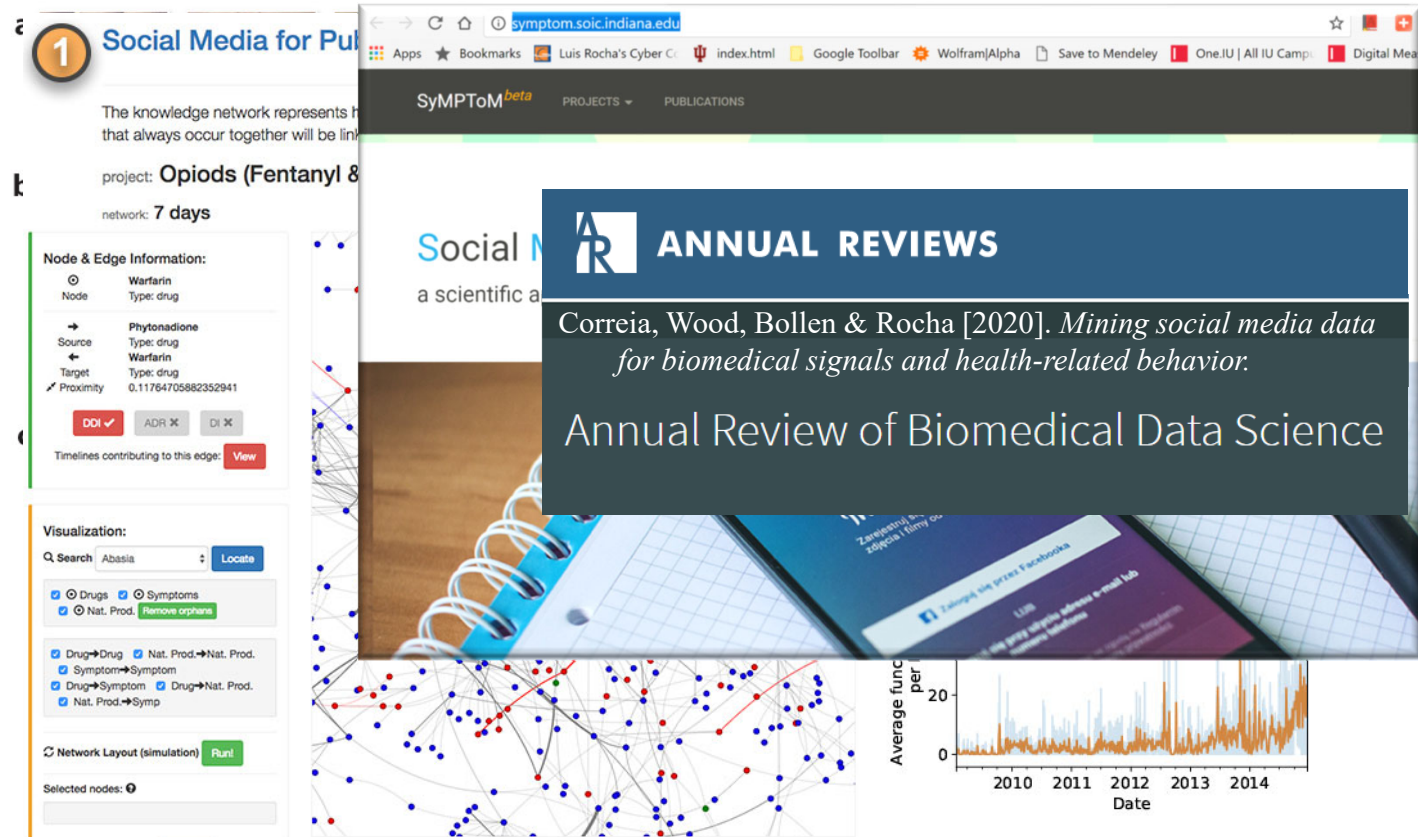
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Correia, Li & Rocha [2016]. *PSB*: 21:492-503.

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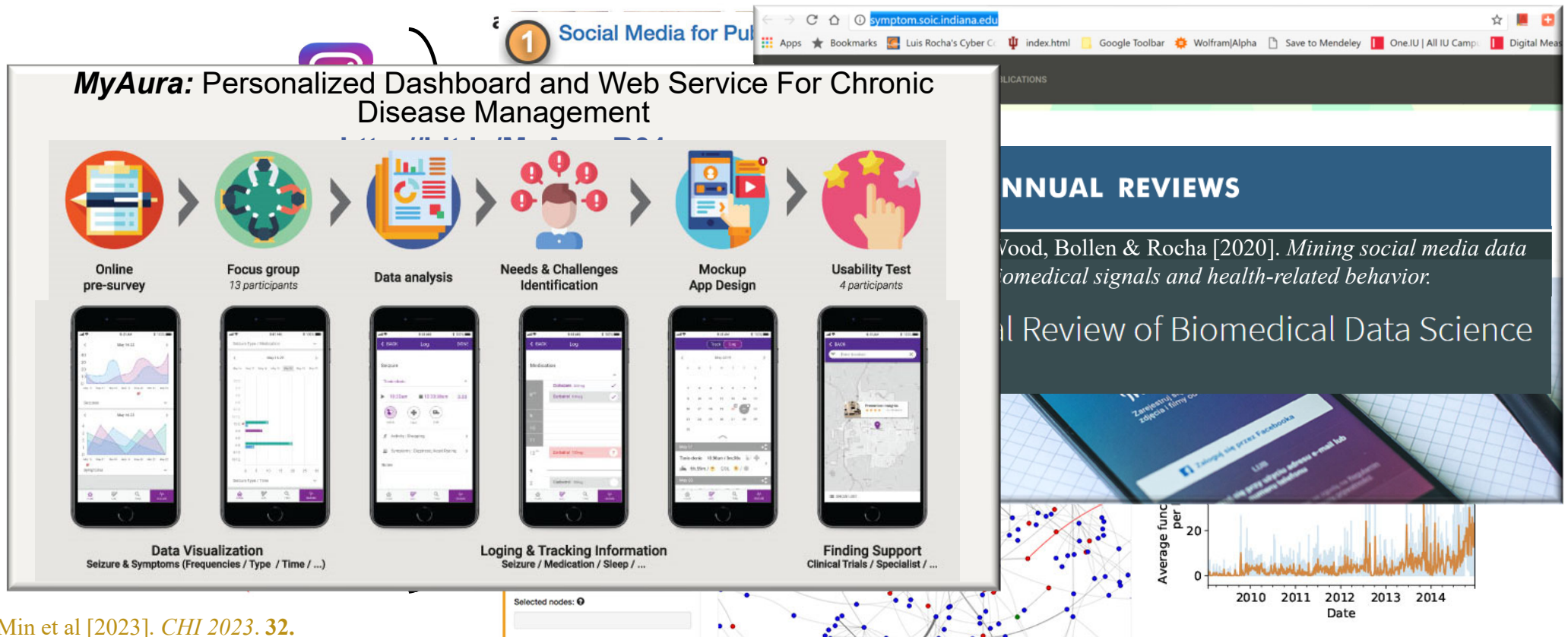
Correia, Wood, Bollen, & Rocha [2020]. *Annual Review of Biomedical Data Science*, 3:1.

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social media data pipelines for biomedicine



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social media data pipelines for biomedicine

1 Social Media for Public Health

MyAura: Personalized Dashboard and Web Service For Chronic Disease Management

Epilepsy & Behavior
Volume 128, March 2022, 108580

Small cohort of patients with epilepsy showed increased activity on Facebook before sudden unexpected death

Ian B. Wood^{a,1}, Rion Brattig Correia^{b,c,a,1}, Wendy R. Miller^d, Luis M. Rocha^{e,a,b}

Data Visualization
Seizure & Symptoms (Frequencies / Type / Time / ...)

Logging & Tracking Information
Seizure / Medication / Sleep / ...

Finding Support
Clinical Trials / Specialist / ...

Usability Test
4 participants

ANNUAL REVIEWS

Wood, Bollen & Rocha [2020]. *Mining social media data for biomedical signals and health-related behavior*.

Annual Review of Biomedical Data Science

Min et al [2023]. *CHI 2023*. 32.

Wood, Correia, Miller, & Rocha [2022]. *Epilepsy & Behavior*. **128**: 108580.

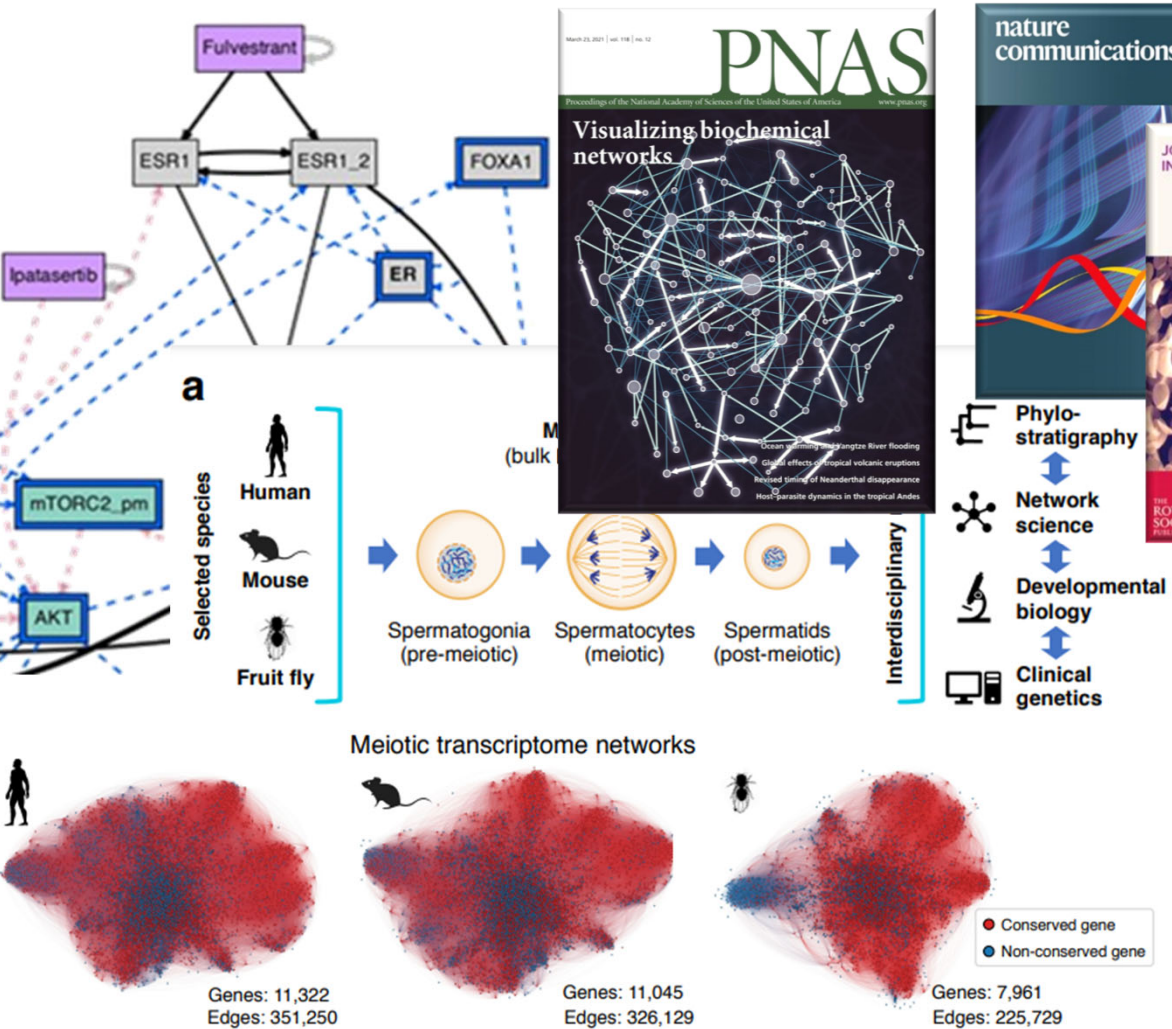
Correia, Wood, Bollen, & Rocha [2020]. *Annual Review of Biomedical Data Science*, 3:1.

Wood, Varela, Bollen, Rocha & Sá [2017]. *Scientific Reports*. 7: 17973.

Correia, Li & Rocha [2016]. *PSB*: **21**:492-503.

Ciampaglia, et al [2015]. *PloS ONE*. **10**(6): e0128193.

integrating and analyzing multiomic electronic health records with network science to predict comorbidity & drug interaction networks, disease factors & interventions



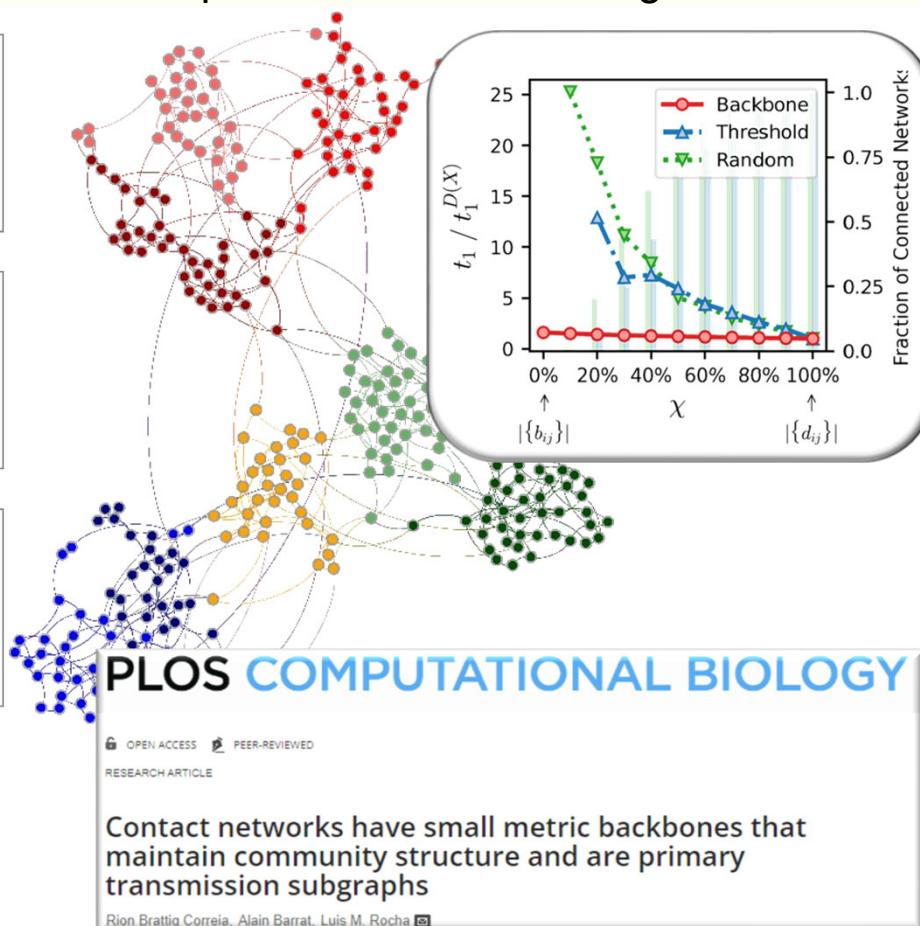
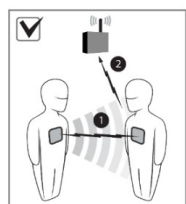
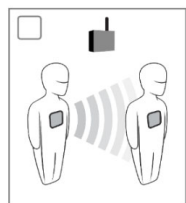
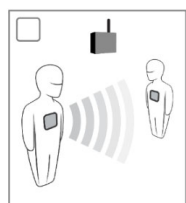
Correia, Araujo, Mattos & Rocha [2019]. 2:74.

Article | Open Access | Published: 23 July 2019

City-wide electronic health records reveal gender and age biases in administration of known drug-drug interactions

integrating and analyzing multilevel data sources with network science

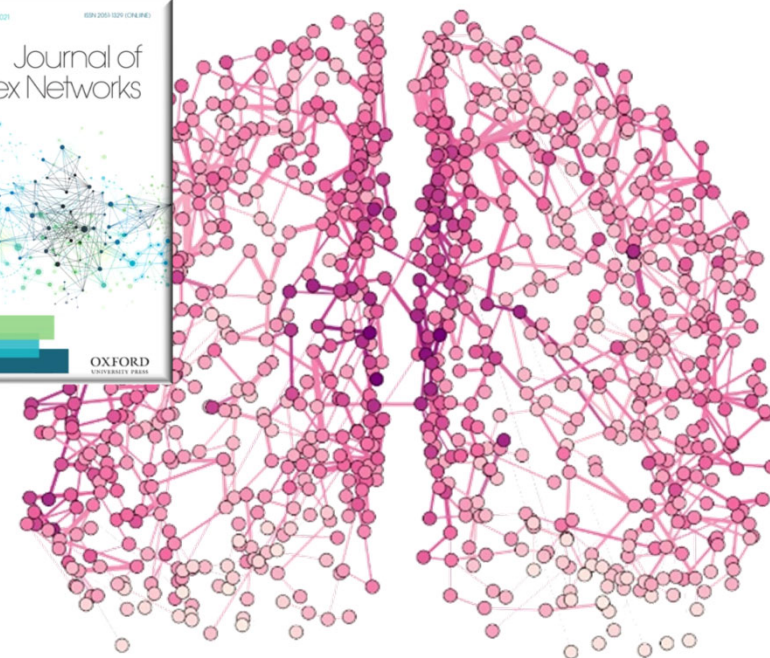
to predict disease spread, information integration



frontiers in
NEUROINFORMATICS

ORIGINAL RESEARCH ARTICLE
published: 24 July 2014
doi: 10.3389/fninf.2014.00066

Multi-scale integration and predictability in resting state brain activity



Simas & Rocha [2015]. *Network Science*. doi:10.1017/nws.2015.11

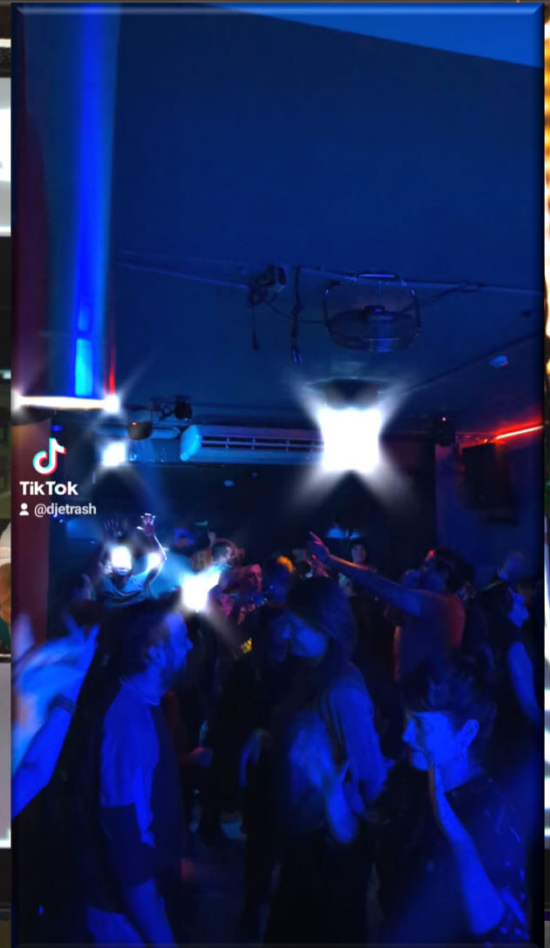
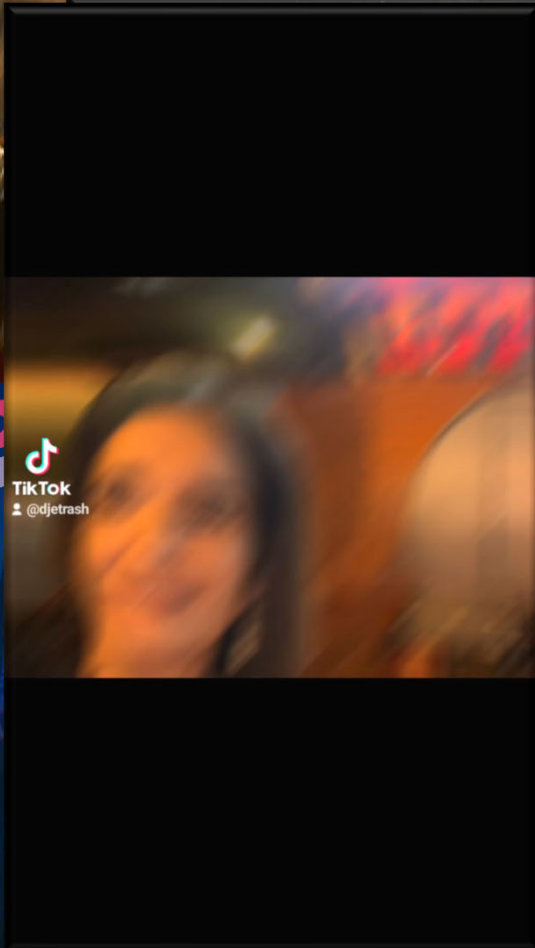
Simas, Correia & Rocha [2021]. *J Complex Networks*. 9 (6), cnab021.

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casci.binghamton.edu/academics/ssie501

E-TRASH

LIVE IN LISBON



FRIDAY, AUGUST 19: 1AM (BASEMENT)

what about you?

- Background
- Interests
- Course expectations




what about you?

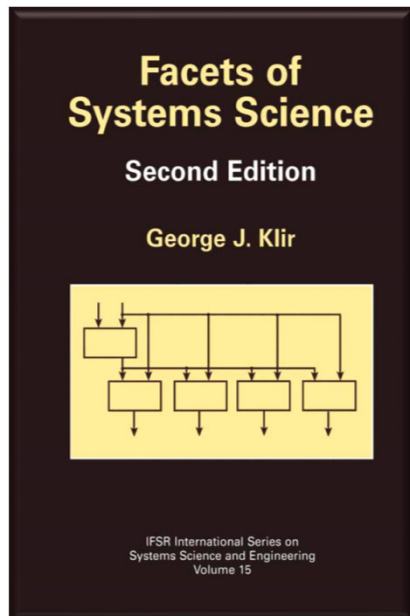
- Background
- Interests
- Course expectations



General Discussions, Questions or Suggestions ▾

Topic	Threads	Posts	Last Post
General Discussion, Question or Suggestion ▾ Aug 20 - Dec 22	1	1	 Luis Rocha just now

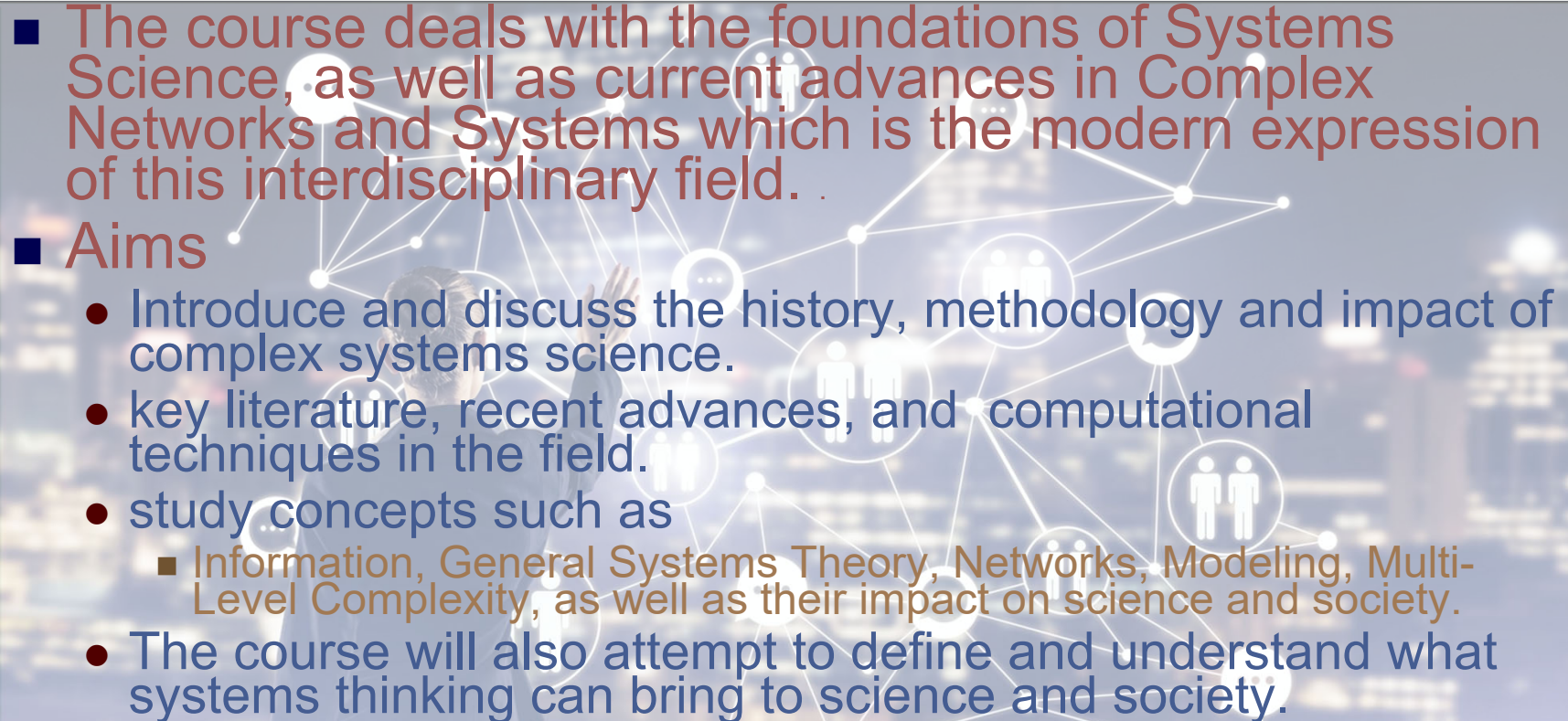
course materials



- **Lecture slides and notes**
 - See course web page and brightspace
- **Web links and general materials**
 - Blog (sciber.blogspot.com) and brightspace
- **Class Book**
 - Klir, G.J. [2001]. *Facets of systems science*. Springer.
 - Available in electronic format for SUNY students.
- **Various literature for discussion**
 - Course web site and brightspace



Overview and aims

- 
- The background of the slide features a person in a dark jacket interacting with a large, glowing network diagram. The diagram consists of numerous white nodes connected by thin white lines, with some nodes containing icons of people. The scene is set against a blurred cityscape at night with lights visible in the background.
- The course deals with the foundations of Systems Science, as well as current advances in Complex Networks and Systems which is the modern expression of this interdisciplinary field. .
 - Aims
 - Introduce and discuss the history, methodology and impact of complex systems science.
 - key literature, recent advances, and computational techniques in the field.
 - study concepts such as
 - Information, General Systems Theory, Networks, Modeling, Multi-Level Complexity, as well as their impact on science and society.
 - The course will also attempt to define and understand what systems thinking can bring to science and society.

evaluation

- **Participation: 20%.**
 - class discussion, everybody reads and discusses every paper
 - engagement in class
- **Paper Presentation and Discussion: 20%**
 - **SSIE501** students are assigned to papers individually or as group lead presenters and discussants
 - all students are supposed to read and participate in discussion of every paper.
 - Presenter prepares short summary of assigned paper (15 minutes)
 - no formal presentations or PowerPoint unless figures are indispensable.
 - **Summary should:**
 - 1) Identify the key goals of the paper (not go in detail over every section)
 - 2) What discussant liked and did not like
 - 3) What authors achieved and did not
 - 4) Any other relevant connections to other class readings and beyond.
 - **ISE440** students chose one of the presented papers to participate as lead discussant
 - not to present the paper, but to comment on points 2-3) above
 - **Class discussion is opened to all**
 - lead discussant ensures we important paper contributions and failures are addressed
- **Black Box: 60%**
 - **Group Project (2 parts)**
 - Assignment I (25%) and Assignment II (35%)

but collegiality above all

■ Attendance

- We expect that students will approach the course as they should a professional job – attend every class.
- No mobile phones and laptops only for class materials
 - All materials available online

■ 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 **Binghamton University Code of Student Conduct**. Cases of academic dishonesty will be reported to the Office of Student Conduct.

■ 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.

for course

A+	98%	<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	94	
A-	90	
B+	85	<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	
B-	75	
C+	70	<i>Good Work.</i> Student performance meets designated course expectations and demonstrates understanding of the course materials at an acceptable level.
C	65	
C-	60	
D+	55	<i>Marginal Work.</i> Student performance demonstrates incomplete understanding of course materials.
D	50	
D-	45	
F	Less than 45	<i>Fail.</i>

key events coming up

- **Paper Presentation: 20%**
 - Present (501) and lead (501&440) the discussion of an article related to the class materials
 - [Enginet students post/send video or join by Zoom synchronously](#)
- **Module 1: Cybernetics and the Information Turn**
- **Today**
 - Borges, Jorge Luis. [1941]. *The Library of Babel*.
 - Borges, Jorge Luis. [1941]. *The Garden of Forking Paths*.
- **Next classes**
 - **Discussion Set 1:**
 - Kline, Ronald R [2015]. *The cybernetics moment, or, why we call our age the information age*. Johns Hopkins University Press. Chapters 1-2.
 - Optional: Heims, S.G. [1991]. *The Cybernetics Group*. MIT Press. Chapters: 1,2, 11, and 12
 - Optional: McCulloch, W. and W. Pitts [1943], "A Logical Calculus of Ideas Immanent in Nervous Activity". *Bulletin of Mathematical Biophysics* **5**:115-133.
 - Gleick, J. [2011]. *The Information: A History, a Theory, a Flood*. Random House. Chapter 8.
 - Optional: Prokopenko, Mikhail, Fabio Boschetti, and Alex J. Ryan. "An information theoretic primer on complexity, self-organization, and emergence." *Complexity* **15.1** (2009): 11-28.
 - **Discussion Set 2**
 - Brenner, Sydney. [2012]. "History of Science. The Revolution in the Life Sciences". *Science* **338** (6113): 1427-8.
 - Brenner, Sydney. [2012]. "Turing centenary: Life's code script. *Nature* **482** (7386) (February 22): 461-461.
 - Cobb, Matthew. [2013]. "1953: When Genes Became 'Information'." *Cell* **153** (3): 503-506.
 - Optional: Searls, David B. [2010]. "The Roots of Bioinformatics". *PLoS Computational Biology* **6**(6): e1000809.
 - Weaver, W. [1948]. "Science and Complexity". *American Scientist*, **36**(4): 536-44. Also available in Klir, G.J. [2001]. *Facets of systems Science*. Springer, pp: 533-540.
 - **Discussion by all**

more upcoming readings (check brightspace)

■ Paper Presentation: 20%

- Present (501) and lead (501&440)

■ Enginet students post/send video or

■ Module 2: Systems Science

- Discussion Set 3:

- Klir, G.J. [2001]. *Facets of system*
 - Optional:
 - Rosen, R. [1986]. "Some commen
 - Klir, G.J. [2001]. *Facets of system*
 - Wigner, E.P. [1960], "The unreason
 - in mathematical sciences delivere

■ Klir, G.J. [2001]. *Facets of system*

- Discussion Set 4:

- Klir, G.J. [2001]. *Facets of system*
 - Optional: Klir, G.J. [2001]. *Facets*
- Schuster, P. (2016). The end of l
- of computational facilities. *Comp*
- Von Foerster, H., P. M. Mora and
- Science **132**(3436):1291-5.

■ Future Modules

- See brightspace

BINGHAMTON UNIVERSITY
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Fall 2023 Intro to Systems Science (ISE-...)

Course Home Calendar **Content** Assignments Quizzes Discussions Evaluation ▾ Classlist Course Tools ▾ Help ▾

Search Topics 🔍

Papers for Presentations ▾

Add dates and restrictions...

All **SSIE501** Students are assigned to one paper as *lead presenters and discussants*, but all students are supposed to read and participate in the discussion of every paper. During class, the presenter prepares a short summary of the paper (10-15 minutes)---no formal presentations or PowerPoint unless figures are indispensable. The summary should:

- 1) Identify the key goals of the paper (not go in detail over every section)
- 2) What discussant liked and did not like
- 3) What authors achieved and did not
- 4) Any other relevant connections to other class readings and beyond.

After initial summary, discussion is opened to all, and role of presenter is to lead the discussion to make sure we address the important paper contributions and failures. **ISE440 students** will chose one of the presented papers to participate as lead discussant, whose role is not to present the paper, but to comment on points 2-3) above.

Next Presentations:

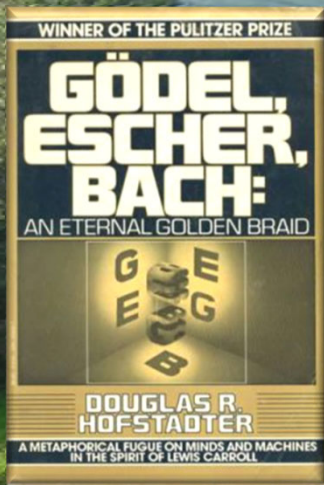
Module 1 - Cybernetics and the Information Turn

Tuesday, August 29th

Presenter 1: Heims, S.G. [1991]. *The Cybernetics Group*. MIT Press. [Chapters: 1 and 2.](#)

Item	Count
Table of Contents	48
Syllabus / Overview	
Bookmarks	
Course Schedule	
Syllabus	
Office Hours	
Readings	45
Papers for Presentations	
Zoom	2
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Personal path in the garden of forking paths



Poetic/metaphorical essays
on Information, memory,
meaning, collective
intelligence (1941. 1979)



readings

■ Class Book

- Klir, G.J. [2001]. *Facets of systems science*. Springer.

■ Papers and other materials

• Discussion Set 1

- Kline, Ronald R [2015]. *The cybernetics moment, or, why we call our age the information age*. Johns Hopkins University Press. Chapters 1-2.
 - Heims, S.G. [1991]. *The Cybernetics Group*. MIT Press. Chapters: 1,2, 11, 12.
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