

Projects

Paul Dwyer - a study trying to measure diversity of thought expression in the blogosphere and the processes that explain it.

Nathan Menke - Modeling the formation of an atherosclerotic plaque in the coronary arteries

Spyro Kotsovilis - Modeling the formation of an atherosclerotic plaque in the coronary arteries

Joe DeRosa - I might be interested in looking at the effects of social networks in solving problems that don't lend themselves to reductionist solutions, i.e., if hierarchy is efficient for solving a reducible problem, what is efficient for solving non-reducible problems?

Rafal Raciborski - trying to bridge political economy models of income redistribution with the optimal taxation literature

Olaf Bochman - I would like to kick off a project that aims to understand the dynamic structure and evolution of genetic networks

Kai Spiekerman - a.) One big question which has been on my mind for quite a while: What is the use of computational models in the social sciences from a descriptive / prescriptive / philosophy of science perspective? Maybe we can work on one aspect of this question...

b.) Recently, Geoff Brennan and Philip Pettit described the "Economy of Esteem" (2004) as a major reason why people obey social norms. Roughly speaking, people want other people to think well of them and adapt their behavior accordingly. Can we think of agent-based models of esteem exchange? Are there interesting dynamics of esteem?

Heather Beil - I would like to do a project that is applying complexity to a health intervention or policy problem so that I can gain a better understanding in how it applies to my field.

Simon Angus - Something that I've been interested in lately is the resurgence in the 'group selection' hypothesis -- (David Sloan Wilson, Elliot Sober etc.) -- many of our (read 'economic') agent models not only confound genotypic and phenotypic selection but also only apply it at the individual level only.. untangling these, and then introducing group selective mechanisms (or are these emergent properties of individual selection pressures?) is something I'd like to explore, either in an abstracted (has been done a bit lately) or applied (not so much; e.g. micro-founded human strategic interaction..) model.

Rhonda Belue - Applying a complex systems framework to intervention design for chronic relapsing disease in disenfranchised populations. I would be interested in using network analysis to find social or community hubs that could be used to increased the sustainability of community based interventions.

Mollie Poynton - I do have remote, IRB-approved access to electronic health records (not de-identified, but meeting limited data set criteria) for a sample of 3000 patients coded as current or former tobacco users. I think it would be interesting to use what we learn at CSSS to examine the effect of different concept representations and/or changes in data quality on feature selection or induction of models from clinical (EHR) data. It would also be really interesting to examine preventive services delivery from a complex systems perspective

Chris Atwood - Yes, I suggest a project on studying whether charge transfer within/between molecules can be chaotic in the presence of a magnetic field and gradient. There might be regimes where an interaction between the field, gradient, and charge motion becomes chaotic, with implications for the behavior of biomolecules.

Aaron Frank - My hope to construct an evolving international system out of boundedly rational agents, with the specific goal of understanding how changes in economic and military technologies and organization can alter the domestic/internal organization of agents (constitutional structure and logic), and the balance of power between them (international relations, trade, war, etc.). At a minimum, I'm hoping for a paper model or concept, while my more ambitious goal would be have something computational.

Andy Bell - i'd like to look at the underlying requirements for self-governing agricultural water systems, and how they can be represented computationally

Amir Goldberg - I hope to find new ways of modelling social contagion and apply them to technological diffusion such as in the case of iPod use or the exponential growth of the blogosphere.

Monika Piotrowska - I do have a particular interest in

- * modeling the cell cycle of normal and cancer cells,
- * the investigation of the role of inflammation on the cancer genesis process and tumor development.

Will Ludington - evolutionary transition from unicellular to multicellular.; One last project I'm interested in: how can molecular motors dragging vesicles can set up bulk flow in the confined, low-Reynolds number environment of the cytosol. I am particularly thinking of the scenario in *Drosophila* and *C. elegans* oocytes where violent churning is observed inside the cell. How big do the vesicles have to be? How fast do the motors have to move? Do similar processes aid mixing without drastic bulk flow in normal cells? In the very small yeast cell? How does this flow aid mixing?

Chris Darabos - I'm currently working on analyzing the tolerance to failure of small boolean networks that share some interesting properties with gene regulatory networks. Another field I'd like to explore and maybe try to model is the regulatory effect of micro-RNA on genes.

Johan Nystrom - I've recently found an article where the morphogenesis of slime mold (like an amoeba) is modeled. The model consists of a cellular automata/PDE and seems to be able to give some very interesting results, including cell sorting and cell movement, with only a very limited number of parameters. It would be fun to use this article as a start of a project, but I'm very open to other suggestions. Anyone interested in PDEs, CAs or morphology in general are very welcome to send me an email and I'll be happy to tell you more.

Gabriele Laspada - I would carry on a project about volatility and stock price random walk at tick-by-tick level. Another interesting issue could be differences and similarities between "large tick" and "small tick" stocks.

Mike Wojnowicz - I've collected dynamical systems-inspired data demonstrating different patterns of mouse-movement trajectories when people report that they "like" or "dislike" different ethnic groups. Although this data has helped me make a particular theoretical claim, it may avail itself to new kinds of analyses.

Elizabeth Mullane - I am interested in exploring how it is possible to use computational modeling to describe self-organization in human systems.

George Obernosterer - it probably needs your help in being well formulated. The story is the following: Around ten years ago developmental biologists discovered by chance so called microRNAs (miRNAs). Those are non protein coding genes, that regulate messenger RNAs by binding to their 3'UTRs (sequences after the STOP codon). Thereby they can shut-down translation. Now there are algorithms that predict miRNA binding sites (imperfect pattern matching) but it is known that the RNA folds back and thereby introduces another level of complexity: secondary structure. Now, I have started to write an algorithm that predicts "accessible regions" in RNA molecules. This is important for miRNAs because it was just recently shown (to be published) that secondary structures around binding sites impair miRNA function. What I would like to build kind of an accessibility= map of genomes and see how different sequences (exons, introns, UTRs) that have diverse sequence complexities (compression levels) differ. It would be cool to then evaluate confirmed miRNA binding sites.

Another problem would be to reconstruct phylogenetic trees from quartets (trees of four leaves) starting with an sequence alignment. However, here I have not done much since a year or so. But, I brought along a lot of literature and I have support from Andreas Dress (<http://www.icb.ac.cn/director1.htm>) who actually started this project.

Dan Neilson - One possible project would use an agent-based approach to examine the role and effects of a lender of last resort during a financial crisis. Another would study the division of large projects into constituent tasks in environments of varying degrees of centralization.

Wenyun Zuo - I am working on theoretical project about biodiversity pattern basic on species niche and range size. Secondly, I am working on a mechanism model for biodiversity distribution pattern by combining logistic equation and diffusion equation. Furthermore, I am looking for the problem in metabolism scaling which I hope to be my project for summer school and part of my dissertation.

Amitabh Trehan - I would be interested in a project to construct/conceptualise/analyse some 'self-healing' system. Another interesting project for me would be to work on dynamics of ecological systems (like population dynamics) and possibly combine both ideas.

Carver Tate - I would like to apply complexity theory to areas that I have not seen it used in yet such as political science and globalization studies. In terms of political science I could see CT being used to try and understand how different political movements/parties are formed and how the political system acts as a complex adaptive system.

Juergen Pahle - the border between stochastic and (quasi-)deterministic behavior and information transfer in biochemical networks

Javier Vincente - I have one project in mind about networks and lead lagger behavior on finance.

Tim Johan – I am also interested in the evolution of 'proto-life', and the question bothering me is:How did metabolic networks, with their special features (scale-free, small-world), arise from 'random' networks. What hypothetical evolutionary rules lead to that, which are physically meaningful.

Kristen Fortney - Within neuroscience, I'm interested in studying properties of networks of aging cells in the brain (e.g. what happens to learning?) Outside of my thesis area, I'd be happy to do a project in the general area of evolutionary dynamics, a subject which I am very interested in but fairly new to... anyone have any good ideas?

Luis Pinzon - As I mentioned before, right now I am interested in understanding how the structure of networks can contribute to individual and organizational learning, but I am open to other topics.

Yossi Yovel - we are trying to understand how bats use echolocation to perform different tasks. In opposed to the vision field that is well studied and there are plenty of works describing the features of natural images, in acoustics the properties of complex acoustical scenes are very poorly studied. We know that bats are able to classify echoes of different trees for instance, which are complex stochastic time series. One side project that I am trying to do is to model these echoes. and more generally to model the properties of natural echoes. The physics of the travel of sound in air and its reflection is available, but once we examine an object with many reflectors like a tree there is no simple equation to describe the echoes. I also have a huge data set of plant echoes created with a bat-like emitted signal, that can be used for comparison.

Ben Mazzota - Cell phones in developing economies are thought to improve productivity by improving information about prices. This reduces waste, improves arbitrage opportunities, and lowers barriers to market entry. I think that agent-based modeling could radically improve our understanding of how cheap information (which the cell phone provides) could change commercial networks and create durable improvements to long-run growth and innovation. That said, I still haven't played with an actual model of an economy, so I'm not sure what the state variables and parameters are going to be.