CoMSES Digest: Fall 2024

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Editor's Note

Warmest greeting from the CoMSES.Net team!

The CoMSES.Net Digest for Fall 2024 brings you the latest updates and insights from the world of agent-based modeling. In this issue, we highlight ongoing developments like new links to GitHub, less known valuable features of CoMSES like its Education Section, upcoming events, and new model uploads in the CoMSES Model Library. We also feature a strikingly stimulating book review of "Tangles: A Structural Approach to Artificial Intelligence in the Empirical Sciences" by Reinhard Diestel, with applications across natural and social sciences. Stay informed and engaged with the latest advancements and opportunities in the CoMSES community.

The commitment of the CoMSES Net team to showcasing the best possible practices in the field is evident through the continued flow of innovations in the online platform, see below the News section of this digest for a start. Indeed, CoMSES.net stands out as a lighthouse in the realm of complexity science, making it accessible to the global research community. CoMSES ensures that knowledge and resources are shared widely, fostering collaboration and innovation across scientific realms, and in particular, continually pushing the boundaries of what is possible in socio-ecological sciences.

These activities and insights are crucial for advancing science. From the humble experience of this guest editor, they are key to exploring the meso-scale, a scale often less understood than the micro- and macro-scales in the social sciences. The meso-scale is crucial in interdisciplinary research, because emergence in local and regional socio-ecosystems involves multiple phenomena, often beyond individual disciplines, and involving complex cross-sectoral interactions.

In the age of urbanization, the meso-scale and its feasible transformations require incorporating insights that only a complexity approach to social-ecological systems can provide. For example by improving our understanding of all the cross-sectoral interactions inside and outside the urban meso-scale: inequality, biodiversity, climate tipping points, crises in supply chains; you name it, at CoMSES they've got materials that will help you approach these topics and others with state-of-the-art approaches.

Dr. Roger Cremades Rodeja
Associate Professor in Urban Environmental Change
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CoMSES.Net Fall Issue Guest Editor

CoMSES News

Ongoing Developments

A feature that integrates the model library with GitHub by mirroring individual models is under active development and can be expected to roll out this fall. This will be an automatic process that model authors can opt in to which will not only improve the accessibility of model software but also open the door for taking advantage of GitHub's collaborative environment and rich automation tooling.

As usual, we have been carrying on with bug fixes and minor improvements such as better moderation tools, streamlining our core services like peer review, and additional software testing. If you have any suggestions for improvement or would like to report an issue, please get in touch via our contact page or by emailing us at support@comses.net.

Feature: CoMSES Site Forgotten Functions

In this new digest segment a brief spotlight will be cast on a selected function or aspect of the CoMSES.Net website. The aim is to build awareness of the many already existing features of the site that readers may not be fully aware of, or may have forgotten about.

This digests focus: Our Education Section

The education section contains educational materials aimed at helping our members develop more than just their agent-based model. The education section includes an introduction to Git and GitHub to familiarize yourself with Git and GitHub through an interactive introductory course hosted on GitHub Classroom. It also includes an introduction to containerization, a way to bundle and archive your code in a reproducible manner. Also, the education section contains a series of video lessons on responsible practices for developing and publishing FAIR+ computational models in efforts to be more transparent, interoperable, and reusable in our work. These training modules can help you, your colleagues, or your students preserve and build upon your agent-based models. All educational modules can be found here: https://www.comses.net/education/

Phasing Out Creative Commons Licenses

Previously, we announced that we would be taking steps to reduce the amount of software in the CoMSES Model Library licensed under the Creative Commons family of licenses due to their unsuitability for software. In order to streamline this we have introduced a new page at https://www.comses.net/cc-license/ which allows you to re-license any submitted models that are currently licensed under Creative Commons to preferred alternatives with one click.

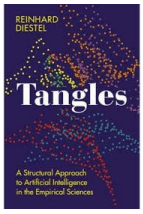
Improved Model Library Search

We have recently rolled out a series of improvements to the search functionality in the CoMSES Model Library including changes to the search query processing to produce more accurate results and additional filters. Improving discoverability is an important goal that we will keep striving towards, so feedback on areas where we can improve is always welcome.

New CoMSES Digest Segment: User Showcase

What do our users use our models for? This was a question raised recently, and it prompted an idea. We are asking you - our readers - for your input. We would love to hear from you, and feature your thoughts in upcoming digest issues. Please complete this brief google form - and maybe you will see your thoughts/experiences in print in a future digest issue!

Book Review



Tangles: A Structural Approach to Artificial Intelligence in the Empirical Sciences
Author: Reinhard Diestel. Cambridge University Press

Review Written by: Hassan Bashiri Hamedan
University of Technology IRAN

Tangles originate from a new theory in graphs in mathematics. The concept of Tangles refers to a region in a graph where nodes are intricately connected, difficult to separate, and do not conform to traditional ideas of high connectivity. This concept is a change in the understanding of local connectivity in a graph or network by focusing on the relative position of "bottlenecks" rather than focusing on the details of vertices and edges. The book Tangles: A Structural Approach to Artificial Intelligence in the Empirical Sciences introduces the concept of Tangles as a methodical approach to identifying and analyzing clusters, especially in fuzzy data. In this book, the author attempts to expand the idea of Tangles beyond graph theory to other research fields and introduce its application in a variety of real-world scenarios in the research fields of natural sciences, social sciences, and data sciences.

To expand the idea of Tangles in other sciences, either the structures in the field of research should be mapped to a graph, or a mapping should be found to match the Tangles in the field of study. In this book, the author applied to use of the second solution. That is Tangles is understood as a structural trace in data in the field of research, including natural sciences, social sciences, and data science, which identifies a set of features or measurements that often occur together. This approach is an alternative to the traditional search for clusters by directly identifying consistent patterns or structures in the data.

According to the specialized field of the audience of the CoMSES Network, the first question is the relation of Tangles with complex systems. For the answer, we remind that a complex system has many diverse interconnected components that show collective behavior often without simple causal relationships. On the other hand, Tangles provides a method to identify and analyze high-level structural patterns in complex systems and focuses on connectivity and interactions within data, to identify basic structures or "footprints" that emerge from the complex interaction of components within the system. This makes tangles particularly useful in identifying and understanding novel features or clusters in complex systems, where traditional methods may struggle to draw clear boundaries or causal relationships. This structural approach can be particularly valuable in agent-based modeling, where understanding the interactions and emergent behaviors of agents often requires a new type of connectivity analysis.

Reinhard Diestel has attempted to introduce an interdisciplinary approach to Tangles. For example, in the natural sciences, Tangles provide a structural alternative to the traditional concept of causality, allowing researchers to identify patterns and relationships between data without the need for explicit causal models. In the social sciences, Tangles can reveal latent mindsets within populations and provide a more nuanced understanding of group behavior and opinions. In data science, Tangles provides a robust method for data clustering that differs from conventional classification methods and helps avoid common exploits.

The content of the book introduces various applications in systems and data analysis:

- Clustering and Classification: In data science, Tangles provides a way to cluster data points without relying on conventional definitions of clusters. Tangles logic can be useful in clustering fuzzy or complex datasets where traditional clustering methods may be ineffective in identifying meaningful groups.
- Pattern recognition in data: Tangles can be used to identify consistent patterns or identify sets of features among large data sets. o Robustness to noise: The idea of Tangles is an ensemble-based concept, and due to the emphasis of Tangles on structural patterns rather than individual data points, it makes them robust to noise and small changes in data, especially in systems where the data may be incomplete or inaccurate.
- Survey Design: In the social sciences, convolutions can be used to design optimal surveys. Key questions that differentiate between different mindsets or opinions can be identified using Tangles.
- Detecting and predicting system behavior: In systems analysis, Tangles are used to identify structural patterns that correspond to different states or behaviors of the system. Tangles are also used to predict the future behavior of the system based on the observed patterns. This feature is useful in artificial intelligence and machine learning.

The innovation of the book can be summed up in expanding the application of the mathematical theory of Tangles beyond its original scope in graph theory, in a wide range of experimental sciences. Traditionally, tangle theory has been limited to the study of graphs, but the book extends the concept to the analysis of real-world data and complex systems in various scientific fields.

The book's central concept, Tangles, is rooted in an advanced, abstract mathematical framework that is inherently complex while being simple. Despite the author's efforts to present the content to a non-mathematical audience, many readers without a strong mathematical background may find it challenging to understand the material presented. To bring the theoretical idea presented in the book closer to practical applications, a library of Python modules has been developed to facilitate the application of tangle theory and has been made available to the audience online.

The developed library provides a set of basic Python modules to help users find and analyze Tangles in different types of data. The module developed for Python can search and analyze tangles in different types of data sets, such as survey data, point clouds, and images. The module is available through interactive Jupyter notebooks provided on GitHub, including tutorials to guide users through specific examples, such as clustering responses in survey data or segmenting images based on tangle theory. [https://github.com/tangle-software/tangles].

Keep Your CoMSES Profile Updated

Please consider keeping the CoMSES community informed by updating your user account on CoMSES Net! Let fellow researchers and modelers get to know you by including a biography, research interests, and/or institutional affiliation. Click here to edit your profile and link your account to GitHub and ORCID! As always, feel free to join the conversation by visiting the Forums tab or by starting a discussion on a specific model, event, or job posting.

Calendar of Events

Follow the links to the local event organizers for the latest information or go to https://comses.net/events/ for a listing of all recent events. You can also subscribe to new events by following us on Twitter or subscribing to our RSS Events feed.

Upcoming Deadlines

Spatial Data Science Symposium 2024
Dates: October 23, 2024 - October 24, 2024

The 5th edition of Spatial Data Science Symposium (SDSS 2024) will take place virtually on 23 - 24th October, 2024. In-person discussions and presentations will be possible at local hubs, including Vienna, McGill University, University of Bristol, Utrecht University, and more to come.

The Computational Social Science Society of the Americas Annual Conference
Dates: October 24, 2024 - October 27, 2024

The computational Social Science (CSS2024) annual conference will be held in-person at The Drury Plaza Hotel in Downtown Santa Fe, New Mexico, 24-27th October 2024. The conference will be focusing on topics related to Agent based modeling and simulation, Sociocultural Analysis, Big data Analytics, Geospatial Analysis, Case Studies, and reports.

13th International Conference on Complex Networks & Their Applications
Dates: December 10, 2024 - December 12, 2024

The 13th International Conference on Complex Networks and their Applications will take place in Istanbul, Turkey , 10-12th December 2024. The abstract submission deadline is 3rd September, 2024. Both full papers (not previously published up to 12 pages) and Extended Abstracts (about published or unpublished research up to 4 pages) are welcome

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Model Library

Newly Reviewed

8 models passed CoMSES's peer review process this quarter!

CoMSES is always looking for new model reviewers! As such we warmly welcome your self nomination. If you would like to join our reviewer network, we invite you to complete This Form.

New Model Uploads

Nineteen new models were published in the CoMSES Model Library on a wide variety of topics that illustrate the depth and breadth of our community. These include:

- Understanding the effects of shocks on global, regional, urban and rural food security
- Exploring the alleviating effects of microfinance service on income and poverty
- Observing models based on the Chilean school system
- Simulating the behavior and decision making processes of individuals in a social network
- Modeling decision making during the fast fashion shift

These models and more can be discovered at the CoMSES Model Library - you can also keep up-to-date with newly published models on our Twitter/X and RSS feeds.

Most Downloaded Models

Published models were downloaded a total of 2178 times this quarter, across

867 unique codebases. Here are the top five:

1. An Agent-based Model of Farmland Transfer by Peng Jiang and Hang Xiong (19 downloads)
2. Integrate land use policies into the agent-based model to simulate land use change by Jing Gao (19 downloads)
3. Sugarscape with Spice by Marco Janssen (18 downloads)
4. World of Cows by Maria Haensel, Thomas Michael Schmitt, and Jakob Bogenreuther (16 downloads)
5. Artificial Anasaziby Marco Janssen (15 downloads)

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