

Resumen sobre la IA en la investigación científica

Se documentaron los usos de la inteligencia artificial en las distintas etapas del método científico, haciendo énfasis en aquellas áreas de la ciencia donde han tenido mayor impacto (por ejemplo, descubrimiento de nuevos fármacos). Particularmente en investigación de operaciones se presentaron algunas de las herramientas que pueden usarse siempre en dependencia del objetivo del proyecto de investigación así como de los datos con los que se cuenta. Se encontraron a su vez áreas que en un futuro podrían tener impacto en las propias investigaciones, como usar redes neuronales para identificar transiciones de fase en procesos epidémicos complejos. A su vez, identificamos limitaciones de estas herramientas, que se documentan a continuación.

En la etapa de revisión de literatura, se encontraron limitantes serios en algunas de las herramientas más populares de inteligencia artificial. Por ejemplo, se le solicitó a chatGPT hablar sobre procesos epidémicos en complejos simpliciales. La definición general que da del tema es bastante acertada, sin embargo, la literatura recomendada es problemática. Si bien los artículos 1 y 3 hablan sobre epidemias, no abordan el tema específico de epidemias en estructuras de orden mayor o epidemias en complejos simpliciales. Los artículos 4 y 5 no hablan del tema ni de algún tema relacionado. Por último, los artículos 2 y 6 no existen. Cabe destacar que R. Lambiotte, uno de los autores del “artículo 6”, sí es un investigador del área mencionada. Ante la inconsistencia, se le solicitó a chatGPT proporcionar el DOI de uno de estos artículos, y nos devuelve uno no existente.

What about epidemic or contagion processes on simplicial complexes?

Simplicial complexes are higher-dimensional analogs of graphs and networks, and have been used to study a variety of complex systems, including epidemic and contagion processes. Here are some papers that deal with epidemic or contagion processes on simplicial complexes:

1. Kivelä, M., Arenas, A., Barthelemy, M., Gleeson, J. P., Moreno, Y., & Porter, M. A. (2014). Multilayer networks. *Journal of Complex Networks*, 2(3), 203-271.
2. Bauke, H. (2007). Epidemic threshold in clustered networks. *Physical Review E*, 75(2), 020901.
3. Bailey, N. T. J. (1975). *The Mathematical Theory of Infectious Diseases and its Applications*. John Wiley & Sons.
4. Kuznetsov, Y. A. (2013). *Elements of Applied Bifurcation Theory*. Springer.
5. Scardovelli, R., & Zaleski, S. (1999). Direct numerical simulation of free-surface and interfacial flow. *Annual Review of Fluid Mechanics*, 31(1), 267-292.
6. Delvenne, J. C., Evans, T., Omodei, E., & Lambiotte, R. (2015). Diffusion on networks. *Reviews of Modern Physics*, 87(3), 953-979.

These papers should provide you with a good understanding of the mathematical foundations of contagion processes on simplicial complexes, and give you some ideas for further study.

Can you give me the DOI of paper 6 from your response?

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10.1103/RevModPhys.87.953

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De la misma manera sucede en otro caso donde se le preguntó a ChatGPT sobre cómo ha impactado la IA en la investigación científica, proporcionando un artículo científico con un DOI inexistente.

The screenshot shows the ChatGPT web interface. The browser address bar displays 'chat.openai.com'. The left sidebar contains a list of chat sessions: 'New chat', 'AI and Scientific Research.', 'IA para plantear probl...', 'Problema de tesis', and 'Inicio de la inv'. The main chat area shows a conversation where the user asks for the DOI of a scientific article. The AI responds with a detailed explanation of how a neural network generates hypotheses and provides the DOI '10.1109/ACCESS.2020.3034794'. The interface includes a 'Regenerate response' button and a footer with the text 'ChatGPT Mar 14 Version. Free Research Preview. Our goal is to make AI systems more natural and safe to interact with. Your feedback will help us improve.'

Finalmente, en la etapa de generación de hipótesis, se utiliza una red neuronal para generar hipótesis automáticamente a partir de las representaciones de los datos. La red neuronal aprende a encontrar patrones y relaciones en los datos, y utiliza esta información para generar hipótesis sobre la relación entre las variables.

El método se evalúa en varios conjuntos de datos, y los resultados muestran que es capaz de generar hipótesis útiles y significativas sobre los datos de manera automática, lo que puede ayudar a los científicos y analistas de datos a encontrar nuevas relaciones y patrones en los datos de manera más eficiente.

Dame el doi de ese artículo científico

Por supuesto, el DOI (Digital Object Identifier) del artículo "Hypothesis Generation with Deep Learning for Exploratory Data Analysis" es: 10.1109/ACCESS.2020.3034794.

Regenerate response

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Otra de las herramientas que se exploró fue la de Paper Digest, misma a la que se le pidió hacer un resumen de literatura con los keywords *Epidemics Simplicial Complex*. El resultado

fue mejor si se compara con chatGPT, empezando con el hecho de que no arrojó trabajos ficticios. El listado de literatura incluye trabajos relevantes sobre el área, sin embargo, también hay trabajos algo distanciados del tema. Además el resumen que proporciona y supone un atractivo de la herramienta, es muy básico. Parece el resultado de sacar una oración de cada artículo listado. Como investigador, Google Scholar ofrece mejores resultados.

Related Work

- [1] Annalisa Buffa; Snorre H. Christiansen; "A Dual Finite Element Complex on The Barycentric Refinement", [MATH. COMPUT.](#), 2007. (IF: 6)
- [2] Li Ding; Ping Hu; "Contagion Processes on Time-Varying Networks with Homophily-Driven Group Interactions", [COMPLEX.](#), 2019.
- [3] Iacopo Iacopini; Giovanni Petri; Alain Barrat; Vito Latora; "Simplicial Models of Social Contagion", [NATURE COMMUNICATIONS](#), 2019. (IF: 5)
- [4] Joan T. Matamalas; Sergio Gómez; Alex Arenas; "Abrupt Phase Transition Of Epidemic Spreading In Simplicial Complexes", [ARXIV: PHYSICS.SOC-PH](#), 2019. (IF: 3)
- [5] Ginestra Bianconi; Sergey N. Dorogovtsev; "The Spectral Dimension Of Simplicial Complexes: A Renormalization Group Theory", [ARXIV-COND-MAT.DIS-NN](#), 2019. (IF: 3)
- [6] Wenyao Li; Xiaoyu Xue; Liming Pan; Tao Lin; Wei Wang; "Competing Spreading Dynamics in Simplicial Complex", [ARXIV: PHYSICS.SOC-PH](#), 2021. (IF: 3)
- [7] Dong Wang; Yi Zhao; Jianfeng Luo; Hui Leng; "Simplicial SIRS Epidemic Models with Nonlinear Incidence Rates", [CHAOS \(WOODBURY, N.Y.\)](#), 2021. (IF: 3)
- [8] Gerardo Palafox-Castillo; Arturo Berrones-Santos; "Stochastic Epidemic Model on A Simplicial Complex", [ARXIV-COND-MAT-STAT-MECH](#), 2022.
- [9] Huan Wang; Hai-Feng Zhang; Pei-Can Zhu; Chuang Ma; "Interplay of Simplicial Awareness Contagion and Epidemic Spreading on Time-varying Multiplex Networks", [CHAOS \(WOODBURY, N.Y.\)](#), 2022.
- [10] Wenjie Li; Yanyi Nie; Wenyao Li; Xiaolong Chen; Sheng Su; Wei Wang; "Two Competing Simplicial Irreversible Epidemics on Simplicial Complex", [CHAOS \(WOODBURY, N.Y.\)](#), 2022.

Summary of the Related Work

It can be seen as a realization of the simplicial cochain complex. (Buffa et. al., 2007) construct a new complex Y^* of finite element spaces on the barycentric refinement of the mesh which can be seen as a realization of the simplicial chain complex on the original (unrefined) mesh, such that the L_2 duality is non-degenerate on $Y_i \times X_{2-i}$ for each $i \in \{0,1,2\}$. (Ding et. al., 2019) investigate the impact of homophily-driven group interactions on the contagion process in temporal networks. (Iacopini et. al., 2019) introduce a higher-order model of social contagion in which a social system is represented by a simplicial complex and contagion can occur through interactions in groups of different sizes. (Matamalas et. al., 2019) cope with the problem of epidemic spreading, using the Susceptible-Infected-Susceptible (SIS) model, in simplicial complexes. Using the renormalization group here (Bianconi et. al., 2019) calculate the spectral dimension of the graph Laplacian of two classes of non-amenable d -dimensional simplicial complexes: the Apollonian networks and the pseudo-fractal networks. (Li et. al., 2021) analyze the model's critical phenomena. (Wang et. al., 2021) propose a simplicial susceptible-infected-recovered-susceptible (SIRS) model to investigate the epidemic spreading via combining the network higher-order structure with a nonlinear incidence rate. A stochastic epidemic model on a simplicial complex is defined, generalizing the known Markovian SIR epidemic process on networks (Palafox-Castillo et. al., 2022). The physical social interaction of individuals is not static but time-varying. Therefore (Wang et. al., 2022) propose a novel sUAU-tSIS model to characterize the interplay of simplicial awareness contagion and epidemic spreading on time-varying multiplex networks, in which one layer with 2-simplicial complexes is considered the virtual information layer to address the complex contagion mechanisms in awareness diffusion and the other layer with time-varying and memory effects is treated as the physical contact layer to mimic the temporal interaction pattern among population. A competing spread model for two simplicial irreversible epidemics (i.e., susceptible-infected-removed epidemics) on higher-order networks is proposed (Li et. al., 2022).

☐ Very Good ☐ Good ☒ Average ☐ Bad ☐ Very Bad

También se manejan herramientas de IA que ayudan en la revisión de literatura, como Semantic Scholar, que cuenta con una buena cantidad de artículos científicos publicados recientemente y que son de buena calidad, lo que facilita el tiempo que se toma en hacer la revisión.

AA semanticscholar.org

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 Economics, Sociology · European Journal of Operational Research · 16 October 2020
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A RECURSIVE OPTIMIZATION-SIMULATION APPROACH FOR THE AMBULANCE LOCATION AND DISPATCHING PROBLEM
 Ettore Lanzarone, Enrico Galluccio, V. Bélanger, Vittorio Nicoletta, Angel B. Ruiz ·
 Sociology · Online World Conference on Soft Computing in... · 1 December 2018
 TLDR This work proposes four Recursive Optimization-Simulation Approaches to estimate the ALDP busy fraction, and applies them to a set of realistic instances and results confirm that the most sophisticated and computing demanding approaches offer a better performance. Expand
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A Cardinality-Constrained Robust Approach for the Ambulance Location and Dispatching Problem
 Vittorio Nicoletta, Ettore Lanzarone, V. Bélanger, Angel B. Ruiz · Economics · 29 June 2017
 TLDR This paper formulate and validate a robust counterpart of the ALDP to deal with demand uncertainty, exploiting the cardinality-constrained approach and shows promising results and proves the practical applicability of the approach. Expand

Sin embargo existen también problemáticas, como en el caso de You, en donde muchos usuarios podrían estar utilizando la herramienta y se satura haciendo que no se aproveche ese tiempo.

AA

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Ambulance location and dispatching

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