

FisMatEcol Boletín

Febrero 2024

Dr. Oliver López Corona
Dra. Elvia Ramírez Carrillo



Eventos

Planeta enfermo: los límites de Gaia -> Martes 27 de febrero de 2024 12:00 - 14:00

Evento híbrido:

Presencial en el [auditorio del C3](#)

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EN EL C3 CON LA ACADEMIA MEXICANA DE CIENCIAS Y
Juan Claudio Toledo / ICN y C3 de la UNAM

Planeta enfermo: los límites de Gaia
Comentaristas: Alejandro Frank, Gabriel García,
Andrea Sáenz-Arroyo
Moderadora: Julia Tagüeña, IER y C3-UNAM, AMC

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Martes 27 de febrero
12 horas
Auditorio del C3

Esta sesión se hará de manera presencial el día jueves 29 de febrero a las 12:00 m., en el salón 13 del edificio C del IIMAS.

A partir de esta charla transmitiremos todas las sesiones del Coloquio a través de Zoom, previa inscripción (basta con hacerlo una vez) en el siguiente enlace:

<https://shorturl.at/goOY1>



M y M
Departamento de
Matemáticas y
Mecánica

COLOQUIO DE
MATEMÁTICAS APLICADAS

¿Qué nos pueden decir la física y la matemática aplicada sobre la salud de los ecosistemas?

Dr. Oliver López-Corona
Investigador por México IIMAS, UNAM



Informes
luis.lopez@mym.iimas.unam.mx

29
FEB

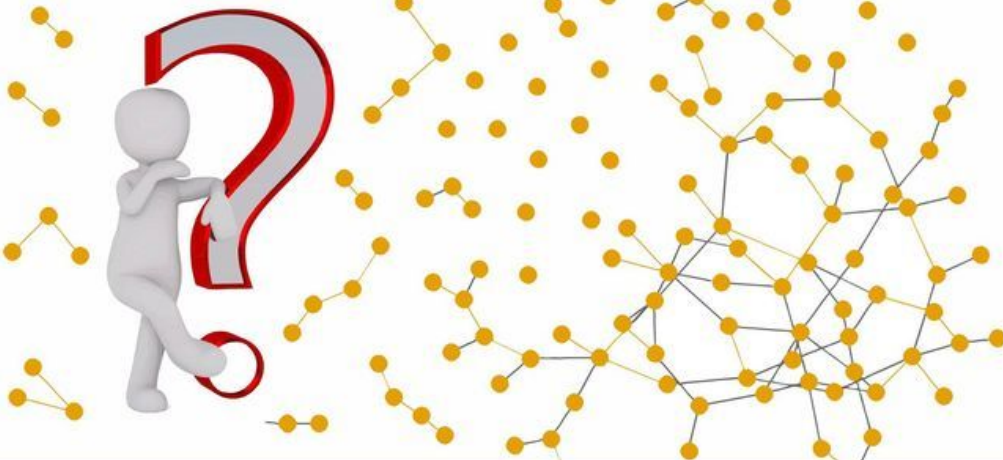
12:00 HRS.
SALÓN 13
EDIFICIO C



EL SER HUMANO VS LA ALEATORIEDAD

27 de
febrero
18:00 hrs.

Museo de
Ciencias
UAZ



Patio Central de Rectoría
Jardín Juárez 147, Centro

Alejandro Puga Candelas

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Undergraduate Complexity Research



Detail from *Plant forms*, an Impression Figure by Margaret Watts Hughes, pigment on glass, date unknown (recolored). Courtesy of Cyfarthfa Castle Museum and Art Gallery via PublicDomainReview.org

A Research Experience for Undergraduate Students

Complex Systems Summer School



Study Complex Behaviors Across Systems



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2024

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Wendy E. Aguilar Martínez
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J. Antonio Nieves Castillo
J. Roberto Romero Ariza

21 de marzo

12:00 horas

Auditorio del IIMAS

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**"Inteligencia artificial para entender,
explicar y optimizar inteligencia
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21

MAR

**INTELIGENCIA ARTIFICIAL PARA
ENTENDER, EXPLICAR Y
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ARTIFICIAL**



Sociedad Mexicana
de Bioquímica
Neurobiología

V Neurobiology Meeting of the Mexican Society for Biochemistry

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Centro Cultural Universitario



<https://sites.google.com/view/smb-neuro24/home>

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Microbiota-gut-brain axis, Neurodegenerative diseases, Brain aging***

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“Use and applications of microscopy imaging in Neuroscience”

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de Neurobiología, UNAM; Carmen Vivar, CINVESTAV, Angélica Zepeda; Instituto de Investigaciones Biomédicas, UNAM

Abstract submission deadline: February 15, 2024

Information: neurobiologia@smb.org.mx

congresoneurobiologia.smb@gmail.com

Art by Rafael Flores Correa



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Oportunidades



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Postdoctoral Scholar, Genomics of Clinical and Environmental Microbes

Job ID: 30986

Updated: February 2, 2024

Location: Foothills Campus

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We would like to take this opportunity to acknowledge the traditional territories of the people of the Treaty 7 region in Southern Alberta. The City of Calgary is also home to Métis Nation of Alberta, Districts 5 and 6.

Position Description

Area: Genomics of Clinical and Environmental Microbes

Duration: Two Year Position

Start Date: ASAP

Annual Stipend: \$60,000-65,000 depending on experience/year plus benefits

The Faculty of Science and the Cumming School of Medicine at the University of Calgary and the Faculty of Science and Technology at Athabasca University are accepting applications for a Postdoctoral Scholar in Wastewater-Based Epidemiology and Molecular Microbiology.

Job Description:

The omics postdoc will be part of an interdisciplinary research team that is using wastewater to track the dynamics of infectious agents. We have developed an integrated surveillance network monitoring 43 municipalities, as well as several sentinel surveillance hubs including a large number of tertiary care hospitals and populations of special interest from which we collect samples 1-3x per week. Wastewater data can be compared with population-level data and hospital-specific data drawing from a single provincial health provider – and the potential of this unique network is exceptional. The omics postdoc will work directly with a transdisciplinary team of clinicians and researchers at the University of Calgary (Faculties of Science, Engineering, and Medicine, and Advancing Canadian Water Assets (ACWA)) and Athabasca University. The postdoc will also have the opportunity to collaborate with the City of Calgary's municipal employees and public health experts at Alberta Health Services.

Lecturer in Professional Development (0.75FTE),
Permanent, Contract Type A, College of Medicine,
Nursing and Health Sciences, University of Galway
(010225)





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Faculty Position -Department of Physiology & Biophysics

Case Western Reserve University: SCHOOL OF MEDICINE: School of Medicine -
Main Campus: Physiology

Location

Cleveland, Ohio

Open Date

Jan 01, 2024

Appl

This i

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Conceptos

Complexity Thoughts

Robustness and resilience in complex systems

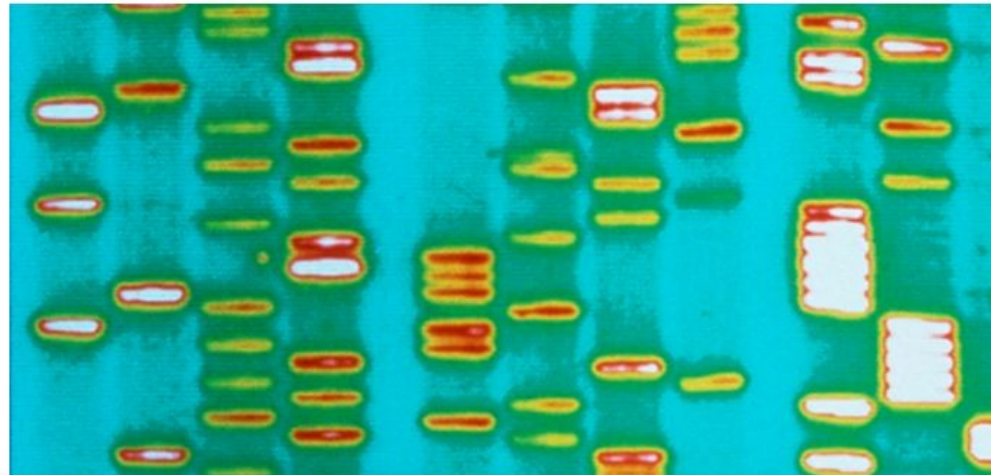
Unraveling how networks respond to disturbances and why it's important for our future

23 FEB 2024

It's time to admit that genes are not the blueprint for life

The view of biology often presented to the public is oversimplified and out of date. Scientists must set the record straight, argues a new book.

By [Denis Noble](#)



How do we know how smart AI systems are?

MELANIE MITCHELL [Authors Info & Affiliations](#)

SCIENCE · 13 Jul 2023 · Vol 391, Issue 6654 · DOI:10.1126/science.ad9957

33,824 2

RELATED INTRODUCTION TO SPECIAL ISSUE

A machine-intelligent world

SCIENCE · 14 JUL 2023

In 1967, Marvin Minsky, a founder of the field of artificial intelligence (AI), made a bold prediction: “Within a generation...the problem of creating ‘artificial intelligence’ will be substantially solved.” Assuming that a generation is about 30 years, Minsky was clearly overoptimistic. But now, nearly two generations later, how close are we to the original goal of human-level (or greater) intelligence in machines?

Some leading AI researchers would answer that we are quite close. Earlier this year, deep-learning pioneer and Turing Award winner Geoffrey Hinton [told](#) *Technology Review*, “I have suddenly switched my views on whether these things are going to be more intelligent than us. I think they’re very close to it now and they will be much more intelligent than us in the future.” His fellow Turing Award winner Yoshua Bengio [voiced a similar opinion](#) in a recent blog post: “The recent advances suggest that even the future where we know how to build superintelligent AIs (smarter than humans across the board) is closer than most people expected just a year ago.”

FEBRUARY 1, 2024 | 18 MIN READ

Brains Are Not Required When It Comes to Thinking and Solving Problems—Simple Cells Can Do It

Tiny clumps of cells show basic cognitive abilities, and some animals can remember things after losing their head

BY ROWAN JACOBSEN



LUNCH COMPLEJO VIRTUAL

What is Life? The Future of Biology

Stuart Alan Kauffman

Institute for Systems Biology (ISB), Seattle, WA, EUA.

Jueves 11 de junio de 2020

Canal de youtube del @c3.unam



you learned
INTEGRATION
WRONG

The background consists of a collage of handwritten mathematical work. It includes various trigonometric identities such as $\cos^2 x = \frac{1 + \cos(2x)}{2}$, $\sin^2 x = \frac{1 - \cos(2x)}{2}$, and $\sin(2x) = 2 \sin x \cos x$. There are also diagrams of triangles with angles like 30° and 45° , and a graph of a sine wave. The text is written in a casual, hand-drawn style.

Cursos

MITx: Fundamentals of Statistics

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Build foundational knowledge of data science with this introduction to probabilistic models, including random processes and the basic elements of statistical inference -- *Part of the MITx MicroMasters program in Statistics and Data Science.*

CURSO

Semestre 2021-2

Sesión

01

16 / FEB / 21

ANÁLISIS DE SEÑALES FISIOLÓGICAS

Facultad de Medicina - UNAM

Ana Leonor Rivera López

Instituto de Ciencias Nucleares y Centro de Ciencias de la Complejidad - UNAM



ana.leonor.rivera@icn.unam.mx

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Comité: Dr. Oliver López-Corona, Dra. Elvia Ramírez-Carrillo, Dr. Pablo Padilla

Sitio web: <https://www.lopezoliver.otrasenda.org/fismatecol/>







Mi propuesta de que es lo que debería enseñarse y cómo.

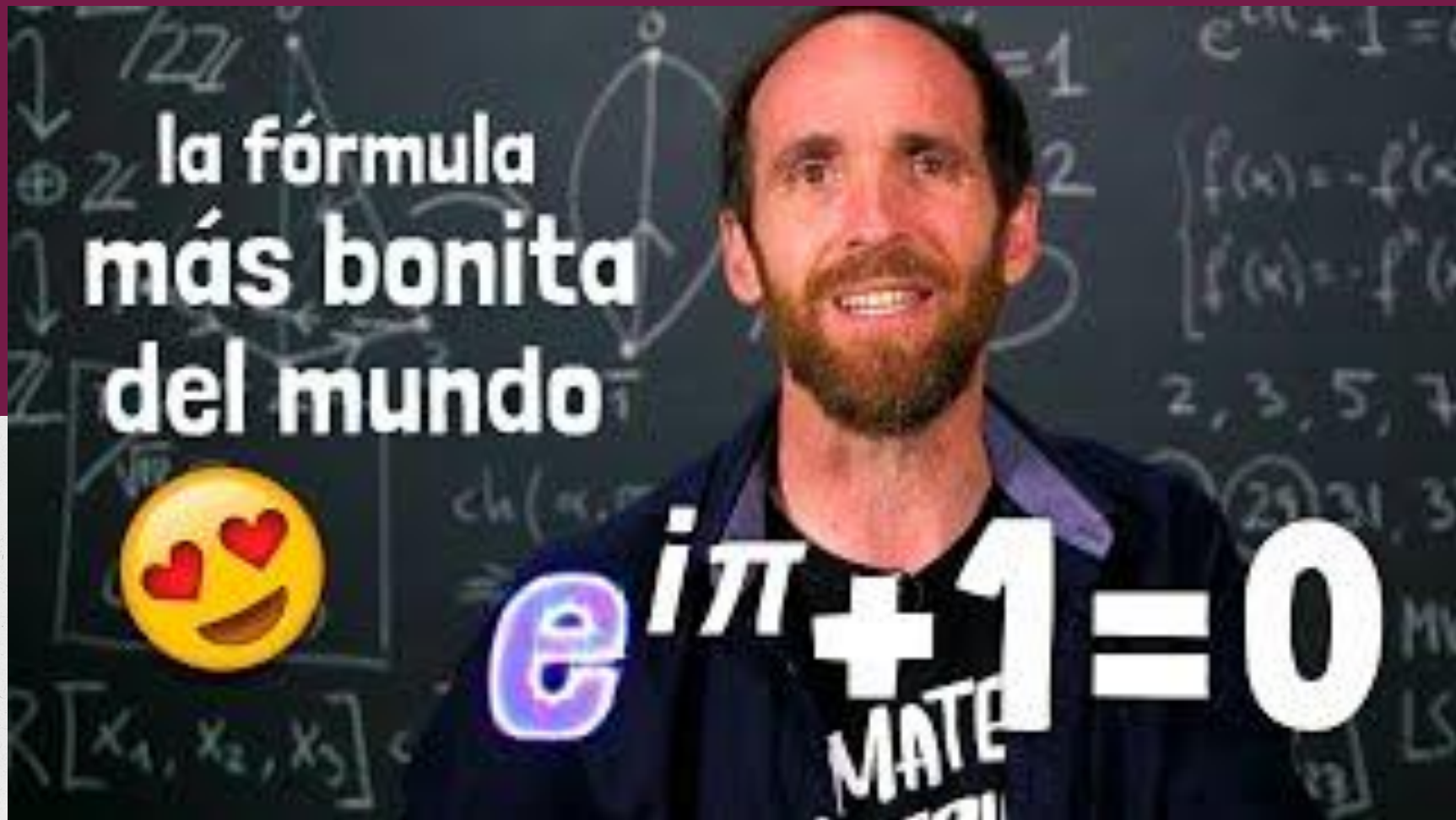


Cultura

la fórmula
más bonita
del mundo



$$e^{i\pi} + 1 = 0$$



EASY



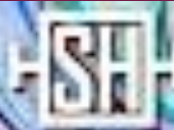
EASY



**ALMOST
IMPOSSIBLE**







COMPLEXITY

Artículo

Existing evidence on the use of environmental DNA as an operational method for studying rivers: a systematic map and thematic synthesis

[R. Cruz-Cano](#), [M. Kolb](#) , [R. A. Saldaña-Vázquez](#), [L. Bretón-Deval](#), [N. Cruz-Cano](#) & [A. Aldama-Cervantes](#)

Environmental Evidence **13**, Article number: 2 (2024) | [Cite this article](#)

218 Accesses | **2** Altmetric | [Metrics](#)

Abstract

Background

Environmental DNA (eDNA) is the DNA that can be extracted from an environmental sample, enabling the monitoring of whole biological communities across a large number of samples, at a potentially lower cost, which can significantly benefit river conservation. A systematic mapping protocol was designed to investigate the use of eDNA in rivers, specifically in terms of research topics, geographic and taxonomic biases, as well as information gaps.

Furthermore, the potential research opportunities of eDNA in rivers and possible paths to find this kind of information on available platforms are identified.

Diagnóstico y análisis de los factores que influyen en la vulnerabilidad de las fuentes de abastecimiento de agua potable a la Ciudad de México, México

Oscar Escolero, Stefanie Kralisch, Sandra E. Martínez, María Perevochtchikova

Departamento de Geología Regional, Instituto de Geología, Universidad Nacional Autónoma de México, Ciudad Universitaria, 04510, Ciudad de México, México.

Department of Applied Geosciences (AGW), Karlsruhe Institute of Technology (KIT), Kaiserstr. 12, 76131, Karlsruhe, Germany.

Departamento de Geología Regional, Instituto de Geología, Universidad Nacional Autónoma de México, Ciudad Universitaria, 04510, Ciudad de México, México.

Centro de estudios ambientales, El Colegio de México AC, Camino al Ajusco N° 20, Pedregal de Sta. Teresa 10740, Ciudad de México, México.

escolero@geologia.unam.mx

Resumen

El aumento de la densidad de población y la dinámica de la expansión urbana, con una marcada tendencia al crecimiento de las zonas urbanas y disminución de la población rural, hacen a las megaciudades focos de vulnerabilidad y de alta complejidad en la tarea de prestar los servicios urbanos básicos. En el caso de la Ciudad de México, la creciente demanda de agua ha impactado de manera negativa y creciente en el balance de las cuencas y acuíferos locales y vecinos que sirven de fuentes de abastecimiento a la ciudad, generando daños económicos y ambientales que ya se muestran dramáticos. Este trabajo se enfoca en realizar un diagnóstico de las fuentes de abastecimiento de agua potable que abastecen a la mega ciudad de México y analizar los factores que inciden en su vulnerabilidad; para ello se analizan tanto factores que están directamente relacionados con la infraestructura hidráulica, los aspectos jurídico-administrativos y sociales, como otros que son de relevante importancia para la sostenibilidad de las fuentes.

A tale of Mexico's most exploited—and connected—watersheds: the Basin of Mexico and the Lerma-Chapala Basin

Jaime J. Carrera-Hernandez 

First published: 28 September 2017 | <https://doi.org/10.1002/wat2.1247> | Citations: 6

Conflict of interest: The authors have declared no conflicts of interest for this article.

[Read the full text >](#)



PDF



TOOLS



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Abstract

Water management policies and their impacts for both the Basin of Mexico and the Lerma-Chapala basin—where nearly 25% of Mexico's inhabitants are found—are described. This work shows that the prevailing water management policy has been the augmentation of water supply and neither policies have focused on water savings nor management of water demand. The effects of the large extraction rates on both basins have caused drying-up of streams due to drawdown rates that reach 2.5 m/year with an associated land subsidence in different cities in these basins. Water management in Mexico needs to change from a water supply approach to a water efficiency approach, where water needs to be efficiently used. Water management will only improve when policies consider both technical and social perspectives. *WIREs Water* 2018, 5:e1247. doi: 10.1002/wat2.1247

This article is categorized under:

Connectivity conservation planning through deep reinforcement learning

Julián Equihua¹ | Michael Beckmann¹ | Ralf Seppelt^{1,2,3}

¹Department of Computational Landscape Ecology, Helmholtz Centre for Environmental Research (UFZ), Leipzig, Germany

²Institute of Geoscience and Geography, Martin-Luther-University Halle-Wittenberg, Halle (Saale), Germany

³German Centre for Integrative Biodiversity Research (iDiv), Leipzig, Germany

Correspondence
Julián Equihua
Email: julian.equihua@ufz.de

Funding information
Deutscher Akademischer Austauschdienst, Grant/Award Number: 91713889

Handling Editor: Lorna Hernandez-Santin

Abstract

1. The United Nations has declared 2021–2030 the decade on ecosystem restoration with the aim of preventing, stopping and reversing the degradation of the ecosystems of the world, often caused by the fragmentation of natural landscapes. Human activities separate and surround habitats, making them too small to sustain viable animal populations or too far apart to enable foraging and gene flow. Despite the need for strategies to solve fragmentation, it remains unclear how to efficiently reconnect nature. In this paper, we illustrate the potential of deep reinforcement learning (DRL) to tackle the spatial optimisation aspect of connectivity conservation planning.
2. The propensity of spatial optimisation problems to explode in complexity depending on the number of input variables and their states is and will continue to be one of its most serious obstacles. DRL is an emerging class of methods focused on training deep neural networks to solve decision-making tasks and has been used to learn good heuristics for complex optimisation problems. While the potential of DRL to optimise conservation decisions seems huge, only few examples of its application exist.
3. We applied DRL to two real-world raster datasets in a connectivity planning setting, targeting graph-based connectivity indices for optimisation. We show that DRL converges to the known optimums in a small example where the objective is the overall improvement of the Integral Index of Connectivity and the only constraint is the budget. We also show that DRL approximates high-quality solutions on a large example with additional cost and spatial configuration constraints where the more complex Probability of Connectivity Index is targeted. To the best of our knowledge, there is no software that can target this index for optimisation on raster data of this size.

Antifragility as a complex system's response to perturbations, volatility, and time

Cristian Axenie¹, Oliver López-Corona², Michail A. Makridis³, Melsam Akbarzadeh⁴, Matteo Saveriano⁵, Alexandru Stancu⁶, and Jeffrey West^{7,*}

¹Department of Computer Science and Center for Artificial Intelligence, Nuremberg Institute of Technology Georg Simon Ohm, Nuremberg, Germany

²Investigadores por México (IxM) at Instituto de Investigaciones en Matemáticas Aplicadas y Sistemas (IIMAS), Universidad Nacional Autónoma de México (UNAM), Ciudad Universitaria, CDMX, México

³IVT, Civil Environmental and Geomatic Engineering, ETH Zurich, Switzerland

⁴Department of Transportation Engineering, Isfahan University of Technology, Isfahan, Iran

⁵Department of Industrial Engineering, University of Trento, Trento, Italy

⁶Department of Electrical and Electronic Engineering, The University of Manchester, Manchester, UK

⁷Department of Integrated Mathematical Oncology, H. Lee Moffitt Cancer Center & Research Institute, Tampa, FL, USA

*jeffrey.west@moffitt.org

ABSTRACT

Antifragility characterizes the benefit of a dynamical system derived from the variability in environmental perturbations. Antifragility carries a precise definition that quantifies a system's output response to input variability. Systems may respond poorly to perturbations (fragile) or benefit from perturbations (antifragile). In this manuscript, we review a range of applications of antifragility theory in technical systems (e.g., traffic control, robotics) and natural systems (e.g., cancer therapy, antibiotics). While there is a broad overlap in methods used to quantify and apply antifragility across disciplines, there is a need for precisely defining the scales at which antifragility operates. Thus, we provide a brief general introduction to the properties of antifragility in applied systems and review relevant literature for both natural and technical systems' antifragility. We frame this review within three scales common to technical systems: intrinsic (input-output nonlinearity), inherited (extrinsic environmental signals), and interventional (feedback control), with associated counterparts in biological systems: ecological (homogeneous systems), evolutionary (heterogeneous systems), and interventional (control). We use the common noun in designing systems that exhibit antifragile behavior across scales and guide the reader along the spectrum of fragility–adaptiveness–resilience–robustness–antifragility, the principles behind it, and its practical implications.

1 Introduction

ANTIFRAGILE is a term coined to describe the opposite of fragile, as defined in a recent book that generated significant interest in both the public and scientific domain¹. Although the term has a wide range of applications, it contains a precise and mathematical definition. Systems or organisms can be defined as antifragile if they derive benefit from systemic variability,

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6



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Universality and Complexity in Natural Languages: Mechanistic and Emergent

 Gemma de les Coves ^{*},  Bernat Corominas Murtra ^{*},  Ricard Sole ^{*}

Version 1 : Received: 21 February 2024 / Approved: 21 February 2024 / Online: 23 February 2024 (06:25:00 CET)

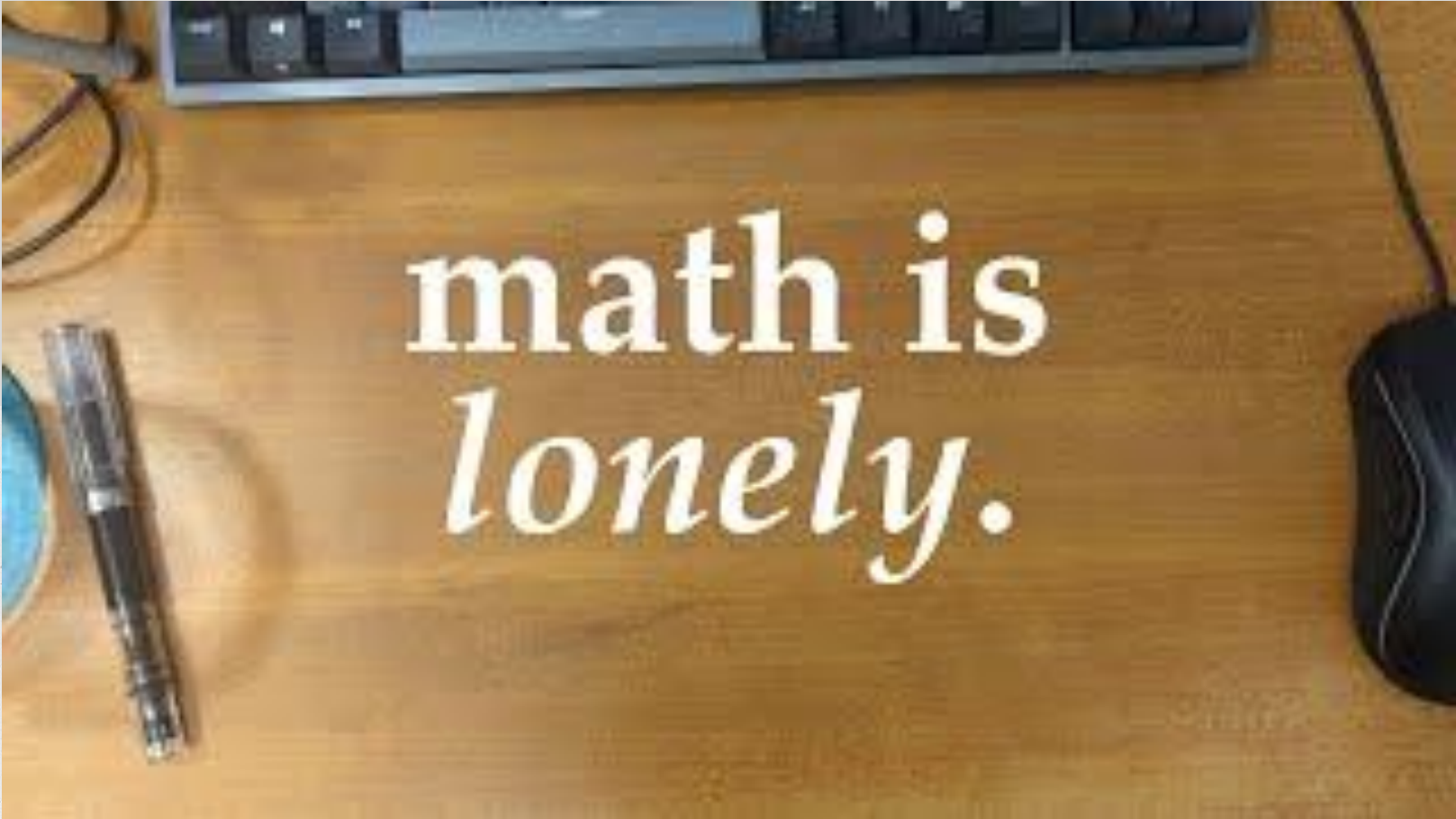
How to cite: de les Coves, G.; Corominas Murtra, B.; Sole, R. Universality and Complexity in Natural Languages: Mechanistic and Emergent. *Preprints* **2024**, 2024021330. <https://doi.org/10.20944/preprints202402.1330.v1> 

Abstract

Human language is a prime example of a complex system characterized by multiple scales of description. Understanding its origins and distinctiveness has sparked investigations with very different approaches, ranging from the Universal Grammar to statistical analyses of word usage, all of which highlight, from different angles, the potential existence of universal patterns shared by all languages. Yet, a cohesive perspective remains elusive. In this paper we address this challenge. First, we provide a basic structure of universality, and define recursion as a special case thereof. We cast generative grammars of formal languages, the Universal Grammar and the Greenberg Universals in our basic structure of universality, and compare their mathematical properties. We then define universality for writing systems and show that only those using the rebus principle are universal. Finally, we examine Zipf's law for the statistics of word usage, explain its role as a complexity attractor, and explore its relation to universal writing systems as well as its similarities with universal Turing machines. Overall, we find that there are two main kinds of universality, termed {it mechanistic} and {it emergent}, and unveil some connections between them.

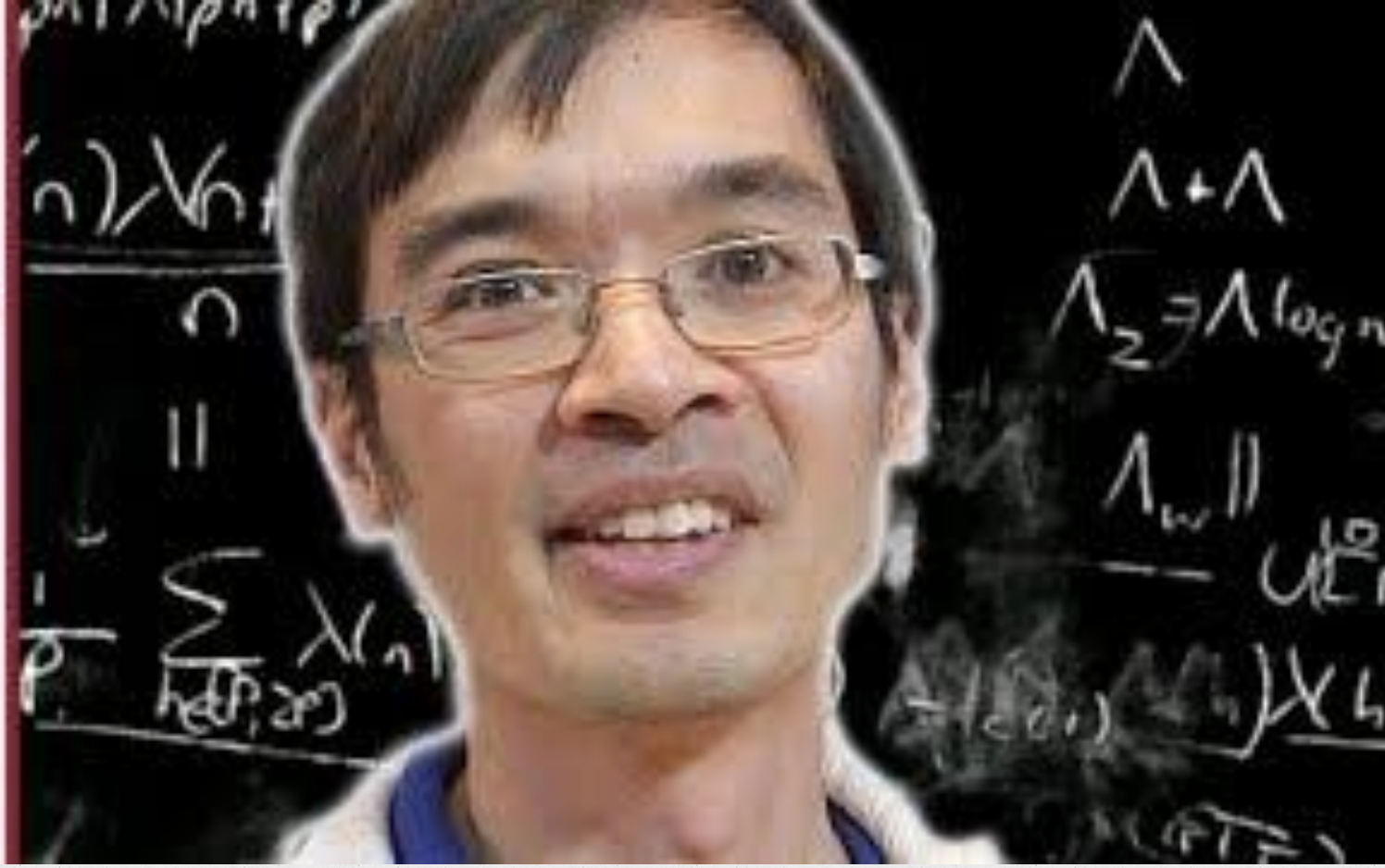
Videos



A photograph of a wooden desk with a keyboard, mouse, and pen. The text "math is lonely." is overlaid in the center. The word "math" is in a white, bold, serif font. The words "is" and "lonely." are in a white, italicized, serif font. The background shows a wooden desk surface, a black keyboard at the top, a black mouse on the right, and a silver pen on the left.

math is
lonely.

Numberphile





Escuela de Gobierno @EGobiernoTP · 30 ago.

...

Hoy en [@TheDataPub](#), el Dr. Oliver López-Corona ([@otrasenda_AC](#)) habló del peligro de las narrativas falsas basadas en datos; se refirió a los límites de la inferencia en sistemas complejos, así como a las fallas típicas en el razonamiento estadístico y probabilístico.



Libros

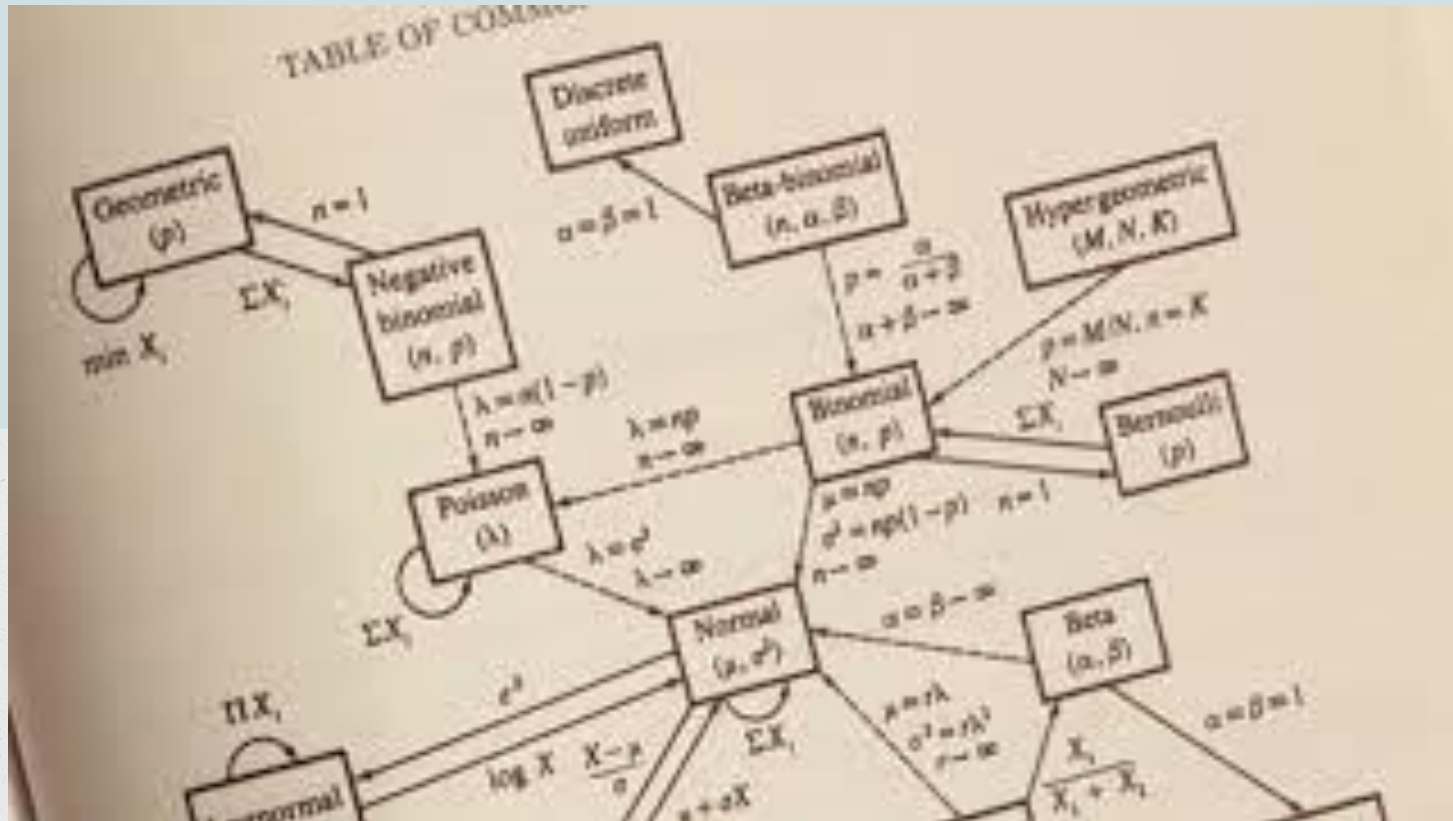
Las **CIUDADES** de México

Retos para el desarrollo sostenible

Luis Zambrano y Salvador Medina
Coordinadores



The Best Book Ever Written on Mathematical Statistics





Tom Froese, Embodied Cognitive Science Unit (ECSU) ✓

@DrTomFroese



New little book stack! 🧐 Is the material basis of consciousness...
Unintelligible? Uncomputable? Unknowable? Causal rather than just
correlated?

[Traducir post](#)





Ricard Solé

@ricard_sole

Working on an exciting foundational paper on universals in the logic of life with several bright colleagues. Always great to navigate through literature, from evolution classics like Monod, Bonner, Jacob and @niles_eldredge to complex systems. Stay tuned.

[Traducir post](#)





Alex & Books

@AlexAndBooks_

Suscribirse

Nassim Taleb spends 30 hours every week reading books.

Here are 27 reading tips from [@nntaleb](#):

1) The minute I was bored with a book or a subject I moved to another one, instead of giving up on reading altogether.

2) The trick is to be bored with a specific book, rather than with the act of reading.

3) A good book gets better at the second reading. A great book at the third. Any book not worth rereading isn't worth reading.

4) I follow the Lindy effect as a guide in selecting what to read: books that have been around for ten years will be around for ten more; books that have been around for two millennia should be around for quite a bit of time, and so forth.

5) The reading of a single text twice is more profitable than reading two different things once.

6) A private library is not an ego-boosting appendage but a research tool.

CUT THE KNOT



Probability Riddles

Alexander Bogomolny

With Foreword by **NASSIM NICHOLAS TALEB**

"For the Love of Physics captures Walter Lewin's extraordinary intellect, passion for physics, and brilliance as a teacher. Hopefully, this book will bring even more people into the orbit of this extraordinary educator and scientist." —Bill Gates

FOR THE
LOVE OF
PHYSICS



From the End of the Rainbow to the
Edge of Time—A Journey Through
the Wonders of Physics

Walter Lewin

with Warren Goldstein

The Re-Read List (RRL)

Contrary to those never ending reading lists, in here we will only share Lindy books that deserve not only to be read but re-read several times. Those books that renew themselves when reopened, in which you may find new hidden details or deeper layers of knowledge.

by

Giovanni H. Uribe & Oliver López-Corona

Notas

HOME / NEWS

Life as a planetary regulator: an experimental test



A new paper proposes an experimental setup that could test the classic Daisyworld model — a hypothesis of a self-regulating planetary ecosystem — in the lab via two synthetic bacterial strains. (image: Victor Maull, created with Image Designer)

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Otro recorte al agua que recibe la CDMX del Cutzamala



ANUNCIO



▶ ÚLTIMAS NOTICIAS




El sistema Cutzamala del Valle de México, el más vulnerable ante el cambio climático: Dr. Oscar Escolero de la UNAM

13 NOVIEMBRE 2014

Y está documentado también que los impactos del cambio climático inciden de manera importante en muchos aspectos de la vida, especialmente en la disponibilidad del agua, en la posibilidad de que ésta sea de calidad, así como en el incremento de los fenómenos hidrometeorológicos extremos (sequías e inundaciones) que año con año ocasionan pérdidas humanas.

En el Valle de México en donde conviven alrededor de 20 millones de personas, se han exacerbado en los últimos años las crisis por el agua. El modelo de crecimiento de la zona ha sobreexplotado a la cuenca, y ha sido necesario desarrollar grandes proyectos de infraestructura hidráulica, y de importación de agua de los alrededores, para garantizar el abasto de los servicios.



The Year in

PHYSICS



