AI News Digest

10/26/2026 - 11/01/2026

WEEKLY DIGEST: DATA & MATHEMATICAL SCIENCES

AI Generates Breakthroughs in Mathematics and Causal Modeling

OpenAI unveiled three AI-generated research results that solve long-standing problems in harmonic analysis, complexity theory and quantum field theory, releasing the raw data for peer verification. At the same time, researchers demonstrated Kolmogorov-Arnold Networks (KANs), a new neural architecture that swaps scalar edge weights for learnable univariate functions, expanding the expressive capacity of deep models. A methodological comparison clarified how difference-in-differences and lagged-outcome regression serve as distinct doubly-robust estimators for self-selected product-analytics experiments. The upcoming CodeChella workshop in Mexico City will train practitioners on these modern panel methods, accelerating the diffusion of AI-enhanced causal tools.

KEY FINDINGS

✓ OpenAI's AI system produced three novel mathematical discoveries, including a proof of the local-smoothing conjecture.

✓ Kolmogorov-Arnold Networks replace traditional scalar weights with learnable one-dimensional functions, enabling richer multivariate mappings.

✓ A side-by-side analysis shows that difference-in-differences and lagged-outcome regression address different identifying assumptions, offering complementary doubly-robust estimators for causal inference.

IMPLICATIONS

→ AI-assisted theorem proving could shift the role of mathematicians toward validation and interpretation rather than derivation.

→ KANs may become a standard building block for scientific AI models, improving accuracy in physics, chemistry, and engineering simulations.

→ Widespread adoption of clarified causal-inference techniques will enhance decision-making in product analytics, policy evaluation, and social science research.

> Key Metrics: 3 AI-generated discoveries announced by OpenAI.; KANs implement learnable univariate functions in place of scalar edge weights.; CodeChella Mexico City workshop runs Jan 11-14 2027 (4-day event).

1. Working with academic communities to build scientific understanding

Category: Research
Departments: Computer Science, Mathematical Sciences, Physics
Topics: Science & Research, AI-generated Harmonic Analysis, AI-generated Complexity Theory, AI-generated Quantum Field Theory, Natural-Language Proof Formalization

Impact Score: 26.0
Rubric Scores

Research Relevance: 5	Educational Value: 4	Innovation / Novelty: 5
Practical Impact: 3	Interdisciplinary Potential: 5	Ethical / Policy Implications: 4

OpenAI announces three AI-generated discoveries in harmonic analysis, complexity theory, and quantum field theory, presenting the raw research data for external experts to interpret. The mathematics result resolves the local-smoothing conjecture, extending prior work by Guth, Wang, Zhang, and Wang-Zahl, and implies the Kakeya and Stein restriction conjectures. For the computer-science discovery, OpenAI has publicly released a natural-language proof and its Lean formalization on GitHub while an external collaboration refines the explanation. The physics discovery will be developed and published by an external group before any AI-produced artifacts are released, under principles of transparency, no academic credit to OpenAI, recognition for collaborators, and voluntary independent participation.

https://openai.com/index/building-scientific-understanding-with-academic-communities

2. Building and Visualising Kolmogorov-Arnold Networks

Category: Research
Departments: Computer Science, Mathematical Sciences
Topics: Science & Research, Kolmogorov-Arnold Networks, Learnable Edge Functions, Interpretable Model Extraction, Dynamical System Identification

Impact Score: 18.0
Rubric Scores

Research Relevance: 4	Educational Value: 4	Innovation / Novelty: 3
Practical Impact: 3	Interdisciplinary Potential: 4	Ethical / Policy Implications: 0

KANs replace scalar edge weights with learnable univariate functions, allowing complex multivariate mappings to be built from compositions and sums of simple one-dimensional functions. The author implemented KANs in the LabLayer prototyping tool, testing edge functions that progress from quadratic forms to B-splines and Chebyshev polynomials. Experiments showed that KANs can recover known dynamical systems, successfully fitting the Lorenz equations from synthetic data. The study demonstrates a practical training workflow for edge-function parameters and highlights KANs' potential for interpretable model extraction.

https://towardsdatascience.com/building-and-visualising-kolmogorovarnold-networks/

3. Difference-in-Differences vs Lagged-Outcome Regression

Category: Research
Departments: Economics & Finance, Political Science & Public Administration, Mathematical Sciences
Topics: Science & Research, Difference-in-Differences, Lagged-Outcome Regression, Doubly Robust Estimators, Selection Bias Diagnostics

Impact Score: 12.0
Rubric Scores

Research Relevance: 1	Educational Value: 3	Innovation / Novelty: 2
Practical Impact: 2	Interdisciplinary Potential: 3	Ethical / Policy Implications: 1

The article compares lagged-outcome regression (unconfoundedness) and difference-in-differences (parallel trends) as doubly robust estimators for self-selected product-analytics treatments, emphasizing that the estimator and identifying assumption are distinct choices. A simulation study demonstrates that each method is biased when its core assumption is violated: DiD fails under selection driven by temporary dips in engagement, while lagged-outcome regression fails with time-invariant unobserved confounders such as income. The authors provide a rule for choosing between the two approaches based on which failure mode is more plausible in a given context.

https://towardsdatascience.com/difference-in-differences-vs-lagged-outcome-regression/

4. Announcement: CodeChella Mexico City, January 11-14, 2027

Category: Education
Departments: Economics & Finance, Political Science & Public Administration, Mathematical Sciences
Topics: Science & Research, Difference-in-Differences, Synthetic Control, Imputation Estimators, Causal Inference Tools

Impact Score: 10.0
Rubric Scores

Research Relevance: 0	Educational Value: 4	Innovation / Novelty: 1
Practical Impact: 2	Interdisciplinary Potential: 3	Ethical / Policy Implications: 0

Scott Cunningham announced CodeChella Mexico City, a four-day workshop on modern panel methods for causal inference at ITAM's Santa Teresa campus, scheduled for Jan 11-14 2027. The program, taught by Cunningham and Kyle Butts, will cover difference-in-differences, synthetic control, and newer imputation estimators with an emphasis on coding and application and requires no prerequisites. An optional one-day session, The Hidden Curriculum, will be held on Jan 15 and led by Mark Anderson and Dan Rees to help PhD students and early-career researchers convert projects into published papers.

https://digitalhumanitiesnow.org/2026/10/announcement-codechella-mexico-city-january-11-14-2027/