

THE DANGERS OF GENERATIVE AI IN NUCLEAR & HADRON PHYSICS RESEARCH

POWERFUL TOOLS. REAL RISKS. HUMAN VERIFICATION IS ESSENTIAL.

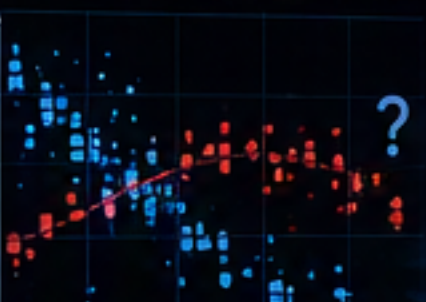
⚠️ UNCHECKED AI OUTPUTS

AI can confidently generate plausible but incorrect results.



⚠️ DATA MISINTERPRETATION

Complex patterns can be misread, leading to false conclusions.



⚠️ MODEL BIAS

Training data biases can skew results and reinforce incorrect theories.

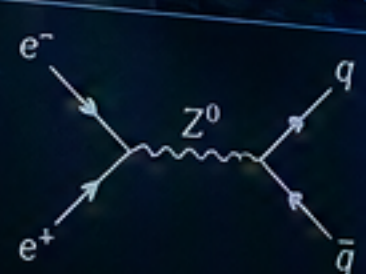


⚠️ SAFETY RISKS

Incorrect predictions in nuclear and particle physics can lead to unsafe assumptions and real-world consequences.



PHYSICS INPUT EXPERIMENTAL DATA



$$\mathcal{L} = -\frac{1}{4}F_{\mu\nu}F^{\mu\nu} + \bar{\psi}(i\gamma^\mu D_\mu - m)\psi + |D_\mu\phi|^2 - V(\phi)$$

GENERATIVE AI MODEL OUTPUTS

AI

```
import torch
model = GPT4
for data in ds:
    output = model(data)
    loss = criterion(output, target)
    loss.backward()
    optimizer.step()
```

CONFIDENCE: 98.7%
RESULT: NEW PARTICLE DISCOVERED
MASS: 126.7 GeV
SIGNIFICANCE: 8.2σ

INCORRECT ⚠️

$$E = mc^2$$

$$E = -\frac{1}{4}F_{\mu\nu}F^{\mu\nu}$$

$$\bar{\psi}(i\gamma^\mu D_\mu - m)\psi = 0$$

$$E = \frac{1}{2}F_{\mu\nu}F^{\mu\nu}$$

$$\partial \cdot A = 0$$

INCONSISTENT RESULTS

DATA SET A DATA SET B AI OUTPUT THEORY

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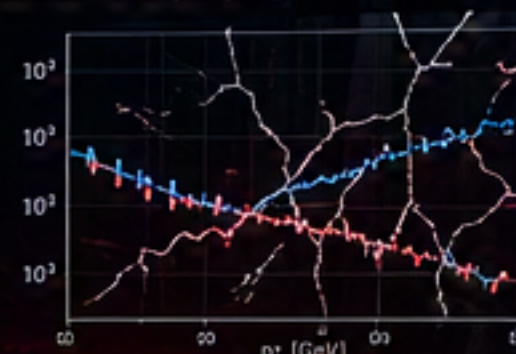
DATA SET A DATA SET B AI OUTPUT THEORY

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⚠️ CRACKED DATA PLOTS

AI-generated plots may look correct but hide critical inconsistencies.



⚠️ UNSTABLE PARTICLE TRACKS

Hallucinated particles or decays can distort experimental interpretations.



⚠️ HALLUCINATED EQUATIONS

AI can produce confident-looking equations that are physically incorrect or meaningless.

$$E = \frac{1}{2}F_{\mu\nu}F^{\mu\nu}$$
$$E = -\frac{1}{2}F_{\mu\nu}F^{\mu\nu}$$
$$E = \frac{1}{2}F_{\mu\nu}F^{\mu\nu}$$

✓ VERIFY RESULTS

- Cross-check with independent methods
- Validate against experimental data
- Understand model limitations
- Maintain scientific skepticism
- Human oversight is non-negotiable

SCIENCE REQUIRES RIGOR.
AI REQUIRES OVERSIGHT.

⚠️ AI IS A TOOL, NOT A TRUTH SOURCE. IN NUCLEAR & PARTICLE PHYSICS, MISTAKES CAN HAVE CONSEQUENCES.

QUESTION. VERIFY. UNDERSTAND.