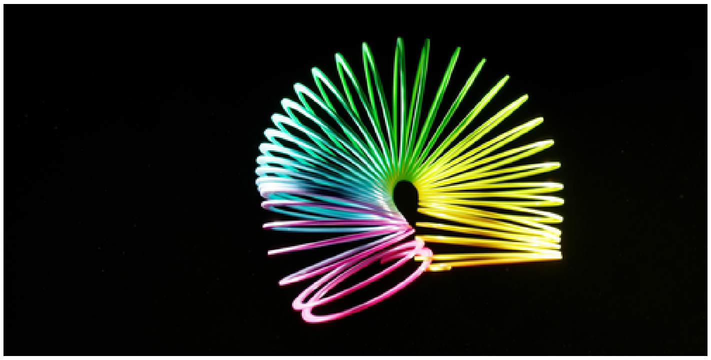
AI Learns to Play with a Slinky

A new artificial intelligence algorithm can model the behavior of a set of objects, such as helical springs or pendulums, using a method that can extrapolate to objects that the algorithm hasn't previously analyzed.

By Michael Schirber

Like many professions, physicists are looking for ways to use artificial intelligence (AI) to improve job performance (without hopefully being replaced by it). In that vein, researchers have now developed an AI algorithm that can analyze the motion of a set of objects, such as swinging pendulums or bouncing Slinkies, and then use that information to develop a general model of the forces acting on these systems [**1**]. This method can extrapolate to objects that weren't previously examined 100 times faster than other AI methods that don't try to generalize.

Physicists have previously shown that AI algorithms can automatically discover hidden relationships in complex data (see **Viewpoint: Physics Insights from Neural Networks**). However, a common criticism of these algorithms is that they are too specific in that they target only one system, says Qiaofeng Li from the University of California, Los Angeles. Li and colleagues have developed a method that can learn from a set of cases and can then generalize to others.



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The researchers provided their algorithm with a set of trajectories, such as the positions and velocities of falling Slinkies—each having a different level of stiffness. The algorithm analyzed these trajectories and then constructed a general model with adjustable parameters that allowed it to analyze in about one minute the motion of any Slinky, even one that was not in its training set. For simpler systems, such as pendulums and oscillating electrical circuits, the analysis could take as little as a few seconds. The team foresees applying the approach to the mechanical analysis of biological cells in different mediums or the control of robots in rapidly changing environments.

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REFERENCES

1. Q. Li *et al.*, "Metalearning generalizable dynamics from trajectories," **Phys. Rev. Lett. 131, 067301 (2023).**