

NUS-ISS

Problem Solving Using Pattern Recognition



Deep learning: Act

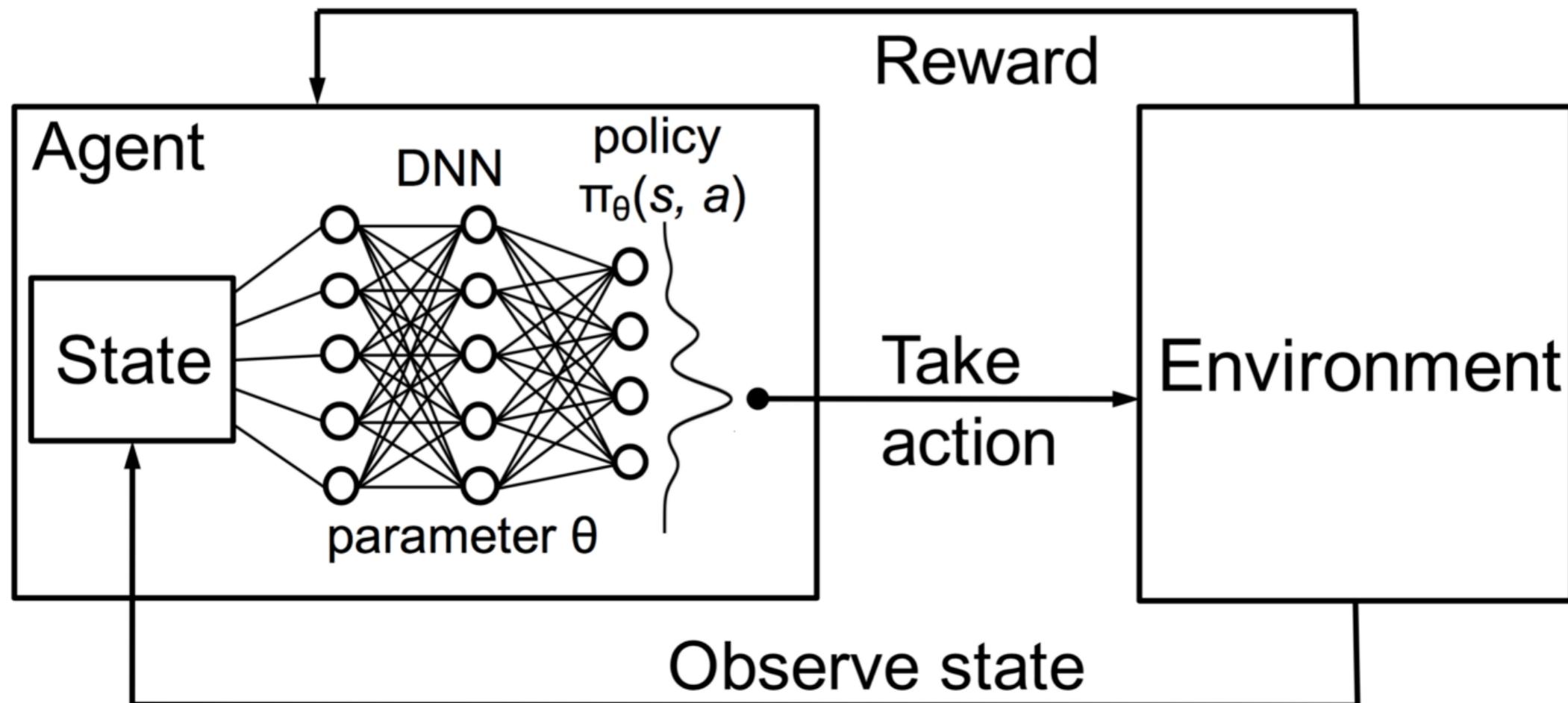
by Dr. Tan Jen Hong

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Several slides have been redacted to provide better learning experience. We will upload the complete materials after the class ends.

Deep Reinforcement learning

Deep Q-learning



Source: <https://towardsdatascience.com/using-deep-q-learning-in-fifa-18-to-perfect-the-art-of-free-kicks-f2e4e979ee66>

Any idea about SpaceX?

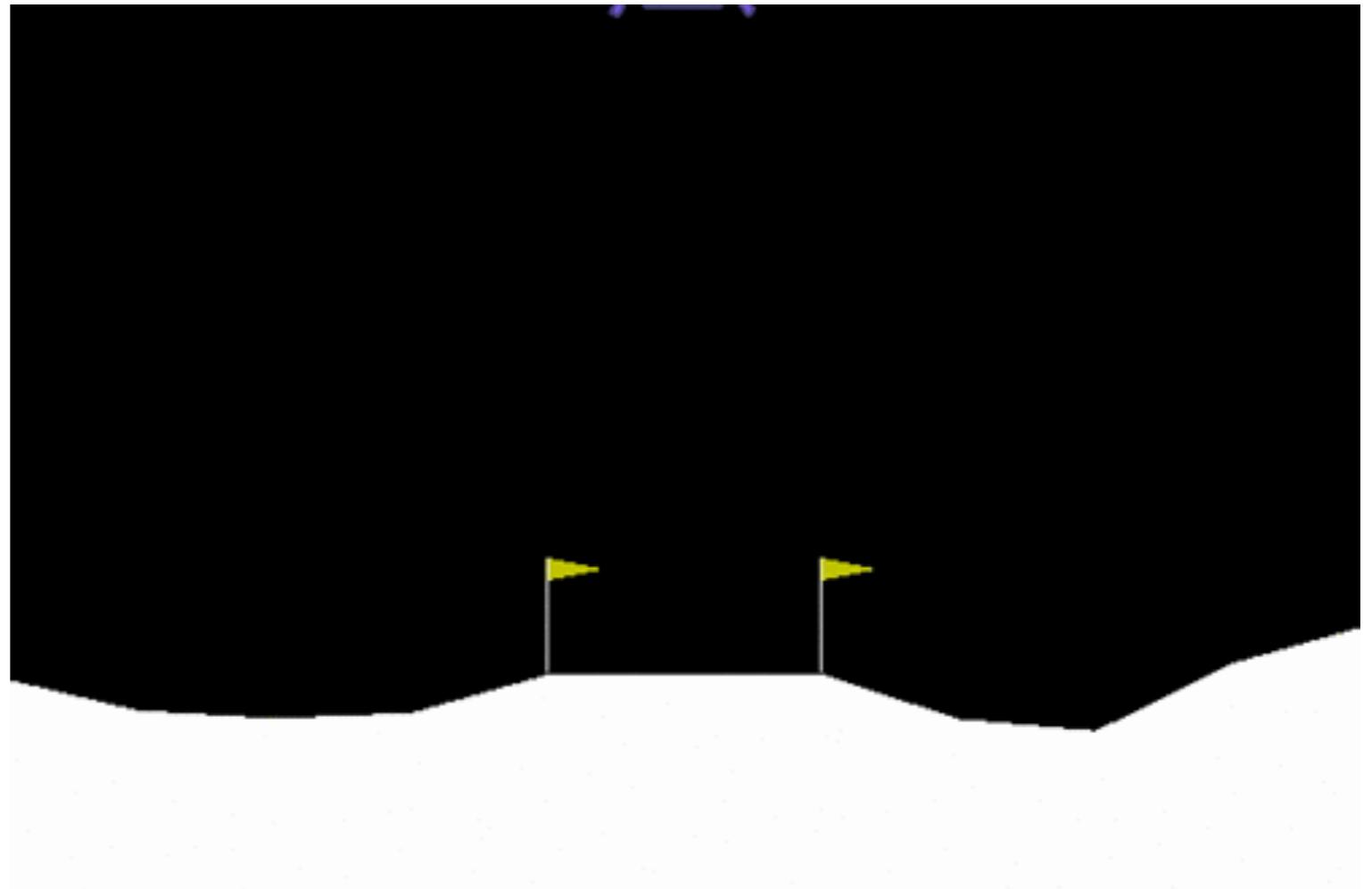
Landing?



Source: SpaceX

Controlled landing

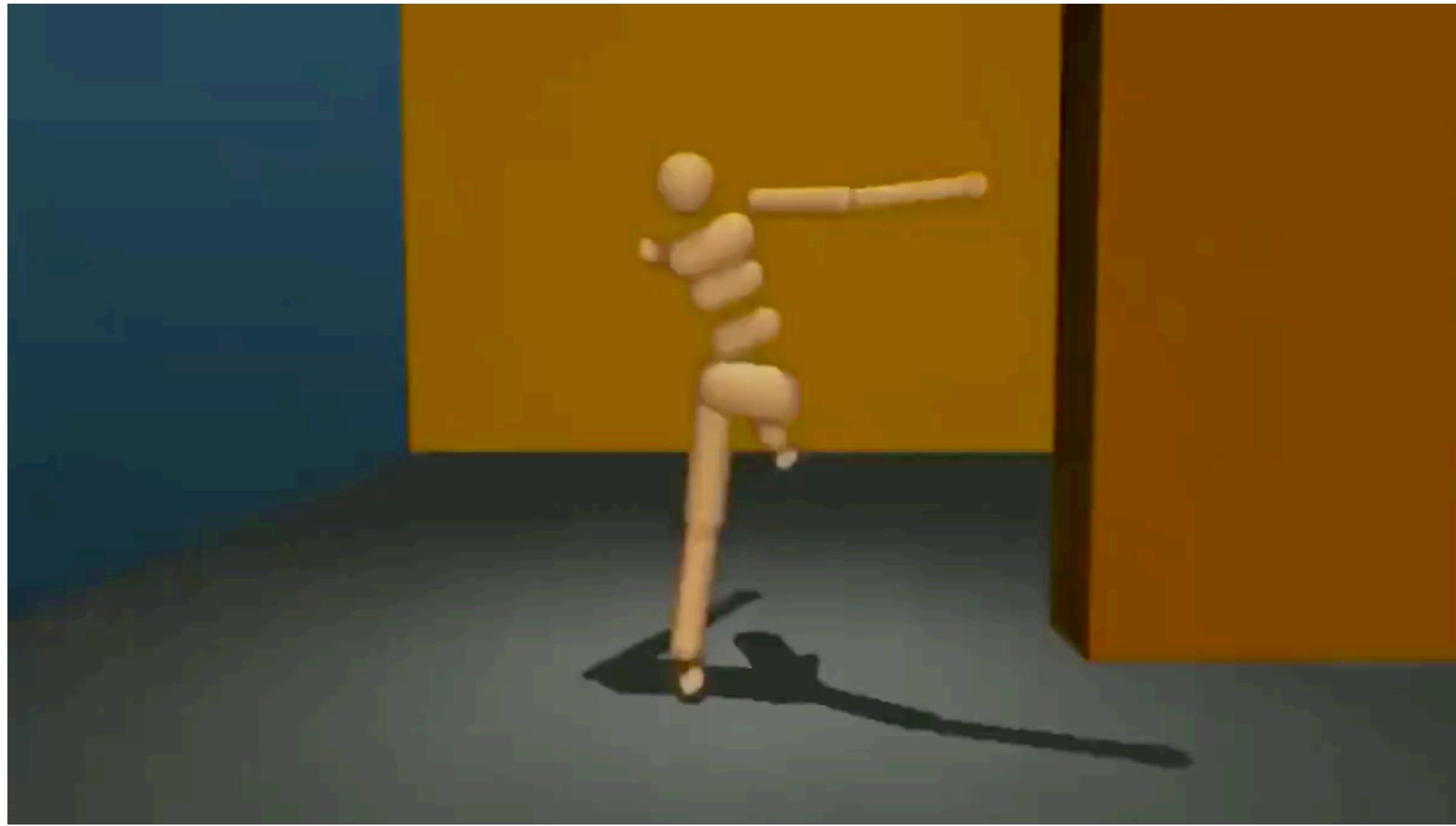
Lunar lander



Source: <https://github.com/udacity/deep-reinforcement-learning/tree/master/dqn>

Walk in style

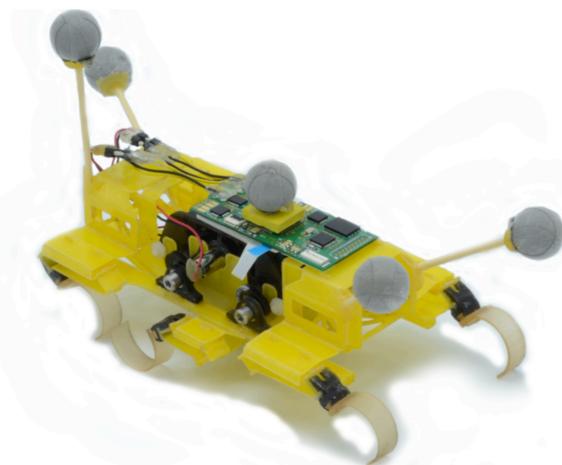
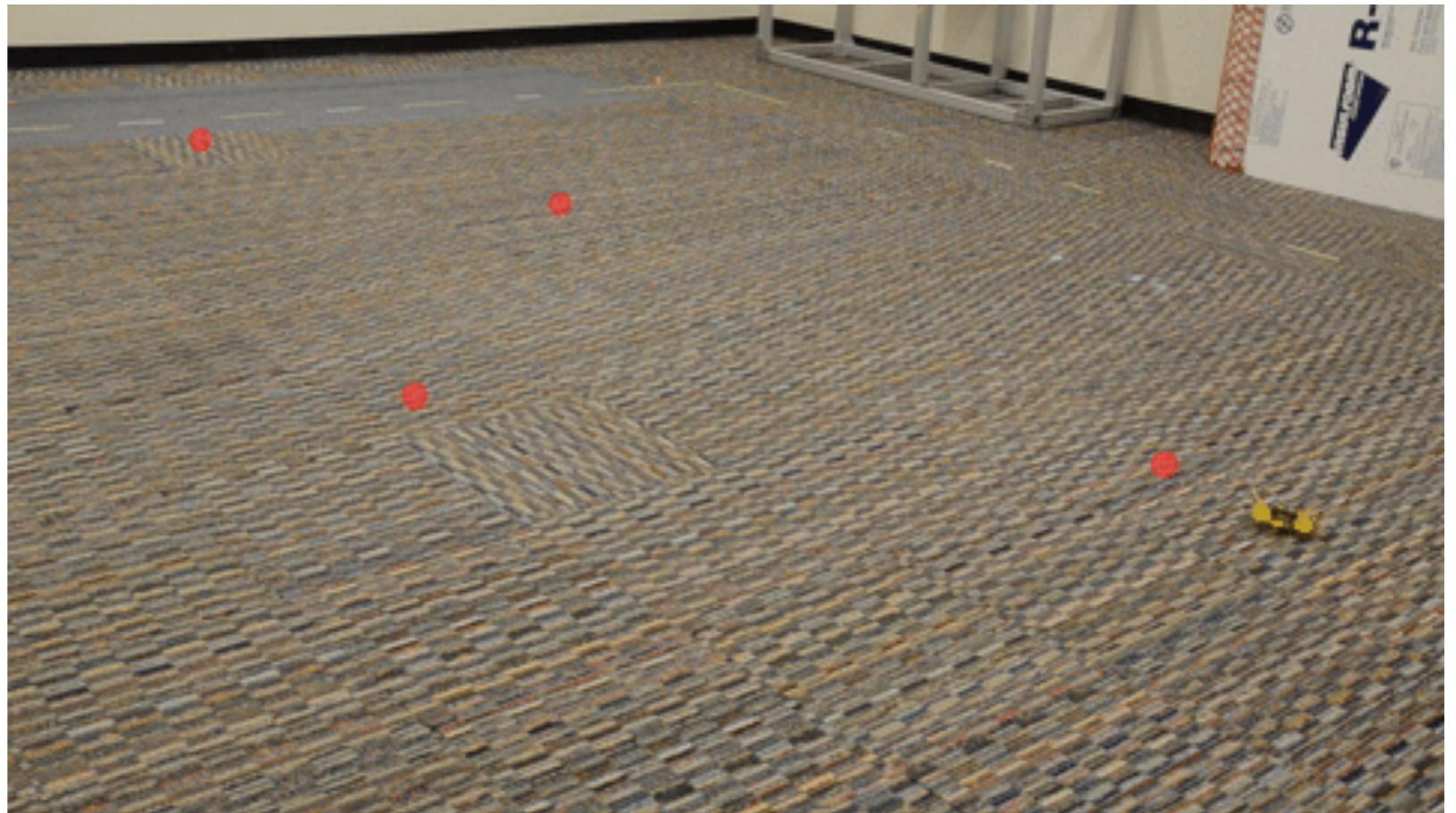
Learn like a kid



Source: https://twitter.com/randal_olson/status/1111683751874945025

Deep learning for landing

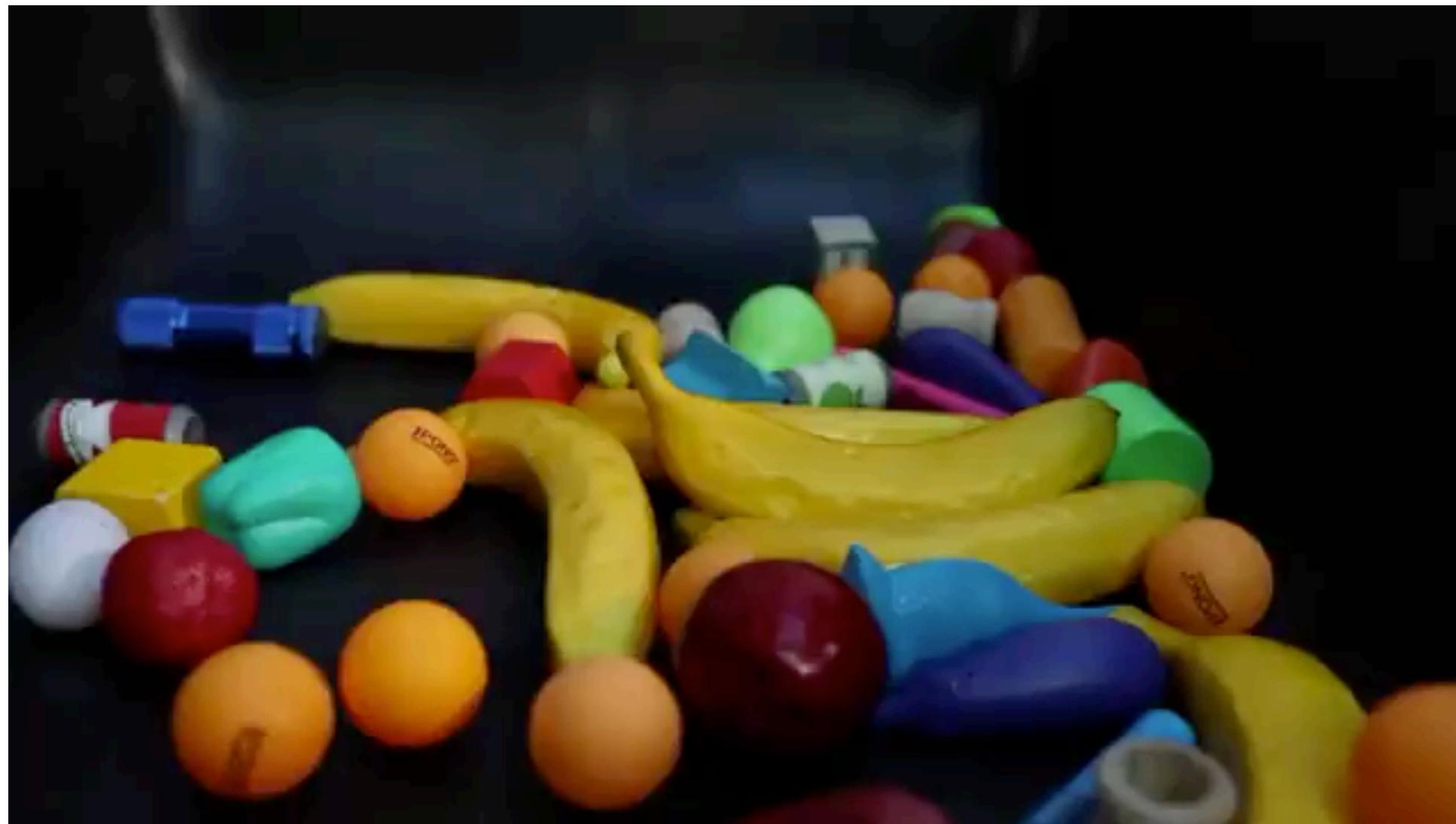
Robot follows



Source: <https://bair.berkeley.edu/blog/2017/11/30/model-based-rl/>

Throwing

Robot follows



Source: <https://twitter.com/andyzengtweets/status/1110655184642936832>

Grasping

Shared learning



Source: <https://ai.googleblog.com/2018/06/scalable-deep-reinforcement-learning.html>

Reinforcement learning for finance

Real-time trading

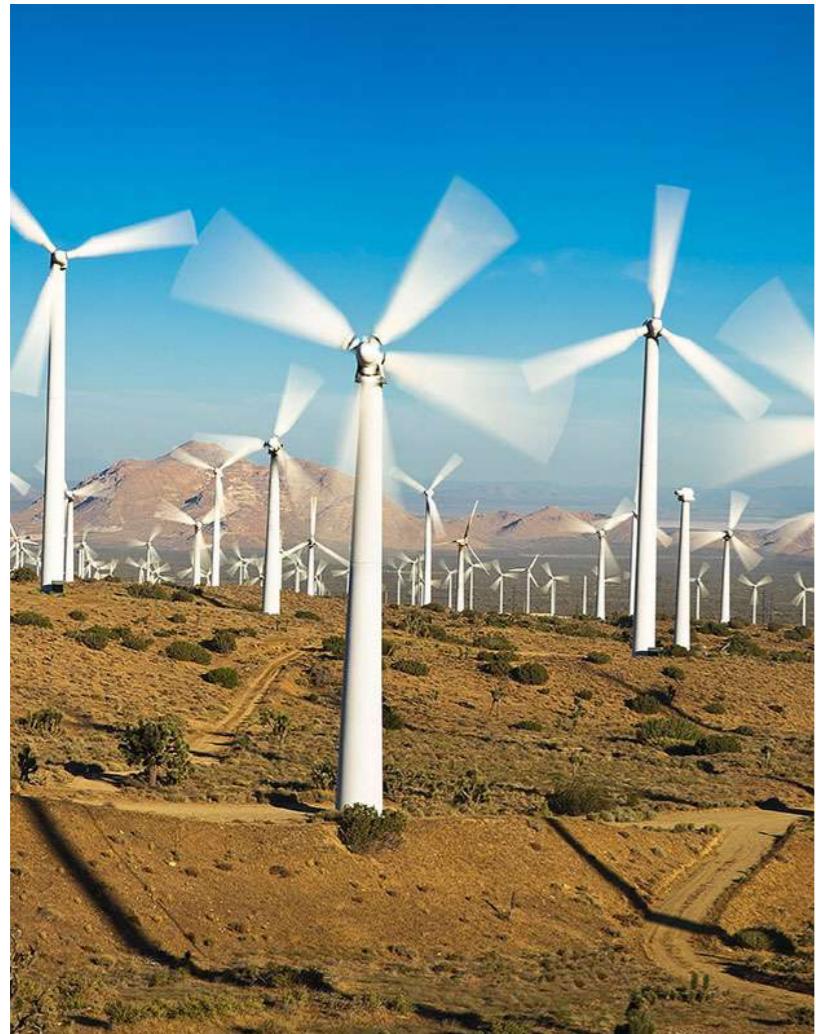
- An AI by JP Morgan Chase for trade execution
- Intention: to reduce market impact and provide best trade execution results for large orders
- Perform best action: choose optimal price, duration and order size based on market conditions
- State: price series, expected spread cost, fill probability, size placed, elapsed time, % progress
- Rewards: price spread, completion, order duration, market penalties

JPMORGAN
CHASE & Co.

Source: <https://medium.com/@ranko.mosic/reinforcement-learning-based-trading-application-at-jp-morgan-chase-f829b8ec54f2>

Wind power output prediction

Better economic value



- Use deep learning to predict wind power output **36** hours ahead of actual generation

- Based on predictions recommend optimal hourly delivery commitments to power grid a full day in advance
- Benefit: scheduled energy sources are more valuable to grid

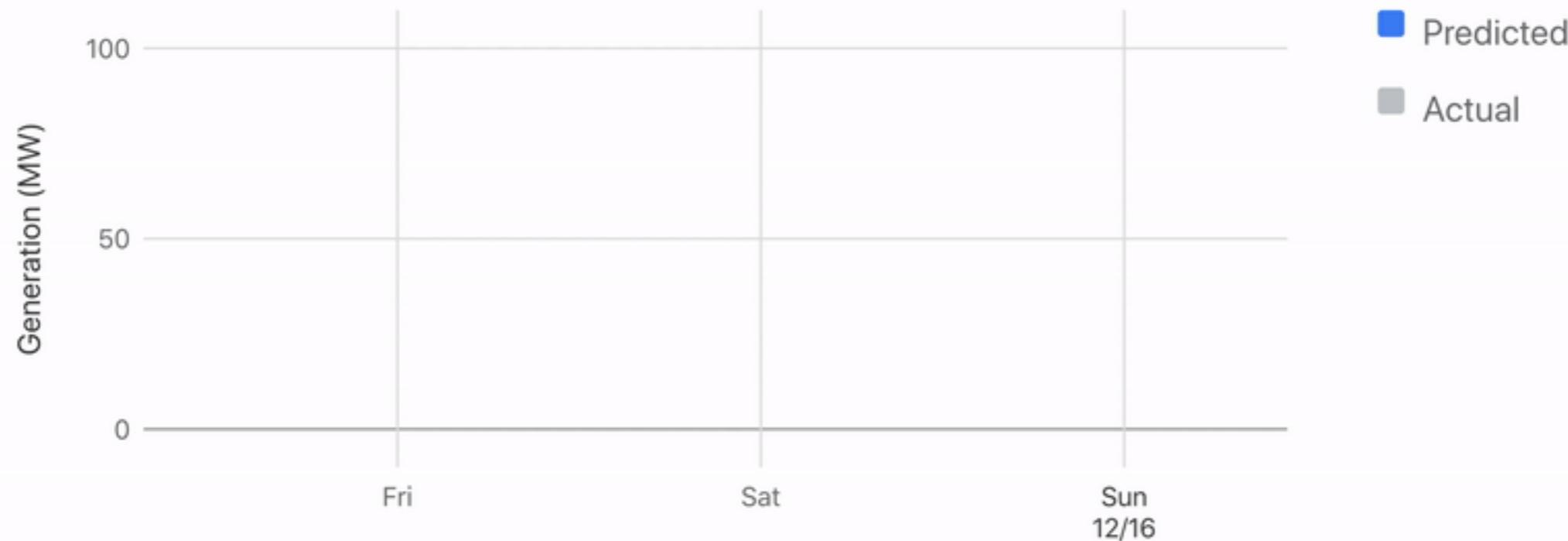
Source: <https://deepmind.com/blog/machine-learning-can-boost-value-wind-energy/>

Wind power output prediction

Better economic value

- Actual vs Predicted

The DeepMind system predicts wind power output 36 hours ahead...

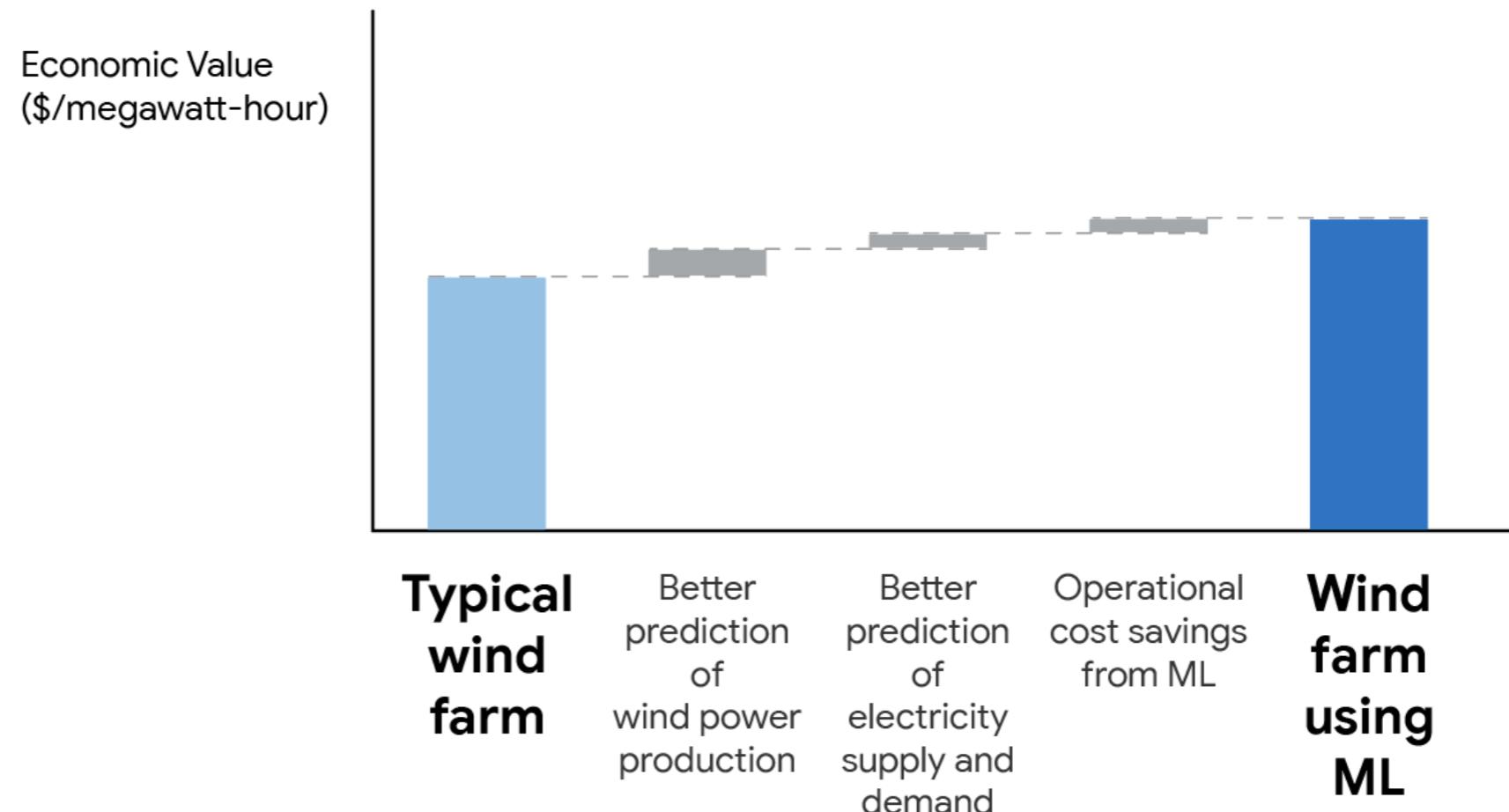


Source: <https://deepmind.com/blog/machine-learning-can-boost-value-wind-energy/>

Wind power output prediction

Better economic value

Machine learning can increase the value of wind energy



Source: <https://deepmind.com/blog/machine-learning-can-boost-value-wind-energy/>

Predict then recommend

What's next?

Predict next item in session



Purchase 1



Purchase 2



Purchase 3



Next purchase

Source: <https://medium.com/recombee-blog/machine-learning-for-recommender-systems-part-2-deep-recommendation-sequence-prediction-automl-f134bc79d66b>