

Prediction Machines

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UNIVERSITY OF
TORONTO



HARVARD BUSINESS REVIEW PRESS

Prediction Machines



The Simple Economics of
Artificial Intelligence

AJAY
AGRAWAL

JOSHUA
GANS

AVI
GOLDFARB

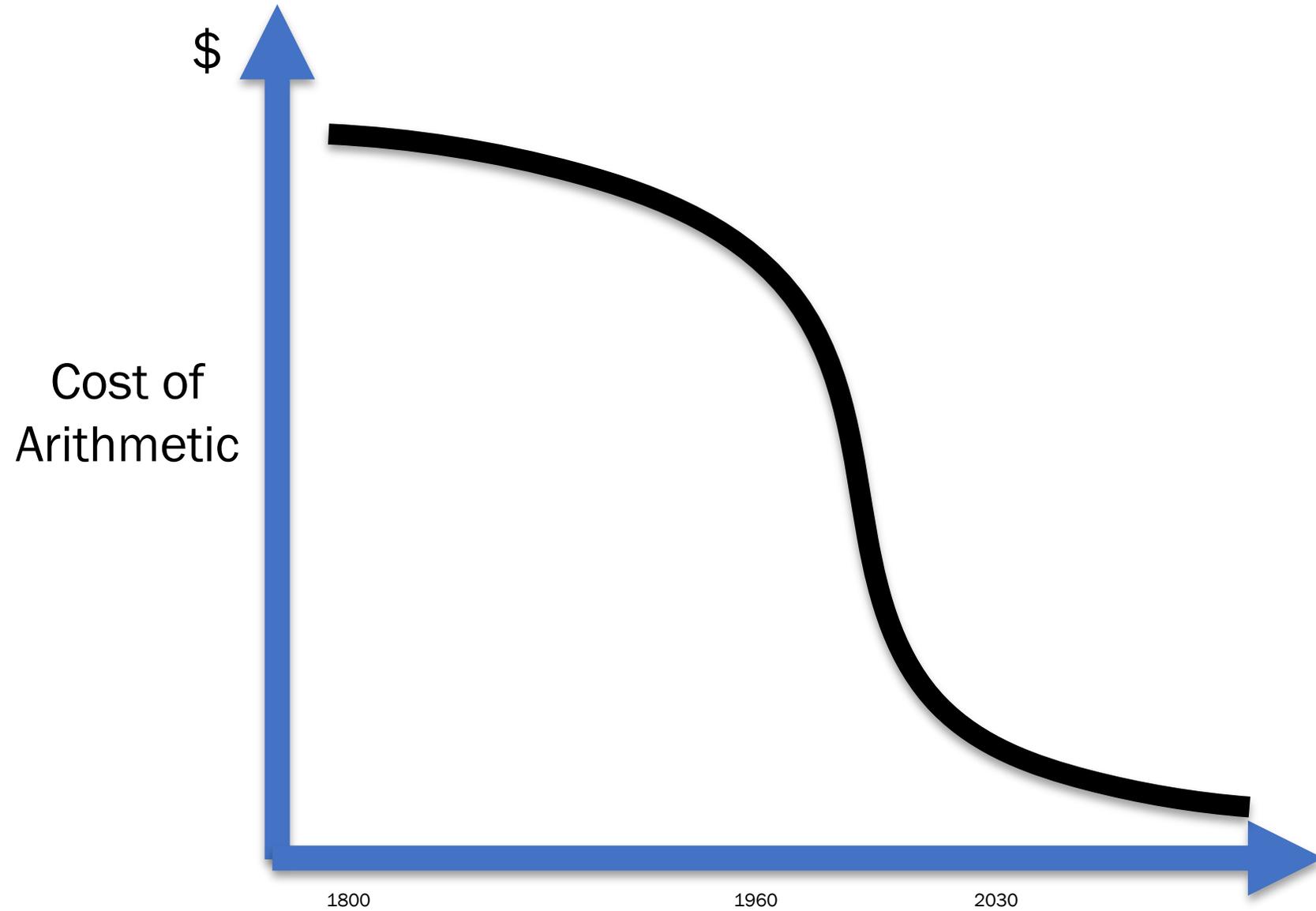


1995?

The image features a close-up of a clear plastic RJ45 network cable connector, positioned diagonally from the bottom left towards the center. The background is a dark grey, semi-transparent network diagram with a grid of nodes and connecting lines, creating a sense of digital connectivity. The text 'New Economy' is centered over the image in a clean, white, sans-serif font.

New Economy

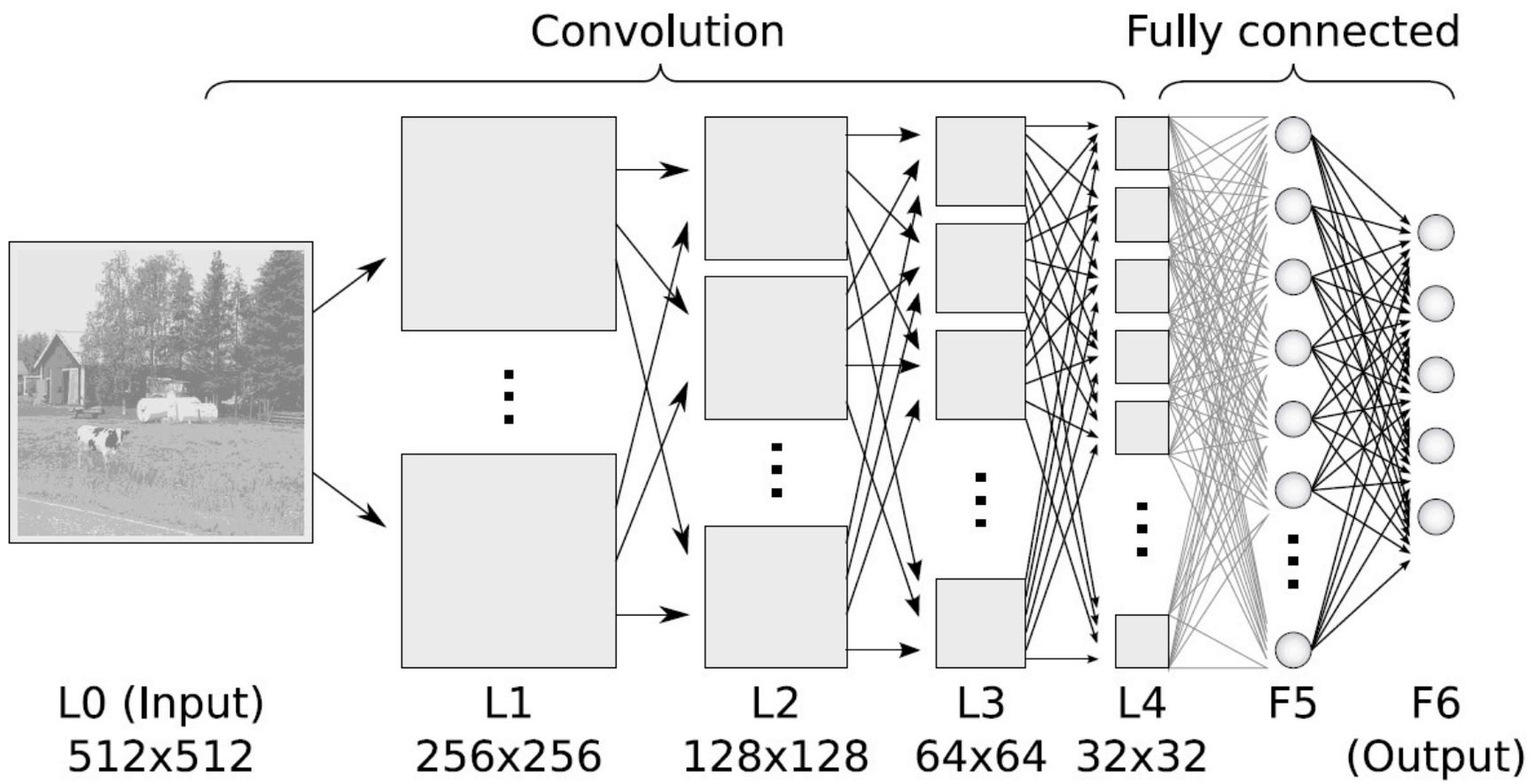
Semiconductors



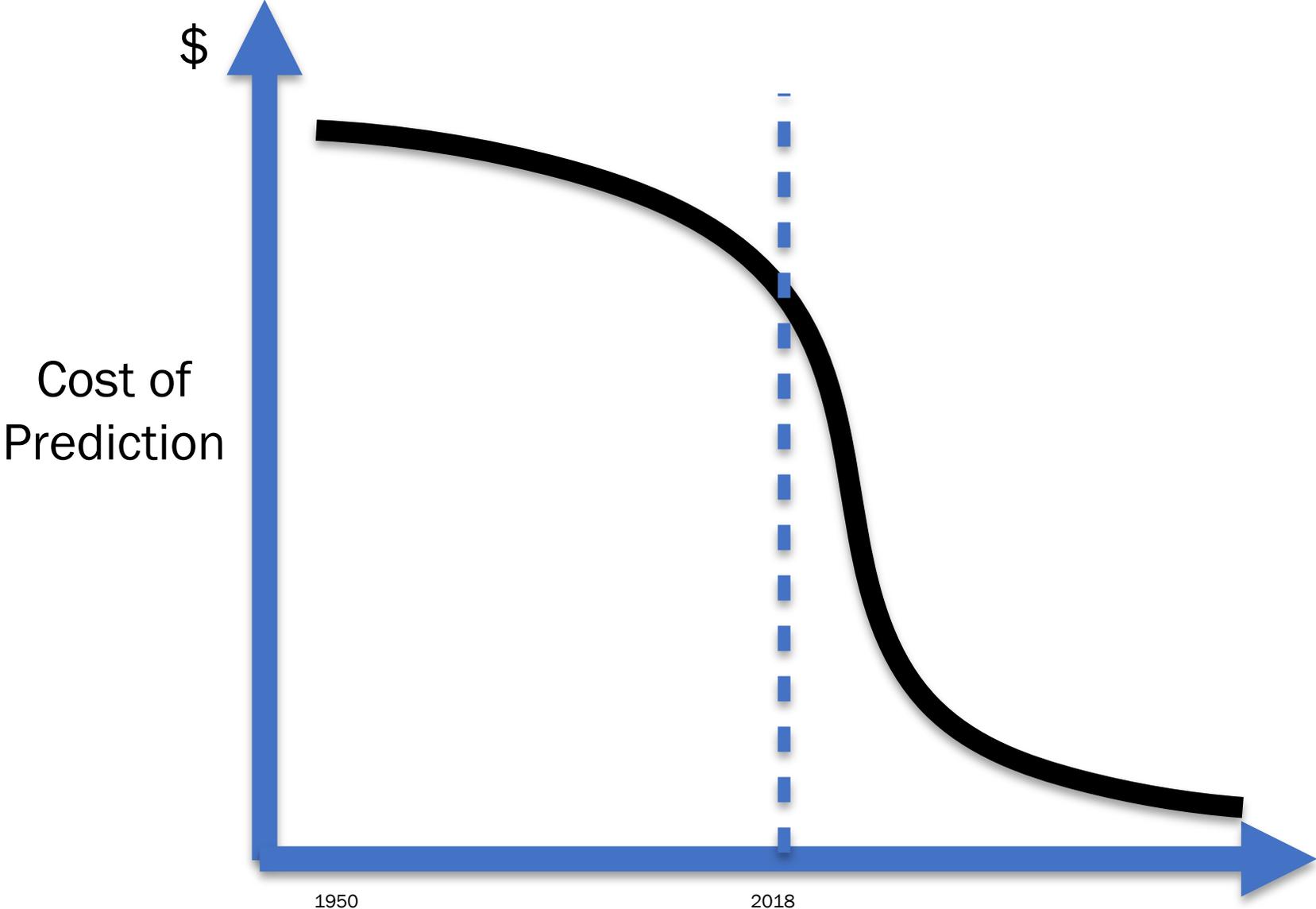
Expanding Range of Use of an Input



Artillery tables
Accounting
Games
Mail
Music
Pictures



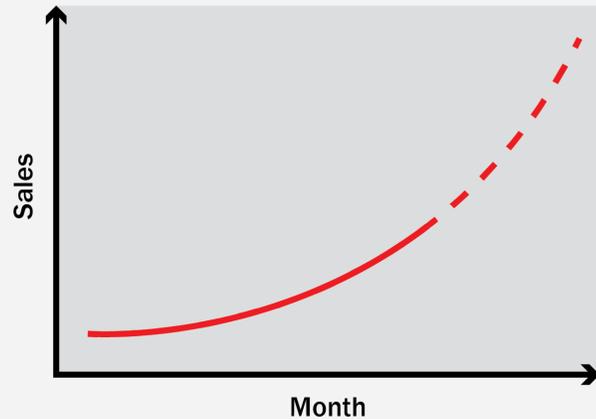
Artificial Intelligence



Prediction

Using information that you do have to generate information that you don't have

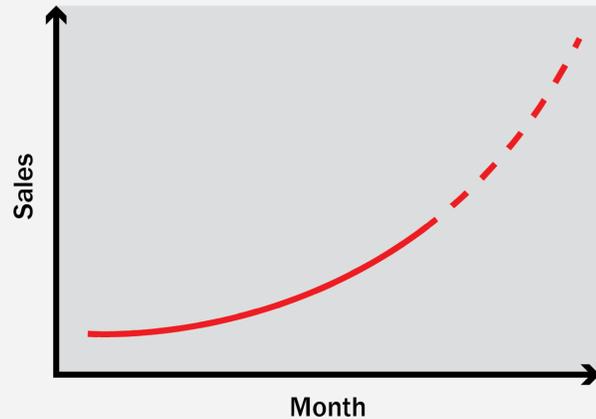
Traditional Prediction:
Historical Sales → Future Sales



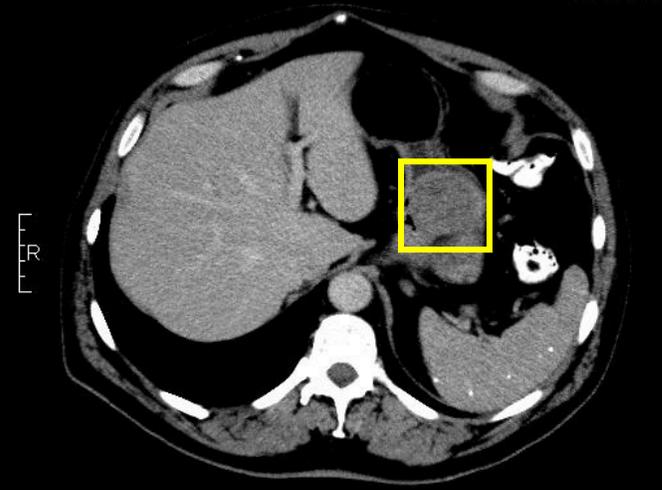
Prediction

Using information that you do have to generate information that you don't have

Traditional Prediction:
Historical Sales → Future Sales



New Areas of Prediction:
Pixels in Image → Label on Tumor



https://commons.wikimedia.org/wiki/File:CT_image_of_a_GIST_tumor_in_the_gastric_cardia.jpg

Rising AI → Falling Cost of Prediction

- More prediction
 - Existing prediction problems: more prediction — better, faster, cheaper

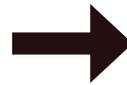
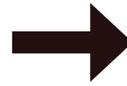
MCKINSEY GLOBAL INSTITUTE

NOTES FROM THE AI FRONTIER INSIGHTS FROM HUNDREDS OF USE CASES

TWO-THIRDS OF THE OPPORTUNITIES TO USE AI ARE IN IMPROVING THE PERFORMANCE OF EXISTING ANALYTICS USE CASES

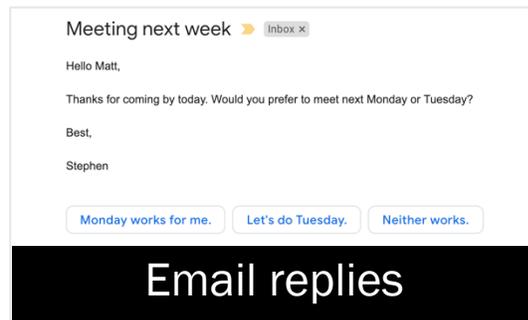
In 69 percent of the use cases we studied, deep neural networks can be used to improve performance beyond that provided by other analytic techniques. Cases in which only neural networks can be used, which we refer to here as “greenfield” cases, constituted just 16 percent of the total. For the remaining 15 percent, artificial neural networks provided limited additional performance over other analytics techniques, among other reasons because of data limitations that made these cases unsuitable for deep learning.

Expanding Range of Use as Input



Rising AI → Falling Cost of Prediction

- Converting problems that historically were not considered to be AI problems into AI

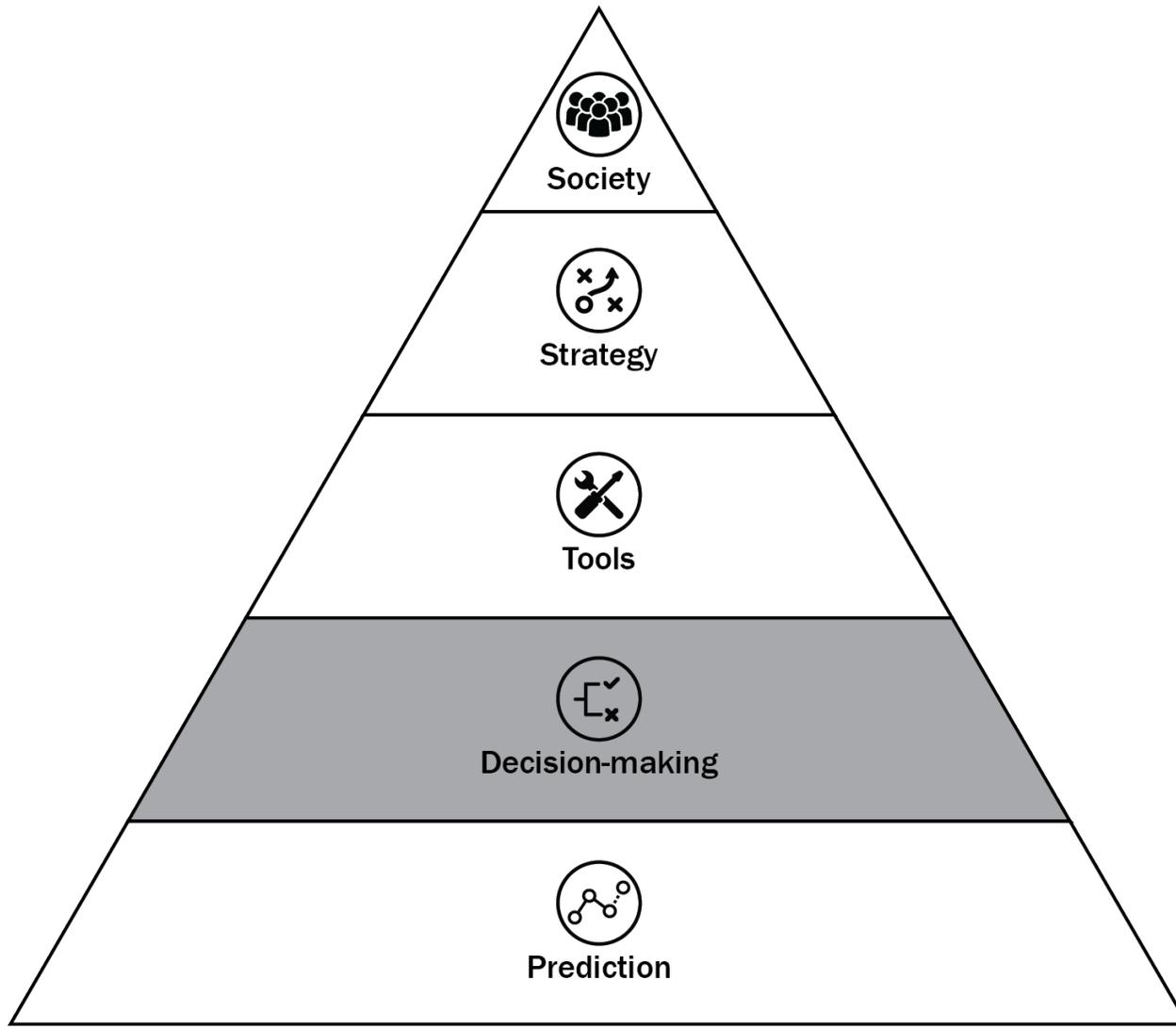


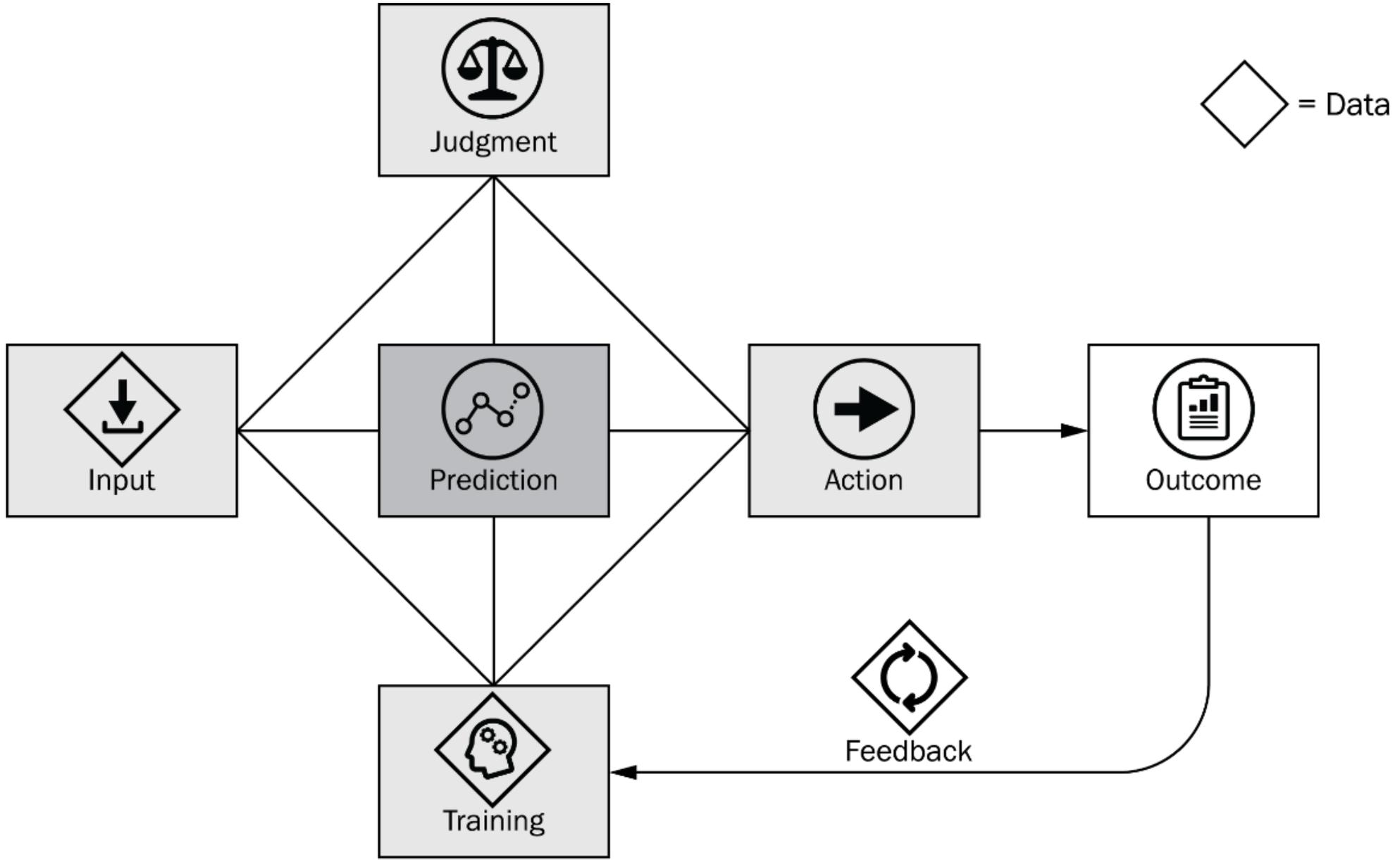
https://commons.wikimedia.org/wiki/File:Ultrasonic_pipeline_test.jpg

**Prediction is valuable because it is an
input into decision-making**

Decision-making is everywhere

Prediction \neq decision-making







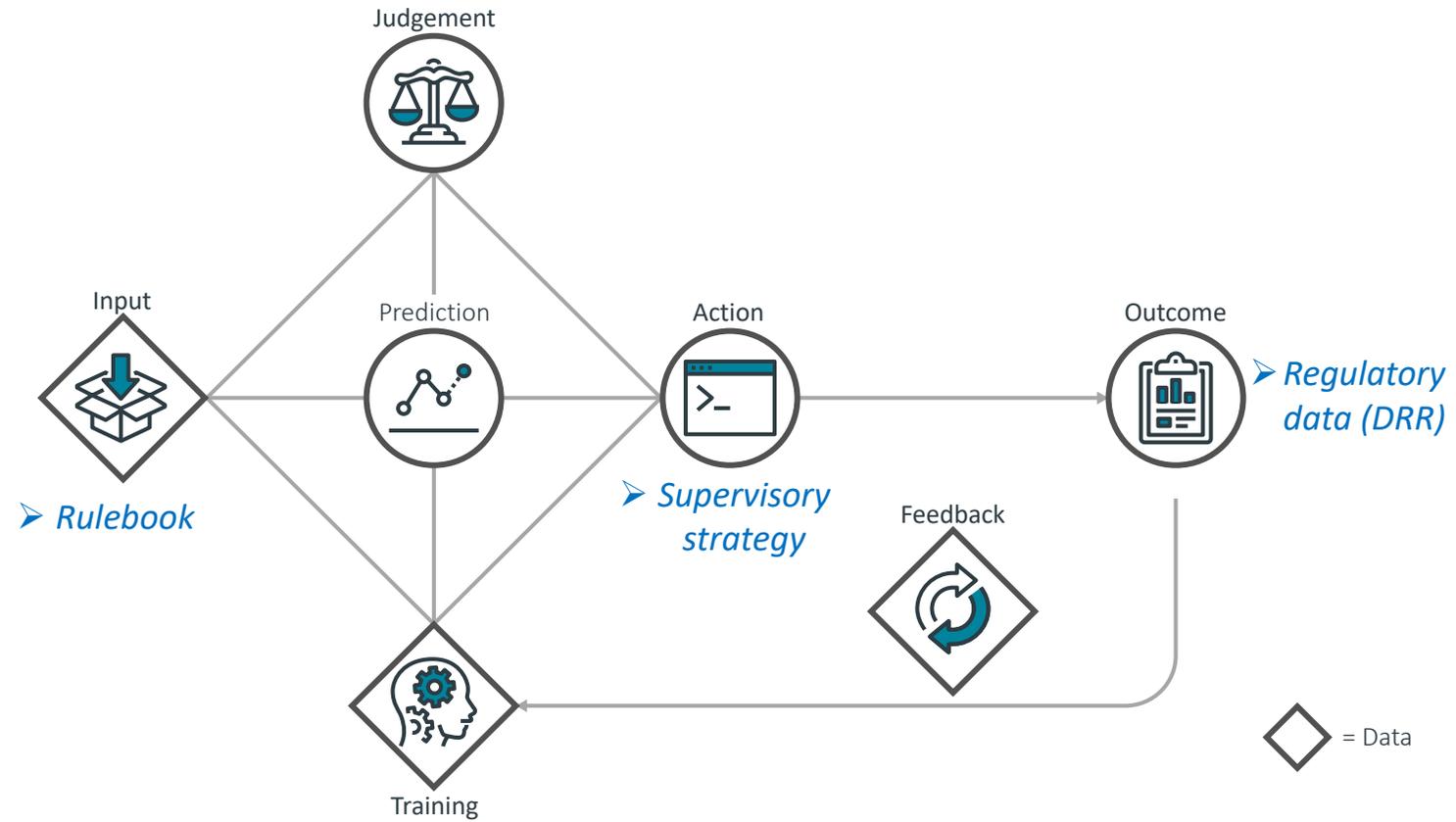
AI and the Global Economy

**Machine Learning and the Market for Intelligence Conference
Rotman School of Management, University of Toronto**

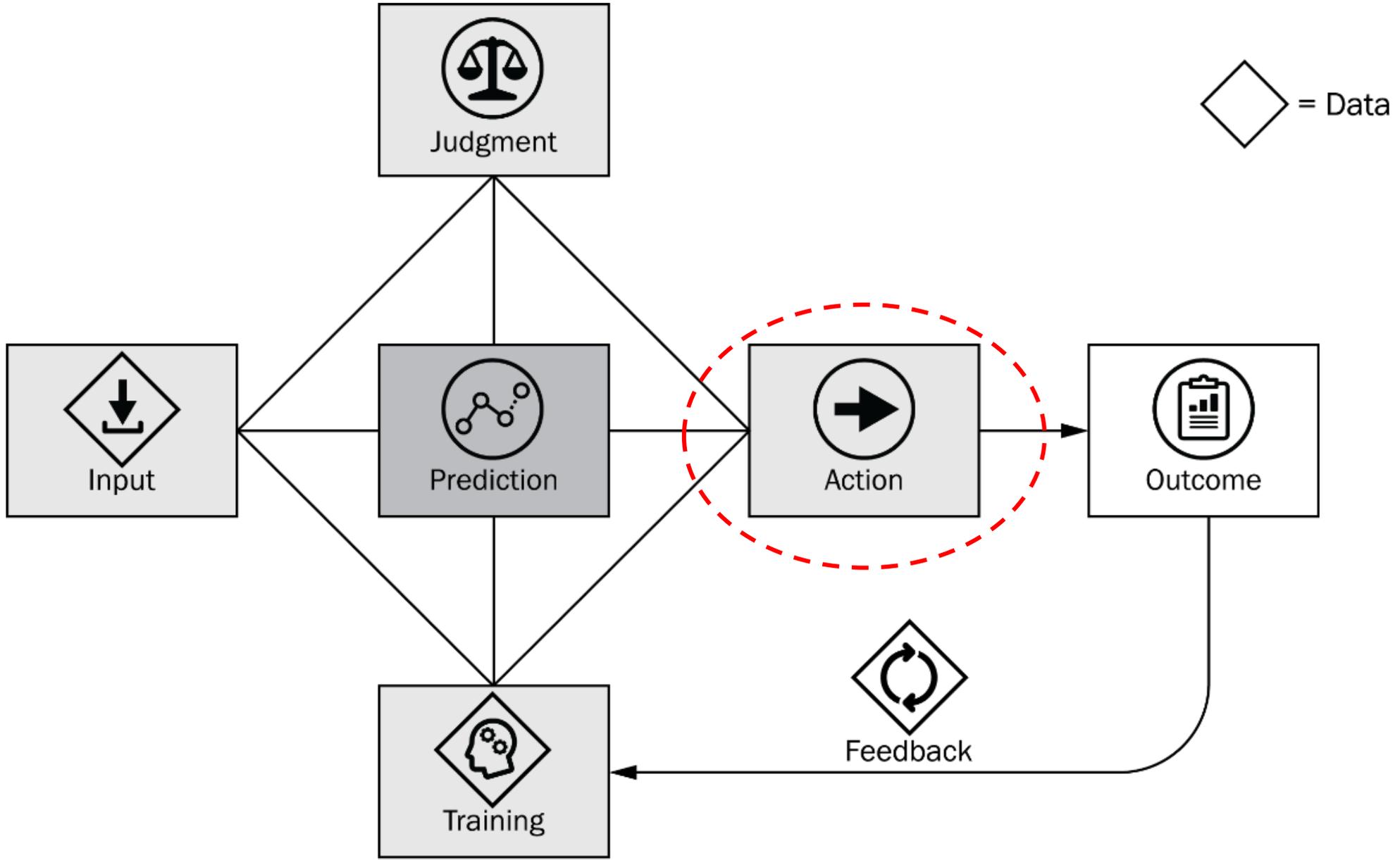
Mark Carney
Governor, Bank of England

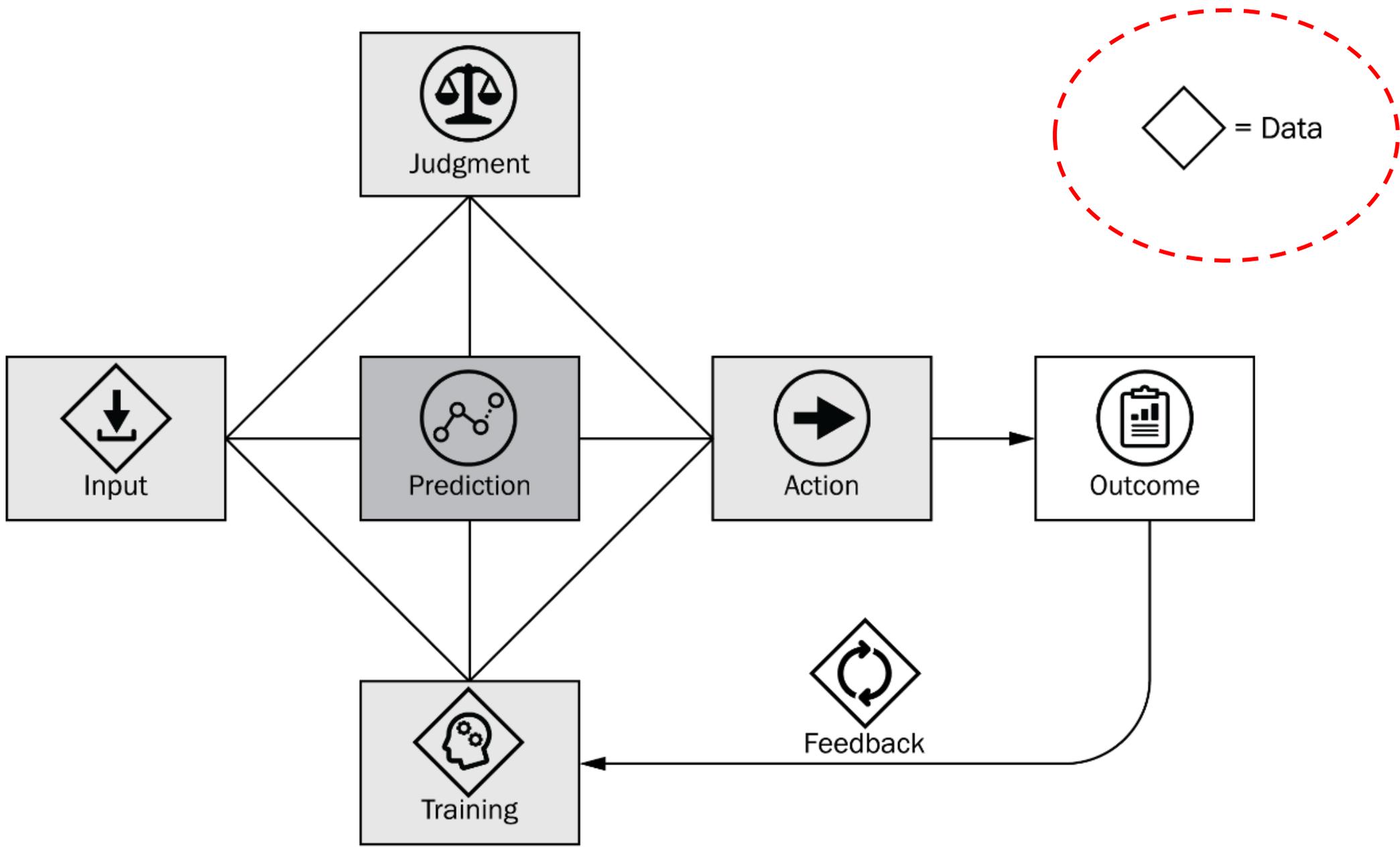
23 October 2018

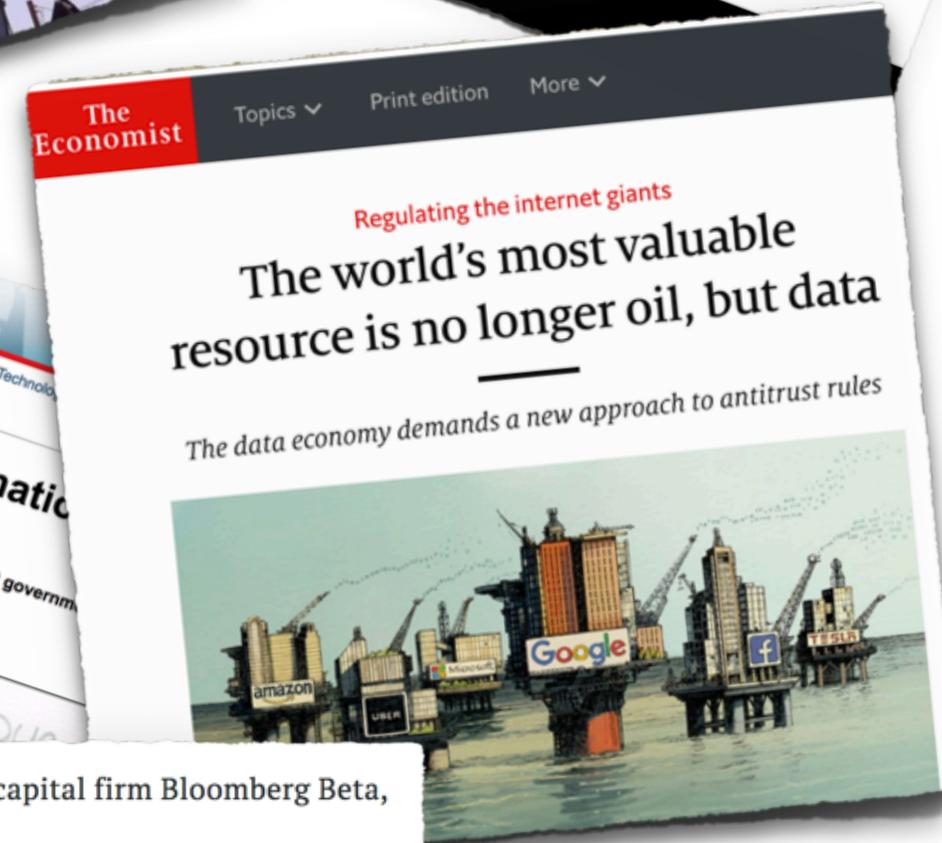
AI in Prudential Regulation



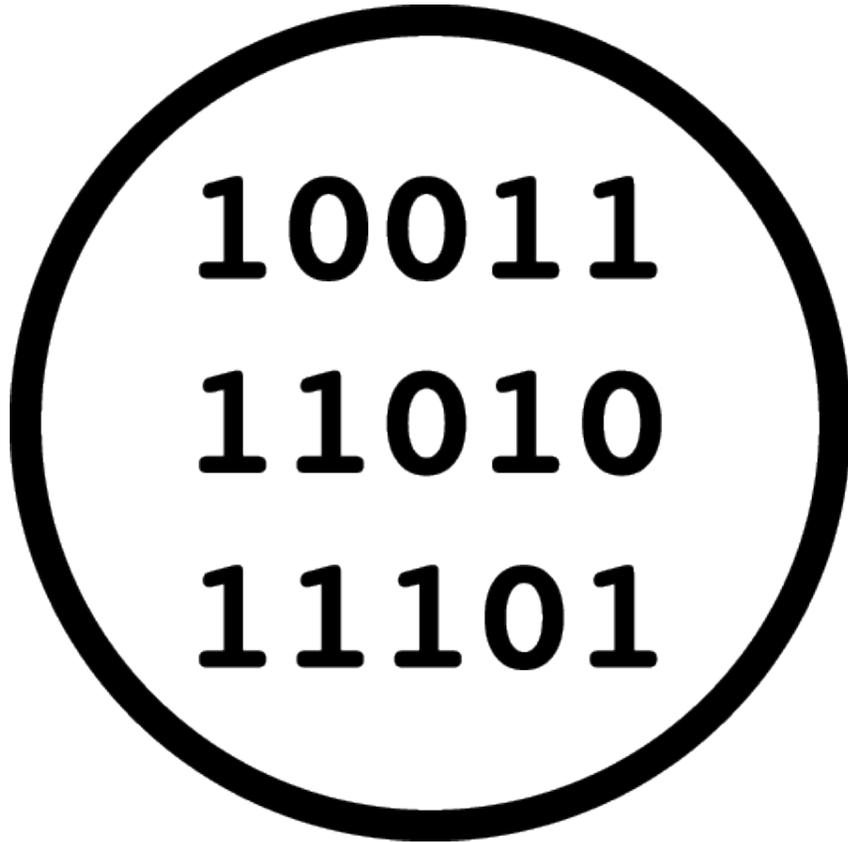
Source: "What managers need to know about Artificial Intelligence" Sloan Management Review, by Ajay Agrawal, Joshua Gans and Avi Goldfarb 2017





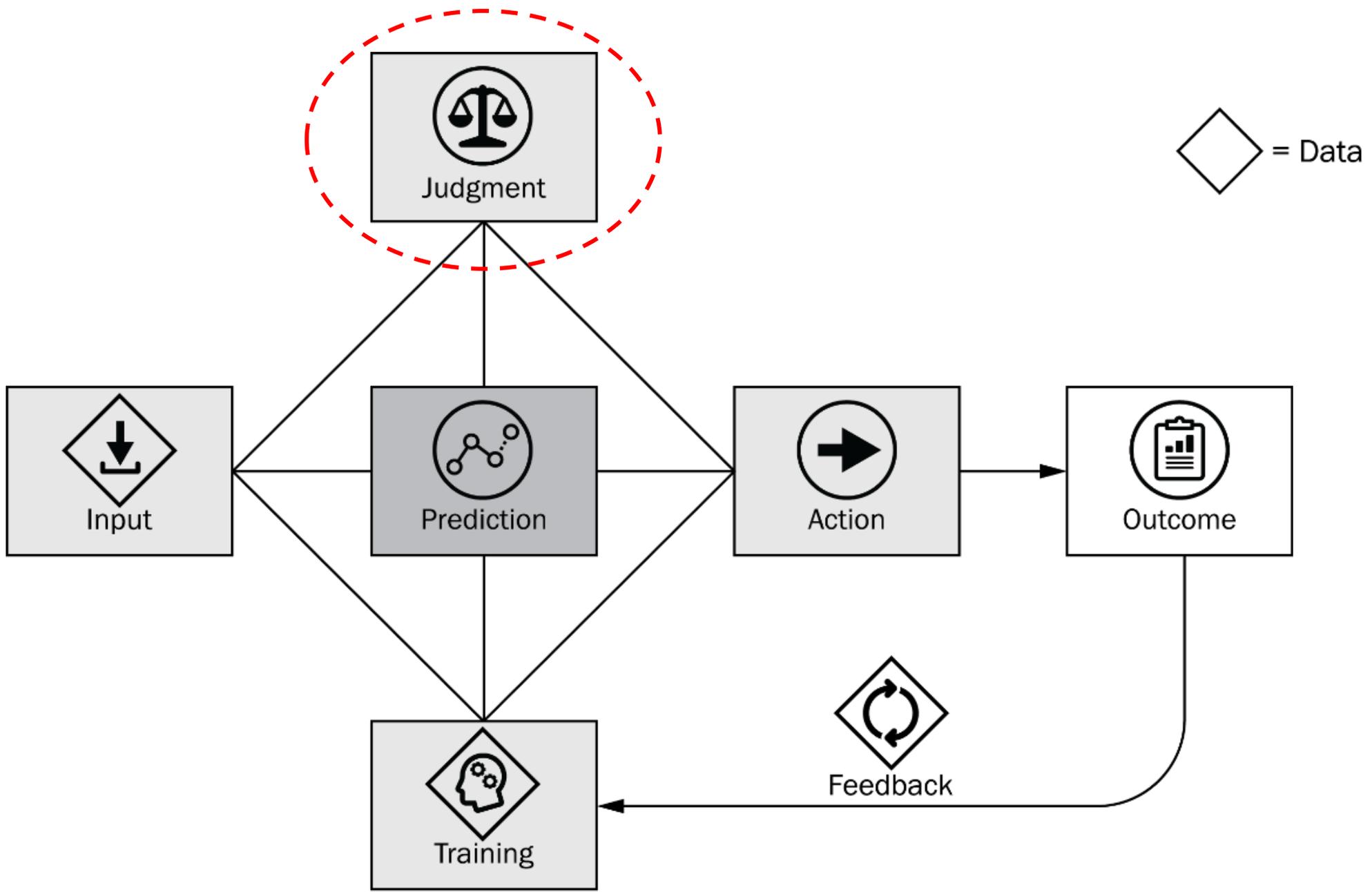


"Data is the new oil," Shivon Zilis, a partner with the venture capital firm Bloomberg Beta, said about data's increasing value.



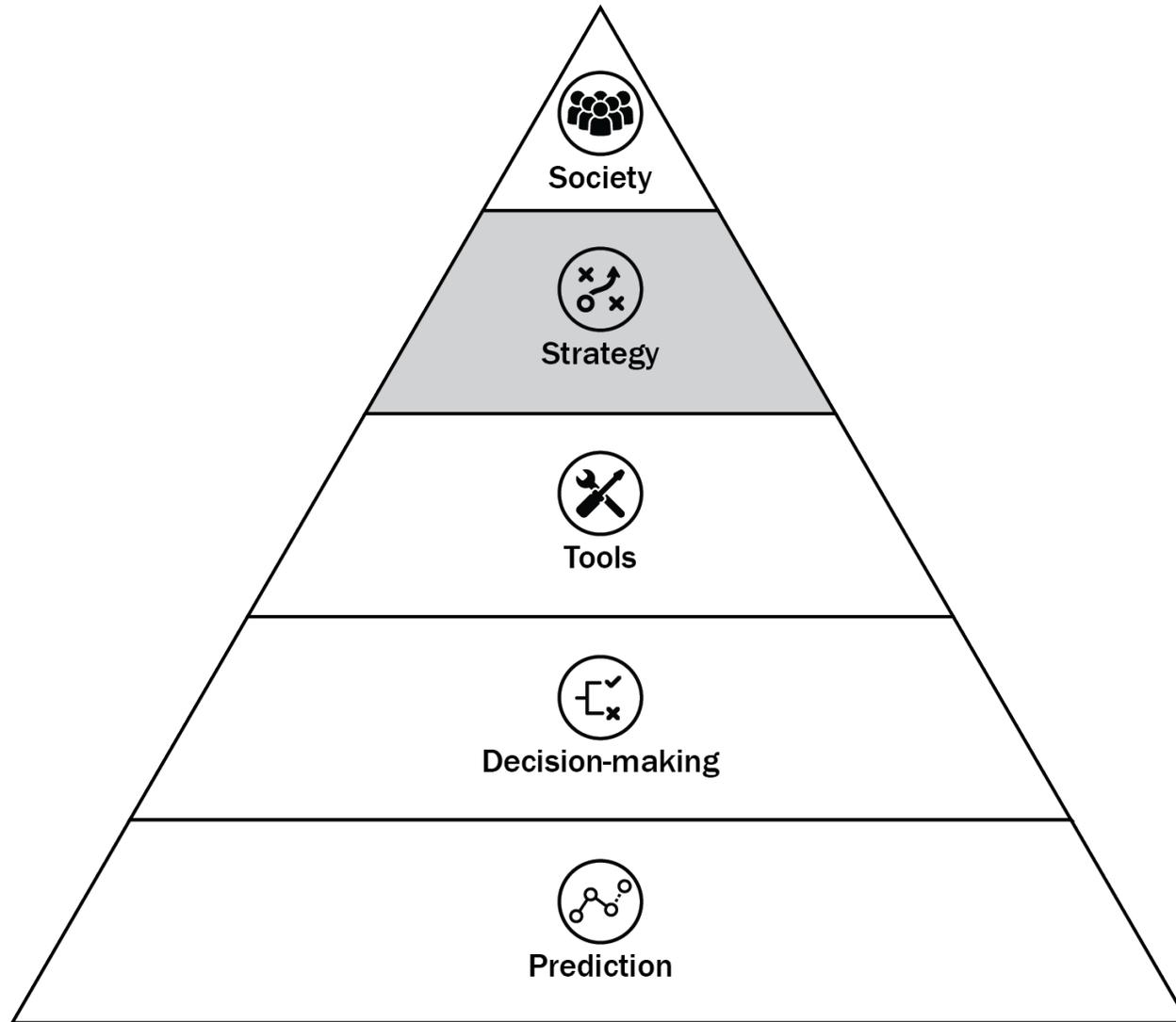
Like oil
data burns when used

What is valuable is
feedback:
the ability to generate
more data





Judgment is the process of determining what the reward is to a particular action in a particular environment.



**Can better prediction change
an industry?**

A THOUGHT EXPERIMENT





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Electronics Deals











US008615473B2

(12) **United States Patent**
Spiegel et al.

(10) **Patent No.:** **US 8,615,473 B2**

(45) **Date of Patent:** **Dec. 24, 2013**

(54) **METHOD AND SYSTEM FOR
ANTICIPATORY PACKAGE SHIPPING**

(75) Inventors: **Joel R. Spiegel**, Woodinville, WA (US);
Michael T. McKenna, Bellevue, WA
(US); **Girish S. Lakshman**, Issaquah,
WA (US); **Paul G. Nordstrom**, Seattle,
WA (US)

(73) Assignee: **Amazon Technologies, Inc.**, Reno, NV
(US)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

(21) Appl. No.: **13/594,195**

(22) Filed: **Aug. 24, 2012**

(65) **Prior Publication Data**
US 2012/0323645 A1 Dec. 20, 2012

Related U.S. Application Data
(62) Division of application No. 13/305,611, filed on Nov.
28, 2011, now Pat. No. 8,271,398, which is a division
of application No. 11/015,288, filed on Dec. 17, 2004,
now Pat. No. 8,086,546.

(51) **Int. Cl.**
G06Q 99/00 (2006.01)

(52) **U.S. Cl.**
USPC **705/332**; 705/330; 705/333; 705/336;
705/337

(58) **Field of Classification Search**
USPC 705/332, 330, 333, 336, 337
See application file for complete search history.

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Primary Examiner — Akiba Allen

(74) *Attorney, Agent, or Firm* — Robert C. Kowert;
Meyertons, Hood, Kivlin, Kowert & Goetzl, P.C.

(57) **ABSTRACT**

A method and system for anticipatory package shipping are
disclosed. According to one embodiment, a method may
include packaging one or more items as a package for even-
tual shipment to a delivery address, selecting a destination
geographical area to which to ship the package, shipping the
package to the destination geographical area without com-
pletely specifying the delivery address at time of shipment,
and while the package is in transit, completely specifying the
delivery address for the package.

24 Claims, 11 Drawing Sheets



There's more

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