

Accelerating the Human Innovation Curve with Artificial Intelligence

Chad Steelberg
CEO Veritone



The Fire Innovation Curve



Kurzweil: Computer Innovation Curve



1 The accelerating pace of change ...



2 ... and exponential growth in computing power ...

Computer technology, shown here climbing dramatically by powers of 10, is now progressing more each hour than it did in its entire first 90 years

COMPUTER RANKINGS

By calculations per second per \$1,000



Analytical engine
Never fully built, Charles Babbage's invention was designed to solve computational and logical problems



Hollerith Tabulator

IBM Tabulator

National Ellis 3000

Zuse 2

Zuse 3

IBM SSEC

EDVAC

Datamatic 1000

IBM 1620

DEC PDP-4

IBM 1130

Whirlwind

Intellec-8

DEC PDP-10

Data General Nova

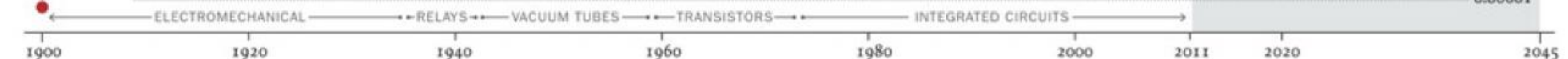
IBM PC

Pentium PC

Pentium II PC

Compaq Deskpro 386

Apple II



3 ... will lead to the Singularity



Apple II
At a price of \$1,298, the compact machine was one of the first massively popular personal computers

Mac Pro

Nvidia Tesla GPU & PC

Dell Dimension 8400

Power Mac G4

10,000,000,000

100,000

1

0.00001

Surpasses brainpower of mouse in 2015

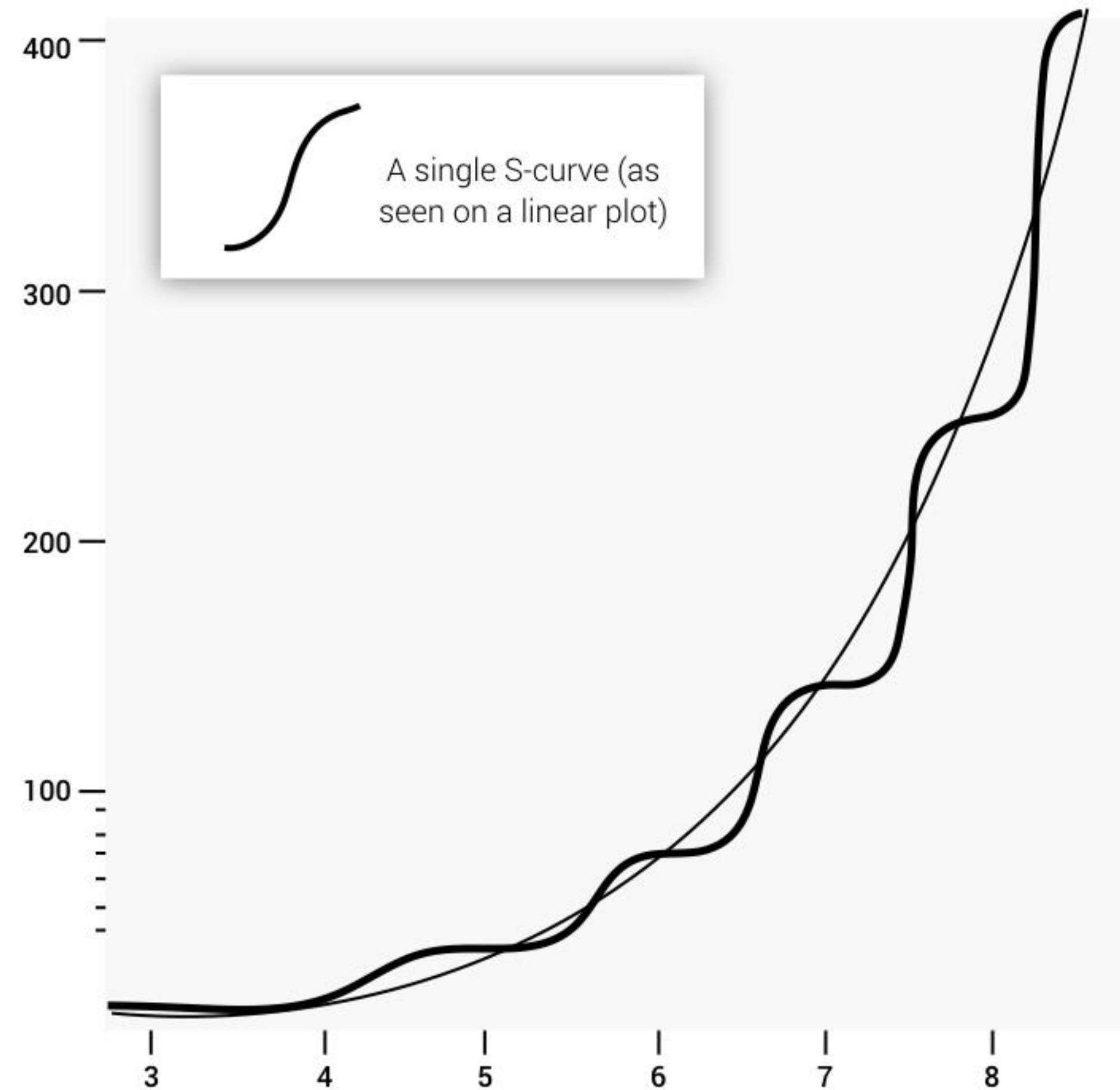


Surpasses brainpower of human in 2023

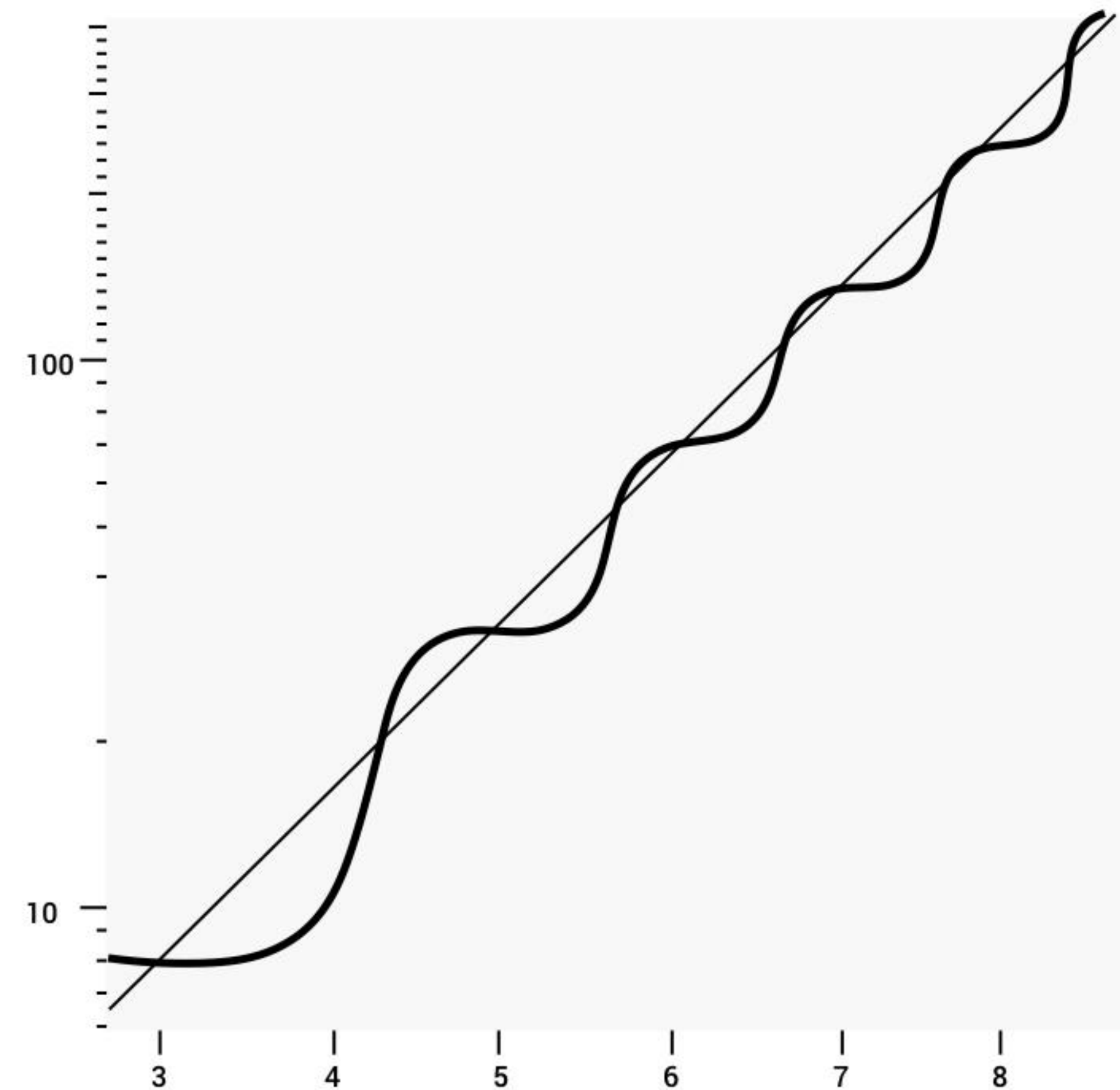


Hyper Expansion Plateau

An ongoing exponential sequence made up of a cascade of S-curves (liner plot)



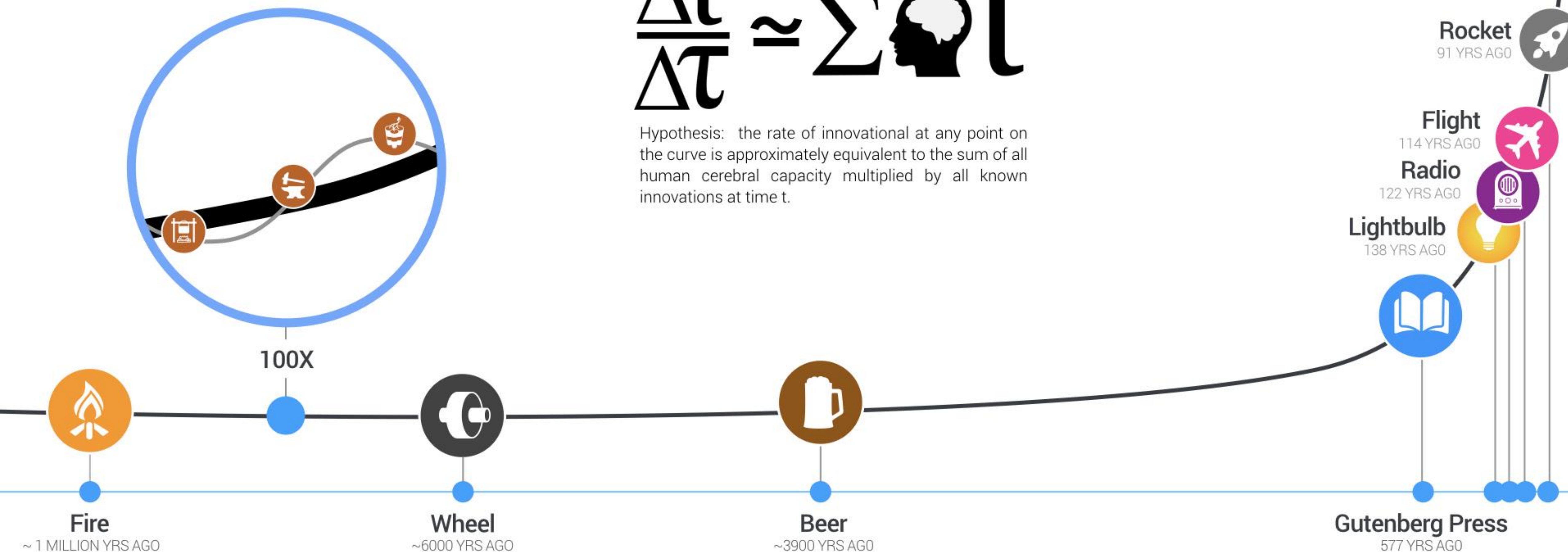
The same exponential sequence of S-curves on a logarithmic plot



Human Innovation Curve

$$\frac{\Delta l}{\Delta \tau} \approx \sum \text{[Brain Icon]} l$$

Hypothesis: the rate of innovational at any point on the curve is approximately equivalent to the sum of all human cerebral capacity multiplied by all known innovations at time t.



The AI Innovation Curve

1951 SNARC
(Marvin
Minsky &
Dean
Edmunds)



Create



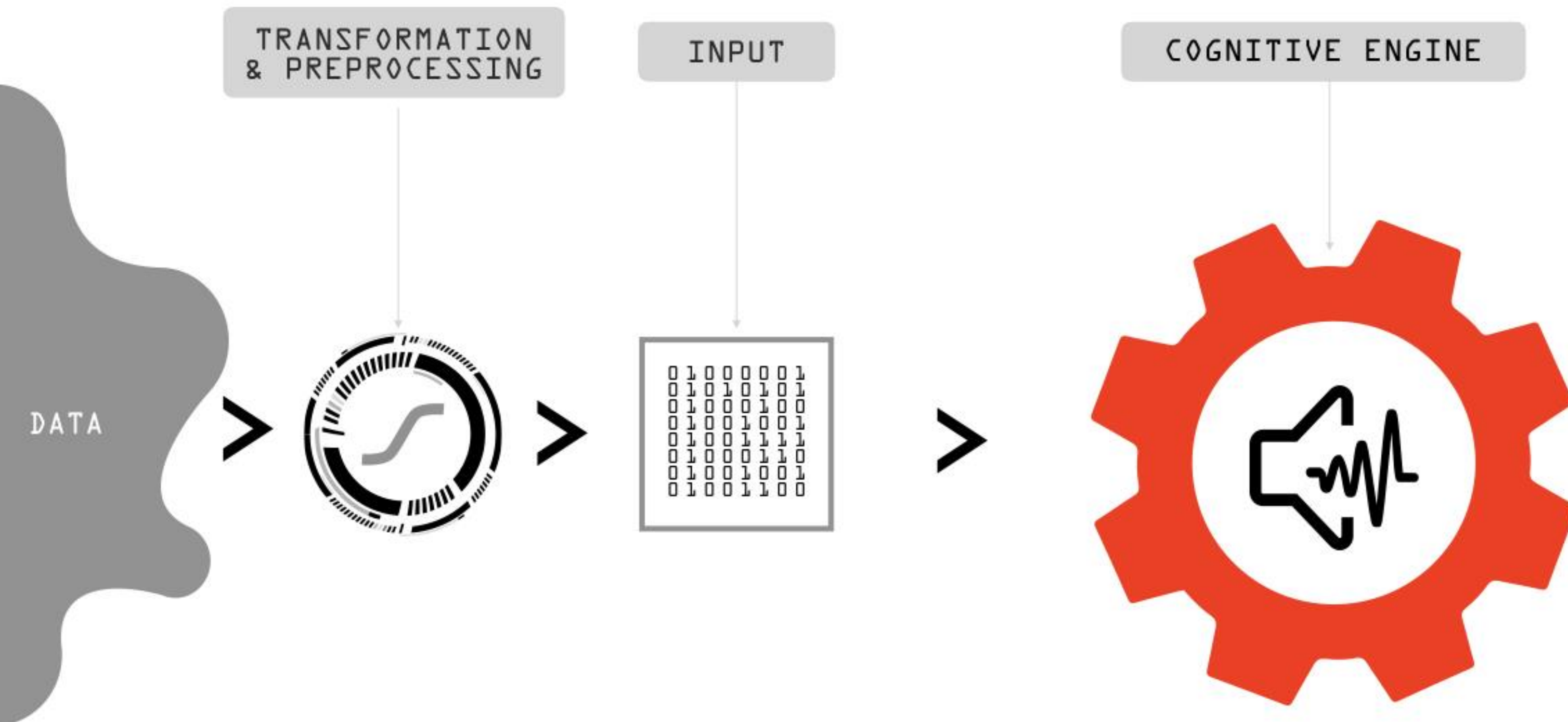
Control



Apply

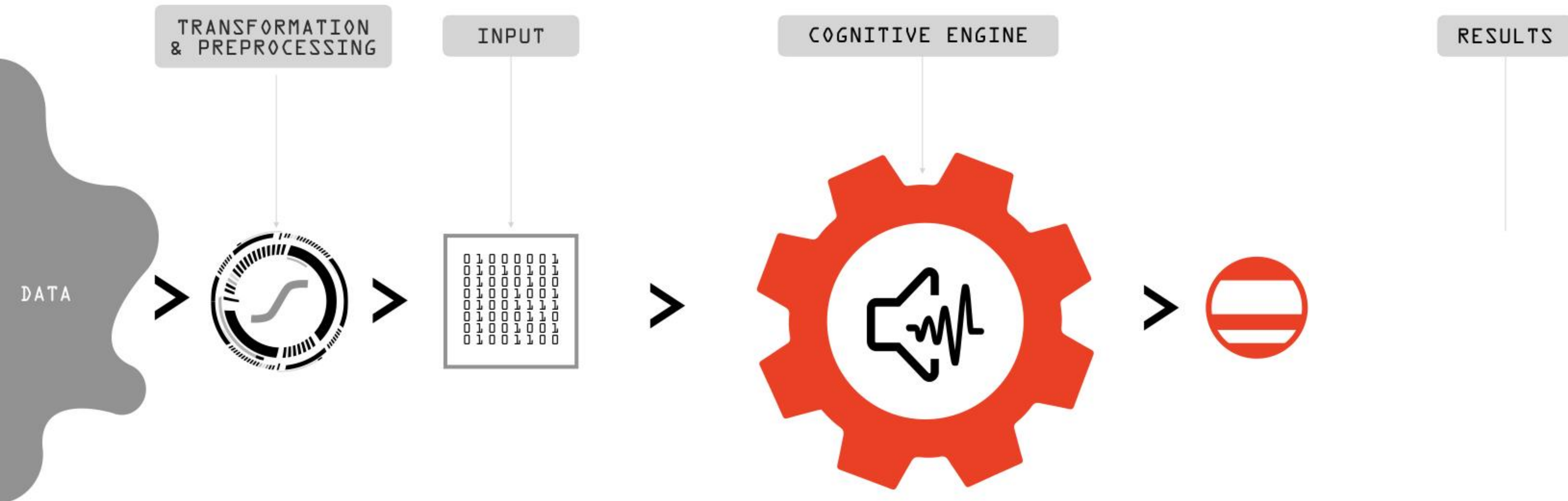
Machine Learning

1x Compute Cost ~ 1x Performance



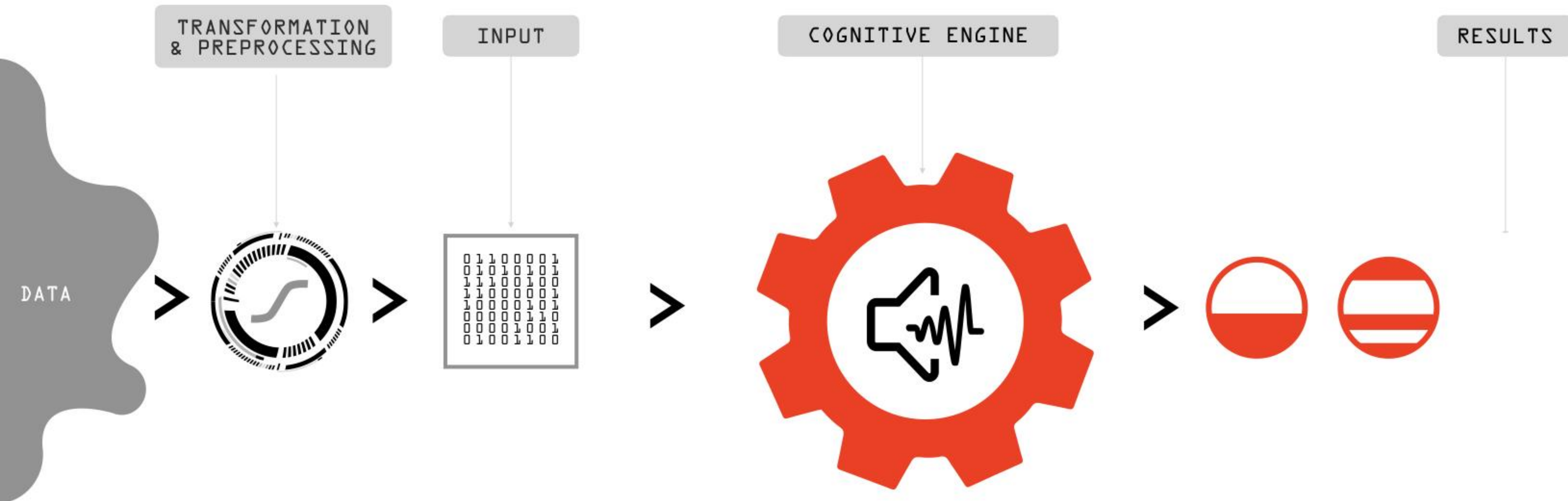
Machine Learning

1x Compute Cost ~ 1x Performance



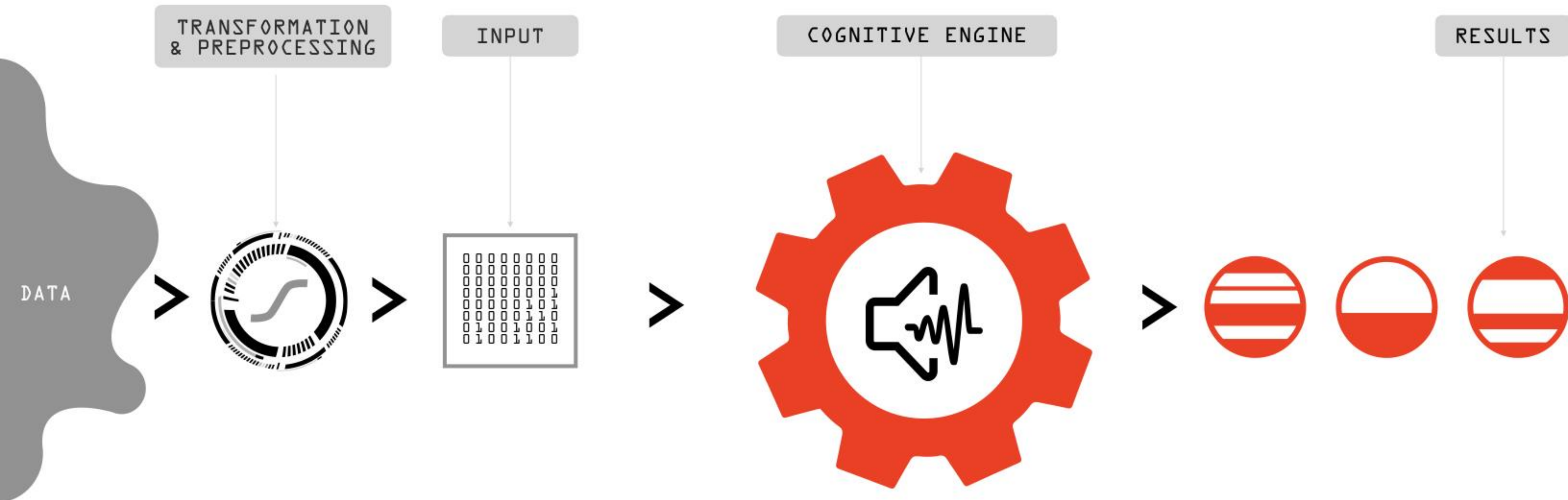
Machine Learning

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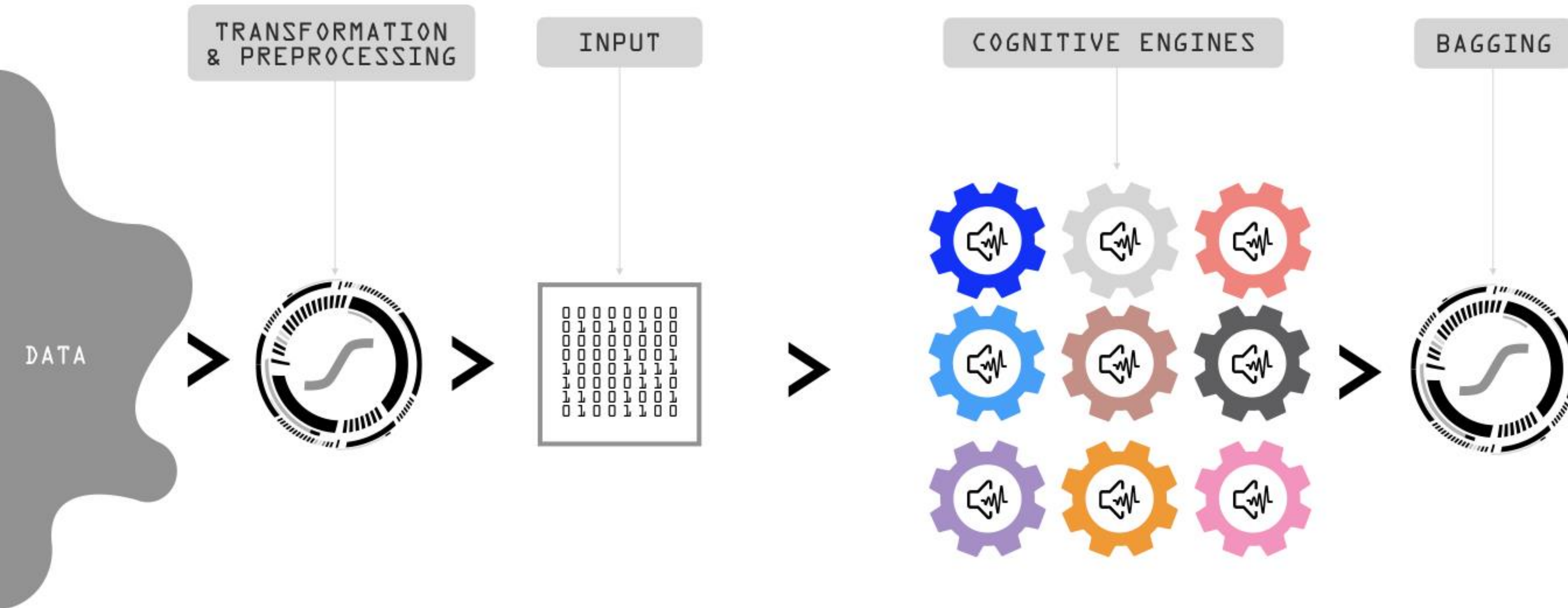
Machine Learning

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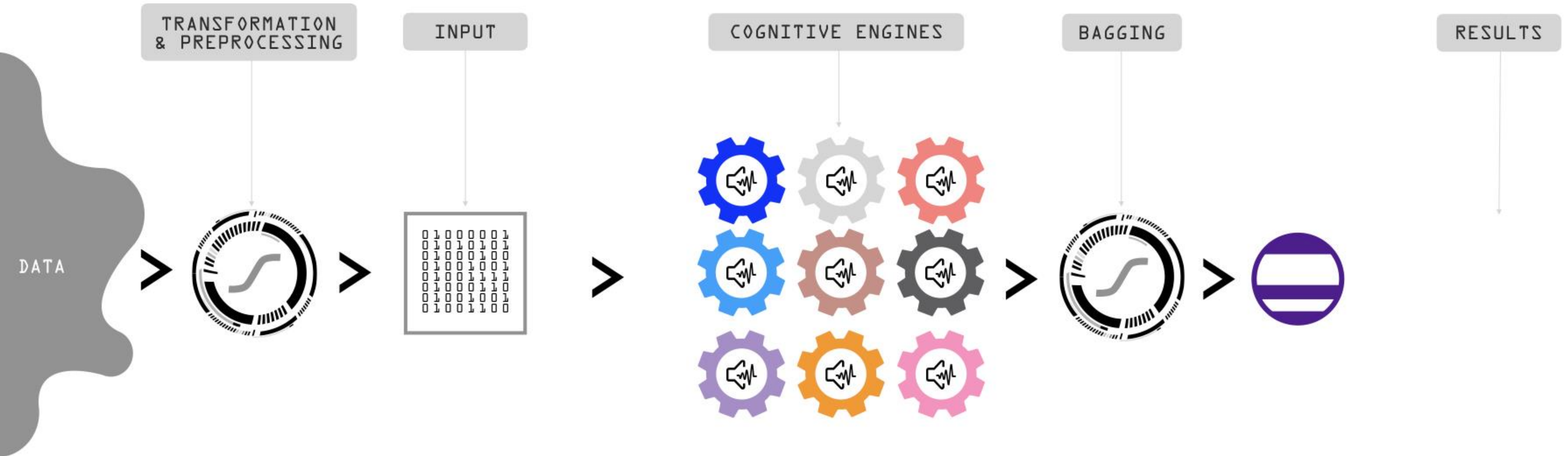
Ensemble Learning

10x Compute Cost → 10x Performance



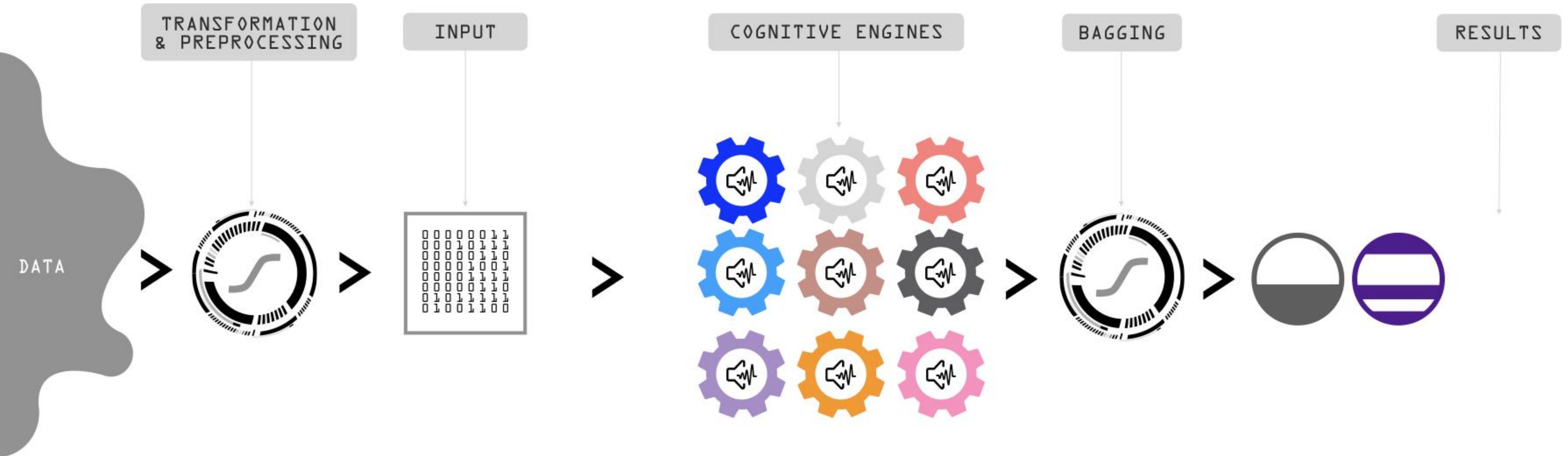
Ensemble Learning

10x Compute Cost → 10x Performance



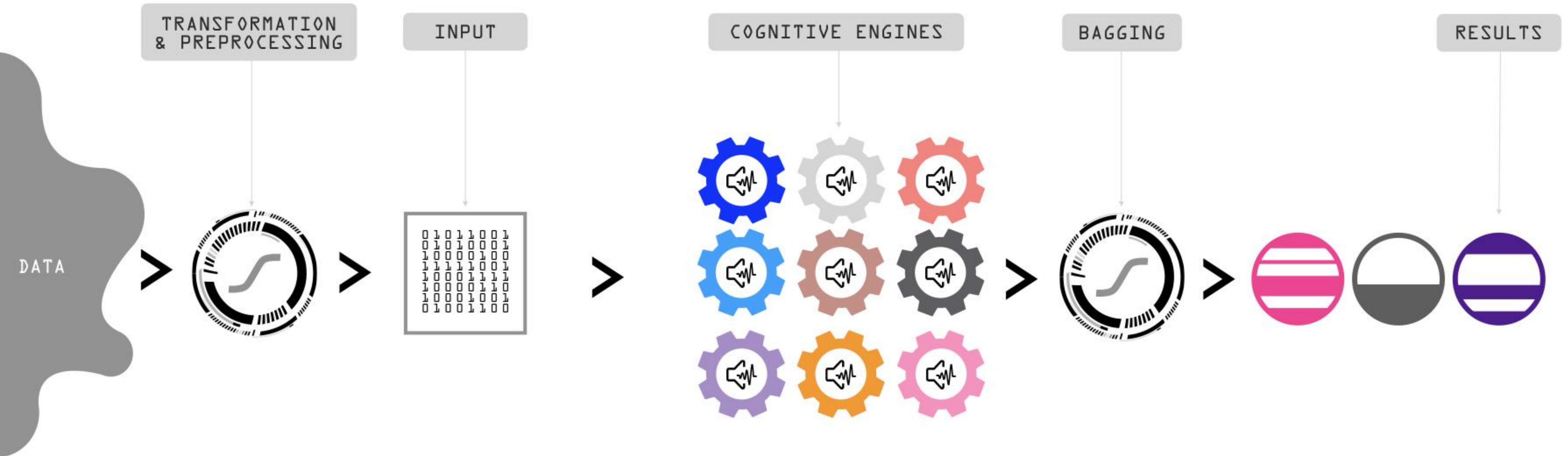
Ensemble Learning

10x Compute Cost \rightarrow 10x Performance



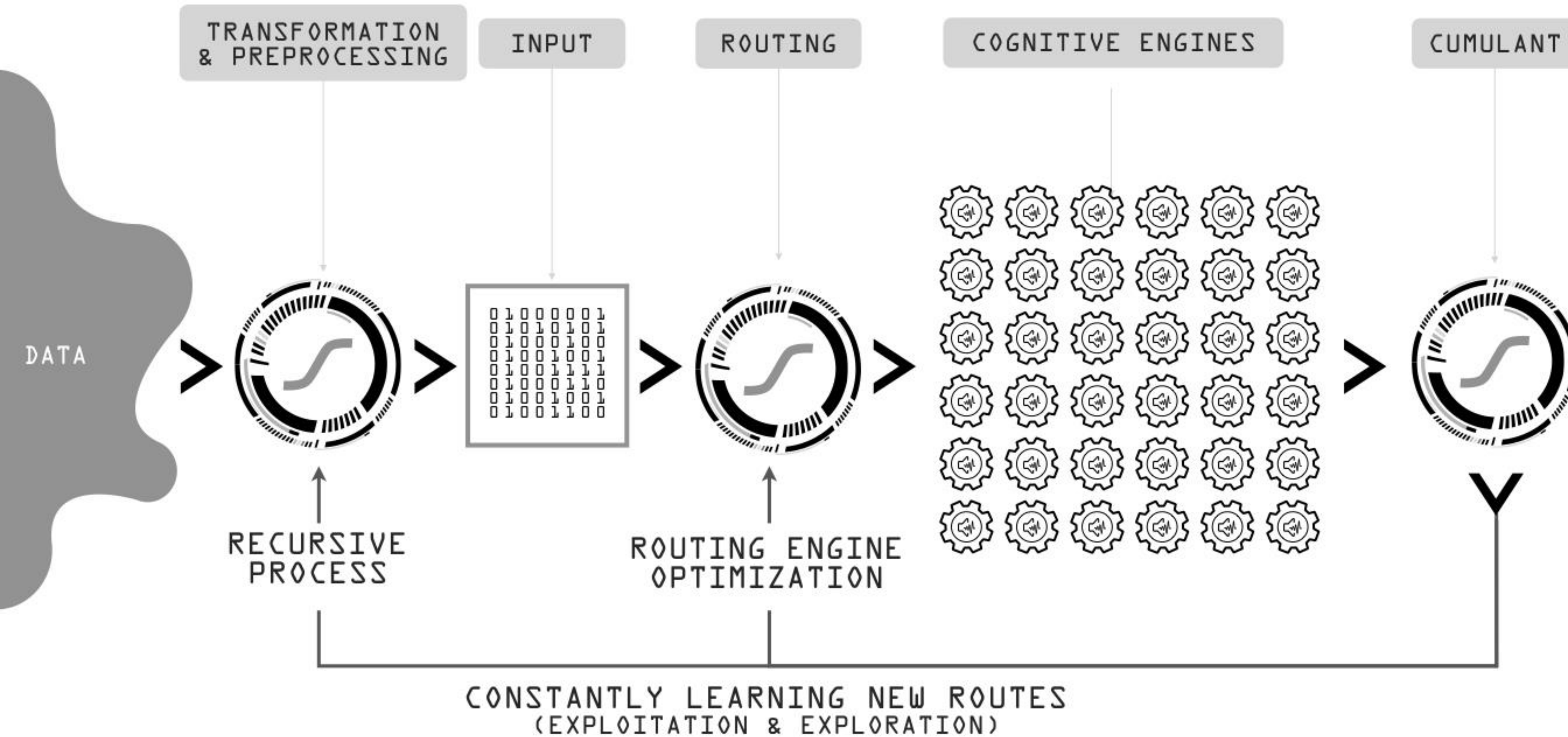
Ensemble Learning

10x Compute Cost \rightarrow 10x Performance



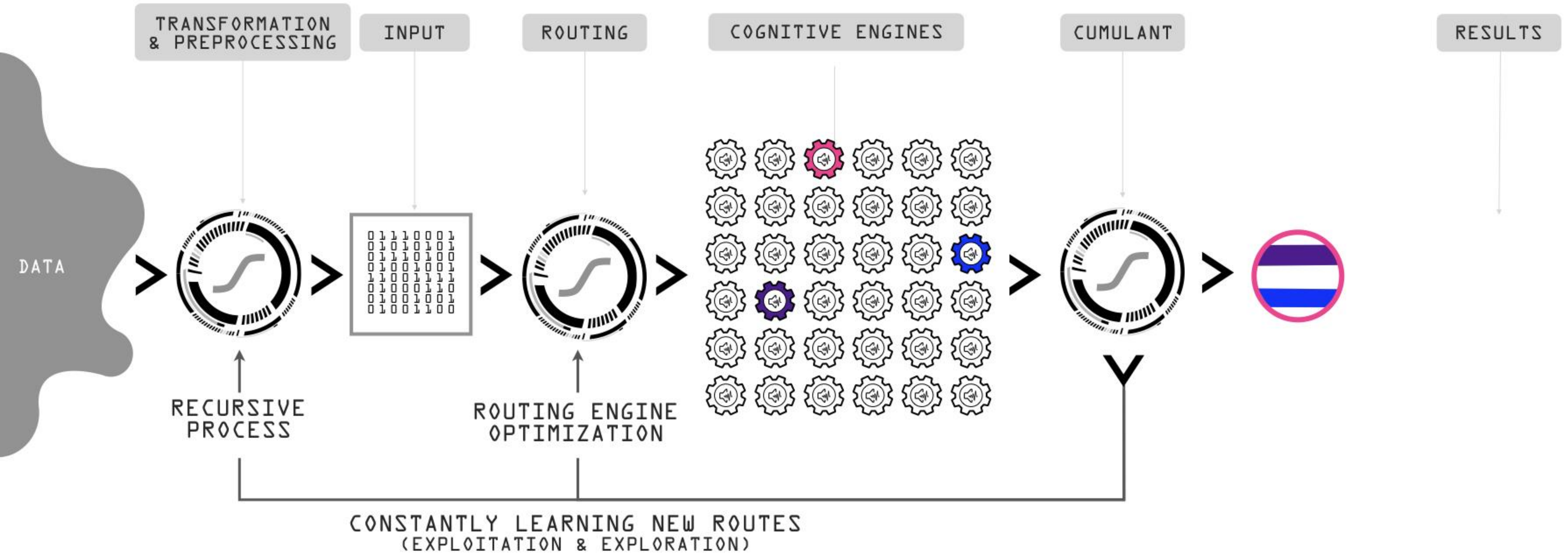
Conducted Learning: Intraclass

Nx Compute Cost $\sim Nx$ Performance



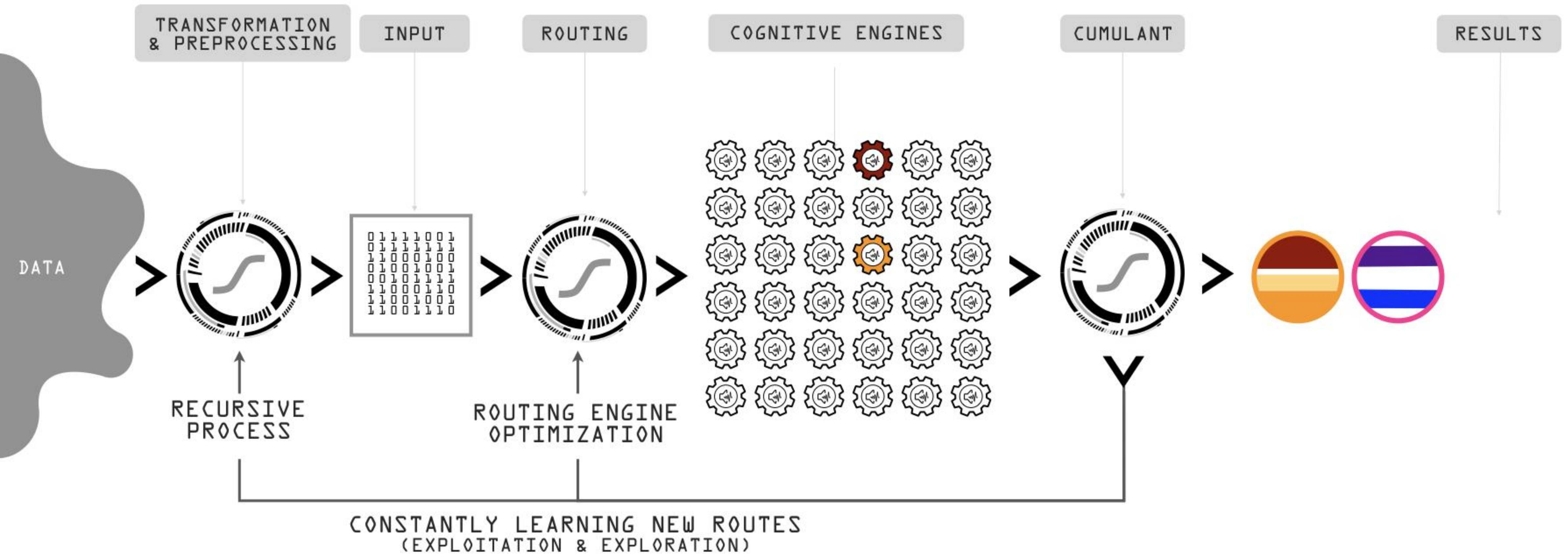
Conducted Learning: Intraclass

Nx Compute Cost $\sim Nx$ Performance



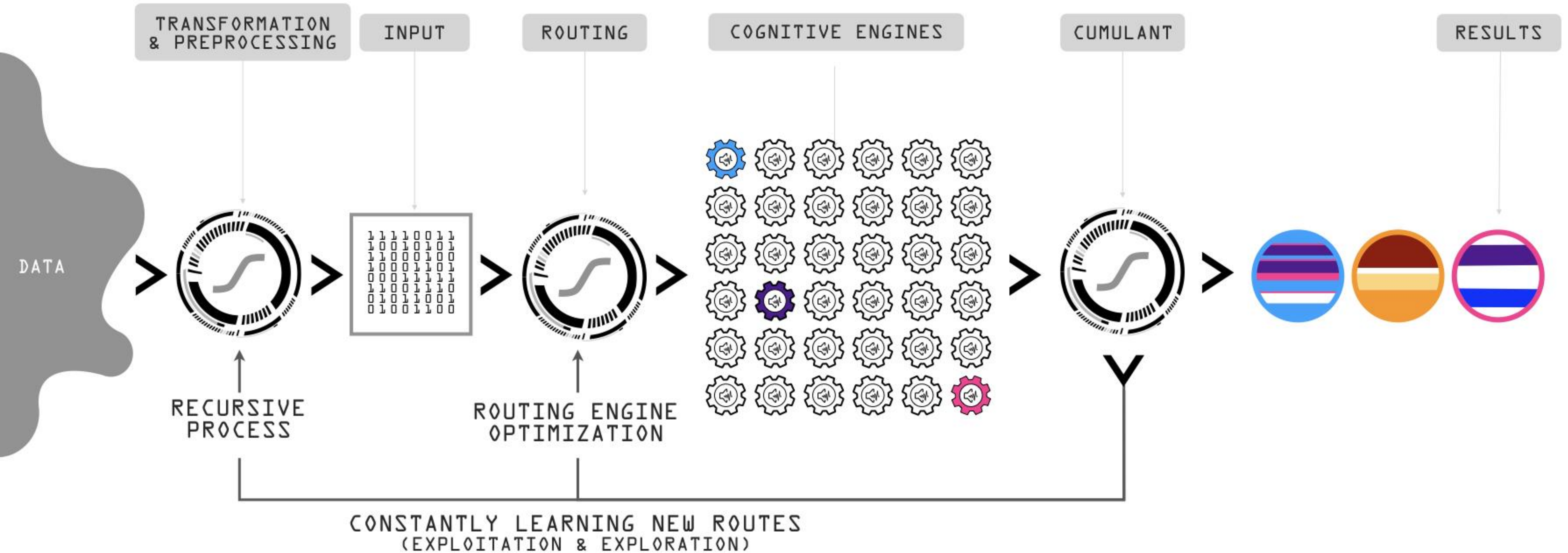
Conducted Learning: Intraclass

Nx Compute Cost $\sim Nx$ Performance



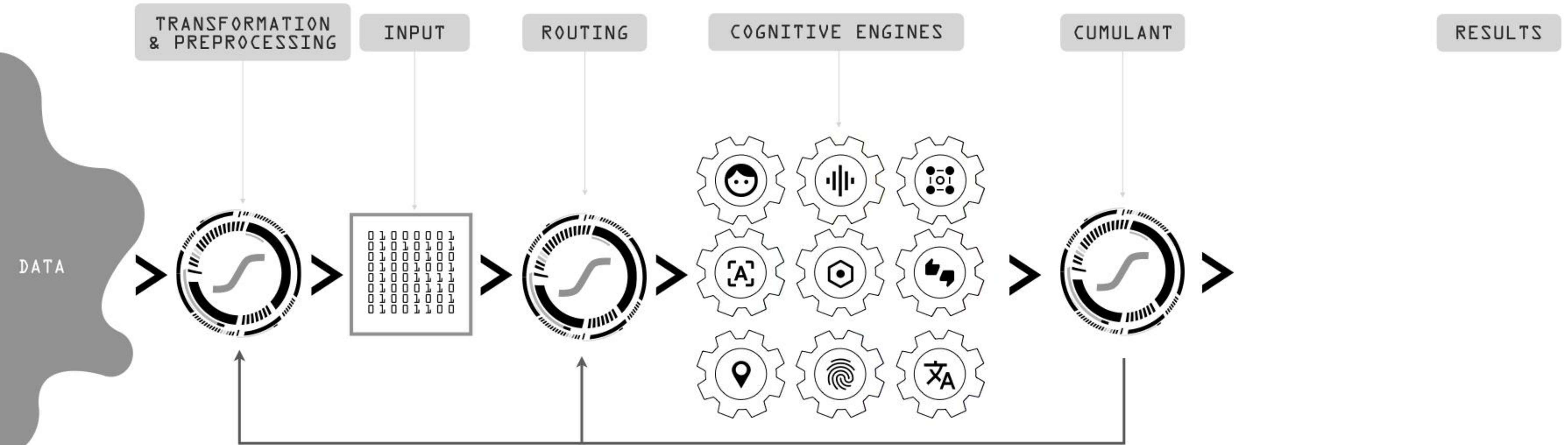
Conducted Learning: Intraclass

Nx Compute Cost $\sim Nx$ Performance



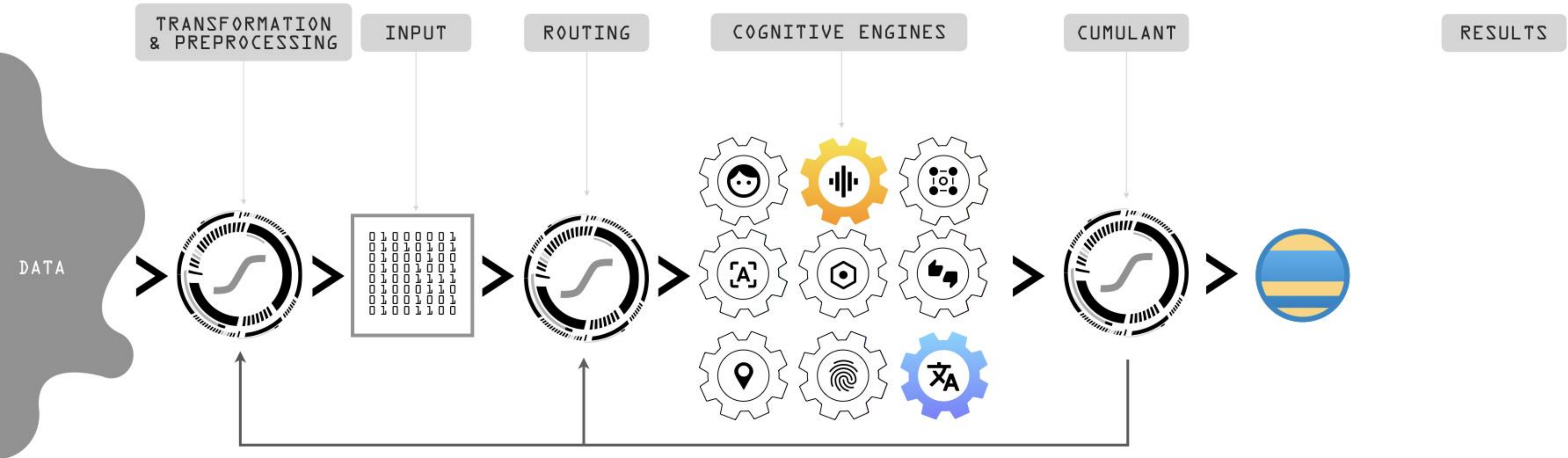
Conducted Learning: Interclass

Nx Compute Cost $\sim Nx$ Performance



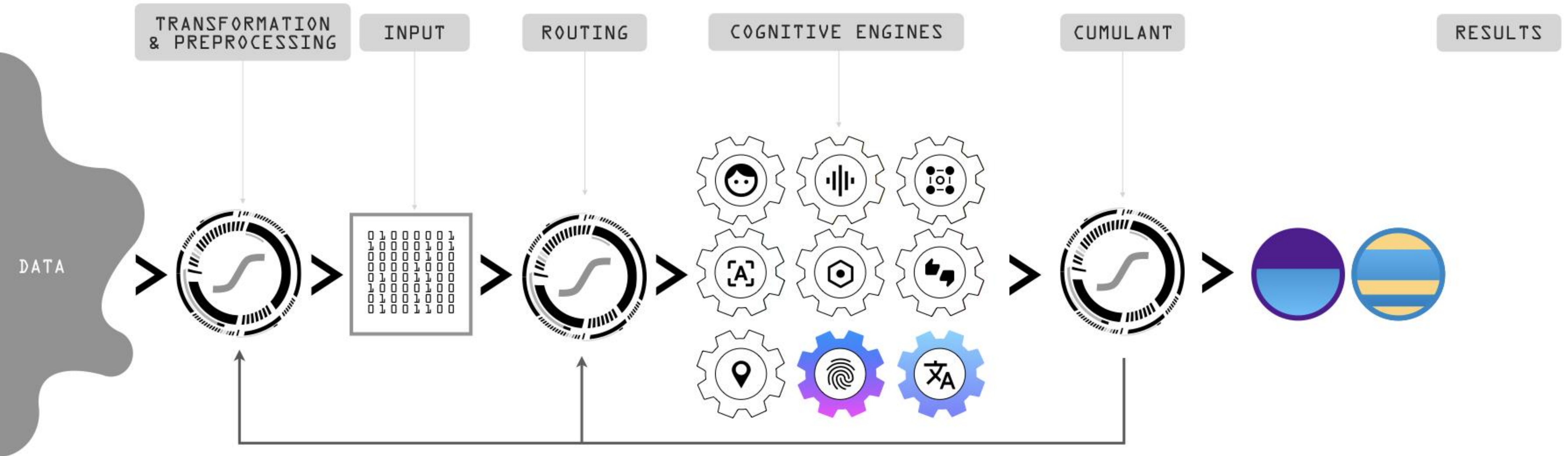
Conducted Learning: Interclass

Nx Compute Cost $\sim Nx$ Performance



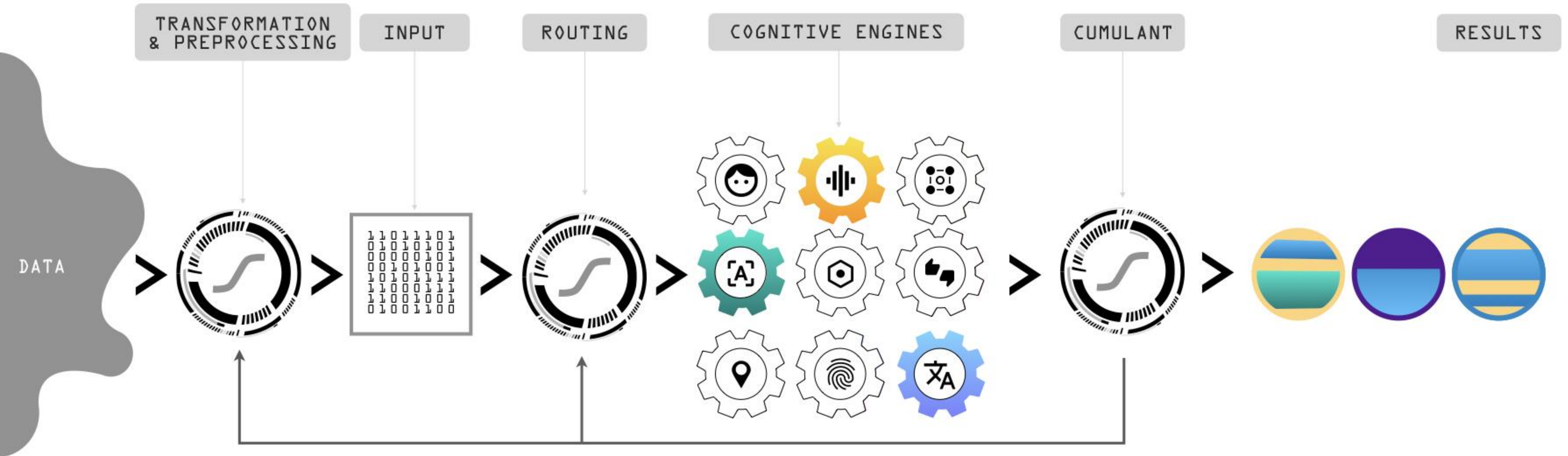
Conducted Learning: Interclass

Nx Compute Cost $\sim Nx$ Performance



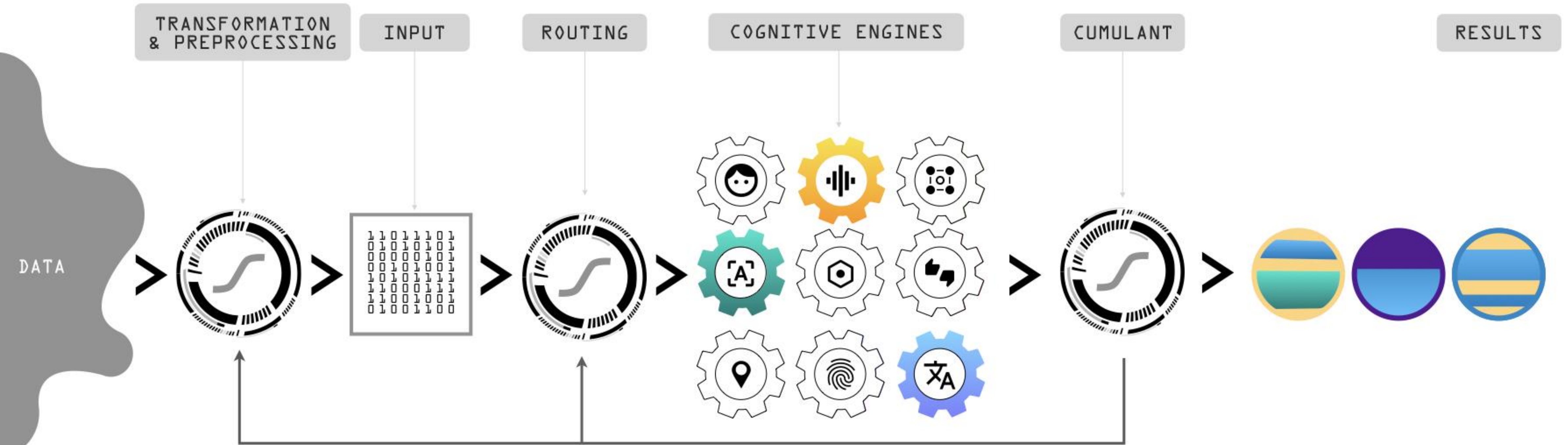
Conducted Learning: Interclass

Nx Compute Cost $\sim Nx$ Performance



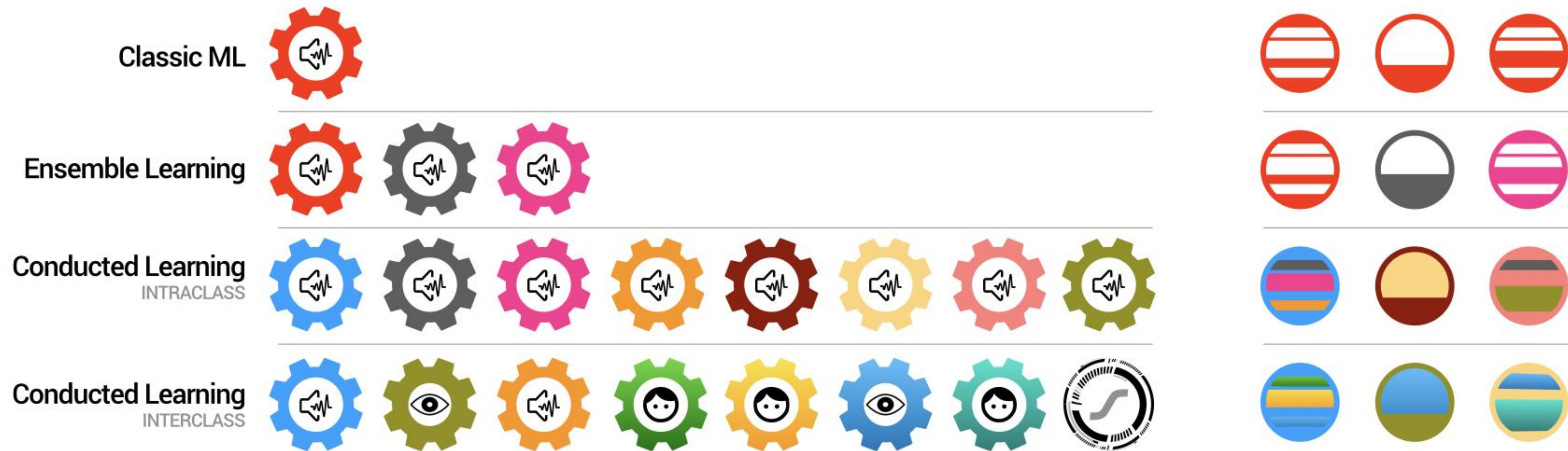
Conducted Learning: Interclass

Nx Compute Cost $\sim Nx$ Performance



“The cow jumped over the ?”

Summary: Types of Learning



14 Classes. 128 Engines. Growing @ 2/wk

Intraclass Conductor Use Case

Legal and Compliance Industry - November 2017

Problem

- **Challenge 01**
Eight (8) Heavy British Accents including Northern Ireland
- **Challenge 02**
Heavily Compressed Audio Files
- **Challenge 03**
Lots of Background noise

Actions

- Ran the best engines to process the files and the best engines of the 89 NLP on the platform averaged between **24% to 55%**
- The client demanded **at least 70%**
- Ran audio-preprocessing
- Optimized Conductor "Precision Voting Algorithm"
- It trained for the eight (8) different heavy British Accents (including Northern Ireland)

New Cognitive Engines Required

- Used Cumulant output to define key training data
- Cost effective ground truth collected
- Two new 3rd party engines trained and deployed within 72 hours

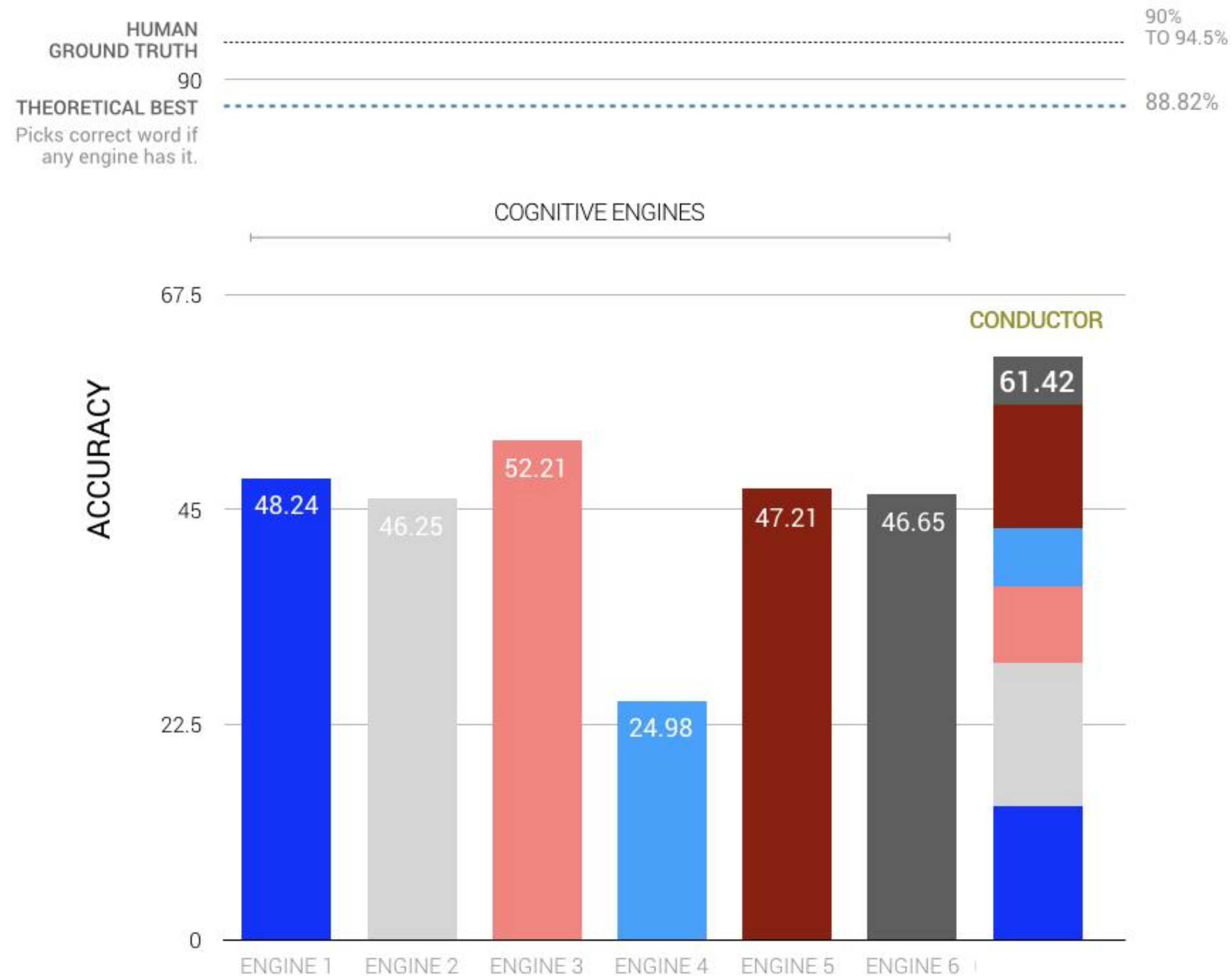
Result

- Delighted our client with **73.25%**

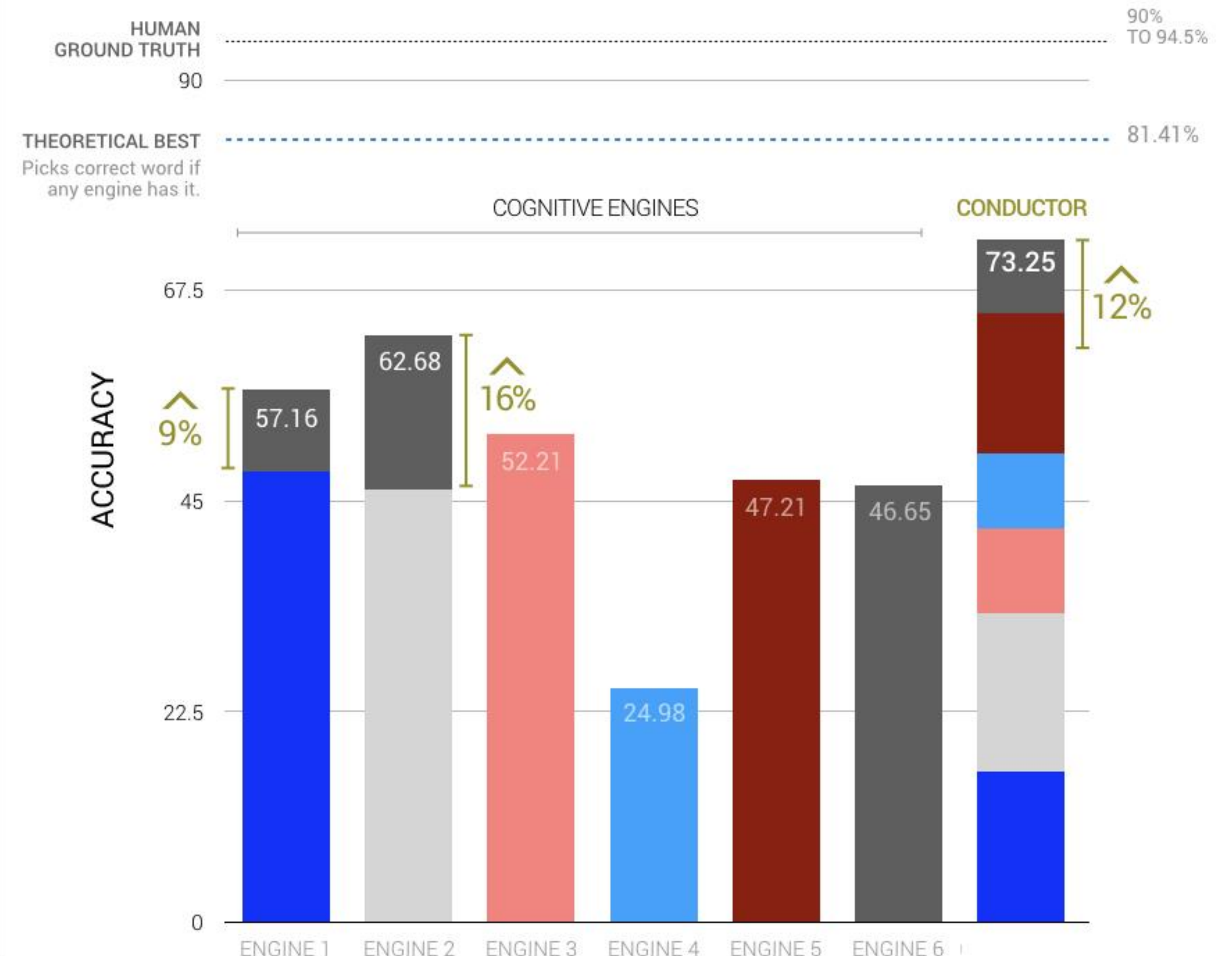
Results of Individual & Collaborative Engines

12% NLP Improvement Using Conductor

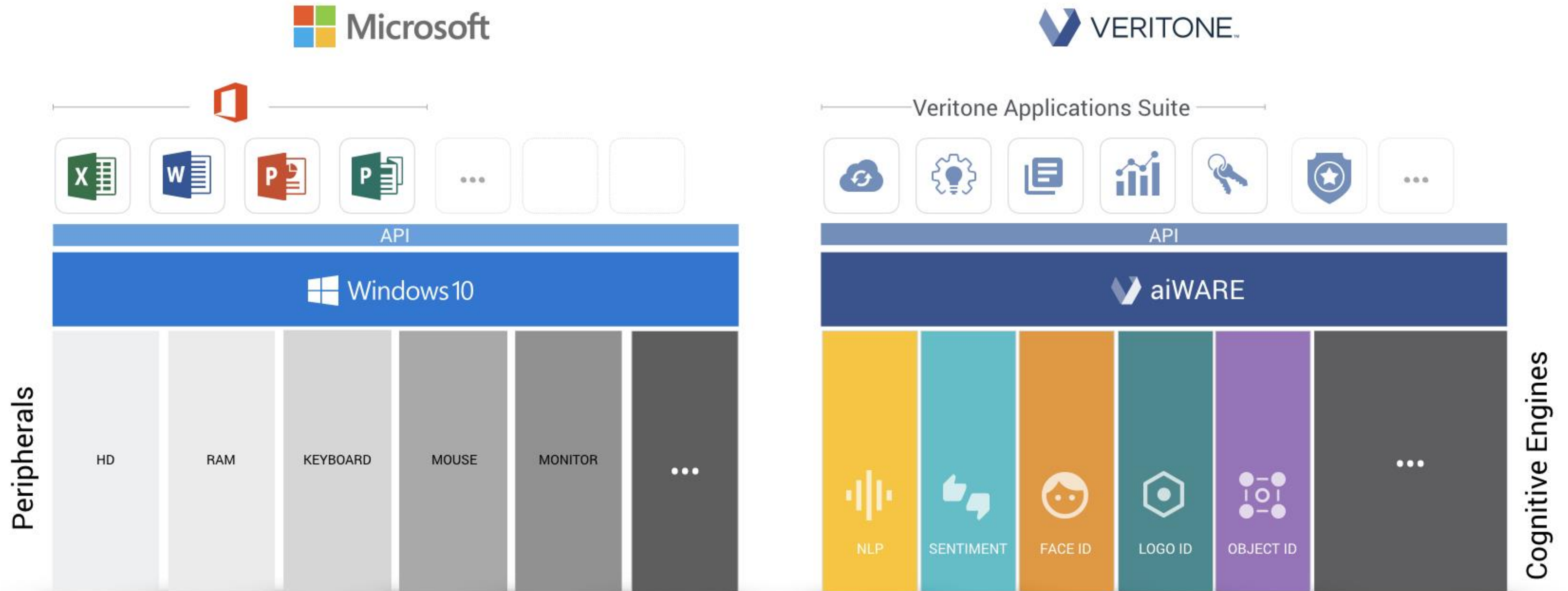
Two Weeks Ago - 89 NLP Engines



Today - 89 + 2 NLP Engines

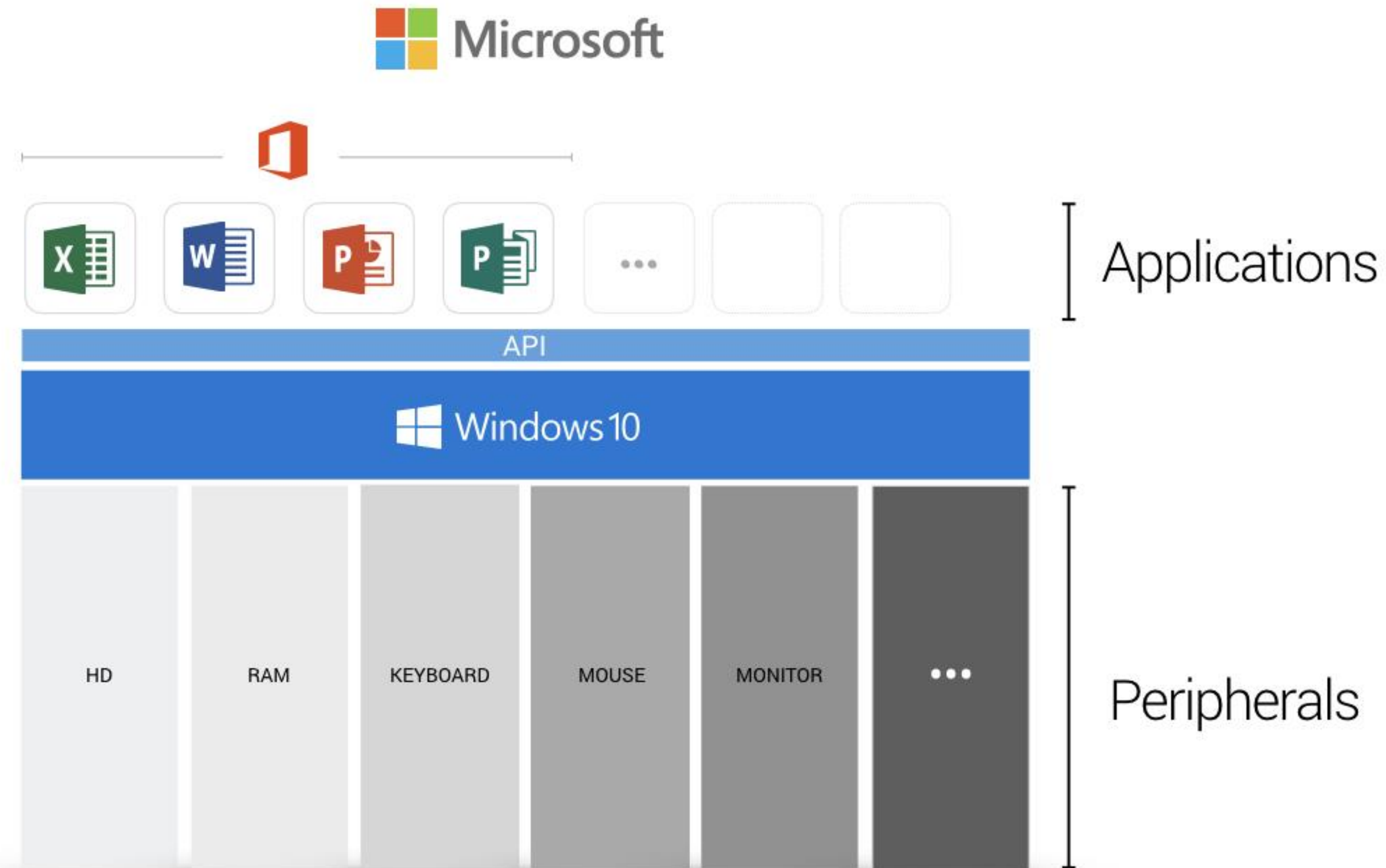


An Operating System for AI



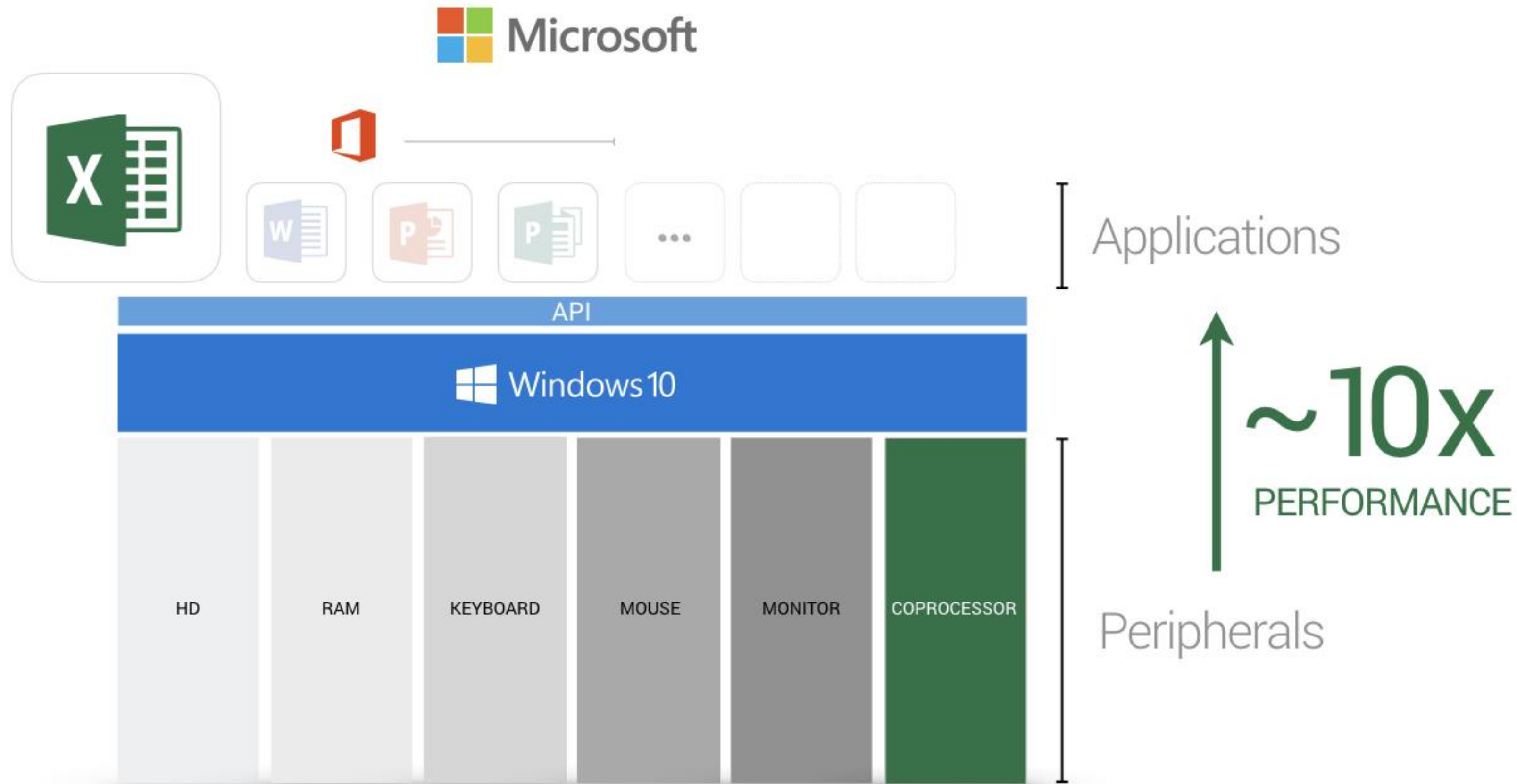
Classic Operating System

2 parallel paths for innovation supported by a framework for interoperability



Open + Innovation + Interoperability

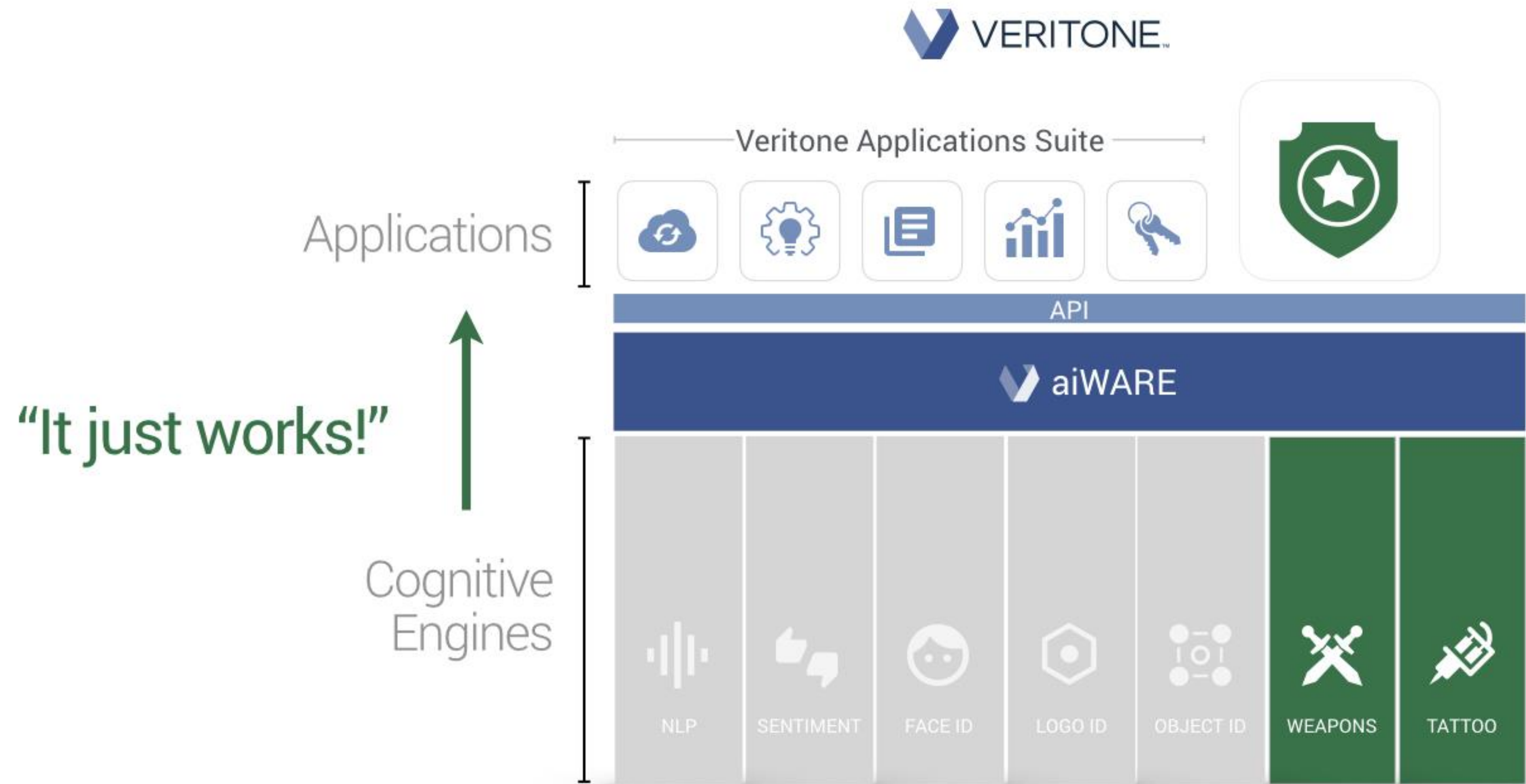
A proven equation for rapid technology adoption



aiWARE : Open A.I. OS



We're following a proven path



So, why is Elon so upset about A.I.?



Things seem good. Right?

Elon Musk

- Serial Entrepreneur
- Super-Wealthy
- Household name
- Invents products like Batteries, and now, Artificial Intelligence and delivers them in unique ways.

A.I.

Boston, MA

Los Angeles, CA



Zip2
1995



PayPal
1999



SpaceX
2002



Tesla
2003



SolarCity
2006



Hyperloop
2013



OpenAI
2015



Boring Co.
2016



Neuralink
2017

So, what's all of this about?

"I keep sounding the alarm bell, but until people see robots **going** down the street killing people, they don't know how to react, **because** it seems so ethereal."



Let's take a look back

Thomas Edison

- Serial Entrepreneur
- Super-Wealthy
- Household name
- Invented products that used electricity in a unique way, ushering in EoT: Electricity of Things



Stock Ticker
1869



Telegraph
1874



Phonograph
1877



Lightbulb
1879



Motion Pictures
1888



Edison General Electric
1890



Battery
1895

Killing: Dogs. Calves. Horses. Man.

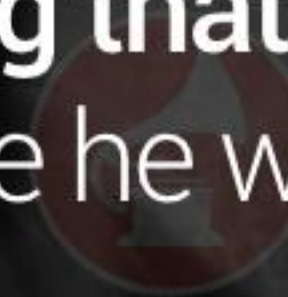
Edison used his power of influence to create a campaign of fear.
Stating that his competitor's technology would be lethal.
(while he was actively selling a nearly identical product).



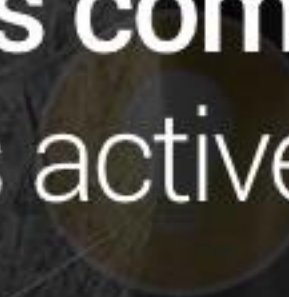
Stock Ticker
1869



Telegraph
1874



Phonograph
1877



Lightbulb
1879



Motion Pictures
1888



Edison General Electric
1890



Battery
1895

CAUTION

The following video, courtesy of Edison Film Company (1893),
contains graphic and inhumane material


To kill an Elephant - 1893

Film Crew and Electrical System provided by the Edison Company

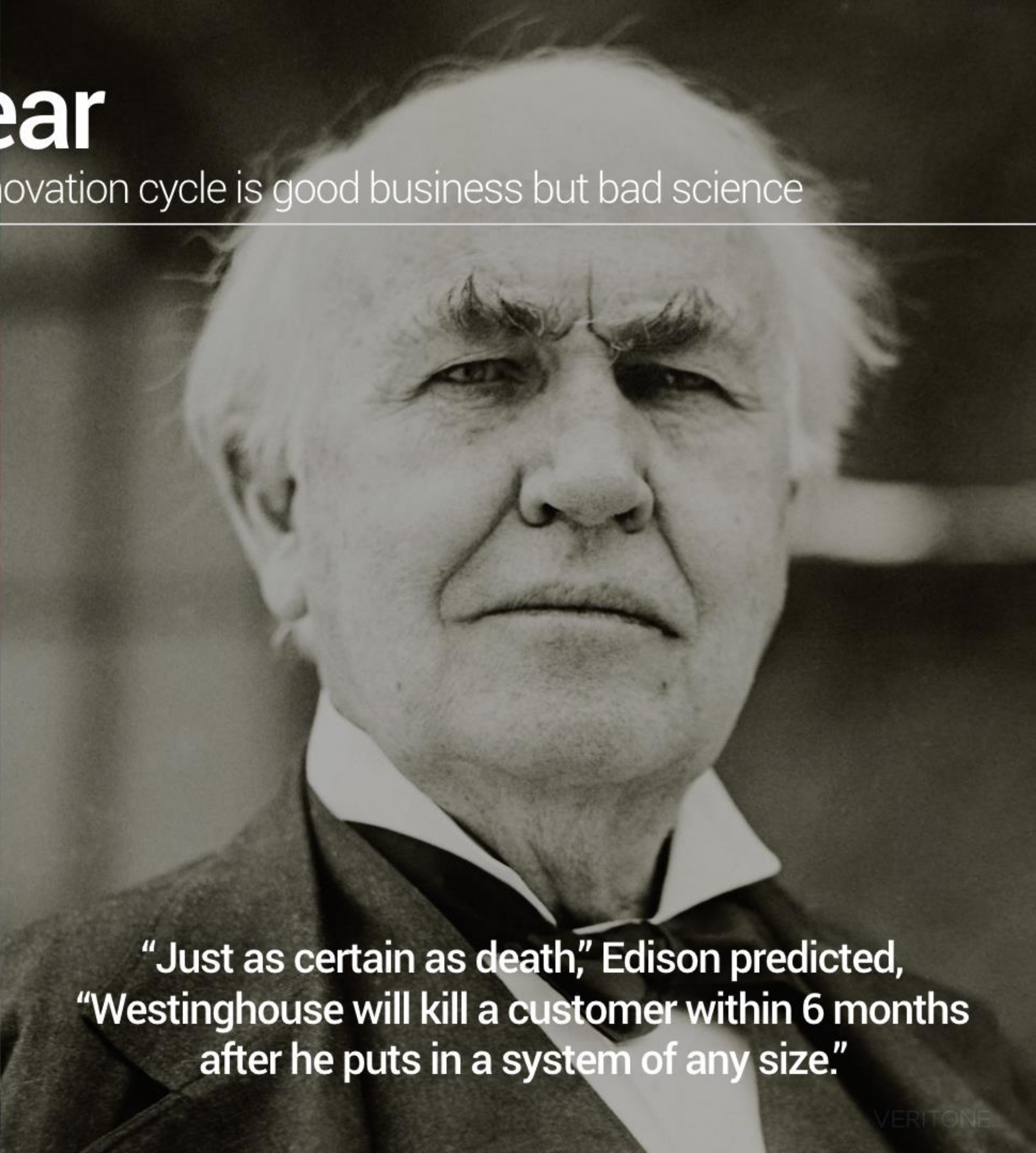


Fear

Slowing down your competition early in the innovation cycle is good business but bad science

A close-up photograph of Elon Musk with a concerned or fearful expression, looking slightly upwards and to the left. He is wearing a dark suit, a light blue shirt, and a red tie.

"[AI represents a] fundamental risk to the existence of civilization."

A black and white portrait of Thomas Edison, an older man with white hair, looking directly at the camera with a serious expression. He is wearing a dark suit, a white shirt, and a dark tie.

"Just as certain as death," Edison predicted, "Westinghouse will kill a customer within 6 months after he puts in a system of any size."

Who was Edison's competition?

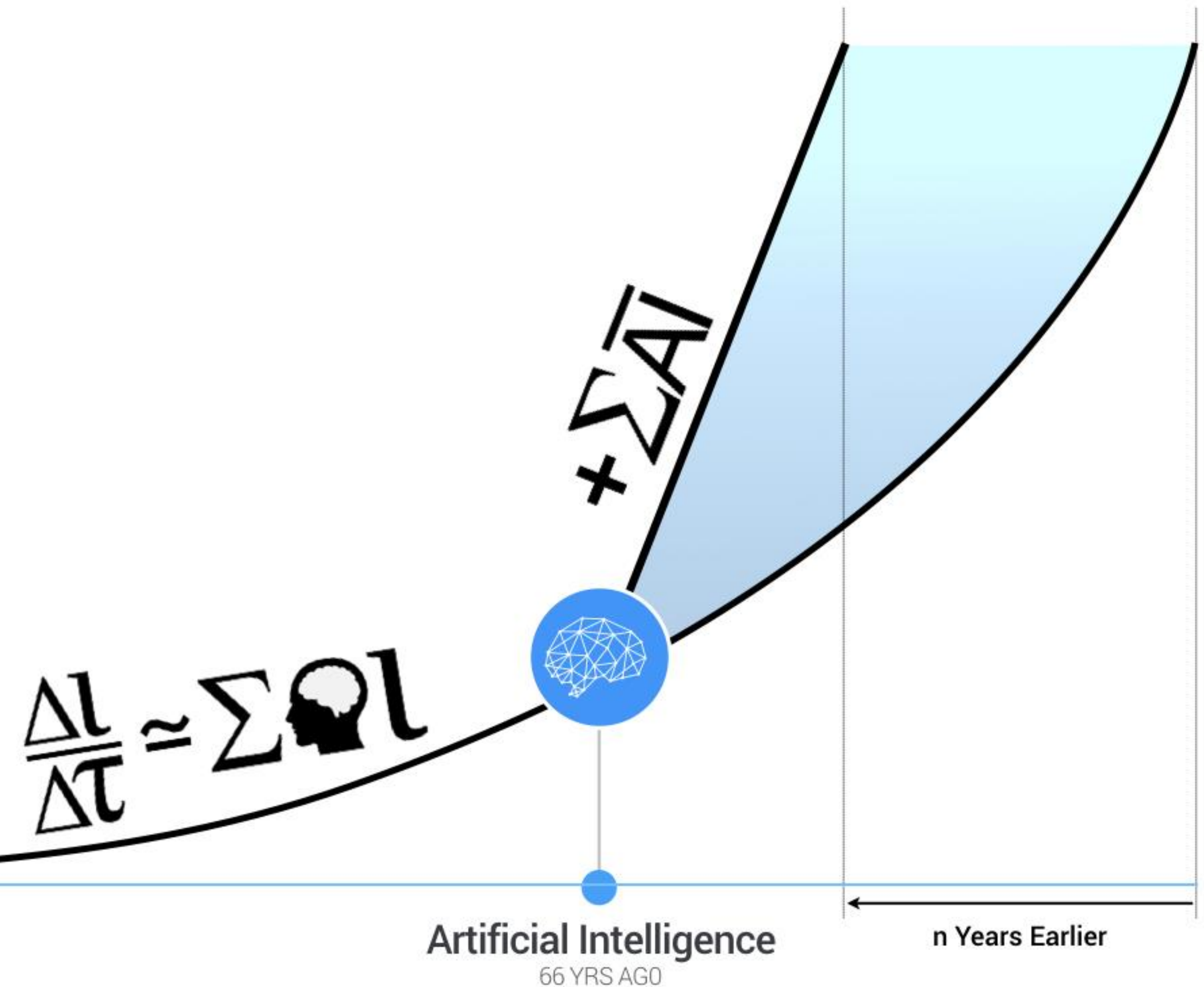
Nikola Tesla



The Human Innovation Curve + AI

$$\frac{\Delta I}{\Delta \tau} \approx \sum \text{Human Brain Icon} I + \sum AI$$

For the first time in history, the innovation equation is about to change. For it is no longer solely dependent on human cerebral capacity and population growth. Artificial Intelligence will become the dominant factor and hyper-accelerate the rate of innovation, as its algorithmic capabilities and computer processing power outpace its biological equivalent.



$+\Sigma\bar{A}i$

The future of human civilization will depend on Artificial Intelligence NOT perish from it.



Thank you

Chad Steelberg
CEO Veritone