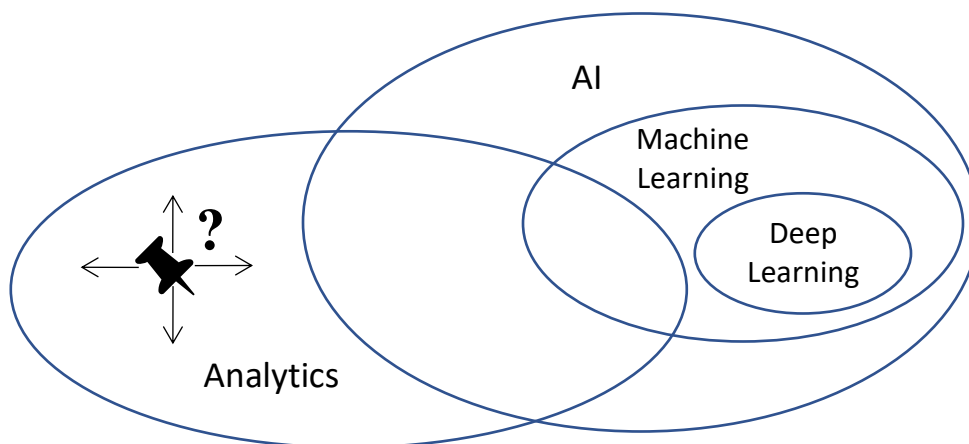


AI \neq Analytics

Last updated 6/26/2019 | Personal Opinion

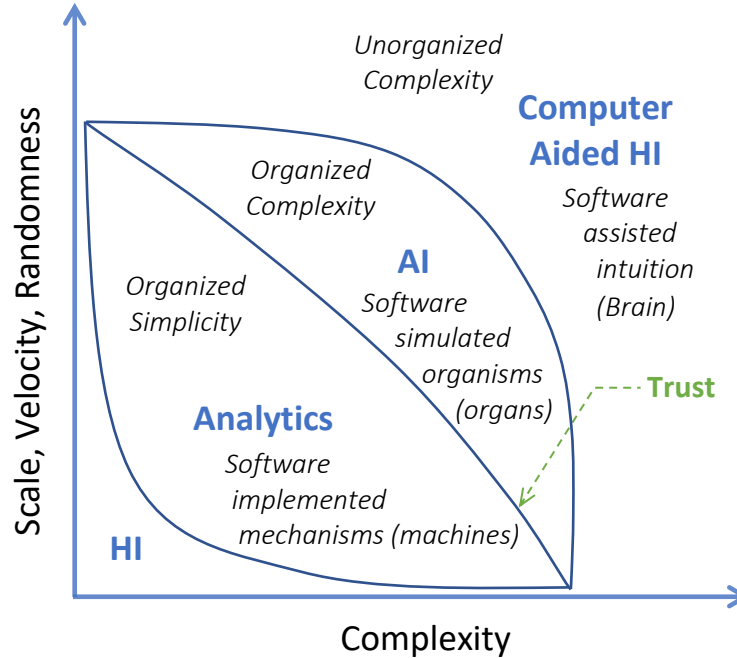
Watching Silicon Valley players eating their cake with AI, many old guard analytics vendors respond with a disdain: “AI = Analytics”, “AI = extension of Analytics”, “Analytics is the godfather of AI”... PR spin aside, no matter from what angle you look at it, equating AI with analytics sounds like a bit stretch, if not wrong.

Trying to pin down the relationship between analytics and AI with a Venn diagram proves a daunting task. But two things we should all agree upon: One is the specialization relationship between deep learning, machine learning, and AI. The other is that deep learning and analytics should be considered disjoint activities.



A Pragmatic View

Let's forget about theory for a moment and instead focus on the challenges posed by real life problems: Complexity corresponds to number of components a system has; Scale refers to number of problems to be solved; Velocity describes how fast data comes in which dictates the response time problem solver / agent has to solve the problem; Lastly but not the least, randomness in the problem domain easily messes up a perfect solution for a deterministic setting.



Human intelligence (HI) excels when scale is small, speed is low, and randomness is minimal. However, thanks to the intricate network of billions of neurons in our brain, human can handle complex problem at ease. Identify cats in five pictures? No problem. Tag a million pictures? No way.

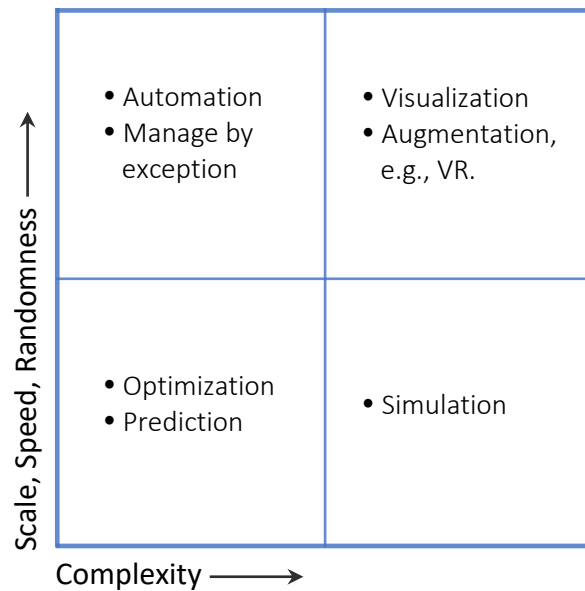
With unlimited memory and compute, analytics complements human's bounded rationality to tackle problems with large scale and high velocity. The rigor of math is used to tame randomness and decision science such as rules and optimization are used to reduce complexity to manageable chunks. Analytics is software implemented machines (mechanisms) that operates in a world of organized simplicity. In this world, sum of parts equal to the whole and replacement of a part doesn't affect the functioning of other parts in the mechanism.

AI ups the ante of analytics with self-learning capability and the relinquishment of mathematical models. Don't bother feature engineering, feed me the raw data and I'll figure the answer out! With the irresistible proposition comes the unexplainability of AI. The layered structure of deep neural network may look neat, but who knows what each of it's millions of weights controls? AI is software implemented organisms which operates in the realm of organized complexity where behavior of the whole is trained without knowing exact functions of parts.

When complexity, scale, velocity and randomness of the problem increase beyond certain level that computation can handle, human intelligence is the only way out, but with the help of analytics and AI. For an example, look no further than how the quants work in the hedge fund world: analytics and AI are merely used to pick up "signals" and ultimate trading decision is made by humans.

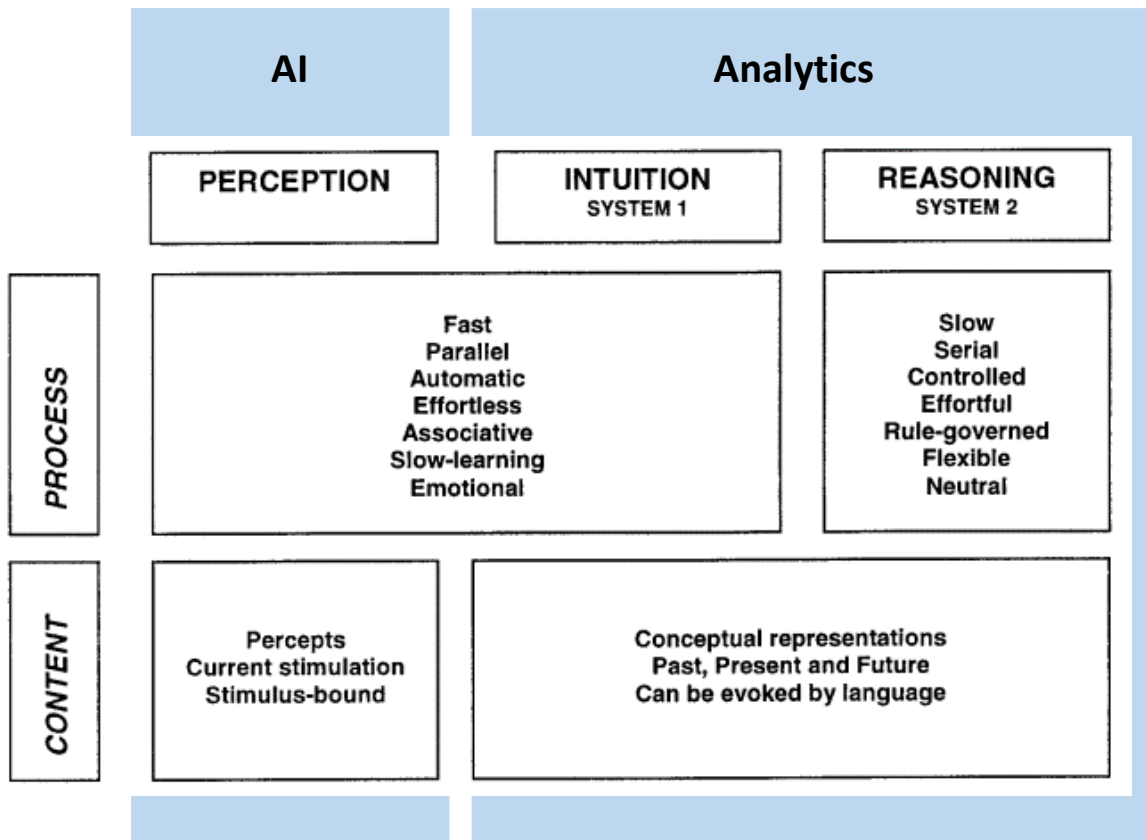
As technology advances, boundaries among the four regions shift. For example, when we completely understand and trust how deep Convolutional Neural Network works, image recognition architecture such as AlexNet and VGGNet can be moved from AI into analytics.

The solution approach to a given problem is dependent on where the problem lands in the complexity scale quadrant.



Use AI Where It Does the Best: Perception

A closer look at human intelligence also sheds light on the distinction between AI and analytics, in his Nobel Prize [acceptance speech](#), Daniel Kahneman talked about “the automatic operations of perception and the deliberate operations of reasoning” which maps nicely to AI and Analytics respectively. Analytics here are codified process and contents in human cognitive system. Note that perception is not even considered as part of the cognitive system.



To Summarize

	AI (Deep Learning)	Analytics
Inputs	Unstructured: Image, voice, text, video, ...	Structured: Tables, networks, hierarchies, ...
Cognitive functionality	Sense making (perception): The architecture of AI may be deep with many layers, but the killer apps of AI are limited to shallow perceptual tasks equivalent to those provided by eyes and ears.	Decision making (reasoning and optimization): Analytics happens after perception: conceptualization, reasoning, logic, rules, heuristics, optimization. If AI is eyes and ears, analytics is mind.
Utility provided to human	Automation: Recognizing a cat picture is super easy for human. But recognizing a million pictures are tedious.	Complement to human's bounded rationality: Humans are biologically bad at dealing with numbers, not to mention with speed. Ask a math professor to come up with the coefficients of the straight line fitted to a bunch of data points.
Trust	Inscrutable: Rather than trying to explain the inherently unexplainable AI with unfathomable techniques (K-LIME, any clue?), we should focus on setting up technical, social, and ethnical boundaries for AI, so they don't go amok.	Explainable, regulatable: Limiting the use of AI to low level perceptual tasks and taking their output as inputs to high level analytical models is a safe way of incorporating AI in highly regulated industries.

Analytics is still the king

It's always the simple things that are used the most. If you do a tally of the code that are executed in production systems, I bet the work horses are simple statistics such as means, distinct count, linear and logistic regressions, and analytics workloads out weight those of AI.

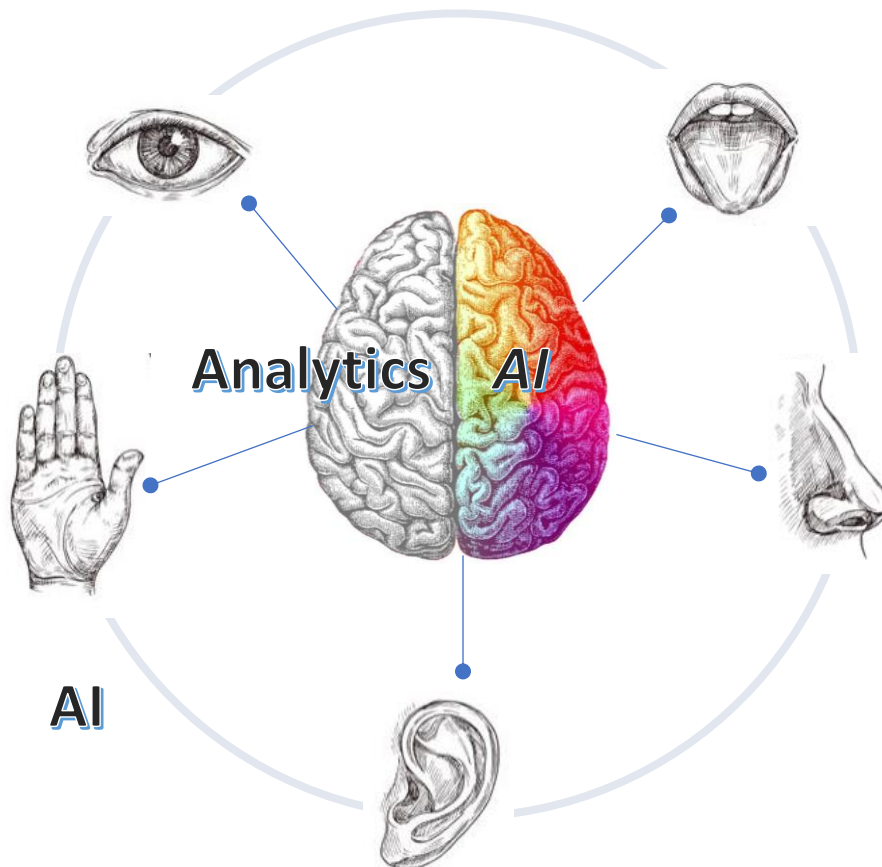
The vendor who creates the most values for customers won't be those who are the best at AI perception such as image tagging or object detection. Rather, it's those who **offer customers the most value-adds (automation, decisions) on top of the results of AI perception**. If AI is the optic fiber construction workers stretched in your neighborhood, analytics is the **last mile** that delivers the gigabits service into your home.

As AI matures beyond simple perception, some of the **pattern finding** capabilities of the right brain maybe emulated by AI. But to get to the Artificial General Intelligence (AGI), symbol-based **logic** capabilities of the left brain is a must.

So the Right Attitude Toward AI?

Analytics + AI = AGI

We'll take advantage of AI, but our focus is always on analytics.



References

[1] CMU's Zachary Lipton blogged about the [rebranding history](#) from AI to ML then back to AI.