A.I. – A poor name

Why Artificial Intelligence is better named Mathematical Engineering

Artificial Intelligence is a poor name for a field.

We don't call Aeronautical Engineering “Artificial Human Flight”; we don't refer to Biological Sciences as “Body Works”.

Names matter – they frame and shape our ambitions. Artificial Intelligence, and its spin-offs, Generative AI, Artificial General Intelligence, and so on are too narrow for what the field could be.

Just as Aeronautical Engineering talks about much more than Human Flight alone, covering generalized scientific principles for flight to building flying machines, Artificial Intelligence could be so much more. Our fields should not be named after just one of the objectives that it is pursuing.

Let us look at it from a different lens. Why is Artificial Intelligence related to, but not the same as Computer Science? Is it even a subset of Computer Science, and should it be? The reality is that computers are where the work of artificial intelligence is done; an absurd parallel is to ask, “Should Mechanical Engineering be a branch of Workshop?”.

What then is a better name for Artificial Intelligence? I am torn between two different names: Mathematical Engineering, and Mathematical Machines. On balance, I would lean towards the former – Mathematical Engineering (but more on the latter name in a bit).

Artificial Intelligence brings together several fields of mathematics – Matrix Algebra, Linear Equations, Calculus, and Statistics – into a practical application. Just as with other engineering, small black-boxes are built with mathematical functions that can be later replaced or fine-tuned, and these black-boxes are combined together using specific algorithms to simulate human intelligence. When building these black-boxes, we find parallels with the biological human brain, just as an airplane wing could draw inspiration from a birds wing, these machines can draw inspiration from organic and biological systems, without copying them exactly.

With a mechanical system like a car, the internals of the car are individual black-boxes (engine, chassis, brake system), and there is an algorithm that brings them together (the drivetrain) – similarly with AI systems, you can understand them like a system of black-boxes that are orchestrated with an algorithm: the perceptron network, the cost reducer, the backpropogator, the attention head, and so on, which are orchestrated through pre-training, fine-tuning, and so on.

This view of Artificial Intelligence allows for a few important outcomes:

1. **Abstraction & Separation of Concerns**: The system can be studied as a system of interconnected black-boxes, each performing a clear abstraction. This can allow a novice to also learn the conceptual aspects of the field quickly.
2. **Specialization**: Each blackbox can be understood independently, and studied at length (just as someone could spend their lifetime working on an engine subsystem as a mechanical engineer)
3. **Flexibility & Fine-tuning:** Each blackbox can be fine-tuned for different outcomes, or can be replaced with different parts.
4. **Experimentation:** You can use these different blackboxes in interesting ways to simulate other outcomes: what if we wanted to simulate bird-intelligence, or simulate Vulcan intelligence? What if we wanted to analyze something not classification or prediction related at all (today's 'closed' definition of intelligence) , say something like creativity or emotional states?
5. **Generalization (from data):** Further, data, which is a large part of the Artificial Intelligence discourse today, can be largely ignored. While data manipulation is a critical aspect of the field, each blackbox can be understood and studied as taking in data from some source and in some specified format - and the rest can be safely ignored.
6. **Generalization (from electronic systems)**: Lastly, separating Artificial Intelligence in this way from Computer Science allows for us to understand these blackboxes as potentially working on more power-efficient and sustainable organic or chemical systems. Our choice of implementation of these blackboxes is computers today - but perhaps better systems can be found?

All these blackboxes above are mathematical functions, and that is why the name Mathematical Engineering. The alternate name proposed above, Mathematical Machines, allows for us to see these blackboxes as components that can be fine-tuned, replaced, and strung together in different ways, and reduces the "scare factor" of the word engineering!

This naming can still be used, and is useful: just as an Airplane can be understood as a machine (the utility aspect), and as an engineering marvel (the systems and algorithms to build such a machine), what we call Artificial Intelligence today can be understood as such - ChatGPT is a Mathematical Machine, and we can marvel at the Mathmatical Engineering work required to create it...

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