On Limits of Thought

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Abstract

Analogously to science reducing objective reality to fundamentals, we apply mathematically inspired reasoning, chosen for its typical effectiveness, to describe human knowledge.

1 On Knowledge

We first define a set as a collection of elements, a map as a directed association between sets, and assume aspects of the world can be thus represented discretely. Assume a completely objective reality, objectivity meaning degree of independence from the individual. Assume time is an objective fundamental, and define a process as a subset of our overall model though time. Define a thought as a set of neural impulses in time, and define a model as a set of thoughts. Consider the distinct sets representing thoughts possible in a human mind and everything in the world, our emphasis being human knowledge of human systems.

Observation is a mental process that inputs external data into thought, i.e. a measurement. Understanding is another mental process, making some sense of the input data. Human knowledge is often a combination of observation and understanding, which are not necessarily distinct. Both observation and understanding are limited by human physiology, and so typically incomplete and error prone. Other considerations aside, we already see human knowledge is imperfect. We can augment our physical ability to observe and understand by using tools, e.g. scientific instruments and computers. Examples of observation are the five senses, and of understanding are thought, emotion, and instinct, making for different forms of knowledge.

We define human measurement as a mapping process from the world to our minds, creating a mental correspondence to reality. Measurement is an infintesimally iterative entanglement of the individual and world, which we represent by degree of objectivity, an abstraction existing only in thought. Inversely to objectivity, thoughts become reality, e.g. attitude. We define truth of the objective component of measurement as a metric measuring degree of correspondence of sets. Thus we extend ’true or not?’ to ’how true?’ And measurement can be very true in one sense, that is by one metric, but not in another.

We define the knowledge map and its truth as purely abstract extensions of measurement. Degree of correspondence through time from the world to our minds can be stable or unstable, and some metrics of its truth are effectiveness and probability. Truth of knowledge is a pure abstraction; what does it mean to know it? Undefined; we can only perpetually test it by measurement. Likewise, knowing the veracity of our model is also undefined; it can only be tested. How can we know the truth of any model that defines knowledge and truth? In general, it is always a thought, and so, physically limited. Our model of knowledge is defined to be very truthful in terms of itself; self-consistency is perhaps the best we can do.

As human measurement is only somewhat objective, determining what exactly is objective is difficult and is easiest using scientific instruments. Human measurement is limited by physical law and the capability of the mind; computers will extend this to physics alone. We abstractly represent this through the knowability or maximum possible truth of the knowledge map.

Some corollaries. As the world is vastly larger than the mind, the world is mostly unknown. Of necessity knowledge of the world is condensed. Colloquially: we don't know what we don't know, and often what we think we know, we don't. Knowing the odds is undefined; the odds exist only in people's minds, and a market takes a poll.

2 On Models

Some pure abstractions. A model's truth is its degree of correspondence to reality. A model's scope is its nonzero preimage in reality; namely, everything it corresponds to, or 'covers' to a degree. A model's scope can extend far outside that of human experience, albeit often with less truth.

We define the representability of a model as how truthfully it can be mapped from the mind to the world. Representability is an abstraction representing a current physical limit on human ability to communicate, and not an inherent feature of models themselves. Representability may be surpassed using human computer interfaces. Human experience is very true and somewhat representable, mathematics applied to the world is somewhat true and completely representable, pure mathematics is completely true and completely representable, and human rationality or reason is somewhat true and somewhat representable. A highly true and highly representable model allows for transmission of knowledge.

The philosophy of science is to create a minimal number of truthful representable models of the world. It compares and reduces knowledge to fundamentals, and if necessary, extends this base self-consistently. Science establishes the axioms of objective reality. The limits of science are knowability and representability.

In the humanities, we have measurement only, and objectivity difficult to establish. Somewhat true models make strict comparison and reduction to axioms impossible, and the scientific ethos inapplicable. However, we can identify models having potentially more truth. We consider multiple models together, each covering important aspects of reality, that in aggregate may capture more truth. This checklist of models is effective in practice.

Lacking fundamental axioms, we assumed and used human reason, because it is often effective in practice. Why is reason effective? Founded on reason, our model cannot answer this. It can only suggest the cause lies in the nature of reality, human thought, or human adaptation to the world. Amazingly, human simplicity is also often effective.

3 On Structure

Define learning as iteratively increasing knowledge or truth through action. Action is a process wherein thought physically directs an individual. Nontrivially, what action will teach is somewhat non-objective and unknowable.

Define an operator on a learning process as a model influencing its progression, with the process possibly influencing the operator as well. For a fixed operator, we consider the number of iterations and degree of learning in each step. Very notably, unlearning can be physiologically difficult, making learned falsehoods pernicious and ease of learning dangerous.

Survival trains instincts and emotions very effectively with narrow scope. This training is multigenerational and automatically eliminates fatal error. Instinct and emotion are coarse knowledge, and thus often illusory considered factually.

Conscious direction trains models with varying effectiveness and scope. Models are learned within one lifetime, notwithstanding genetic priming. The effort of learning is substantial, with truth difficult to ascertain, and scope difficult to expand predictably. For example, consciously 'asking why?' trains human reason somewhat effectively with broad scope. Reason is precise, thus it enables more effective models.

Innate knowledge is as precise as necessary for effectiveness. For example, human audiovisual knowledge is particularly precise, and higher thinking may build upon this. The structure of reason may be based on our physical evolution to our environment. Thus reason itself may be environment specific, and hence limited. The precise extent of human physical priming for reason is difficult to measure and replicate in a computer. A different environment may create a different form of intelligence, unsuited to our physical reality and incomprehensible to humans.

A model's structure influences the model's scope. Considering reason's precision, broad thought can result in creative constructs atypical of reason, and intuition provides almost instantaneous results inaccessible to ponderous reason. What are the structures of thought? They are connected to the physical operation and structure of the brain, and difficult to determine by reason alone. While physical limits may exist, we wonder at the possibilities of thought and the scope of the mind.

Continuing our mathematical analog, topology defines micro structure on a set; it is loosely defined as prototypical groupings of elements into 'open sets'. Here we refer to granularity, i.e. coarse or fine, and implied precision of maps connecting topologized sets, i.e. the coarser. Thought has varying granularity in neural impulses and time, and may have a minimum functional granularity. The world may have minimum granularity in space, matter, and time. The topology of thought determines the precision of measurement, and hence abstractly, that of the knowledge map. Geometry characterizes macro structure on a set; in the mind we refer to deep, superficial, left, right, etc. Reformulating, what are possible topologies and geometries of thought?

Different forms of thought are often entangled in the mind. Recognizing and understanding their relations is difficult. For example, deep coarse knowledge typically dominates. We see self-directed reason is imperfect, with objectivity necessary to refine mental knowledge. The 'self' itself evolves. Precise knowledge of all mental faculties is unnecessary for their effective use. Dangerously, incorrect knowledge can self-impose false limitations.

Humans learn to frequently use certain models, typically without examining their efficacy and limitations, or awareness of this process. These habits of thought include reason, science, language, religion, culture, law, etc. Models are imperfect in knowledge and representation, and vary in scope. Therefore, accustoming flexibility between models is most effective generally, distinguishing art from science. Often precise knowledge is far less practical than coarse effectiveness, and possible precision may even be limited. Often we don't need to know why, just that it works.

4 Applications

The mass behavior of people is somewhat nonobjective and unknowable. It can change depending on the observer's role and the people's manner of thought. With experiments non-repeatable, the key parameters of reality are difficult to identify and generalize in a model, with at best limited truth. Thus the scientific model has limited applicability to finance, economics, and the humanities. Human systems are best explained by multiple models that work for a time to a degree.

Considering some examples, company performance and stock price are not always entirely distinct, and likewise for human nature and nurture. The economy functions best implementing a mix of structure and freedom. Value investing often works because of the high degree of confidence or truth possible in estimating how much, how likely, and when. As knowledge is imperfect, we see research is most accurately appraised conservatively. Thus economics should err toward human dignity, medicine toward noninvasion, and justice toward mercy.

References

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