12-2015

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Comments:
Technical Report: UTEP-CS-15-95
To appear in *Journal of Uncertain Systems*, 2017, Vol. 11.

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Abstract

At first glance, Tertullian's idea – that absurdity of a statement makes it more believable – sounds irrational, maybe appropriate for theology but definitely not for science. However, somewhat surprisingly, a similar idea was successfully used by the Nobelist Niels Bohr in theoretical physics – an epitome of rationality in science. In this paper, we show that this Tertullian-Bohr idea actually has a simple rational explanation. Specifically, if previous attempts to construct a theory which is consistent with what is perceived as common sense were unsuccessful, this implies that a true theory much contradict common sense – and thus, the fact that a given theory contradicts common sense increases the probability of its correctness.

1 Formulation of the Problem

Historically first claim: in theology. The famous Latin phrase *Credo quia absurdum* (*I believe because it is absurd*) attributed to Tertullian, the father of Western theology, is actually not an exact citation: it is a paraphrase of a statement "prorsus credibile est, quia ineptum est" ("it is by all means to be believed, because it is absurd") from his book *De Carne Christi* (*On the Flesh of Christ*); see, e.g., [4].

Somewhat surprisingly, a similar claim has been made in science. A scientifically minded reader may be tempted to dismiss this phrase as an example of irrational thinking of theology as opposed to rational thinking of science. However, a very similar statement was regularly made by a modern scientist, the Nobelist Niels Bohr. In 1958, after another Nobelist Wolfgang Pauli presented his and Heisenberg's nonlinear field theory of elementary particles at a Columbia University seminar, Bohr famously said: "We all agree that your theory is crazy.

The question that divides us is whether it is crazy enough to have a chance of being correct"; see, e.g., [1, 2].

Is there a rational explanation for this seemingly irrational idea? At first glance, the idea that the absurdness or craziness can somehow increase our degree of belief in a statement seems irrational. But since Niels Bohr, an extremely successful scientist, has used this idea, it make sense to see if this idea can indeed by rationally justified.

What we do in this paper. In this paper, we show that this idea can indeed be explained in rational terms.

2 Qualitative Analysis of the Problem

Description of the situation. In general, we have a set of facts $F = \{F_1, F_2, \ldots\}$ that we need to explain – and for which we do not yet have a good explanation.

That we do not have a good explanation means that all the previous attempts to come up with a theory,

- which explains all the facts and
- which is consistent with what is now considered common sense C

have not been successful.

What can we infer from this situation. Numerous attempts to come up with a theory which is consistent both with the facts F and with common sense C have failed.

These were attempts by very smart people; in case of physics, by Nobel prize winners. It is therefore reasonable to conclude that if it was possible to come up with a theory which is consistent both with F and C, then there is a high probability that such a theory would have been found.

The fact that such theory has not been found is an indication that with high probability, such a theory does not exist. Thus, with high probability, any theory which explains all the facts should be inconsistent with the common sense C – what Tertullian calls absurd and what Bohr calls crazy.

Resulting explanation. So, if we have a theory that explains some of the facts, and we also know that this theory is inconsistent with C, this inconsistency increases our degree of belief that this theory is correct. In other words, the seeming absurdness (craziness) of a theory does seem to increase our degree of belief that this theory is true.

Comment. To make this explanation more convincing, let us supplement the above qualitative explanation with a simple quantitative one.

3 A Simple Quantitative Analysis

Description of the situation. When a theory is proposed, usually, it is first checked against a few basic facts, at which point it is presented to the community – and checked against other facts as well. Let us therefore consider only theories which are consistent with all these basic facts.

Out of all such theories, some turn out to be true – i.e., consistent with all known facts – while others will eventually turn out to be inconsistent with some of the known facts. Let us denote the event that the theory is consistent with all known facts by T. Let $P(T)$ denote the probability of this event, i.e., the probability that a theory which is consistent with the basic facts will also be consistent with *all* known facts.

As we have mentioned earlier, we have strong reasons to believe that a theory which is consistent with all the known facts will be inconsistent with common sense. Let us denote inconsistency with common sense by I. The above belief means, in effect, that the assumption that the theory explains all the facts increases the probability that this theory is inconsistent. In other words:

- the conditional probability $P(I \mid T)$ that a consistent-with-all-the-facts theory is inconsistent with common sense is higher than
- the probability $P(I)$ that a randomly selected theory contradicts common sense:

$$P(I \mid T) > P(I). \tag{1}$$

What we want to explain. What we want to explain is a "strange" idea that, once we learn that the theory is inconsistent with common sense, our probability that this theory is correct increases. In other words, the idea that we need to explain is that

- the conditional probability $P(T \mid I)$ that a theory is true under the condition that it is inconsistent with common sense is larger than
- the general probability $P(T)$ that the theory is true:

$$P(T \mid I) > P(T). \tag{2}$$

Explanation. Let us show that this seemingly counterintuitive idea can indeed be explained, i.e., that indeed (1) implies (2).

Indeed, by definition of conditional probability $P(A \mid B) \stackrel{\text{def}}{=} \dfrac{P(A \,\&\, B)}{P(B)}$, the equation (1) means that $\dfrac{P(I \,\&\, T)}{P(T)} > P(I)$. Multiplying both sides of this inequality by $P(T)$, we conclude that $P(I \,\&\, T) > P(T) \cdot P(I)$.

This expression is symmetric with respects to T and I. Thus, if we divide both sides of this inequality by $P(I)$, we get $\dfrac{P(I\,\&\,T)}{P(I)} > P(T)$. By definition of conditional probability, this means exactly that $P(T\,|\,I) > P(T)$.

So, we can indeed infer the desired inequality (2) from the given inequality (1). The seemingly irrational idea of Bohr (and Tertullian) is thus explained.

Acknowledgments

This work was supported in part by the National Science Foundation grants HRD-0734825 and HRD-1242122 (Cyber-ShARE Center of Excellence) and DUE-0926721.

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