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Editorial

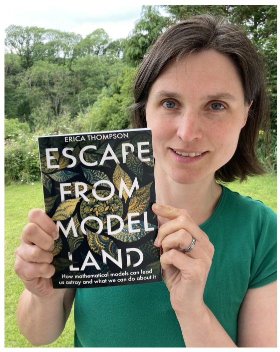
Dear Reasoners, it a pleasure to introduce this issue, featuring my interview with Erica Thompson. Erica is Senior Policy Fellow at the LSE Data Science Institute in addition to being fellow of the London Mathematical Laboratory and Honarary Senior Research Fellow at UCL Department for Science, Technology, Engineering and Public Policy. She recently authored *Escape from Model Land: How Mathematical Models Can Lead Us Astray and What We Can Do About It*, a book which brings to the wider audience a set of thorny methodological issues related to mathematical models. It has received great reviews in, among others, The Guardian, The Wall Street Journal and The Economist. In the interview Erica covers the path which led her to writing the book, and more generally to develop her highly interesting views on how uncertainty sometimes can be way trickier than we expect. I'm grateful to Erica for her time and for sharing her thoughts with the readers of The Reasoner.

Hykel Hosni
University of Milan

Features

Interview with Erica Thompson

Hykel Hosni: Can you tell us about your background?



Erica Thompson: I studied Natural Sciences for my undergraduate degree, because I couldn't decide which subject I liked best. After specialising in theoretical physics, I realised that I had a choice between studying extremely big things (astrophysics) or extremely small things (quantum physics). But for me the interest of science has always been in the human scale, things that you can observe directly, and so I was more interested in statistical physics, electromagnetism and particularly fluid dynamics. To study those, it turned out you needed to be in the Maths department, so I switched subjects and pursued an MMath.

HH: Was it, in retrospect, a good choice?

ET: Well, I have no access to my counterfactual life and wouldn't trust a model of it, so I can't make a relative comparison but I am happy with how things have turned out! I took

Uncertain Reasoning

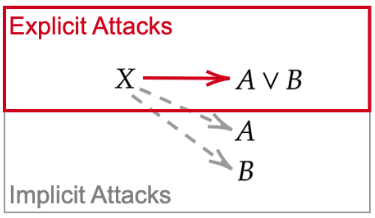
Let us consider the following statements:

X : Gas price rises;

A : Hybrid car sales fall;

B : SUVs sales grow.

Then, we could agree that whenever the gas price rises, it is not the case that hybrid cars sales fall or SUVs sales grow, i.e. *X attacks* $A \vee B$, in symbols $X \longrightarrow A \vee B$. X and $A \vee B$ should be understood as claims of two different arguments where arguments are entities made of three parts: the support, the claim (or conclusion) and the method of inference between the support and the claim. Suppose now that these two arguments, presumably, belong to a bigger argumentation framework and in principle, there might be not just one, but a class of them. Therefore, by only looking at the explicit attack $X \longrightarrow A \vee B$, we shall say that the implicit attacks $X \longrightarrow A$ (whenever the gas price rises, it is not the case that hybrid car sales fall) and $X \longrightarrow B$ (whenever the gas price rises it is not the case that SUVs sails grow) should also belong to the class of argumentative frameworks compatible with $X \longrightarrow A \vee B$.



These kinds of rules referred to as Attack Principles (APs), have been introduced in (Corsi and Fermüller, 2017), they have been defined for all main four connectives and they refine the existence, or not existence, of specific attack relations once the arguments involved share in their claims some propositional formula. APs are defined on an intermediary level of abstraction between Dung-style argumentation frameworks where both the arguments and the attack relation are abstract entities (Dung, 1995) and deductive or logical argumentation frameworks where the arguments are defined as above and also the attack relation is instantiated using some logical inferences that the argument involved might or might not satisfy (Besnard and Hunter, 2001). Even though the above attack principle seems very reasonable and easy to formally justify, this might not always be the case. For example, the strong attack principle for conjunction states that if an argument with claim X attacks an argument with claim $A \wedge B$, then the former argument either attacks also an argument with claim A, or an argument with claim B. The use of the term *strong* for the attack principle just introduced refers at the fact that this principle, in contrast with one concerning disjunction previously introduced, is hard to justify. Thus, if our explicit attack is $X \longrightarrow A \wedge B$, we might be hesitant about how to close off the argumentative framework and consider compatible both the argumentative frameworks in which $X \longrightarrow A$ and $X \not\longrightarrow B$ and those in which $X \longrightarrow B$ and $X \not\longrightarrow A$. The symbol $\not\longrightarrow$ stands for *not attacking*.

The general approach in abstract and deductive argumentation theory is that, given an argumentation framework, identify which argument or set of arguments is more acceptable than others. Thus, all the arguments are known and the attack relations are explicit. Through the attack principles, we can change the perspective and given some attack relation among arguments, that might be seen as *evidence*, we are able to identify the class of frameworks compatible with it. However, some attack principles are easier to justify than others and depending on the set of attack principles we consider acceptable the class of argumentation frameworks compatible with the evidence might change. The understanding of the compatible argumentation frameworks given a specific attack can be seen as an *explanation* of the existence of that attack. E.g., going back to the example, a possible explanation for the attack $X \longrightarrow A \vee B$ is that the argument with claim X also attacks both the argument whose claim is A and the argument whose claim is B. This inference process can be related to *abductive reasoning* in which, given some data (or evidence) we infer the best explanation. In our specific example, the attacks $X \longrightarrow A$ and $X \longrightarrow B$ are naively acceptable and once the arguments and the attack relations are instantiated in logical argumentation frameworks, we can find a counterexample whenever the attack relation is, for example, *defeat*. In addition, in abductive reasoning, the conclusion does not deductively follow from the premises. In the context of argumentation theory and attack principles, it is not even clear which should be the logic of the arguments and if classical logic seems to be a good candidate, many are the reasons (e.g. the expressive power or the computational complexity) to consider weaker logics. In a recent work by Arieli, Borg, Hesse and Straßer, (Arieli et al. *Abductive Reasoning with Sequent-Based Argumentation.* Proceedings of the 20th International Workshop on Non-Monotonic Reasoning, Part of FLoC 2022) where arguments are understood as sequents, the authors introduce *abductive sequents* which are expressions of the form $A \dashv \Gamma[\varepsilon]$ with the intuitive meaning that "(the explanandum) A may be inferred from Γ, assuming that ε holds". Abductive arguments are a new type of hypothetical argument that is subjected to potential defeats. Given its high degree of modularity, these new enriched sequent-based frameworks might represent a good starting point to formalise the argumentative reasoning depicted above. The explanandum could be understood as the attack on the argument with claim A, Γ could be instantiated with the attack on $A \vee B$ and $[\varepsilon]$ could be seen as the satisfaction of the attack principle **(A. ∨)** If $X \longrightarrow A \vee B$, then $X \longrightarrow A$ and $X \longrightarrow B$. Thus, given an attack principle and an explicit attack, the corresponding abductive sequent can be defined and a new argumentative framework that works at meta-argumentative level is introduced. Then, the several argumentation frameworks compatible with the initial attack relation can be characterised by the different abductive arguments that can be generated considering the different ways of "closing off" the initial attack considering the various APs.

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