

- VINCENZO CRUPI, TIZIANO DALMONTE, ANDREA IACONA,

*Non-monotonicity and Contraposition.*

University of Turin.

*E-mail:* [andrea.iacona@unito.it](mailto:andrea.iacona@unito.it).

It is widely acknowledged that an adequate formal theory of defeasible reasoning must not include *Monotonicity*, the principle according to which, if  $\alpha$  entails  $\beta$ , then  $\alpha \wedge \gamma$  entails  $\beta$ , for any  $\gamma$ . A consequence relation that does not have this property — and so qualifies as non-monotonic — crucially differs from the classical relation of logical consequence. What remains to be settled, however, is which of the other properties of the latter relation should be retained.

In a seminal paper, Gabbay (1985) suggested a restricted set of fundamental properties of non-monotonic logic. His proposal has then been elaborated and refined in different ways. Notably, Kraus, Lehmann, and Magidor (1990) identified a set of properties of non-monotonic systems — known as KLM logic — which included Gabbay’s properties. The current literature on non-monotonic logic contains a wide variety of formal theories that develop similar ideas.

There is one point, however, on which most of these theories tend to agree, and which we do not find fully satisfactory: *Contraposition* — the principle according to which, if  $\alpha$  entails  $\beta$ , then  $\neg\beta$  entails  $\neg\alpha$  — is hardly regarded as an essential trait of defeasible reasoning. As far as we can see, no compelling reason has ever been provided for thinking that defeasible reasoning is non-contrapositive.

The line of thought articulated in our paper, accordingly, hinges on the idea that Contraposition is an essential feature of defeasible reasoning. First we define a minimal logic where Contraposition features as the characteristic principle. This logic will be called **E** — for ‘evidential’ — in line with the terminology adopted by Crupi and Iacona (2022). Then we show some interesting relations that hold in **E** between other principles that have been widely discussed in the literature on non-monotonic logic. Finally, we discuss different ways of strengthening **E**, and provide suitable semantics for each of them.