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DISCUSSION NOTE

THE COUNTERFACTUAL THEORY OF INFORMATION REVISITED

Hilmi Demir

I present and discuss a consequence of the counterfactual theory of information.

Cohen and Meskin [2006] explored a theory of information grounded in counterfactual conditionals, as an alternative to the standard probabilistic theories of information such as Dretske's [1981]. In their theory, information relations are defined as follows: '**(S*)** ... x's being F carries information about y's being G if and only if the counterfactual conditional ''if y were not G, then x would not have been F'' is non-vacuously true' [335].

Furthermore, they [2008] identified the corresponding counterfactual for 'A carries information that B and C' with the following: **(1)** If (B and C) were not the case, then A would not have been true.

(1) together with (S*) leads to a consequence that needs to be taken into account in assessing the merits and defects of the counterfactual theory. The consequence is that 'A carries information that B' necessarily implies 'A carries information that B and C' for any C such that the closest not-C world is more remote than the closest not-B world. Let me explain this with an example.

A: Joe is in France, **B:** Joe is in Europe, **C:** The sun will rise tomorrow morning.

Clearly, Joe's being in France carries information that Joe is in Europe. Thus, A carries information that B. The counterfactual account yields the same result, because the corresponding counterfactual, 'If Joe were not in Europe, then Joe would not have been in France', is non-vacuously true. In the closest world in which Joe is not in Europe (not-B world), he is also not in France (not-A world). Let's take this world, call it *W*, and see what else we can infer about it. Since *W* is a not-B world, it is also a 'not-B or not-C' world. Notice that *W* is the closest 'not-B or not-C' world. It is the closest not-B world, and all of the other not-C worlds are farther away than *W*, because all of the worlds in which the sun will not rise tomorrow morning are farther away than the closest world in which Joe is not in Europe. By

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logical equivalence, *W* is the closest not (B and C) world. It is also a not-A world. Thus, 'If (B and C) were not the case, then A would not have been the case' is true. This counterfactual, according to (1), is equivalent to 'A carries information that B and C.' Hence, Joe's being in France carries information that Joe is in Europe and the sun will rise tomorrow morning.

This result is generalizable. It is quite straightforward to prove formally that, given (S*) and (1), 'A carries information that B' necessarily implies 'A carries information that B and C' for any arbitrary C, independent of its content, as long as the closest not-C world is more remote than the closest not-B world. Given this implication, for any relation 'A carries information that B' included in the counterfactual theory, any appropriate C can be conjoined with B, and then A will carry information that B and C, as well. It should also be noted that this can be done as many times as the number of appropriate Cs, which is potentially infinite. As explained above, Joe's being in France carries information that Joe's presence in Europe (B) and the sun's movement (C). Not only that, but it also carries information that B and C for many other Cs, some of which are the following:[1]

C_1: In terms of purchasing power, 1 Turkish lira is worth more than 1 Japanese yen.

C_2: In terms of land mass, Russia is the biggest country in the world.

C_3: Accra is the capital city of Ghana.

A simple message about Joe's whereabouts carries information about B and C_1, B and C_2, and B and C_3. Moreover, this list can be extended indefinitely. Is such a result acceptable? At first glance, the answer seems to be no, because under a reasonable assumption it leads to contradiction. The message carries information that B and C_i. It is also reasonable and quite intuitive to assume that if a message carries information that B and C_i, it also carries information that C_i, because C_i is logically implied by B and C_i. Under this assumption, the message carries information about C_1, C_2, and C_3. According to (S*), however, the message does not carry information about any of the Cs, because for none of the Cs is the corresponding counterfactual true. On one hand, the counterfactual account implies that the message carries information about the Cs. On the other hand, according to the counterfactual definition of informational relations, the message does not carry information about the Cs. This is a contradiction. The counterfactual theorist, however, may object to enlisting our reasonable intuitions. After all, it is claimed that the counterfactual account aims to explicate a technical notion of information, not our intuitive understanding of it. The counterfactual theorist may reject our intuitive assumption and simply see no problem in accepting the following three statements together: i) A carries information that B, ii) A carries information that B and C, iii) A does not carry information that C.

[1]It is quite straightforward to verify that these statements are appropriate Cs.

The consequence presented here is a peculiar feature of the counterfactual account. None of the known theories of information has this feature. It also leads to contradiction under a reasonable assumption. Thus, it needs to be taken into account in assessing the merits and defects of the counterfactual account as a theory of information.

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