Reverse inference is not a fallacy per se: Cognitive processes can be inferred from functional imaging data

The process of inferring the presence of a specific cognitive process from observed brain activation is called **reverse inference**. It is widely thought that it is a weak method, and its validity has been increasingly regarded as limited. The author agrees that a careless use of the method is problematic, but he proposes a new formulation that gives stronger results.

Since a specific brain region can be activated by a wide range of cognitive processes it can be problematic to infer the involvement of a specific cognitive process from the activation of this brain region. The paper aims to provide a revised formulation of reverse inference that includes an additional conditional constraint that has been previously acknowledged, but so far not implemented: **task-setting**.

Activation can co-occur with the process or can take place in the absence of the process. Using bayes distribution conditioning by the task we increase the precision of reverse inference due to a more specific false-alarm rate. *(To get an idea of how this formulation works check the paper).*

The author also gives an example and shows figures where we get to see areas of the brain where bayes factor decisive and very strong evidence. He proposes a use of this new formulation to give reverse inference more reliability.