Introduction

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Bayesian Epistemology

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1 Background

The idea to produce this special issue arose when I was writing a project application to be submitted to the German Research Foundation on Evidence and Objective Bayesian Epistemology. This special issue was meant to accompany the project conference. Fortunately, the project was funded and the conference (including the preceding Summer School) took place albeit virtual; see Corsi (2021) for a conference report. Fast forward five years from the days of grant application writing, and here we are. The special issue you are now reading presents current thinking on Bayesian Epistemology and its applications.

2 Bayesian Epistemology

2.1 The Rise of Bayesian Epistemology

Bayesianism has for some time been an important approach in the philosophy of science (Bovens and Hartmann 2003; Earman 1992; Howson and Urbach 2006) concerned with uncertain inference; Bayesian ideas have also played a prominent role in Bayesian statistics (Bernardo and Smith 2000) and its applications. Bayesianism has been gaining popularity in recent years evidenced by the publication of a large number of overviews and monographs (Briggs 2015; Dallmann 2019; Easwaran 2015; Eriksson and Hájek 2007; Helzner and Hendricks 2019; Huber 2016; Joyce 2011; Kvanvig 2016; Pettigrew and Weisberg 2019; Sprenger and Hartmann 2019; Vickers 2013; Weisberg 2015). Interest is spreading to corners of philosophy one would initially not connect to Bayesianism such as "Educational Theory and Philosophy" (Landes 2020).

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As with every successful movement, there will be discontents taking issue with some of the tenets held by the mainstream. Discontents with mainstream Bayesian epistemology have developed offshoots from the mainstream resulting in the creation of their own flavours of Bayesian epistemology. Some doubt that rationality is properly explicated by a single probability function and prefer to use *sets of probability functions* to better represent ignorance (Bradley 2015; Dubois and Prade 1997), others are concerned with boundedly rational agents (Bradley 2017), some prefer non-quantitative beliefs (Spohn 2012) or different updating rules (Raidl 2020) and yet another group is not happy with the subjectivity of Bayesian epistemology (Williamson 2010).

Personally, I'm in favour of an objective Bayesian epistemology explicating a principle of entropy maximisation to reduce the subjectivity (Landes and Masterton 2017; Landes and Williamson 2013, 2015; Landes, Wallmann, and Williamson 2021); see Landes (2015), Paris (2014), Pettigrew (2020), Wheeler (2012), and Williamson (2012) for more discussions. While, in my opinion, such an approach is preferable to the more subjective mainstream, the approach I prefer has only a relatively small number of followers. I hence deemed devoting the conference or this special issue to objective Bayesianism overly restrictive, and I instead decided to broaden the scope to all variants of Bayesian epistemology and its philosophical applications.

2.2 Important Relevant Topics

Since Bayesian epistemology and its philosophical applications have been continuously researched for decades, it is outside the scope of this editorial to list the important topics of current (or past) research. The non-initiated reader is referred to the aforementioned overview works. I shall instead briefly introduce areas relevant to the contributions in this special issue.

Coherence of a body of evidence for a hypothesis, or so it has been long discussed, provides confirmation qua coherence of the items of evidence (Lewis 1946). One important strand of research has been the search for an/the appropriate measure of confirmation (Schupbach 2011; Shogenji 1999). Claims have been made that there is no such measure; Bovens and Hartmann (2003) presented an explication of Bayesian Coherentism that is inconsistent. Recent important general approaches to coherence and confirmation are Crupi and Tentori (2014) and Schippers and Koscholke (2020).

Relatedly, the issue of *in*coherence has come up. For example, what to do with incoherent beliefs (De Bona and Staffel 2017) and how to measure incoherence (Easwaran and Fitelson 2012; Staffel 2015) have been discussed. Coherence has also been discussed in relation to other issues such as mechanisms and

explanations (Colombo, Hartmann, and van Iersel 2015) and in connection with imprecise probabilities (Flaminio, Godo, and Hosni 2015). Attention to the notion of coherence has spread to important real-world topics; coherence in the public debate on the evidence for anthropogenic climate change has been considered (Hahn, Harris, and Corner 2016).

Evidence aggregation: almost all of Bayesian epistemology can be construed as an approach to evidence aggregation. One notable exception, which shall not be discussed here, are metaphysical questions about the nature of evidence (Kelly 2015; Williamson 2015). One of the key idea is that free evidence is an epistemically beneficial thing (Good 1967). Surprisingly, free evidence can sometimes be epistemically detrimental (Bradley and Steele 2016).

Evidence aggregation is an important topic in (the philosophy of) the sciences (Fletcher, Landes, and Poellinger 2019). Interesting questions are how to aggregate computer generated evidence in theory (Parker 2022) and practise (Brassey et al. 2019; De Pretis, Landes, and Peden 2021). Furthermore, causal inference based on the aggregation real-world evidence continues to be much discussed (De Pretis and Landes 2021; Mayo-Wilson 2014; Sherman et al. 2016).

Peer disagreement and merging of opinions can be understood as a particular type of evidence aggregation problem, in which evidence emerges in a social setting, where *groups* of agents are aggregating evidence. Philosophically, there are two main options, when one disagrees with a peer. One may dogmatically hold one to one's views or conciliatory pool different opinions. The latter is overviewed in Dietrich and List (2017) from a subjective Bayesian point of view and addressed in an objective Bayesian fashion in Wilmers (2015). Again, important applications abound in (the philosophy of) political/economic theory (Satterthwaite 1975) and artificial intelligence (Bench-Capon, Doutre, and Dunne 2007).

Similarly to the idea that free evidence is epistemically always a good thing, truth-conducive shared evidence among truth-seeking agents is thought to lead to agreement (Blackwell and Dubins 1962). Interestingly, cases have been reported, in which truth-seeking rational agents sharing an infinite stream of truth-conducive evidence end up with diametrically opposed beliefs (Henderson and Gebharter 2021; Nielsen and Stewart 2021). Their beliefs are said to have *polarised*.

3 Papers in this Special Issue

The contributions in this special issue can be classified into two categories. Bradley (2022) and Weber (2022) are much interested in *evidence and its aggregation* while Poston (2022) and Ragno (2022) focus on the *coherence* of a body of evidence.

I will next tease these four papers in the hope that the reader will be interested in digging into their original arguments rather than simply reading my take on their work.

3.1 Evidence and its Aggregation

Bradley (2022) discusses learning from evidence in the imprecise probability framework, in which rational beliefs are modelled by sets of probability functions. Bradley considers a type of learning that features prominently in applied decision making frameworks called α-cuts (Jahanshahloo, Lotfi, and Izadikhah 2006) and discusses advantages and dis-advantages of this learning procedure.

Weber (2022) investigates sets of agents obtaining evidence concerning the same issue. He wonders whether the order, in which the evidence is received, ought to matter for the agents. Ought they first pool their evidence and then form beliefs or should they first form their beliefs separately and then pool their beliefs? He then applies his thinking to the suspension of beliefs in the framework of imprecise probabilities.

3.2 Coherence

Ragno (2022) is interested in reductions of scientific theories. To which degree do two theories which permit a synchronic intertheoretic reduction cohere and how does the choice of a measure of coherence influence this degree of coherence? He goes on to study relationships between coherence and confirmation based on examples that have featured prominently in the literature.

Poston (2022) considers the question of whether items of evidence must individually confirm to provide positive confirmation qua coherence. He studies a case, in which subsequent observations cause a change in initial beliefs. He provides a Bayesian reconstruction of this case and concludes that coherence can provide confirmation in a Bayesian setting.

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