In epistemology, the rationality of a given belief system is often seen as virtually equivalent to its epistemic justifiability (cf. e.g. BAUMANN 2006). And while there is no universal consensus about the structure of epistemic justification, even epistemologists who reject coherentism will concede that coherence forms an integral component thereof (cf. e.g. AUDI 2011). We propose to study rationality, through the lens of formal epistemology, in its relation to both coherence and aggregation of belief systems.

Very recently, a new formal coherence notion has been proposed (HERZBERG 2014a,b). Its novelty lies in (i) the formalisation of the thrust of an influential coherence notion from traditional analytic epistemology (BONJOUR 1985) and (ii) a mathematical framework that is more general (and arguably more plausible) than the framework commonly used in the literature on coherence measures. Therefore, it can circumvent the various impossibility results of the coherence-measures literature (cf. e.g. BOVENS–HARTMANN 2003, 2006; SIEBEL–WOLFF 2008 and SIEBEL 2005, 2011). Within this framework, formalisations of logical and probabilistic consistency as well as of inferential connectedness are developed.

Coherence is here understood as a (potentially multi-dimensional) graded concept that applies — holistically — to belief systems, which in turn are formalised as sets of conditional probability assignments to pairs of propositions. Technically speaking, belief systems are analysed as Bayesian networks; inferential connectivity is measured through a combination of graph theory and Bayesian confirmation theory; logical consistency is defined semantically, based on a binary reduc derived via the Lockean thesis; probabilistic consistency is formalised in a way that allows for a belief system to be consistent with more than one probability measure. This latter feature is in agreement with recent trends in both psychology (as in the multi-mind literature, cf. e.g. MINSKY 1986, ORNSTEIN 1986) and decision theory (as in the multiple-priors literature, cf. e.g. GILBOA–SCHMEIDLER 1989, MACCHERONI–MARINACCI–RUSTICCHI 2006), where the belief system of an individual agent is no longer modelled by a single probability measure but rather it is thought of as being compatible with a whole (generically, non-singleton) set of probability measures. (This generalised account of uncertainty is also of philosophical interest, cf. e.g. BRADLEY–DRECHSLER 2014.)

While this attempt at formalising coherence is a useful point of departure, it is obviously a far cry from a comprehensive formal account of rationality. In particular, a systematic comparison with other accounts of rationality — for instance, logical, probabilistic, or based on behavioural economics — is necessary. Furthermore, for the formal analysis of coherence, a better understanding of what constitutes an “anomaly” in a doxastic system (beyond logical or probabilistic inconsistency or lack of inferential connectivity) would be desirable; this might be achieved semi-geometrically, through a combination of entropy and centrality analyses of the Bayesian network, using a generalised eigenvector centrality measure. Moreover, due to the Bayesian character of this formalisation of coherence, recent challenges to Bayesianism (e.g. HAJEK 2012, EASWARAN 2014) and Bayesian confirmation theory (e.g. MILLER 2014) will have to be addressed, too.

(Criteria for the coherence of belief systems are not just of import in epistemology, but also in meta-ethics. Exploring the applicability of our formal analysis of coherence in practical philosophy would be interesting.)

An important objection to our formal analysis of coherence could be that by deliberately allowing for (non-singleton) sets of subjective probability measures, we are forced to abandon the classical von Neumann–Morgenstern expected utility theory, the benchmark theory of decision making under uncertainty. However, this objection might be refuted by the following line of reasoning — which finally leads on to the question of how to aggregate several probability measures into a single one.

Firstly, decision theorists have studied ambiguous subjective probability measures (uncertainty in the sense of KNIGHT 1921) for a quarter-century. Secondly, even if — for reasons of psychological plausibility, social dynamics etc. — one considers (as in, e.g., BRADLEY–DIETRICH–LIST 2012) situations where decisions have to be based on a single, aggregate, probability measure (which then permits the classical von Neumann–Morgenstern expected utility theory to be applied), all that is needed is a convincing theory of aggregating subjective probability measures. Aggregation is thus an important topic in a formal analysis of practical rationality. The pivotal point of this line of argument is that there already exists a candidate for such an aggregation theory — which even admits infinite profiles of probability measures (HERZBERG 2014c).

This aggregation theory for subjective probability measures calls for a comparison with some of the recent very general theories of aggregation that emerged out of the judgment aggregation literature (cf. LIST–PUFFE 2009 and MONGIN 2012 for surveys) and the even more general theory of propositional-attitude aggregation (DIETRICH–LIST 2010), such as model aggregation theory (HERZBERG–ECKERT 2012) or universal algebraic aggregation theory (HERZBERG 2014d). Ultimately, we hope to achieve an even greater unification of the existing general theories of aggregation.

(A comprehensive theory of aggregation might be utilised to address several interesting questions from the philosophy of science, too — such as the ontological status of theoretical entities in the natural and the social sciences. For example, the representative agent of macroeconomic models can be characterised as the embodiment of an aggregate utility function under a suitable notion of aggregation — as has been formally demonstrated, at least for a class of very stylised models, in HERZBERG 2010.)

For an updated version including references, see http://herzberg.userweb.mwn.de/spp1516.pdf
REFERENCES