

Ethics and Choice in Anticipatory Systems

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Extended abstract

When predicted futures influence current action, a system becomes an anticipatory system. The nature of such systems have been studied in great detail in anticipatory system theory. In this paper, we extend anticipatory system theory by asking how such systems could become ethical. Different ethical theories lead to different models of anticipatory systems and make different assumptions concerning the nature of system environment. We show that utilitarian and capability-based models of ethics assume mechanistic and non-complex environments. Dialogical ethics, in contrast, is potentially able to address complex environments and interactions among anticipatory systems. By formalizing key assumptions of ethical theories in the context of anticipatory systems, the present study clarifies assumptions that underpin research on social choice, economics, philosophy of ethics, and responsible design and innovation, opening new lines of research, for example, on ethics of artificial intelligence.

Intelligence requires capability to choose among several alternative actions, and ethics becomes possible only when an actor can choose what it does. Without undetermined choice there is no “free will” or responsibility for action. An intelligent and ethical system, therefore, has to be able to predict consequences of alternative possible actions and evaluate their outcomes. This implies that the system incorporates a subsystem that composes from the observables of its predictive model an indicator that values the alternatives. Furthermore, the resulting valuation has to impact system action. Although, in general, predictions of future states of the world can be entangled with values, in this paper we focus on characteristics of anticipatory systems that have a separate subsystem that values and orders possible futures.

Different types of evaluation subsystems can be associated with different theories of ethics. In this paper, we address three approaches to ethics—utilitarian, capability-based, and dialogical—and outline general characteristics of anticipatory systems that have the related ethical capabilities.

Mathematically the simplest such systems can be associated with classical utilitarian theories in philosophy and economics that argue that maximization of indicators such as happiness, well-being, or “utility” can provide a foundation for ethical theory. In general, these approaches assume that predicted outcomes can be ordered to find optimal values. More generally, modern social choice theories assume that individuals can order possible future states, and that these orderings can be used to develop aggregate measures of social well-being. A fundamental claim in these theories is that individual ethical agents can rank all possible states of the world, that ethical considerations are reflected in these individual rankings and in the functional structure that is used to aggregate individual rankings of social states into collective orderings that reflect desirable futures. This position has been taken, for example, by Dasgupta (2009).

Several leading ethical theorists have argued that individual agents cannot order future states of the world. Utilitarian and neoclassical economics is therefore inherently incapable to take into account ethical considerations. Among others, Sen (2002, 2009), Nussbaum (2000), and Putnam (2002)

have argued that there are no universally valid indicators of utility. According to Sen, the valuation of preferences, including ethical preferences, depends on idiosyncratic individual and cultural situations, and there can be multiple incompatible preferences and meta-preferences. Sen has argued, however, that it is often possible to make partial comparisons between possible choices and rank them.

Research on anticipatory systems suggests that both of these above mentioned highly influential approaches imply that the system environment is mechanistic and cannot contain anticipatory systems or living organisms. As Rosen has shown, anticipatory systems are complex in the sense that their dynamics cannot be captured by a single “most refined” model. An acting anticipatory agent exists in an environment that consists of other anticipatory agents, which are complex in this Rosennean sense. Predictive models of such environments are therefore models of complex systems, and value models of such systems are models of complex models.

We show that utilitarian theories can be realized in anticipatory systems when a function exists that maps the predicted future states of system observables to real numbers. Capability-based models, as promoted by Sen, in turn, require evaluation subsystems that value futures using mathematical structures known as non-total partial orders. When an ethical agent interacts with other anticipatory systems, dialogical models of ethical theories, however, become relevant. We suggest that dialogical ethics as outlined in the partially preserved early writings by Bakhtin, is of specific relevance in complex environments.

Large bodies of extant literature on ethics have focused on normative approaches, starting from virtues, duties, and institutional, economic, and contractual structures that could be labeled as “good,” “moral,” or “just.” In this paper, we turn these traditional ethical debates around, asking what is required from a system that can realize such forms of ethical theory, and what types of environments the resulting anticipatory systems can model. A conceptual and formal study of ethical theories in the context of anticipatory system theory, therefore, has practical implications on how we model, study, design, and realize anticipatory systems.

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