Johan van Benthem (ILLC UvA, Stanford University & Tsinghua University)
*Reexamining the Basics of Functional Dependence* (joint work with Alexandru Baltag)

Dependence is a notion pervading many areas. In this talk, I present a new decidable logic that models both ontic and epistemic senses of functional dependence, and explore its expressive strength and complete proof calculus. The system is a generalized first-order logic and at the same time a modal logic, in terms of notions and proof techniques. I also discuss dynamic extensions when models change, and boundaries with more complex logical systems, e.g., the undecidable modal logic of reasoning about independence. I conclude with comparisons with notions of dependence in linear algebra, causal networks, games, and dynamical systems.

Marta Bilková (The Czech Academy of Science)
*Fixpoint epistemic modalities in non-classical context*

Modal formulas expressing epistemic group attitudes such as various forms of common belief or knowledge come naturally in a form of fixpoint schemes. We shall therefore briefly discuss extensions of modal logics based on Belnap-Dunn’s or substructural propositional logics with fixpoint modalities. Main concern is to prove whether the obvious (in)finite axiomatizations of such modalities are sound and complete with respect to a natural frame semantics of the underlying logic.

Dominik Klein (University of Bayreuth & University of Bamberg)
*The Logic of Maximizing Expected Utility*

Maximizing expected utility is a core concept within classic game theory. It combines a variety of game theory’s core aspects including the agent’s beliefs, preferences and their strategy space, pure or mixed. The framework requires quantitative notions in various ways - which is at odds with the classic qualitative perspective of logical modelling. In particular, utility maximization requires both, a quantitative, probabilistic representation of the agent’s beliefs as well as a quantitative account of their preferences. In this presentation, we present a first exploration on whether reasoning about expected utilities can be tracked with logical frameworks. In particular, we explore a framework that combines a classic logic for strategic form games with a mild probabilistic logic.

Hannes Leitgeb (Ludwig-Maximilians-Universität München)
*From Communicative Belief Revision to a Theory of Semantic and Pragmatic Meaning*

The talk will develop a joint theory of semantic meaning (constraints on worlds) and pragmatic meaning (constraints on actions). I will show how communication can be rationally reconstructed by means of the theory, how the (qualitative or numerical) beliefs of communication partners may change rationally through communication, and how semantic and pragmatic meaning may depend on each other.

Ondrej Majer (The Czech Academy of Science)
*Non-classical probabilities over Dunn Belnap logic* (Dominik Klein, Ondrej Majer, Soroush Rafiee Rad)

Belnap and Dunn [1] introduced a four valued propositional logic allowing, in addition to the classical truth values True and False, the attribution of non-classical truth values Neither and Both accounting for possibly incomplete or contradictory information concerning a particular proposition. The Belnap-Dunn four-valued logic has been extensively studied since its introduction and has been proved fruitful in the study of rational agency and the rational agents attitude towards the truth or falsity of propositions in more realistic contexts. More recently there has been attempts to study also the probabilistic extensions of this logic by Dunn [2] and Childers, Majer and Milne [3]. In particular Dunn investigates this probabilistic extension by introducing non-classical probability functions that assign to each proposition in the language a normalised four valued vector that encodes a probability mass function on the four possible truth values. This is in contrast to the classical case where the probability function on the language assigns to each proposition two values expressing a mass function on the proposition and its negation. Dunn [2] studies the logical structure of this probabilistic setting. However to define the logical connectives he makes some very strong independence assumptions that end up having undesirable consequences. In particular in that setting every proposition ends up probabilistically independent of every other proposition. Even of its logical consequences and even of itself. Our work picks up on the non-classical probability functions defined by Dunn but redefines the logical connectives in a way to avoid such undesirable independence consequences. In this new setting we introduce the necessary ingredients for defining conditional probabilities and will show the standard properties for it. Furthermore we propose strategies for aggregating these four valued probability assignments and show the standard properties for the proposed aggregation procedures. We also study the connection with the approach given in [3] and will show that the two settings are inter-translatable.

Alessandra Marra (University of Bayreuth)
*The Dynamics of Oughts and Goals* (joint work with Dominik Klein)

The talk focuses on (an interpretation of) the Enkratic principle of rationality, according to which rationality requires that if an agent sincerely and with conviction believes she ought to X, then X-ing is a goal in her plan. We analyze the logical structure of Enkrasia, and explore its implications for practical rationality. To do so, we elaborate on the distinction between basic and derived oughts, and provide a dynamic logic with three characteristic operators: a non-normal operator for basic oughts, a non-normal operator for goals in plans, and a normal operator for derived oughts. We illustrate how this setting informs certain debates in practical rationality, and specifically on the stability of oughts and goals under dynamics.

Joke Meheus (Ghent University)
*The cooperative understanding of information arising from different perspectives*

As acknowledged in the SEGA project, complex coordinated efforts require pooling and sharing of information. When rescuing flood victims, for instance, information has to be pooled to arrive at an estimate of the number of victims. In some cases, however, mere pooling of information will not be sufficient—an understanding of the pooled information may be needed. When a group of soldiers is trying to establish whether the driver of a fast approaching car is a dangerous enemy or an innocent civilian, simply putting together the data will not suffice. They will have to generate potential explanations that account for the observed facts. For this, they will have to rely on domain knowledge, and additional information may lead to a revision of their original hypotheses.

In this talk, I shall focus on the cooperative understanding of pieces of information that result from different perspectives and that are seemingly incompatible. Starting from a toy example, I shall argue in favour of a contextual view that leaves room for individual differences, and moreover defend the idea that we need a unified account of deductive and ampliative inferences, and of declarative and interrogative sentences. I shall present a defeasible variant of erotetic epistemic logic that can account for the interplay between abduction and question generation, and end with a discussion of the different types of dynamics that can be handled by this variant.

Gabriella Pigozzi (Université Paris-Dauphine)
*Mixing dyadic and deliberative opinion dynamics in an agent-based model of group decision-making*

We propose an agent-based model of opinion diffusion and voting where influence among individuals and deliberation in a group are mixed. The model is inspired from social modeling, as it describes an iterative process of collective decision-making that repeats a series of interindividual influences and collective deliberation steps, and studies the evolution of opinions and decisions in a group. It also aims at founding a comprehensive model to describe collective decision-making as a combination of two different paradigms: argumentation theory and ABM-influence models, which are not obvious to combine as a formal link between both is required. In our model, we find that deliberation, through the exchange of arguments, reduces the variance of opinions and the proportion of extremists in a population, as long as not too much deliberation takes place in the decision processes. Additionally, if we define correct decisions in the system regarding the arguments that should be accepted, allowing for more deliberation favors convergence towards the correct decisions. (Joint work with G. Butler and J. Rouchier)

Soroush Rafiee Rad (University of Bayreuth)
*Learning Probabilities*

We propose a new model for forming beliefs and learning about unknown probabilities (such as the probability of picking a red marble from a bag with an unknown distribution of coloured marbles). The most widespread model for such situations of ‘radical uncertainty’ is in terms of imprecise probabilities, i.e. representing the agent’s knowledge as a set of probability measures. We add to this model a plausibility map, associating to each measure a plausibility number, as a way to go beyond what is known with certainty and represent the agent’s beliefs about probability. There are a number of standard examples: Shannon Entropy, Centre of Mass etc. We then consider learning of two types of information: (1) learning by repeated sampling from the unknown distribution (e.g. picking marbles from the bag); and (2) learning higher-order information about the distribution (in the shape of linear inequalities, e.g. we are told there are more red marbles than green marbles). The first changes only the plausibility map (via a ‘plausibilistic’ version of Bayes’ Rule), but leaves the given set of measures unchanged; the second shrinks the set of measures, without changing their plausibility. Beliefs are defined as in Belief Revision Theory, in terms of truth in the most plausible worlds. But our belief change does not comply with standard AGM axioms, since the revision induced by (1) is of a non-AGM type. This is essential, as it allows our agents to learn the true probability: we prove that the beliefs obtained by repeated sampling converge almost surely to the correct belief (in the true probability). We end by sketching the contours of a dynamic doxastic logic for statistical learning.

Olivier Roy and Zoé Christoff (University of Bayreuth)
*Forgetful Groups*

The proximate goal of this talk is to make a preliminary survey of circumstances in which a group can lose, i.e. forget, common or distributed knowledge, especially when its members have perfect recall. This goal will be embedded in a broader set of, in our view, new research questions for dynamic epistemic logic pertaining to so-called content or information “curation”, both in general and with respect to group forgetfulness.
Igor Sediář (The Czech Academy of Sciences)
*Almost arbitrary information updates*

An almost arbitrary information update by A is an update by any admissible piece of information supporting A. A special case are almost arbitrary public announcements, generalizing arbitrary public announcements (Balbiani et al., 2008). In this talk we discuss some open problems concerning AAIUs and their relation to non-classical logics such as intuitionistic logic and the Lambek Calculus.

Sebastian Sequoiah-Grayson (University of Sydney)
*Rules and Actions*

Psychological epistemic actions allow us to recover from epistemic deficits. These are deficits from which we recover via a priori routes. Such actions may be decomposed into aggregative and combinatorial types. The properties of the latter will supervene in the logical form of the information being handled. I shall propose and defend a fine-grained formal epistemic framework for modelling such actions.

Sonja Smets (University of Amsterdam)
*Computing Social Behavior*

Recently, epistemic-social phenomena have received more attention from the logic community, analyzing peer pressure, studying informational cascades, inspecting priority-based peer influence, modeling diffusion and prediction, and examining reflective social influence. In this presentation, I will contribute to this line of work and focus in particular on the logical features of social group creation. I pay attention to the mechanisms which indicate when agents can form a team based on the correspondence in their set of features (behavior, opinions, etc.). Our basic approach uses a semi-metric on the set of agents, which is used to construct a network topology. This structure is then extended with epistemic features to represent the agents’ epistemic states, allowing us to explore group-creation alternatives where what matters is not only the agent’s differences but also what they know about them. The logical settings in this work make use of the techniques of dynamic epistemic logic to represent group-creation actions, to define new languages in order to describe their effects, and to provide sound and complete axiom systems. This talk is based on recent joint work with Fernando Velazquez Quesada at the University of Amsterdam.

Frederik Van De Putte (University of Bayreuth)
*Evidence-based Group Belief*

When beliefs are based on (fallible, possibly conflicting, incomplete) evidence, what could group belief look like? What is its logic? Starting from a well-known model of an agent’s evidence and the derived beliefs of that agent, I will present a modal logic that can express two core notions of evidence-based group belief: (i) group belief based on shared evidence, and (ii) group belief based on distributed evidence. To axiomatize these concepts, I rely on a characterization of Evidence Logic (originally proposed by van Benthem and Pacuit) using the notion of combined factive evidence, following the work of Baltag and co-authors. This characterization in turn suggests a general schema for formalizing and axiomatizing various notions of evidence-based group belief, of which (i) and (ii) are particular instances.

Rineke Verbrugge (Department of Artificial Intelligence, Bernoulli Institute, University of Groningen)
*What could they have been thinking? Reasoning about reasoning strategies*

When engaging in social interaction, people rely on their ability to reason about other people’s mental states, including goals, intentions, and beliefs. This theory of mind ability allows them to more easily understand, predict, and even influence the behavior of others. People can also use their theory of mind to reason about the theory of mind of others, which allows them to understand sentences like “Alice believes that Bob does not know about the surprise party”. But while the usefulness of higher orders of theory of mind is apparent in many social interactions, empirical evidence so far suggests that people often do not use this ability spontaneously when playing games, even when doing so would be highly beneficial.

In this lecture, we discuss some experiments in which we have attempted to encourage participants to engage in higher-order theory of mind reasoning by letting them play games against computational agents: a one-shot competitive game named the Mod game; a turn-taking game named Marble Drop; and a mixed-motive negotiation game named Colored Trails. It turns out that we can entice people to use second-order theory of mind in Marble Drop and Colored Trails, and in the Mod game even third-order theory of mind. We discuss different methods of estimating participants’ possible reasoning strategies in these games, some of them based only on their moves in a series of games, others based on their reaction times or their eye movements, in order to get an inkling of what the participants could have been thinking.