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Split and bounded memory in a statistical approach to trust and reputation.

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Abstract:

Consider a set of agents all being confronted with the same reinforcement learning task, e.g. a provider selection problem. We apply a statistical approach, where agents not only remember and communicate a possibly weighted average of past experiences, but a also the confidence based on number and spreading of these experiences. We show how agents weight and combine sample descriptions from different sources. To deal with violations of the independent sample requirement that come through receiving information about the same event by different communication partners or at different time steps agents are equipped with a split memory for own samples and those samples received via others. If agents are noisy or lie in communications, then learning about best communication partners is a second level reinforcement learning. Hence, it is about trusting providers and trusting different information sources. Our statistical approach allows to use empirical alphas for judging a partner's precision. We discus the concept of careful exploration, which is another solution to the classic exploration–exploitation dilemma. We additionally bound the number of providers that agents can remember. This causes a social dilemma, since if everybody only remembers the best producers, then no knowledge about bad producers is present in the system. We present a solution to this problem and thereby contribute to the issue of scalability of trust and reputation mechanisms. Our solution causes an endogenous emergence of a distributed memory among networked agents. The talk presents a first prototype that is systematically built from building blocks out of the Artificial Intelligence toolbox. It allows to identify crucial issues and reports about first contributions to these issues. All modelling steps are supported and illustrated by simulations.