

# Three GAMA plugins to define agent behavior: Argumentation framework, Bayesian network and Machine learning

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## Abstract

GAMA provides several tools to model the behavior of agents: reflexes, BDI architecture, systems of differential equations, etc. Nevertheless, in the last few years different plug-ins have been developed to enrich these possibilities. We present here 3 plug-ins: the argumentation plugin, the Bayesian network plugin and the artificial learning plugin.

The first one allows modellers to use the Dung's argumentation system to simulate opinion dynamics [1, 2]. More precisely, this plug-in allows to explicitly represent agents' own mental deliberation process from arguments towards an opinion, through the use of the argumentation system of Dung. This plugin was already used to study the adoption of vegetarian diets and digital tools in agriculture.

The second plugin allows modelers to build a bayesian network, i.e. a probabilistic graphical model that represents a set of variables and their conditional dependencies via a directed acyclic graph, and make decisions based on them: typically, knowing the probability of a variable from a set of other variables.

The last plugin based on the open-source library Weka [3] allows the modeler to use a large number of supervised (CHAID, JRip, Multi-layer perceptrons, SMO, J48, Random Forest...) and unsupervised (K-means, EM, DB-scan, Cobweb...) learning algorithms. In particular, this plugin allows to build a classifier from a set of instances and to use the classifier to classify new instances.

## References

- [1] Patrick Taillandier, Nicolas Salliou, and Rallou Thomopoulos. Coupling agent-based models and argumentation framework to simulate opinion dynamics: application to vegetarian diet diffusion. In *Social Simulation Conference (SSC 2019)*, 2019.
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- [3] Ian H Witten, E Frank, MA Hall, and CJ Pal. The weka workbench. online appendix for "data mining: Practical machine learning tools and techniques". In *Morgan Kaufmann*. 2016.

## Additional material

Github (plug-ins code): <https://github.com/gama-platform/gama.experimental>