

Generating Structured Argumentation Frameworks: AFBenchGen2

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Abstract. In this paper we describe AFBenchGen2, which allows to randomised argumentation frameworks for testing purposes with a large variety of structures.

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Introduction

Dung’s abstract argumentation framework (*AF*) [4] provides a fundamental reference in computational argumentation. An *AF* consists of a set of arguments and an *attack* relation between them. The concept of *extension* plays a key role in this simple setting, where an *extension* is a set of arguments which can “survive the conflict together.” Different notions of extensions and of the requirements they should satisfy correspond to alternative *argumentation semantics*.

In previous research we introduced AFBenchGen [3], allowing for the generation of challenging *AFs* based on the Erdős-Rényi model [5]. However, as [2] discussed, different structures can give rise to interesting different results w.r.t. performance for existing solvers of decision and enumeration problems on Dung’s *AFs*. In this paper we present AFBenchGen2, the first open-source, configurable system for generating *AFs* with a variety of structures.

1. AFBenchGen2

Differently from its predecessor, AFBenchGen2¹ is written in Java and can create *AFs* with a configurable number of arguments, and of type: (1) Erdős-Rényi [5]; (2) Watts-Strogatz [8]; (3) Barabasi-Albert [1].

Erdős-Rényi Erdős-Rényi graphs [5] are generated by randomly selecting attacks between arguments. AFBenchGen2 allows the selection of the probability of attacks via the parameter `-ER_probAttacks` (between 0 and 1).

¹<https://sourceforge.net/projects/afbenchgen/>

Watts-Strogatz Watts and Strogatz [8] show that many biological, technological and social networks are neither completely regular nor completely random, but something in the between. These systems can be highly clustered, like regular lattices, yet have small characteristic path lengths, like random graphs, and they are named *small-world* networks by analogy with the small-world phenomenon.

AFBenchGen2 generates a ring of n arguments where each argument is connected to its k nearest neighbors in the ring: k can be specified via the parameter `-WS_baseDegree` and it must satisfy $n \gg k \gg \log(n) \gg 1$ to ensure a connected graph. Then AFBenchGen2 considers each argument and *rewires* each of its edges toward the not yet processed arguments with randomly chosen arguments with a probability β that can be specified with the parameter `-WS_beta` (between 0 and 1).

Barabasi-Albert As discussed in [1], a common property of many large networks is that the node connectivities follow a scale-free power-law distribution. Therefore, generating a Barabasi-Albert graph requires to iteratively connect a given number of new nodes and to prefer sites that are already well connected. In order to resemble online discussions, we chose to tune AFBenchGen2 to add a single new argument at every iteration: however, this can be made configurable.

Both Watts-Strogatz and Barabasi-Albert would result in undirected graph (or, directed graph with no cycles); we therefore added an additional parameter `-BA_WS_probCycles` (between 0 and 1) that describes the probability of an argument to be in at least one cycle. AFBenchGen2 will therefore add extra attacks accordingly.

2. Conclusions

In the last years, thank also to the ICCMA15 [7] there has been an increased attention in the community towards implementations and experimental analysis. However, benchmarks and raw data are as important as papers and systems code: in certain disciplines the majority of published findings cannot be reproduced [6]. Making AFBenchGen2 freely available and open source goes in the direction of reducing such a risk for the argumentation in AI community.

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