Automatic Graph Representation Learning

Junwei Sun[1], Bai Wang[1], and Bin Wu[1]

Beijing University of Posts and Telecommunications, Beijing 100876, China
{junweisun,wangbai,wubin}@bupt.edu.cn

Abstract. Graph Neural Network (GNNs) have shown great power for processing graph-structured data. Most GNN architectures are hand crafted, which requires domain knowledge and difficult to generalize to different kinds of graphs. Recently, several attempts have been made to automatically search data-specific GNN architectures in a pre-defined search space and expect to acquire well-performed GNNs. Although these efforts have achieved promising performance, some drawbacks of them are remain to be addressed. To overcome these drawbacks, we present AutoGL, an Automatic Machine Learning framework on Graph-Structured data. Unlike previous work that only search for a good model architecture, we first combine different aspects of machine learning consist of data argumentation, hyper parameter optimization (HPO), neural architecture search (NAS) and ensemble methods into an unified search space, then use an efficient algorithm to search the best combination on a particular dataset. Extensive experiments demonstrate that AutoGL achieves better or competitive results on various tasks and datasets compared to state-of-the-art GNN architectures. Our code is available at https://github.com/JunweiSUN/AutoGL.

Keywords: Graph representation learning · Automatic machine learning · Graph neural network

1 Introduction

1.1 A Subsection Sample

Please note that the first paragraph of a section or subsection is not indented. The first paragraph that follows a table, figure, equation etc. does not need an indent, either.

Subsequent paragraphs, however, are indented.

Sample Heading (Third Level) Only two levels of headings should be numbered. Lower level headings remain unnumbered; they are formatted as run-in headings.

Sample Heading (Fourth Level) The contribution should contain no more than four levels of headings. Table 1 gives a summary of all heading levels.

Table 1. Table captions should be placed above the tables.

Heading level	Example	Font size and style
Title (centered)	**Lecture Notes**	14 point, bold
1st-level heading	**1 Introduction**	12 point, bold
2nd-level heading	**2.1 Printing Area**	10 point, bold
3rd-level heading	**Run-in Heading in Bold.** Text follows	10 point, bold
4th-level heading	*Lowest Level Heading.* Text follows	10 point, italic

Displayed equations are centered and set on a separate line.

$$x + y = z \tag{1}$$

Please try to avoid rasterized images for line-art diagrams and schemas. Whenever possible, use vector graphics instead (see Fig. 1).

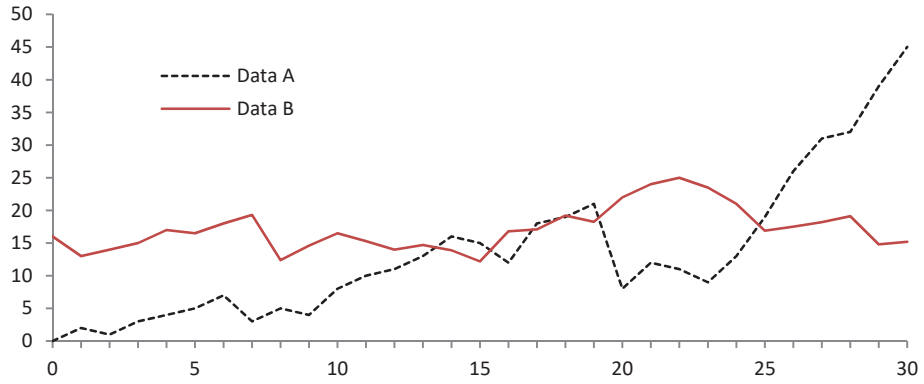

Fig. 1. A figure caption is always placed below the illustration. Please note that short captions are centered, while long ones are justified by the macro package automatically.

Theorem 1. *This is a sample theorem. The run-in heading is set in bold, while the following text appears in italics. Definitions, lemmas, propositions, and corollaries are styled the same way.*

Proof. Proofs, examples, and remarks have the initial word in italics, while the following text appears in normal font.

2 Related Works

2.1 Automatic Machine Learning

2.2 Graph Neural Networks

For citations of references, we prefer the use of square brackets and consecutive numbers. Citations using labels or the author/year convention are also accept-

able. The following bibliography provides a sample reference list with entries for journal articles [1], an LNCS chapter [2], a book [3], proceedings without editors [4], and a homepage [5]. Multiple citations are grouped [1–3], [1, 3–5].

References

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