This is the sample article title

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Summary

The graph neural network (GNN) has become a popular research area for its state-of-the-art performance in many graph analysis tasks. Recently, various graph neural network libraries have emerged. They make the development of GNNs convenient, but their performance on large datasets is not satisfying. In this work, we analyze the performance bottleneck in training GNN with GPUs empirically. A GNN layer can be decomposed into two parts: the vertex and the edge calculation parts. According to their computational complexity, we select four representative GNNs (GCN, GGNN, GAT, GaAN) for evaluation. We breakdown their training time and memory usage, evaluate the effects of hyper-parameters, and assess the efficiency of the sampling techniques. The experimental evaluation indicates that the edge-related calculation is the performance bottleneck for most GNNs, dominating the training time and memory usage. Future optimization can focus on it. The sampling techniques are essential for training big graphs on GPU, but their current implementations still have room for improvement.

KEYWORDS:
graph neural network, performance bottleneck analysis, empirical evaluation, machine learning system, GPU

1 | MACROS

This URL contains the LaTeX Class file for Software: Practice and Experience (SP&E):

`\url{https://onlinelibrary.wiley.com/page/journal/1097024x/homepage/la_tex_class_file.htm}`

Clicking on "AMA-stix.zip" downloads the file AMA-stix-1510051231000.zip from this URL:

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In file AMA-stix/ama/wileyNJD-AMA.tex, there is an example latex document for authors. I have edited this file to demonstrate problems with the latex macros in files WileyNJD-v2.cls and WileyNJD-AMA.bst, and used the following command to generate a PDF file.

```
pdflatex wileyNJD-AMA; bibtex wileyNJD-AMA; pdflatex wileyNJD-AMA; pdflatex wileyNJD-AMA;
```

2 | FIRST PROBLEM

The header on this page is:

I'm a figure above the caption

FIGURE 1 This is the sample figure caption

TABLE 1 This is the sample table caption

I'm a table below the caption

Received 26 April 2016 | Revised 6 June 2016 | Accepted 6 June 2016

Authors do not know these dates, so they are likely to just leave the dates unchanged. It would be better to have a placeholder:

Received Added at production | Revised Added at production | Accepted Added at production

3 | SECOND PROBLEM

SP&E style use symbols for footnotes and numbers for bibliography citations. However, the latex macros generate numbers for footnotes rather than symbols number, which makes it impossible to tell the difference between a footnote and a citation. This is a footnote[†] and this is a citation[1], and they both are numbered [1]. Attempting to fix the problem by adding the following latex command results in an error.

```
\renewcommand{\thefootnote}{\fnsymbol{footnote}}
```

4 | THIRD PROBLEM

The "ref" macro used to print label for section, figures and tables leaves an extra space after the label number for figures and tables but not sections. Figure 1 has an extra space after the number, as does Table 1, but Section 4 does not have an extra space.

5 | FOURTH PROBLEM

There are multiple problems in the WileyNJD-AMA.bst macros for formatting bibliographic entries. Specifically, fields within entries are missing, as is space between fields, possibly in an attempt to shorten the length of the bibliographic entries.

Here is an exhaustive list of all fields for all bibliography entries.

article[2], book[1], booklet[3], inbook[4], incollection[5], inproceedings[6], manual[7], mastersthesis[8], misc[9], phdthesis[10], proceedings[11], techreport[12], unpublished[13]

Looking at the references below, there are multiple fields missing from the bibliographic entries, there are spaces before periods, and there are fields run together, etc.

References

1. surname f. *title*. volume of *series*. address: publisher. edition ed. year. note.

2. surname f. title. *journal* year; volume(number): pages. note.

3. surname f. title. howpublished: address. year. note.

[†]Footnote

4. surname f. *title*. volume of *series*. type chapter: pages; address: publisher. edition ed. year. note.

5. surname f. title. In: surname f., ed. *booktitle*. volume of *series*. address: publisher. edition ed. year (pp. pages). note.

6. surname f. title. In: surname f., ed. *title*. volume of *series*. organization. publisher; year; address: pages. note.

7. surname f. *title*. organization; address: edition ed. year. note.

8. surname f. title. type. school. address: year. note.

9. surname f. title. howpublished; year. note.

10. surname f. *title*. type. school, address; year. note.

11. surname f., ed., *title*. volume of *series*(address); organization, publisher: year. note.

12. surname f. title. type number, institution; address: year. note.

13. surname f. title. note; year.

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