

MAGNN: Metapath Aggregated Graph Neural Network for Heterogeneous Graph Embedding

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Tóm tắt nội dung—Một lượng lớn các đồ thị hay mạng trong thực tế vốn dĩ không đồng nhất, có nhiều loại nút và nhiều loại quan hệ. Embedding đồ thị không đồng nhất là việc embed từ cấu trúc lớn và nhiều thông tin của đồ thị về biểu diễn nút trong không gian thấp chiều. Các mô hình đã tồn tại tường định nghĩa metapaths trong một đồ thị không đầu nhất để ghi lại các quan hệ và định hướng lựa chọn "hàng xóm". Tuy nhiên các mô hình này bỏ qua đặc trưng của từng nút mà tìm hiểu ngay lập tức các nút trên metapath hoặc chỉ xem xét một metapath. Để khắc phục ba giới hạn này, tác giả đề xuất một mô hình mới là *Metapath Aggregated Graph Neural Network* (MAGNN) để tăng tốc hiệu năng cuối cùng. Đặc biệt, MAGNN sử dụng ba thành phần chính, biến đổi nội dung của nút thành các thuộc tính đóng gói của nút đầu vào, tổng hợp intra-metapath để kết hợp các nút ngữ nghĩa trung gian và tổng hợp inter-metapath để kết hợp thông tin từ nhiều metapaths. Các thí nghiệm được thực hiện trên ba bộ dữ liệu đồ thị không đồng nhất trong thực tế để phân loại nút, phân cụm nút và dự đoán liên kết chỉ ra rằng MAGNN đạt được kết quả dự đoán chính xác hơn so với các mô hình state-of-the-art hiện tại.

I. INTRODUCTION

Nhiều bộ dữ liệu thực tế được biểu diễn với cấu trúc dữ liệu đồ thị, trong đó các đối tượng và quan hệ giữa chúng được biểu diễn bằng các nút và cạnh. Các ví dụ bao gồm mạng xã hội [14, 29], hệ thống vật lý [2, 10], mạng giao thông [18, 34], mạng trích dẫn [1, 14, 16], hệ thống gợi ý [26, 35], đồ thị tri thức [3, 24], ... Bản chất non-Euclidean của đồ thị khiến chúng khó mô hình hóa bằng các mô hình học máy truyền thống. Với tập hàng xóm của mỗi nút, không hề có thứ tự hoặc giới hạn về kích thước, Tuy nhiên, hầu hết các mô hình thống kê giả định rằng một đầu vào có thứ tự và kích thước cố định trong không gian Euclid. Do đó, sẽ thuận tiện nếu các nút có thể được biểu diễn bằng các vector thấp chiều trong không gian Euclid và từ đó có thể lấy làm đầu vào của mô hình học máy khác.

Các kĩ thuật embed đồ thị khác nhau được đề xuất cho cấu trúc dữ liệu đồ thị. LINE [25]

II. EASE OF USE

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Before you begin to format your paper, first write and save the content as a separate text file. Complete all content and organizational editing before formatting. Please note sections III-A–III-E below for more information on proofreading, spelling and grammar.

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A. Abbreviations and Acronyms

Define abbreviations and acronyms the first time they are used in the text, even after they have been defined in the abstract. Abbreviations such as IEEE, SI, MKS, CGS, ac, dc, and rms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.

B. Units

- Use either SI (MKS) or CGS as primary units. (SI units are encouraged.) English units may be used as secondary units (in parentheses). An exception would be the use of English units as identifiers in trade, such as “3.5-inch disk drive”.
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- Use a zero before decimal points: “0.25”, not “.25”. Use “cm³”, not “cc”).

C. Equations

Number equations consecutively. To make your equations more compact, you may use the solidus (/), the exp function,

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$$a + b = \gamma \quad (1)$$

Be sure that the symbols in your equation have been defined before or immediately following the equation. Use “(1)”, not “Eq. (1)” or “equation (1)”, except at the beginning of a sentence: “Equation (1) is . . .”

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Please use “soft” (e.g., `\eqref{Eq}`) cross references instead of “hard” references (e.g., (1)). That will make it possible to combine sections, add equations, or change the order of figures or citations without having to go through the file line by line.

Please don’t use the `{eqnarray}` equation environment. Use `{align}` or `{IEEEeqnarray}` instead. The `{eqnarray}` environment leaves unsightly spaces around relation symbols.

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- The word “data” is plural, not singular.
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- In American English, commas, semicolons, periods, question and exclamation marks are located within quotation marks only when a complete thought or name is cited, such as a title or full quotation. When quotation marks are used, instead of a bold or italic typeface, to highlight a word or phrase, punctuation should appear outside of the quotation marks. A parenthetical phrase or statement

at the end of a sentence is punctuated outside of the closing parenthesis (like this). (A parenthetical sentence is punctuated within the parentheses.)

- A graph within a graph is an “inset”, not an “insert”. The word alternatively is preferred to the word “alternately” (unless you really mean something that alternates).
- Do not use the word “essentially” to mean “approximately” or “effectively”.
- In your paper title, if the words “that uses” can accurately replace the word “using”, capitalize the “u”; if not, keep using lower-cased.
- Be aware of the different meanings of the homophones “affect” and “effect”, “complement” and “compliment”, “discreet” and “discrete”, “principal” and “principle”.
- Do not confuse “imply” and “infer”.
- The prefix “non” is not a word; it should be joined to the word it modifies, usually without a hyphen.
- There is no period after the “et” in the Latin abbreviation “et al.”.
- The abbreviation “i.e.” means “that is”, and the abbreviation “e.g.” means “for example”.

An excellent style manual for science writers is [7].

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The class file is designed for, but not limited to, six authors. A minimum of one author is required for all conference articles. Author names should be listed starting from left to right and then moving down to the next line. This is the author sequence that will be used in future citations and by indexing services. Names should not be listed in columns nor group by affiliation. Please keep your affiliations as succinct as possible (for example, do not differentiate among departments of the same organization).

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Headings, or heads, are organizational devices that guide the reader through your paper. There are two types: component heads and text heads.

Component heads identify the different components of your paper and are not topically subordinate to each other. Examples include Acknowledgments and References and, for these, the correct style to use is “Heading 5”. Use “figure caption” for your Figure captions, and “table head” for your table title. Run-in heads, such as “Abstract”, will require you to apply a style (in this case, italic) in addition to the style provided by the drop down menu to differentiate the head from the text.

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Bảng I
TABLE TYPE STYLES

Table Head	Table Column Head		
	Table column subhead	Subhead	Subhead
copy	More table copy ^a		

^aSample of a Table footnote.



Hình 1. Example of a figure caption.

Figure Labels: Use 8 point Times New Roman for Figure labels. Use words rather than symbols or abbreviations when writing Figure axis labels to avoid confusing the reader. As an example, write the quantity “Magnetization”, or “Magnetization, M”, not just “M”. If including units in the label, present them within parentheses. Do not label axes only with units. In the example, write “Magnetization (A/m)” or “Magnetization {A[m(1)]}”, not just “A/m”. Do not label axes with a ratio of quantities and units. For example, write “Temperature (K)”, not “Temperature/K”.

ACKNOWLEDGMENT

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REFERENCES

Please number citations consecutively within brackets [1]. The sentence punctuation follows the bracket [2]. Refer simply to the reference number, as in [3]—do not use “Ref. [3]” or “reference [3]” except at the beginning of a sentence: “Reference [3] was the first ...”

Number footnotes separately in superscripts. Place the actual footnote at the bottom of the column in which it was cited. Do not put footnotes in the abstract or reference list. Use letters for table footnotes.

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the first word in a paper title, except for proper nouns and element symbols.

For papers published in translation journals, please give the English citation first, followed by the original foreign-language citation [6].

TÀI LIỆU

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