Formatting Instructions for Authors Using LaTeX

AAAI Press
Association for the Advancement of Artificial Intelligence
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Abstract

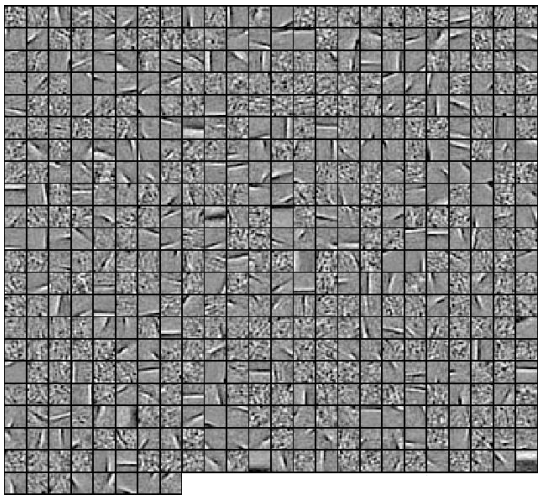
We propose a novel way to search natural images by higher-level features from the observations in human primary visual cortex to combine the simulation result of v1 neurons and expect to do large images search as a new cognitive architecture. We leverage sparsity-based dictionary learning and hash-based auto-learned feature selection algorithm to show fast images retrieval results. Finally, we consider a more general problem of how a learned dictionary might be related to large-scale data retrieval and expect to draw more attention to this important research.

Motivation and Introduction

Similar image retrieval has become an important problem with many real-world applications in artificial intelligence field. To be able to process the growing amount of data, more efficient and reliable algorithms are needed. Until now, there is still a lack of an effective guideline to decide similarity for a computer, though the problem posts no difficulty to human beings. This motivated us to incorporate the biology-inspired sparse coding and hashing techniques for more intuitive, real time retrieval results. There are many researches studying about how to make image retrieval effective. Conventionally, there are three steps in large-scale content-based image retrieval when given a set of indexed images and a query image. The first is feature extraction. Many complex approaches are developed to find effective image representation to encode a variety of images. Secondly, dimension reduction is important to speed up the retrieval process. Finally, effective metric is needed to compute the similarity between features. Compared to the traditional framework we propose a different solution without the part of feature extraction to solve this problem by the plausible model of visual cortexsparse coding.

Sparse coding with an overcomplete basis representations (Olshausen and Field 1996), inspired from mammalian striate cortex by neural science community has been widely applied in many computer sciences fields, such as data compression, speech recognition and image denoising, etc. (Sivaram 2010), (Wright et al. 2009). One important property of sparse coding is that it can extract effective higher-level features from the data by simulating partial activity of neurons. According to promising neural science theory and the high performance of algorithms developed within decades, we assume that sparse coding which simulates mammalian visual cortex activities is a very efficient approach to find the latent features compared to traditional unsupervised learning such as PCA. We also assume that neuron simulation-based approach for image representation is better than other widely used computer vision features including SIFT (Lowe 1999), GIST (Oliva et al. 2001), HOG (Dalal et al. 2005) and etc. because we have our visual system as promising evidence to support.

Some people have images search problem with the representation of sparse codes proposed by (Ge et al. 2013). However, finding sparse codes has high computational costs on doing effective real time search. We propose a novel approach to solve this problem by using overcomplete basis in dictionary rather than computing sparse codes and we will show that our approach is effective in natural image.



Preprocessing-Unsupervised dictionary learning

Sparse-based dictionary learning has proven been effective in natural images which are mostly scene image. Given in-

put unlabeled scene images, the effective sparse coding proposed by (Lee et al. 2007) captures succinct feature with higher meanings and generate a dictionary with overcomplete bases which are effective to represent the image in data set given the corresponding sparse code. The basic descriptions such as edges and line segments are efficiently encoded into atoms of dictionary so we will pre-trained the dictionary as our dimension reduction projection bases. (dictioanry)

System framework

Given a query natural image, we firstly decorrelate the image to equalize the variance which is also employed in preprocessing for dictionary due to potential factual and corrupted and this also roughly simulate spatial-frequency reponse characteristic of retinal ganglion cells proposed by (Olshausen 1997) in our cognitive system. We then uniformly select several image patches to extract a certain pattern of the image. We feed all extracted vectors into our auto-learned feature selection algorithms to encode the data. Finally, we use L2 distance as default metric to compute similarity score. The system diagram is shown in Figure 2.

Auto-learned feature selection algorithms

Since our retrieval framework encode the image pattern of natural images into sparsity-based dictionary, we are motivated to select effective feature, especially those have high response to patches of natural images. Inspired by localitive sensitive hashing proposed by (Andoni et al. 2008), where high dimensional data can be projected to lower dimensional space with similarity preserving promise, we propose our novel algorithm to find out the atom of feature pattern in the dictionary to perform our hash-based dimensional reduction.

Firstly, we project our patches vector onto the atom of dictionary to get the highest values of the result for each vector of patches and have another zero array with the same size. We call those atoms strong responsive to the corresponding patches vector. Then, we set the value of each patches vector at corresponding atom of dictionary to be one.

Secondly, we substract the strong responsive atom from the corresponding patches vector in order to select second strong responsive atom with respect to the corresponding patches vector.

Iteratively, we will rank out the top n strong responsive atoms as our output for each patch vector. By this way, we can encode the raw data directly by the ranking of the response of corresponding atom based on sparsity based dictionary and we will show that the result has some effects consistent with our visual system.

Experimental results

- show the recall and precision for some image
- show the result images

Conclusion

Rather than traditional human-turned feature extraction our cognitive system based on sparse coding successfully combine proposed novel auto-learned feature selection algorithm with sparsity-based dictionary to retrieve natural images with high performance. The sparsity-based dictionary which capture basic elements consisting a natural image is a well learned structure to encode images. Although it needs more powerful algorithm and research in large-scale image retrieval or other big data, this is the promising direction of relative application.

How to work with big data?

When the world is filled with big data, effective approach is needed to deal with such a challenge. Large-scale image with effective and reliable performance is one of examples. Recently, we are attempting to address an open question if there is new approach based our framework to handle this old but not well-solved problem. Our work lies in how we design the connection between visual neuron encoding simulation and image retrieval problem and how we investigate an effective large-sale image retrieval new candidate.

References

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Dalal, Navneet, and Bill Triggs. "Histograms of oriented gradients for human detection." Computer Vision and Pattern Recognition, 2005. CVPR 2005. IEEE Computer Society Conference on. Vol. 1. IEEE, 2005.

CACM survey of LSH (2008): "Near-Optimal Hashing Algorithms for Approximate Nearest Neighbor in High Dimensions" (by Alexandr Andoni and Piotr Indyk).Communications of the ACM, vol. 51, no. 1, 2008, pp. 117-122. directly from CACM

key sentence

Critical question or point:

- **software systems: emulate actual neurophysiological mechanisms and algorithms that support human cognition**

- **what are the emerging machine learning technologies that address the big data challenges implied by cognitive computing applications?**
- **How can cognitive computing techniques improve human computation, and what demands do the latter put on the former?**
- **Sparsity-based techniques and process unstructured data**

  Our point:

- **sparse coding**
- **images patches rather than human-turned feature extraction**
- **unsupervised dictionary learning**
- **hashing rather than sparse code computing**
- **large-scale data search (future work and our vision)**
- **effective similarity preservation by auto-learned feature selection algorithm**

Book with Multiple Authors
Engelmore, R., and Morgan, A. eds. 1986. *Blackboard Systems.* Reading, Mass.: Addison-Wesley.

Journal Article
Robinson, A. L. 1980a. New Ways to Make Microcircuits Smaller. *Science* 208: 1019–1026.

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Hasling, D. W.; Clancey, W. J.; and Rennels, G. R. 1983. Strategic Explanations in Consultation. *The International Journal of Man-Machine Studies* 20(1): 3–19.

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Clancey, W. J. 1983b. Communication, Simulation, and Intelligent Agents: Implications of Personal Intelligent Machines for Medical Education. In Proceedings of the Eighth International Joint Conference on Artificial Intelligence, 556–560. Menlo Park, Calif.: International Joint Conferences on Artificial Intelligence, Inc.

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Clancey, W. J. 1984. Classification Problem Solving. In *Proceedings of the Fourth National Conference on Artificial Intelligence,* 49–54. Menlo Park, Calif.: AAAI Press.

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Rice, J. 1986. Poligon: A System for Parallel Problem Solving, Technical Report, KSL-86-19, Dept. of Computer Science, Stanford Univ.

Dissertation or Thesis
Clancey, W. J. 1979b. Transfer of Rule-Based Expertise through a Tutorial Dialogue. Ph.D. diss., Dept. of Computer Science, Stanford Univ., Stanford, Calif.

Forthcoming Publication
Clancey, W. J. 1986a. The Engineering of Qualitative Models. Forthcoming.

Formatting Requirements in Brief

We need source and PDF files that can be used in a variety of ways and can be output on a variety of devices. AAAI imposes some requirements on your source and PDF files that must be followed. Most of these requirements are based on our efforts to standardize conference manuscript properties and layout. These requirements are as follows, and all papers submitted to AAAI for publication must comply:

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- All fonts must be embedded in the PDF file — **this includes your figures.**
- Modifications to the style sheet (or your document) in an effort to avoid extra page charges are NOT allowed.
- No type 3 fonts may be used (even in illustrations).
- Your title must follow US capitalization rules.
- LaTeX documents must use the Times or Nimbus font package (do not use Computer Modern for the text of your paper).
- No LaTeX 209 documents may be used or submitted.
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- Two-column format in AAAI style is required for all papers.
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- The source file must exactly match the PDF.
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- The number of pages and the file size must be as specified for your event.
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- Your source and PDF must not have any page numbers, footers, or headers.
- Your PDF must be compatible with Acrobat 5 or higher.
- Your LaTeX source file (excluding references) must consist of a **single** file (use of the "input" command is not allowed.
- Your graphics must be sized appropriately outside of LaTeX (do not use the "clip" command) .

If you do not follow the above requirements, it is likely that we will be unable to publish your paper.

What Files to Submit

You must submit the following items to ensure that your paper is published:

- A fully-compliant PDF file.

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- All your graphics files.
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- All the nonstandard style files (ones not commonly found in standard LaTeX installations) used in your document (including, for example, old algorithm style files). If in doubt, include it.

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Your files should work without any supporting files (other than the program itself) on any computer with a standard LaTeX distribution. Place your PDF and source files in a single tar, zipped, gzipped, stuffed, or compressed archive. Name your source file with your last (family) name.

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Using LaTeX to Format Your Paper

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In the LaTeX source for your paper, you **must** place the following lines as shown in the example in this subsection. This command set-up is for three authors. Add or subtract author and address lines as necessary, and uncomment the portions that apply to you. In most instances, this is all you need to do to format your paper in the Times font. The helvet package will cause Helvetica to be used for sans serif, and the courier package will cause Courier to be used for the typewriter font. These files are part of the PSNFSS2e package, which is freely available from many Internet sites (and is often part of a standard installation).

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```
\documentclass[letterpaper]article
% Required Packages
\usepackage{aaai}
\usepackage{times}
\usepackage{helvet}
\usepackage{courier}
\setlength{\pdfpagewidth}{8.5in}
\setlength{\pdfpageheight}{11in}
%%%%%%%%%%
% PDFINFO for PDFLaTeX
% Uncomment and complete the following for metadata (your paper must compile with PDFLaTeX)
\pdfinfo{
/Title (Input Your Paper Title Here)
/Author (John Doe, Jane Doe)
/Keywords (Input your paper's keywords in this optional area)
}
%%%%%%%%%%
% Section Numbers
% Uncomment if you want to use section numbers
% and change the 0 to a 1 or 2
% \setcounter{secnumdepth}{0}
%%%%%%%%%%
% Title, Author, and Address Information
\title{Title}
\author{Author 1 \and Author 2\\
Address line\\
Address line\\
\And
Author 3\\
Address line\\
Address line}
%%%%%%%%%%
% Body of Paper Begins
\begin{document}
\maketitle
...
%%%%%%%%%%
% References and End of Paper
\bibliography{Bibliography-File}
\bibliographystyle{aaai}
\end{document}
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...
\bibliography{Bibliography-File}
\bibliographystyle{aaai}
\end{document}
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- hyperref
- natbib
- geometry
- titlesec
- layout
- caption
- titlesec
- T1 fontenc package (install the CM super fonts package instead)

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- \input
- \vspace (when used before or after a section or subsection)
- \addtolength
- \columnsep
- \top margin (or text height or addsidemargin or even side margin)

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Papers must be formatted to print in two-column format on 8.5 x 11 inch US letter-sized paper. The margins must be exactly as follows:

- Top margin: .75 inches
- Left margin: .75 inches
- Right margin: .75 inches
- Bottom margin: 1.25 inches

The default paper size in most installations of LaTeX is A4. However, because we require that your electronic paper be formatted in US letter size, you will need to alter the default for this paper to US letter size. Assuming you are using the 2e version of LaTeX, you can do this by including the [letterpaper] option at the beginning of your file: \documentclass[letterpaper]article.

This command is usually sufficient to change the format. Sometimes, however, it may not work. Use PDFLaTeX and include \setlength{\pdfpagewidth}{8.5in} \setlength{\pdfpageheight}{11in} in your preamble.

Do not use the Geometry package to alter the page size. Use of this style file alters aaai.sty and will result in your paper being rejected.

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If your paper is too long, turn on \frenchspacing, which will reduce the space after periods. Next, shrink the size of your graphics. Use \centering instead of \begin{center} in your figure environment. If these two methods don't work, you may minimally use the following. For floats (tables and figures), you may minimally reduce \floatsep, \textfloatsep, \abovecaptionskip, and \belowcaptionskip. For mathematical environments, you may minimally reduce \abovedisplayskip, \belowdisplayskip, and \arraycolsep. You may also alter the size of your bibliography by inserting \fontsize{9.5pt}{10.5pt} \selectfont right before the bibliography.

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Obtaining Type 1 Computer Modern for LaTeX. If you use Computer Modern for the mathematics in your paper (you cannot use it for the text) you may need to download type 1 Computer fonts. They are available without charge from the American Mathematical Society: http://www.ams.org/tex/type1-fonts.html.

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Address line \\ ... \\ Address line}
```

If the names do not fit well on one line use:

```
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{\bf Author 2}\\ ... \\ {\bf Author n}\\
Address line \\ ... \\ Address line}
```

For authors from different institutions, use \And:

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\author{Author 1\\ Address line \\ ... \\ Address line
\And ... \And Author n\\
Address line\\ ... \\ Address line}
```

To start a separate "row" of authors, use \AND:

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\author{Author 1\\ Address line \\ ... \\ Address line\\
\AND
Author 2 \\ Address line \\ ... \\ Address line\\
\And
Author 3 \\ Address line \\ ... \\ Address line\\
}
```

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Avoid footnotes as much as possible; they interrupt the reading of the text. When essential, they should be consecutively numbered throughout with superscript Arabic numbers. Footnotes should appear at the bottom of the page, separated from the text by a blank line space and a thin, half-point rule.

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First-level heads should be twelve-point Times Roman bold type, mixed case (initial capitals followed by lower case on all words except articles, conjunctions, and prepositions, which should appear entirely in lower case), with fifteen-point leading, centered, with one blank line preceding them and three additional points of leading following them. Second-level headings should be eleven-point Times Roman bold type, mixed case, with thirteen-point leading, flush left, with one blank line preceding them and three additional points of leading following them. Do not skip a line between paragraphs. Third-level headings should be run in with the text, ten-point Times Roman bold type, mixed case, with twelve-point leading, flush left, with six points of additional space preceding them and no additional points of leading following them.

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Appendices. Any appendices follow the acknowledgments, if included, or after the main body of text if no acknowledgments appear.

References The references section should be labeled "References" and should appear at the very end of the paper (don't end the paper with references, and then put a figure by itself on the last page). A sample list of references is given later on in these instructions. Please use a consistent format for references. Poorly prepared or sloppy references reflect badly on the quality of your paper and your research. Please prepare complete and accurate citations.

Illustrations and Figures

Figures, drawings, tables, and photographs should be placed throughout the paper near the place where they are first discussed. Do not group them together at the end of the paper. If placed at the top or bottom of the paper, illustrations may run across both columns. Figures must not invade the top, bottom, or side margin areas. Figures must be inserted using the \usepackage{graphicx}. Number figures sequentially, for example, figure 1, and so on.

The illustration number and caption should appear under the illustration. Labels, and other text in illustrations must be at least nine-point type.

Low-Resolution Bitmaps. You may not use low-resolution (such as 72 dpi) screen-dumps and GIF files—these files contain so few pixels that they are always blurry, and illegible when printed. If they are color, they will become an indecipherable mess when converted to black and white. This is always the case with gif files, which should never be used. The resolution of screen dumps can be increased by reducing the print size of the original file while retaining the same number of pixels. You can also enlarge files by manipulating them in software such as PhotoShop. Your figures should be a minimum of 266 dpi when incorporated into your document.

LaTeX Overflow. LaTeX users please beware: LaTeX will sometimes put portions of the figure or table or an equation in the margin. If this happens, you need to scale the figure or table down, or reformat the equation. Check your log file! You must fix any overflow into the margin (that means no overfull boxes in LaTeX). If you don't, the overflow text will simply be eliminated. **Nothing is permitted to intrude into the margins.**

Using Color. Your paper will be printed in black and white and grayscale. Consequently, because conversion to grayscale can cause undesirable effects (red changes to black, yellow can disappear, and so forth), we strongly suggest you avoid placing color figures in your document. Of course, any reference to color will be indecipherable to your reader.

Drawings. We suggest you use computer drawing software (such as Adobe Illustrator or, (if unavoidable), the drawing tools in Microsoft Word) to create your illustrations. Do not use Microsoft Publisher. These illustrations will look best if all line widths are uniform (half- to two-point in size), and you do not create labels over shaded areas. Shading should be 133 lines per inch if possible. Use Times Roman or Helvetica for all figure call-outs. **Do not use hairline width lines** — be sure that the stroke width of all lines is at least .5 pt. Zero point lines will print on a laser printer, but will completely disappear on the high-resolution devices used by our printers.

Photographs and Images. Photographs and other images should be in grayscale (color photographs will not reproduce well; for example, red tones will reproduce as black, yellow may turn to white, and so forth) and set to a minimum of 266 dpi. Do not prescreen images.

Resizing Graphics. Resize your graphics **before** you include them with LaTeX. You may **not** use trim or clip options as part of your \includgraphics command. Resize the media box of your PDF using a graphics program instead.

Fonts in Your Illustrations You must embed all fonts in your graphics before including them in your LaTeX document.

References

The aaai.sty file includes a set of definitions for use in formatting references with BibTeX. These definitions make the bibliography style fairly close to the one specified below. To use these definitions, you also need the BibTeX style file "aaai.bst," available in the author kit on the AAAI web site. Then, at the end of your paper but before \enddocument, you need to put the following lines:

```
\bibliographystyle{aaai} \bibliography{bibfile1,bibfile2,...}
```

The list of files in the \bibliography command should be the names of your BibTeX source files (that is, the .bib files referenced in your paper).

The following commands are available for your use in citing references:

\cite: Cites the given reference(s) with a full citation. This appears as "(Author Year)" for one reference, or "(Author Year; Author Year)" for multiple references.
\shortcite: Cites the given reference(s) with just the year. This appears as "(Year)" for one reference, or "(Year; Year)" for multiple references.
\citeauthor: Cites the given reference(s) with just the author name(s) and no parentheses.
\citeyear: Cites the given reference(s) with just the date(s) and no parentheses.

Warning: The aaai.sty file is incompatible with the hyperref and natbib packages. If you use either, your references will be garbled.

Formatted bibliographies should look like the following examples.

Book with Multiple Authors
Engelmore, R., and Morgan, A. eds. 1986. *Blackboard Systems.* Reading, Mass.: Addison-Wesley.

Journal Article
Robinson, A. L. 1980a. New Ways to Make Microcircuits Smaller. *Science* 208: 1019–1026.

Magazine Article
Hasling, D. W.; Clancey, W. J.; and Rennels, G. R. 1983. Strategic Explanations in Consultation. *The International Journal of Man-Machine Studies* 20(1): 3–19.

Proceedings Paper Published by a Society
Clancey, W. J. 1983b. Communication, Simulation, and Intelligent Agents: Implications of Personal Intelligent Machines for Medical Education. In Proceedings of the Eighth International Joint Conference on Artificial Intelligence, 556–560. Menlo Park, Calif.: International Joint Conferences on Artificial Intelligence, Inc.

Proceedings Paper Published by a Press or Publisher
Clancey, W. J. 1984. Classification Problem Solving. In *Proceedings of the Fourth National Conference on Artificial Intelligence,* 49–54. Menlo Park, Calif.: AAAI Press.

University Technical Report
Rice, J. 1986. Poligon: A System for Parallel Problem Solving, Technical Report, KSL-86-19, Dept. of Computer Science, Stanford Univ.

Dissertation or Thesis
Clancey, W. J. 1979b. Transfer of Rule-Based Expertise through a Tutorial Dialogue. Ph.D. diss., Dept. of Computer Science, Stanford Univ., Stanford, Calif.

Forthcoming Publication
Clancey, W. J. 1986a. The Engineering of Qualitative Models. Forthcoming.

Producing Reliable PDF Documents with LaTeX

Generally speaking, PDF files are platform independent and accessible to everyone. When creating a paper for a proceedings or publication in which many PDF documents must be merged and then printed on high-resolution PostScript RIPs, several requirements must be met that are not normally of concern. Thus to ensure that your paper will look like it does when printed on your own machine, you must take several precautions:

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- Use only standard Times, Nimbus, and CMR font packages (not fonts like F3 or fonts with tildes in the names or fonts—other than Computer Modern—that are created for specific point sizes, like Times˜19) or fonts with strange combinations of numbers and letters
- Embed all fonts when producing the PDF
- Do not use the [T1]fontenc package (install the CM super fonts package instead)

Creating Output Using PDFLaTeX Is Required

By using the PDFTeX program instead of straight LaTeX or TeX, you will probably avoid the type 3 font problem altogether (unless you use a package that calls for metafont). PDFLaTeX enables you to create a PDF document directly from LaTeX source. The one requirement of this software is that all your graphics and images must be available in a format that PDFLaTeX understands (normally PDF).

PDFLaTeX's default is to create documents with type 1 fonts. If you find that it is not doing so in your case, it is likely that one or more fonts are missing from your system or are not in a path that is known to PDFLaTeX.

dvipdf Script Scripts such as dvipdf which ostensibly bypass the Postscript intermediary should not be used since they generally do not instruct dvips to use the config.pdf file.

dvipdfm Do not use this dvi-PDF conversion package if your document contains graphics (and we recommend you avoid it even if your document does not contain graphics).

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Additional Resources

LaTeX is a difficult program to master. If you've used that software, and this document didn't help or some items were not explained clearly, we recommend you read Michael Shell's excellent document (testflow doc.txt V1.0a 2002/08/13) about obtaining correct PS/PDF output on LaTeX systems. (It was written for another purpose, but it has general application as well). It is available at www.ctan.org in the tex-archive.

Acknowledgments

AAAI is especially grateful to Peter Patel Schneider for his work in implementing the aaai.sty file, liberally using the ideas of other style hackers, including Barbara Beeton. We also acknowledge with thanks the work of George Ferguson for his guide to using the style and BibTeX files — which has been incorporated into this document — and Hans Guesgen, who provided several timely modifications, as well as the many others who have, from time to time, sent in suggestions on improvements to the AAAI style.

The preparation of the LaTeX and BibTeX files that implement these instructions was supported by Schlumberger Palo Alto Research, AT&T Bell Laboratories, Morgan Kaufmann Publishers, The Live Oak Press, LLC, and AAAI Press. Bibliography style changes were added by Sunil Issar. \pubnote was added by J. Scott Penberthy. George Ferguson added support for printing the AAAI copyright slug. Additional changes to aaai.sty and aaai.bst have been made by the AAAI staff.

Thank you for reading these instructions carefully. We look forward to receiving your electronic files!