2017 Formatting Instructions for Authors Using LaTeX

AAAI Press
Association for the Advancement of Artificial Intelligence
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Palo Alto, California 94303

Abstract

The Proposed H Distance

We consider the one dimensional case as a start. Following is the optimal H distance proposed in place of Wasserstein distance,

$$H^*(x, \mathbb{P}_r, \mathbb{P}_g) = |\int_x^1 \mathbb{P}_r(x')dx' - \int_x^1 \mathbb{P}_g(x')dx'| \quad (1)$$

while the Wasserstein distance is,

$$H^*(x, \mathbb{P}_r, \mathbb{P}_g) = |\int_x^1 \mathbb{P}_r(x')dx' - \int_x^1 \mathbb{P}_g(x')dx'| \quad (2)$$

where x_r are real samples sampled from distribution $\mathbb{P}_r$, and x_g are generated samples sampled from distribution $\mathbb{P}_g$,

$$x_r \sim \mathbb{P}_r \quad (3)$$

$$x_g \sim \mathbb{P}_g \quad (4)$$

Note that both x_r and x_g are normalized between $[0, 1]$, so that the integral operation in (2) can be conducted in $[0, 1]$, instead of $[-\infty, +\infty]$. This distance is modeled for every x, which means we train the generative model g to minimize H^* at every x_g,

$$\min_g \mathbb{E}_{x_g \sim \mathbb{P}_g}[H^*(x_g, \mathbb{P}_r, \mathbb{P}_g)] \quad (5)$$

To give insight on why it is better This distance is better than Wasserstein distance in the sense that it computes the unbalance of the whole distribution at every point.

Assuming we have a optimal D model that can model the part in the

Following Chris's second equation,

$$\mathbb{E}[f(X_r)] - \mathbb{E}[f(X_g)] = \sum_{n=1}^{\infty} \frac{a_n}{n!}(\mathbb{E}[X_r^n] - \mathbb{E}[X_g^n]) \quad (6)$$

The coefficient in above equation, i.e., $a_0, a_1, ..., a_n$ is variables to be learnt, which means it is modeled by a neural network D with parameter vector θ_n and input of X_r or X_g, and it is different for X_r and X_g,

$$a_n = D_{\theta_n}(X_r) \quad (7)$$

$$b_n = D_{\theta_n}(X_g) \quad (8)$$

As we discussed, $\theta_0, \theta_1, ..., \theta_n$ may share most of the parameters. So Chris (6) should be,

$$\mathbb{E}[f(X_r)] - \mathbb{E}[f(X_g)] = \sum_{n=1}^{\infty}(\mathbb{E}[\frac{a_n}{n!}X_r^n] - \mathbb{E}[\frac{b_n}{n!}X_g^n]) \quad (9)$$

or to be more specific,

$$\mathbb{E}[f(X_r)] - \mathbb{E}[f(X_g)] = \sum_{n=1}^{\infty}(\mathbb{E}[\frac{D_{\theta_n}(X_r)}{n!}X_r^n] - \mathbb{E}[\frac{D_{\theta_n}(X_g)}{n!}X_g^n]) \quad (10)$$

I do not know how to continue to prove it is

Consider,

$$x_r \sim \mathbb{P}_r \quad (11)$$

$$x_g \sim \mathbb{P}_g \quad (12)$$

$$u \sim U[0, 1] \quad (13)$$

$$x_u = ux_u + (1 - u)x_g \quad (14)$$

where $U[0, 1]$ is uniform distribution between 0 and 1. Assuming x_u follows a distribution given by $\mathbb{P}_u$,

$$x_u \sim \mathbb{P}_u \quad (15)$$

Apparently, $\mathbb{P}_u$ can be represented by $\mathbb{P}_r$ and $\mathbb{P}_g$, but in a tricky way.

I think the distance we are trying to minimize for the new loss is,

$$H^*(\mathbb{P}_r, \mathbb{P}_g) = \int_{\nvDash}^{\nVdash} \{|\int_x^{\nVdash} \mathbb{P}_r(x')dx' - \int_x^{\nVdash} \mathbb{P}_g(x')dx'|\}dx \quad (16)$$

Since we update the model on position x_u, we actually can only achieve,

$$H(\mathbb{P}_r, \mathbb{P}_g) = \mathbb{E}_{x_u \sim \mathbb{P}_u}\{\int_{x_u}^{\nVdash} \mathbb{P}_r(x)dx - \int_{x_u}^{\nVdash} \mathbb{P}_g(x)dx\} \quad (17)$$

and x_g is sampled from $\mathbb{P}_g$,

$$x_g \sim \mathbb{P}_g \quad (18)$$

which is produced by a generative model G^β, with parameter vector β to to be optimized. For every x_r, x_g pair, we sample x_ϵ between x_r and x_g,

$$x_\epsilon = \epsilon x_r + (1-\epsilon)x_g \tag{19}$$

where

$$\epsilon \sim Uniform[0,1] \tag{20}$$

Assuming x_ϵ follows a distribution given by $\mathbb{P}_\epsilon$,

$$x_\epsilon \sim \mathbb{P}_\epsilon \tag{21}$$

Apparently, $\mathbb{P}_\epsilon$ can be represented by $\mathbb{P}_r$ and $\mathbb{P}_g$, but in a tricky way.

Then we build a model D^θ with parameter vector θ. For every set of $\{x_r, x_g, x_\epsilon\}$, the update rule of θ is,

$$\theta \longrightarrow \theta + \nabla_\theta \|\nabla_{x_\epsilon} D^\theta(x_\epsilon) - \frac{x_r - x_g}{\|x_r - x_g\|}\|^2 \tag{22}$$

which means the optimal D^θ has the following attribute,

$$\nabla_x D^{\theta^*}(x) = \mathbb{E}_{x_r \sim \mathbb{P}_r, x_g \sim \mathbb{P}_g}\{\frac{x_r - x_g}{\|x_r - x_g\|}\} \tag{23}$$

Under this D^{θ^*}, the update rule of G^β is

$$\min_\phi \mathbb{E}_{(P_g, P_r, U)}[\|\nabla_{\tilde{x}} f_\phi(x_{\tilde{x}}) - \frac{x_r - x_g}{\|x_r - x_g\|}\|^2] \tag{24}$$

$$\max_g \mathbb{E}_{(P_g, P_r, U)}[f_\phi(x_g)] \tag{25}$$

the same as,

$$\min_\phi \mathbb{E}_{(P_g, P_r, U)}[\|\nabla_{\tilde{x}} f_\phi(x_{\tilde{x}}) - \frac{x_g - x_r}{\|x_g - x_r\|}\|^2] \tag{26}$$

$$\min_g \mathbb{E}_{(P_g, P_r, U)}[f_\phi(x_g)] \tag{27}$$

I believe the distance we are minimizing for the new loss is,

where x_ϵ is a random variable computed by,

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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.
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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.
- Your LaTeX source file submitted as a **single** .tex file (do not use the "input" command to include sections of your paper — every section must be in the single source file). The only exception is the reference list, which you should include separately. Your source must compile on our system, which includes the standard LaTeX support files.
- Only the graphics files used in compiling paper.
- The LaTeX-generated files (e.g. .aux and .bib file, etc.) for your compiled source.
- If you have used an old installation of LaTeX, you should include algorithm style files). If in doubt, include it.

Your LaTeX source will be reviewed and recompiled on our system (if it does not compile, you may incur late fees). **Do not submit your source in multiple text files.** Your single LaTeX source file must include all your text, your bibliography (formatted using aaai.bst), and any custom macros. Accompanying this source file, you must also supply any nonstandard (or older) referenced style files and all your referenced graphics files.

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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. 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}
\usepackage{aaai}
\usepackage{times}
\usepackage{helvet}
\usepackage{courier}
\usepackage{url}
\usepackage{graphicx}
\frenchspacing
% Add additional packages here. The following
% packages may NOT be used  (this list
% is not exhaustive:
% authblk, caption, CJK, float, fullpage, geometry,
%hyperref, layout, nameref, natbib, savetrees,
%setspace, titlesec, tocbibind, ulem
%
%US Lettersize Paper Is Required
\setlength{pdfpagewidth}{8.5in}
\setlength{pdfpageheight}{11in}\\
%
%
% PDFINFO
% You are required to complete the following
% for pass-through to the PDF.
% No LaTeX commands of any kind may be
% entered. The parentheses and spaces
% are an integral part of the
% pdfinfo script and must not be removed.
%
\pdfinfo{
/Title (Input Your Paper Title Here)
/Author (John Doe, Jane Doe)
```

```
/Keywords (Input your 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 and Author Information Must Immediate Follow
% the pdfinfo within the preamble
%
\title{Title}\\
\author\{Author 1 \ and Author 2\\
Address line\\
Address line\\
\ And\\
Author 3\\
Address line\\
Address line
}\\
%
```

Preparing Your Paper

After the preamble above, you should prepare your paper as follows:

```
%
\begin{document}
\maketitle
\begin{abstract}
%...
\end{abstract}
```

The Following Must Conclude Your Document

```
%References and End of Paper
%These lines must be placed at the end of your paper
\bibliography{Bibliography-File}
\bibliographystyle{aaai}
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```

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```
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\maketitle
...
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\bibliographystyle{aaai}
\end{document}
```

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- caption
- CJK
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- geometry
- hyperref
- layout
- nameref
- natbib
- savetrees
- setspace
- titlesec
- tocbibind
- ulem
- T1 fontenc package (install the CM super fonts package instead)

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The following commands may not be used in your paper (this list is not exhaustive — there are others; generally, if it alters floats, margins, fonts, linespacing, or the presentation of the references and citations, it is unacceptable:

- \renewcommand (in almost all instances)
- baselinestretch
- \setlength (except for titlebox)
- \input
- \vspace or vskip (when used before or after a section or subsection)
- \addtolength
- \columnsep
- \top margin (or text height or addsidemargin or even side margin)
- trim or clip (used to crop figures)
- any command that globally alters floats, space above and below figures and tables

Illegal Commands in Final Paper

For your final camera ready copy, you must not use any page break commands, including, but not limited to:

- \newpage
- \break
- \clearpage
- \pagebreak

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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:

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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.

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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. For mathematical environments, you may reduce fontsize. You may also alter the size of your bibliography by inserting \fontsize{9.5pt}{10.5pt} \selectfont right before the bibliography (the minimum size is \fontsize{9.0pt}{10.0pt}.

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Your title must appear in mixed case (nouns, pronouns, and verbs are capitalized) near the top of the first page, centered over both columns in sixteen-point bold type (twenty-four point leading). This style is called "mixed case." Author's names should appear below the title of the paper, centered in twelve-point type (with fifteen point leading), along with affiliation(s) and complete address(es) (including electronic mail address if available) in nine-point roman type (the twelve point leading). (If the title is long, or you have many authors, you may reduce the specified point sizes by up to two points.) You should begin the two-column format when you come to the abstract.

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

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\author{Author 1} ... \\
{\bf \Large Author  ...  Author}\\
Address line \\ ... \\ Address line
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Address line\\ ... \\ Address line}
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\author{AuthorTwo},\textsuperscript{2}
\author{AuthorThree},\textsuperscript{3}
\author{AuthorFour},\textsuperscript{4}
\author{AuthorFive}, \textsuperscript{5}\\
\textsuperscript{1}AffiliationOne}\\
\textsuperscript{2}AffiliationTwo}\\
\textsuperscript{3}AffiliationThree}\\
\textsuperscript{4}AffiliationFour}\\
\textsuperscript{5}AffiliationFive}\\
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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.

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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 with the actual illustration must be at least nine-point type.

If your paper includes illustrations that are not compatible with PDFTeX (such as .eps or .ps documents), you will need to convert them. The epstopdf package will usually work for eps files. You will need to convert your ps files to PDF however.

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 300 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 margin or gutter.**

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 300 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 style 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,...}

Please note that you are required to use \bibliographystyle{aaai} for your references. You may not use named, plain, apalike, acm, ieeetr, siam, chicago, or any other style. Use of natbib is also not acceptable.

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 and your paper will not be published.

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:

- Use type 1 fonts (not type 3 fonts)
- 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, jpg, or png).

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.

Ghostscript

LaTeX users should not use GhostScript to create their PDFs.

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!