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# High-Fidelity Counterfactual Explanations through Conformal Prediction

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## Abstract

1 The abstract paragraph should be indented 1/2 inch (3 picas) on both the left- and  
2 right-hand margins. Use 10 point type, with a vertical spacing (leading) of 11 points.  
3 The word **Abstract** must be centered, bold, and in point size 12. Two line spaces  
4 precede the abstract. The abstract must be limited to one paragraph.

## 5 1 Submission of papers to NeurIPS 2022

6 Please read the instructions below carefully and follow them faithfully.

### 7 1.1 Style

8 Papers to be submitted to NeurIPS 2022 must be prepared according to the instructions presented  
9 here. Papers may only be up to **nine** pages long, including figures. Additional pages *containing only*  
10 *acknowledgments and references* are allowed. Papers that exceed the page limit will not be reviewed,  
11 or in any other way considered for presentation at the conference.

12 The margins in 2022 are the same as those in 2007, which allow for ~15% more words in the paper  
13 compared to earlier years.

14 Authors are required to use the NeurIPS L<sup>A</sup>T<sub>E</sub>X style files obtainable at the NeurIPS website as  
15 indicated below. Please make sure you use the current files and not previous versions. Tweaking the  
16 style files may be grounds for rejection.

### 17 1.2 Retrieval of style files

18 The style files for NeurIPS and other conference information are available on the World Wide Web at

19 <http://www.neurips.cc/>

20 The file `neurips_2022.pdf` contains these instructions and illustrates the various formatting re-  
21 quirements your NeurIPS paper must satisfy.

22 The only supported style file for NeurIPS 2022 is `neurips_2022.sty`, rewritten for L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub>.  
23 **Previous style files for L<sup>A</sup>T<sub>E</sub>X 2.09, Microsoft Word, and RTF are no longer supported!**

24 The L<sup>A</sup>T<sub>E</sub>X style file contains three optional arguments: `final`, which creates a camera-ready copy,  
25 `preprint`, which creates a preprint for submission to, e.g., arXiv, and `nonatbib`, which will not  
26 load the `natbib` package for you in case of package clash.

27 **Preprint option** If you wish to post a preprint of your work online, e.g., on arXiv, using the  
28 NeurIPS style, please use the `preprint` option. This will create a nonanonymized version of your

work with the text “Preprint. Work in progress.” in the footer. This version may be distributed as you see fit. Please **do not** use the `final` option, which should **only** be used for papers accepted to NeurIPS.

At submission time, please omit the `final` and `preprint` options. This will anonymize your submission and add line numbers to aid review. Please do *not* refer to these line numbers in your paper as they will be removed during generation of camera-ready copies.

The file `neurips_2022.tex` may be used as a “shell” for writing your paper. All you have to do is replace the author, title, abstract, and text of the paper with your own.

The formatting instructions contained in these style files are summarized in Sections 2, 3, and 4 below.

## 2 General formatting instructions

The text must be confined within a rectangle 5.5 inches (33 picas) wide and 9 inches (54 picas) long. The left margin is 1.5 inch (9 picas). Use 10 point type with a vertical spacing (leading) of 11 points. Times New Roman is the preferred typeface throughout, and will be selected for you by default. Paragraphs are separated by  $\frac{1}{2}$  line space (5.5 points), with no indentation.

The paper title should be 17 point, initial caps/lower case, bold, centered between two horizontal rules. The top rule should be 4 points thick and the bottom rule should be 1 point thick. Allow  $\frac{1}{4}$  inch space above and below the title to rules. All pages should start at 1 inch (6 picas) from the top of the page.

For the final version, authors’ names are set in boldface, and each name is centered above the corresponding address. The lead author’s name is to be listed first (left-most), and the co-authors’ names (if different address) are set to follow. If there is only one co-author, list both author and co-author side by side.

Please pay special attention to the instructions in Section 4 regarding figures, tables, acknowledgments, and references.

## 3 Headings: first level

All headings should be lower case (except for first word and proper nouns), flush left, and bold.

First-level headings should be in 12-point type.

### 3.1 Headings: second level

Second-level headings should be in 10-point type.

#### 3.1.1 Headings: third level

Third-level headings should be in 10-point type.

**Paragraphs** There is also a `\paragraph` command available, which sets the heading in bold, flush left, and inline with the text, with the heading followed by 1 em of space.

## 4 Citations, figures, tables, references

These instructions apply to everyone.

### 4.1 Citations within the text

The `natbib` package will be loaded for you by default. Citations may be author/year or numeric, as long as you maintain internal consistency. As to the format of the references themselves, any style is acceptable as long as it is used consistently.



Figure 1: Sample figure caption.

69 The documentation for natbib may be found at

70 `http://mirrors.ctan.org/macros/latex/contrib/natbib/natnotes.pdf`

71 Of note is the command `\citet`, which produces citations appropriate for use in inline text. For  
72 example,

73 `\citet{hasselmo} investigated\dotso`

74 produces

75 Hasselmo, et al. (1995) investigated...

76 If you wish to load the natbib package with options, you may add the following before loading the  
77 neurips\_2022 package:

78 `\PassOptionsToPackage{options}{natbib}`

79 If natbib clashes with another package you load, you can add the optional argument nonatbib  
80 when loading the style file:

81 `\usepackage[nonatbib]{neurips_2022}`

82 As submission is double blind, refer to your own published work in the third person. That is, use “In  
83 the previous work of Jones et al. [4],” not “In our previous work [4].” If you cite your other papers  
84 that are not widely available (e.g., a journal paper under review), use anonymous author names in the  
85 citation, e.g., an author of the form “A. Anonymous.”

## 86 4.2 Footnotes

87 Footnotes should be used sparingly. If you do require a footnote, indicate footnotes with a number<sup>1</sup>  
88 in the text. Place the footnotes at the bottom of the page on which they appear. Precede the footnote  
89 with a horizontal rule of 2 inches (12 picas).

90 Note that footnotes are properly typeset *after* punctuation marks.<sup>2</sup>

## 91 4.3 Figures

92 All artwork must be neat, clean, and legible. Lines should be dark enough for purposes of reproduction.  
93 The figure number and caption always appear after the figure. Place one line space before the figure  
94 caption and one line space after the figure. The figure caption should be lower case (except for first  
95 word and proper nouns); figures are numbered consecutively.

96 You may use color figures. However, it is best for the figure captions and the paper body to be legible  
97 if the paper is printed in either black/white or in color.

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<sup>1</sup>Sample of the first footnote.

<sup>2</sup>As in this example.

Table 1: Sample table title

Part		
Name	Description	Size ( $\mu\text{m}$ )
Dendrite	Input terminal	$\sim 100$
Axon	Output terminal	$\sim 10$
Soma	Cell body	up to $10^6$

#### 98 4.4 Tables

99 All tables must be centered, neat, clean and legible. The table number and title always appear before  
100 the table. See Table 1.

101 Place one line space before the table title, one line space after the table title, and one line space after  
102 the table. The table title must be lower case (except for first word and proper nouns); tables are  
103 numbered consecutively.

104 Note that publication-quality tables *do not contain vertical rules*. We strongly suggest the use of the  
105 booktabs package, which allows for typesetting high-quality, professional tables:

106 <https://www.ctan.org/pkg/booktabs>

107 This package was used to typeset Table 1.

#### 108 5 Final instructions

109 Do not change any aspects of the formatting parameters in the style files. In particular, do not modify  
110 the width or length of the rectangle the text should fit into, and do not change font sizes (except  
111 perhaps in the **References** section; see below). Please note that pages should be numbered.

#### 112 6 Preparing PDF files

113 Please prepare submission files with paper size “US Letter,” and not, for example, “A4.”

114 Fonts were the main cause of problems in the past years. Your PDF file must only contain Type 1 or  
115 Embedded TrueType fonts. Here are a few instructions to achieve this.

- 116 • You should directly generate PDF files using `pdflatex`.
- 117 • You can check which fonts a PDF files uses. In Acrobat Reader, select the menu  
118 Files>Document Properties>Fonts and select Show All Fonts. You can also use the program  
119 `pdf fonts` which comes with `xpdf` and is available out-of-the-box on most Linux machines.
- 120 • The IEEE has recommendations for generating PDF files whose fonts are also ac-  
121 ceptable for NeurIPS. Please see [http://www.emfield.org/icuwb2010/downloads/](http://www.emfield.org/icuwb2010/downloads/IEEE-PDF-SpecV32.pdf)  
122 `IEEE-PDF-SpecV32.pdf`
- 123 • `xfig` “patterned” shapes are implemented with bitmap fonts. Use “solid” shapes instead.
- 124 • The `\bbold` package almost always uses bitmap fonts. You should use the equivalent AMS  
125 Fonts:

126 `\usepackage{amsfonts}`

127 followed by, e.g., `\mathbb{R}`, `\mathbb{N}`, or `\mathbb{C}` for  $\mathbb{R}$ ,  $\mathbb{N}$  or  $\mathbb{C}$ . You can also  
128 use the following workaround for reals, natural and complex:

129 `\newcommand{\RR}{\mathbb{R}} %real numbers`  
130 `\newcommand{\Nat}{\mathbb{N}} %natural numbers`  
131 `\newcommand{\CC}{\mathbb{C}} %complex numbers`

132 Note that `amsfonts` is automatically loaded by the `amssymb` package.

133 If your file contains type 3 fonts or non embedded TrueType fonts, we will ask you to fix it.

## 134 6.1 Margins in L<sup>A</sup>T<sub>E</sub>X

135 Most of the margin problems come from figures positioned by hand using `\special` or other  
136 commands. We suggest using the command `\includegraphics` from the `graphicx` package.  
137 Always specify the figure width as a multiple of the line width as in the example below:

```
138 \usepackage[pdftex]{graphicx} ...  
139 \includegraphics[width=0.8\linewidth]{myfile.pdf}
```

140 See Section 4.4 in the graphics bundle documentation ([http://mirrors.ctan.org/macros/](http://mirrors.ctan.org/macros/latex/required/graphics/grfguide.pdf)  
141 [latex/required/graphics/grfguide.pdf](http://mirrors.ctan.org/macros/latex/required/graphics/grfguide.pdf))

142 A number of width problems arise when L<sup>A</sup>T<sub>E</sub>X cannot properly hyphenate a line. Please give LaTeX  
143 hyphenation hints using the `\-` command when necessary.

## 144 References

145 References follow the acknowledgments. Use unnumbered first-level heading for the references. Any  
146 choice of citation style is acceptable as long as you are consistent. It is permissible to reduce the font  
147 size to `small` (9 point) when listing the references. Note that the Reference section does not count  
148 towards the page limit.

## 149 Checklist

150 The checklist follows the references. Please read the checklist guidelines carefully for information on  
151 how to answer these questions. For each question, change the default **[TODO]** to **[Yes]**, **[No]**, or  
152 **[N/A]**. You are strongly encouraged to include a **justification to your answer**, either by referencing  
153 the appropriate section of your paper or providing a brief inline description. For example:

- 154 • Did you include the license to the code and datasets? **[Yes]** See Section 2.
- 155 • Did you include the license to the code and datasets? **[No]** The code and the data are  
156 proprietary.
- 157 • Did you include the license to the code and datasets? **[N/A]**

158 Please do not modify the questions and only use the provided macros for your answers. Note that the  
159 Checklist section does not count towards the page limit. In your paper, please delete this instructions  
160 block and only keep the Checklist section heading above along with the questions/answers below.

- 161 1. For all authors...
  - 162 (a) Do the main claims made in the abstract and introduction accurately reflect the paper's  
163 contributions and scope? **[TODO]**
  - 164 (b) Did you describe the limitations of your work? **[TODO]**
  - 165 (c) Did you discuss any potential negative societal impacts of your work? **[TODO]**
  - 166 (d) Have you read the ethics review guidelines and ensured that your paper conforms to  
167 them? **[TODO]**
- 168 2. If you are including theoretical results...
  - 169 (a) Did you state the full set of assumptions of all theoretical results? **[TODO]**
  - 170 (b) Did you include complete proofs of all theoretical results? **[TODO]**
- 171 3. If you ran experiments...
  - 172 (a) Did you include the code, data, and instructions needed to reproduce the main experi-  
173 mental results (either in the supplemental material or as a URL)? **[TODO]**
  - 174 (b) Did you specify all the training details (e.g., data splits, hyperparameters, how they  
175 were chosen)? **[TODO]**
  - 176 (c) Did you report error bars (e.g., with respect to the random seed after running experi-  
177 ments multiple times)? **[TODO]**

- 178 (d) Did you include the total amount of compute and the type of resources used (e.g., type  
179 of GPUs, internal cluster, or cloud provider)? **[TODO]**
- 180 4. If you are using existing assets (e.g., code, data, models) or curating/releasing new assets...
- 181 (a) If your work uses existing assets, did you cite the creators? **[TODO]**
- 182 (b) Did you mention the license of the assets? **[TODO]**
- 183 (c) Did you include any new assets either in the supplemental material or as a URL?  
184 **[TODO]**
- 185 (d) Did you discuss whether and how consent was obtained from people whose data you're  
186 using/curating? **[TODO]**
- 187 (e) Did you discuss whether the data you are using/curating contains personally identifiable  
188 information or offensive content? **[TODO]**
- 189 5. If you used crowdsourcing or conducted research with human subjects...
- 190 (a) Did you include the full text of instructions given to participants and screenshots, if  
191 applicable? **[TODO]**
- 192 (b) Did you describe any potential participant risks, with links to Institutional Review  
193 Board (IRB) approvals, if applicable? **[TODO]**
- 194 (c) Did you include the estimated hourly wage paid to participants and the total amount  
195 spent on participant compensation? **[TODO]**

## 196 **A Appendix**

197 Optionally include extra information (complete proofs, additional experiments and plots) in the  
198 appendix. This section will often be part of the supplemental material.