

ML4H 2024 Template: Proceedings Track

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Abstract

This is the abstract for this article. If you are making your code available, *do not link to it in the abstract since many indexing services will automatically remove or redact the link*. Instead, we are requiring every paper to have an initial statement on data and code availability right after the abstract.

Keywords: List of keywords

Data and Code Availability This initial paragraph is **mandatory**. Briefly state what data you use (including citations if appropriate) and whether and where the data are available to other researchers. If you are not sharing code, you must explicitly state that you are not making your code available. If you are making your code available, then at the time of submission for review, please include your code as supplemental material or as a code repository link; in either case, your code must be anonymized. If your paper is accepted, then you should de-anonymize your code for the camera-ready version of the paper. *If you do not include this data and code availability statement for your paper, or you provide code that is not anonymized at the time of submission, then your paper will be desk-rejected*. Your experiments later could refer to this initial data and code availability statement if it is helpful (e.g., to avoid restating what data you use).

Institutional Review Board (IRB) This initial paragraph is **mandatory**. If your research requires IRB approval or has been designated by your IRB as Not Human Subject Research, then for the camera-ready version of the paper, you must provide IRB information (and at the time of submission for review, you can say that this IRB information will be

provided if the paper is accepted). If your research does not require IRB approval, then you must state this to be the case.

1. Introduction

Instructions This is the template for submissions to the **Proceedings Track** for the Machine Learning for Health (ML4H) symposium 2024. Please note the following requirements:

- The submission in the Proceedings Paper Track is limited to 8 pages (excluding references and appendices). If your paper is accepted, one extra page will be provided for the camera-ready.
- Please, use the packages automatically loaded (amsmath, amssymb, natbib, graphicx, url, algorithm2e) to manage references, write equations, and include figures and algorithms. The use of different packages could create problems in the generation of the camera-ready version. Please, follow the example provided in this file.
- References must be included in a .bib file.
- Please write your paper in a single .tex file.
- The manuscript, data and code must be anonymized during the review process.
- For writing guidelines please consider the official ML4H call for papers at ahli.cc/ml4h

* These authors contributed equally

61 This is a sample article that uses the `jmlr` class
 62 with the `wcp` class option. Please follow the guide-
 63 lines in this sample document as it can help to re-
 64 duce complications when combining the articles into
 65 a book. Please avoid using obsolete commands, such
 66 as `\rm`, and obsolete packages, such as `epsfig`.¹ Some
 67 packages that are known to cause problems for the
 68 production editing process are checked for by the
 69 `jmlr` class and will generate an error. (If you want
 70 to know more about the production editing process,
 71 have a look at the video tutorials for the produc-
 72 tion editors at [http://www.dickimaw-books.com/
 73 software/makejmlrbookgui/videos/](http://www.dickimaw-books.com/software/makejmlrbookgui/videos/).)

74 Please also ensure that your document will com-
 75 pile with PDF \LaTeX . If you have an error message
 76 that's puzzling you, first check for it at the UK
 77 TUG FAQ <https://texfaq.org/FAQ-man-latex>.
 78 If that doesn't help, create a minimal working exam-
 79 ple (see [https://www.dickimaw-books.com/latex/
 80 minexample/](https://www.dickimaw-books.com/latex/minexample/)) and post to somewhere like \TeX on
 81 StackExchange (<http://tex.stackexchange.com/>)
 82 or the \LaTeX Community Forum ([http://www.
 83 latex-community.org/forum/](http://www.latex-community.org/forum/)).

84 NOTE:

85 This is an numbered theorem-like environment that
 86 was defined in this document's preamble.

87 1.1. Sub-sections

88 Sub-sections are produced using `\subsection`.

89 1.1.1. SUB-SUB-SECTIONS

90 Sub-sub-sections are produced using
 91 `\subsubsection`.

92 **Sub-sub-sub-sections** Sub-sub-sub-sections are
 93 produced using `\paragraph`. These are unnumbered
 94 with a running head.

95 **Sub-sub-sub-sub-sections** Sub-sub-sub-sub-
 96 sections are produced using `\subparagraph`. These
 97 are unnumbered with a running head.

98 2. Cross-Referencing

99 Always use `\label` and `\ref` (or one of the com-
 100 mands described below) when cross-referencing.
 101 For example, the next section is Section 3 but you
 102 can also refer to it using Section 3. The `jmlr` class

1. See <http://www.ctan.org/pkg/l2tabu>

103 provides some convenient cross-referencing com-
 104 mands: `\sectionref`, `\equationref`, `\tableref`,
 105 `\figureref`, `\algorithmref`, `\theoremref`,
 106 `\lemmaref`, `\remarkref`, `\corollaryref`,
 107 `\definitionref`, `\conjectureref`, `\axiomref`,
 108 `\exampleref` and `\appendixref`. The argument of
 109 these commands may either be a single label or a
 110 comma-separated list of labels. Examples:

111 Referencing sections: Section 3 or Sections 1 and 3
 112 or Sections 1, 3, 5.1 and 5.2.

113 Referencing equations: Equation (1) or Equa-
 114 tions (1) and (3) or Equations (1), (2), (3) and (4).

115 Referencing tables: Table 1 or Tables 1 and 2 or
 116 Tables 1, 2 and 3.

117 Referencing figures: Figure 1 or Figures 1 and 2 or
 118 Figures 1, 2 and 3 or Figures 3(a) and 3(b).

119 Referencing algorithms: Algorithm 1 or Algo-
 120 rithms 1 and 2 or Algorithms 1, 2 and 3.

121 Referencing theorem-like environments: Theorem
 122 1, Lemma 2, Remark 3, Corollary 4, Definition 5,
 123 Conjecture 6, Axiom 7 and Example 1.

124 Referencing appendices: Appendix A or Appen-
 125 dices A and B.

126 3. Equations

127 The `jmlr` class loads the `amsmath` package, so you can
 128 use any of the commands and environments defined
 129 there. (See the `amsmath` documentation for further
 130 details.²)

131 Unnumbered single-lined equations should be dis-
 132 played using `\[` and `\]`. For example:

$$E = mc^2$$

133 or you can use the `displaymath` environment:

$$E = mc^2$$

134 Numbered single-line equations should be displayed
 135 using the `equation` environment. For example:

$$\cos^2 \theta + \sin^2 \theta \equiv 1 \tag{1}$$

136 This can be referenced using `\label` and
 137 `\equationref`. For example, Equation (1).

2. Either `texdoc amsmath` or [http://www.ctan.org/pkg/
 amsmath](http://www.ctan.org/pkg/amsmath)

138 Multi-lined numbered equations should be dis-
139 played using the `align` environment.³ For example:

$$f(x) = x^2 + x \quad (2)$$

$$f'(x) = 2x + 1 \quad (3)$$

140 Unnumbered multi-lined equations can be displayed
141 using the `align*` environment. For example:

$$f(x) = (x + 1)(x - 1)$$

$$= x^2 - 1$$

142 If you want to mix numbered with unnumbered lines
143 use the `align` environment and suppress unwanted
144 line numbers with `\nonumber`. For example:

$$y = x^2 + 3x - 2x + 1$$

$$= x^2 + x + 1 \quad (4)$$

145 An equation that is too long to fit on a single line
146 can be displayed using the `split` environment. Text
147 can be embedded in an equation using `\text` or
148 `\intertext` (as used in Theorem 1). See the `ams-`
149 `math` documentation for further details.

150 3.1. Operator Names

151 Predefined operator names are listed in Ta-
152 ble 1. For additional operators, either use
153 `\operatorname`, for example `\operatorname{var}(X)` or declare it
154 with `\DeclareMathOperator`, for example

155 `\DeclareMathOperator{\var}{var}`

156 and then use this new command. If you want
157 limits that go above and below the operator (like
158 `\sum`) use the starred versions (`\operatorname*` or
159 `\DeclareMathOperator*`).

160 4. Vectors and Sets

161 Vectors should be typeset using `\vec`. For example
162 `x`. (The original version of `\vec` can also be accessed
163 using `\orgvec`, for example `\vec{x}`.) The `jmlr` class also
164 provides `\set` to typeset a set. For example `S`.

3. For reasons why you shouldn't use the obsolete `eqnarray` environment, see Lars Madsen, *Avoid eqnarray!* TUGboat 33(1):21–25, 2012.

165 5. Floats

166 Floats, such as figures, tables and algorithms, are
167 moving objects and are supposed to float to the near-
168 est convenient location. Please don't force them to
169 go in a particular place. In general it's best to use
170 the `htbp` specifier and don't put the figure or table in
171 the middle of a paragraph (that is make sure there's
172 a paragraph break above and below the float). Floats
173 are supposed to have a little extra space above and
174 below them to make them stand out from the rest of
175 the text. This extra spacing is put in automatically
176 and shouldn't need modifying.

177 If your article will later be reprinted in the Chal-
178 lenges for Machine Learning, please be aware that
179 the CiML books use a different paper size, so if you
180 want to resize any images use a scale relative to the
181 line width (`\linewidth`), text width (`\textwidth`)
182 or text height (`\textheight`).

183 To ensure consistency, please *don't* try changing
184 the format of the caption by doing something like:

185 `\caption{\textit{A Sample Caption.}}`

186 or

187 `\caption{\em A Sample Caption.}`

188 You can, of course, change the font for individual
189 words or phrases, for example:

190 `\caption{A Sample Caption With Some \emph{Emphasized Words}}`

191 5.1. Tables

192 Tables should go in the `table` environment. Within
193 this environment use `\floatconts` (defined by `jmlr`)
194 to set the caption correctly and center the table con-
195 tents. The location of the caption depends on the
196 `tablecaption` setting in the document class options.

197 If you want horizontal rules you can use the
198 `booktabs` package which provides the commands
199 `\toprule`, `\midrule` and `\bottomrule`. For exam-
200 ple, see Table 3.

201 If you really want vertical lines as well, you can't
202 use the `booktabs` commands as there'll be some un-
203 wanted gaps. Instead you can use L^AT_EX's `\hline`,
204 but the rows may appear a bit cramped. You can add
205 extra space above or below a row using `\abovestru`
206 and `\belowstrut`. For example, see Table 4. How-
207 ever, you might want to read the `booktabs` documen-
208 tation regarding the use of vertical lines.

Table 1: Predefined Operator Names (taken from amsmath documentation)

<code>\arccos</code>	arccos	<code>\deg</code>	deg	<code>\lg</code>	lg	<code>\projlim</code>	projlim
<code>\arcsin</code>	arcsin	<code>\det</code>	det	<code>\lim</code>	lim	<code>\sec</code>	sec
<code>\arctan</code>	arctan	<code>\dim</code>	dim	<code>\liminf</code>	liminf	<code>\sin</code>	sin
<code>\arg</code>	arg	<code>\exp</code>	exp	<code>\limsup</code>	limsup	<code>\sinh</code>	sinh
<code>\cos</code>	cos	<code>\gcd</code>	gcd	<code>\ln</code>	ln	<code>\sup</code>	sup
<code>\cosh</code>	cosh	<code>\hom</code>	hom	<code>\log</code>	log	<code>\tan</code>	tan
<code>\cot</code>	cot	<code>\inf</code>	inf	<code>\max</code>	max	<code>\tanh</code>	tanh
<code>\coth</code>	coth	<code>\injlim</code>	injlim	<code>\min</code>	min		
<code>\csc</code>	csc	<code>\ker</code>	ker	<code>\Pr</code>	Pr		
		<code>\varlimsup</code>	$\overline{\lim}$	<code>\varinjlim</code>	\varinjlim		
		<code>\varliminf</code>	$\underline{\lim}$	<code>\varprojlim</code>	\varprojlim		

Table 2: An Example Table

Dataset	Result
Data1	0.12345
Data2	0.67890
Data3	0.54321
Data4	0.09876

Table 3: A Table With Horizontal Lines

Dataset	Result
Data1	0.12345
Data2	0.67890
Data3	0.54321
Data4	0.09876

Table 4: A Table With Horizontal and Vertical Lines

Dataset	Result
Data1	0.12345
Data2	0.67890
Data3	0.54321
Data4	0.09876

If you want to align numbers on their decimal point, you can use the `siunitx` package. For further details see the `siunitx` documentation⁴.

If the table is too wide, you can adjust the inter-column spacing by changing the value of `\tabcolsep`. For example:

```
\setlength{\tabcolsep}{3pt}
```

If the table is very wide but not very long, you can use the `sidewaystable` environment defined in the `rotating` package (so use `\usepackage{rotating}`). If the table is too long to fit on a page, you can use the `longtable` environment defined in the `longtable` package (so use `\usepackage{longtable}`).

5.2. Figures

Figures should go in the `figure` environment. Within this environment, use `\floatconts` to correctly position the caption and center the image. Use `\includegraphics` for external graphics files but omit the file extension. Do not use `\epsfig` or `\psfig`. If you want to scale the image, it's better to use a fraction of the line width rather than an explicit length. For example, see Figure 1.



Figure 1: Example Image

If your image is made up of \LaTeX code (for example, commands provided by the `pgf` package) you

4. Either `texdoc siunitx` or <http://www.ctan.org/pkg/siunitx>

233 can include it using `\includeteximage` (defined by
 234 the `jmlr` class). This can be scaled and rotated in the
 235 same way as `\includegraphics`. For example, see
 236 Figure 2.

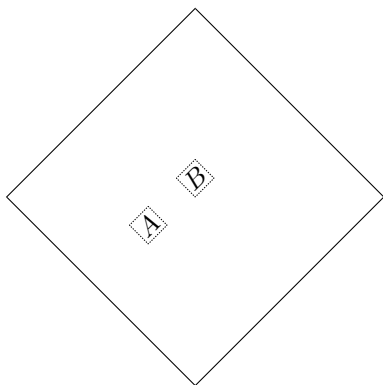


Figure 2: Image Created Using L^AT_EX Code

237 If the figure is too wide to fit on the page, you can
 238 use the `sidewaysfigure` environment defined in the
 239 rotating package.

240 Don't use `\graphicspath`.⁵ If the images
 241 are contained in a subdirectory, specify
 242 this when you include the image, for example
 243 `\includegraphics{figures/mypic}`.

244 5.2.1. SUB-FIGURES

245 Sub-figures can be created using `\subfigure`, which
 246 is defined by the `jmlr` class. The optional argument
 247 allows you to provide a subcaption. The label should
 248 be placed in the mandatory argument of `\subfigure`.
 249 You can reference the entire figure, for example Fig-
 250 ure 3, or you can reference part of the figure using
 251 `\figureref`, for example Figure 3(a). Alternatively
 252 you can reference the subfigure using `\subfigref`, for
 253 example (a) and (b) in Figure 3.

254 By default, the sub-figures are aligned on the base-
 255 line. This can be changed using the second optional
 256 argument of `\subfigure`. This may be `t` (top), `c`
 257 (centered) or `b` (bottom). For example, the subfig-
 258 ures (a) and (b) in Figure 4 both have `[c]` as the
 259 second optional argument.

5. This is specific to the `jmlr` class, not a general recommen-
 dation. The main file that generates the proceedings or
 the CiML book is typically in a different directory to the
 imported articles, so it modifies the graphics path when it
 imports an article.

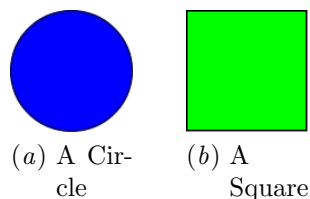


Figure 3: An Example With Sub-Figures.

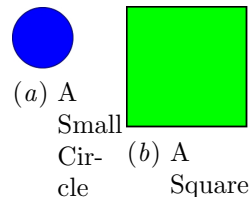


Figure 4: Another Example With Sub-Figures.

5.3. Sub-Tables

260 There is an analogous command `\subtable` for sub-
 261 tables. It has the same syntax as `\subfigure` de-
 262 scribed above. You can reference the table using
 263 `\tableref`, for example Table 5 or you can refer-
 264 ence part of the table, for example Table 5(a).
 265 Alternatively you can reference the subtable using
 266 `\subtabref`, for example (a) and (b) in Table 5.
 267

Table 5: An Example With Sub-Tables

(a)		(b)	
A	B	C	D
1	2	3	4
		5	6

268 By default, the sub-tables are aligned on the top.
 269 This can be changed using the second optional argu-
 270 ment of `\subtable`. This may be `t` (top), `c` (cen-
 271 tered) or `b` (bottom). For example, the sub-tables
 272 (a) and (b) in Table 6 both have `[c]` as the second
 273 optional argument.

5.4. Algorithms

274 Enumerated textual algorithms can be displayed us-
 275 ing the `algorithm` environment. Within this envi-
 276 ronment, use `\caption` to set the caption and you
 277 can use an `enumerate` or nested `enumerate` environ-
 278

Table 6: Another Example With Sub-Tables

	(a)		(b)
A	B	C	D
1	2	3	4
		5	6

279 ments. For example, see Algorithm 1. Note that
 280 algorithms float like figures and tables.

Algorithm 1: The Gauss-Seidel Algorithm

1. For $k = 1$ to maximum number of iterations

(a) For $i = 1$ to n

- i. $x_i^{(k)} = \frac{b_i - \sum_{j=1}^{i-1} a_{ij}x_j^{(k)} - \sum_{j=i+1}^n a_{ij}x_j^{(k-1)}}{a_{ii}}$
- ii. If $\|\mathbf{x}^{(k)} - \mathbf{x}^{(k-1)}\| < \epsilon$, where ϵ is a specified stopping criteria, stop.

281 If you'd rather have the same numbering through-
 282 out the algorithm but still want the convenient in-
 283 dentation of nested `enumerate` environments, you can
 284 use the `enumerate*` environment provided by the `jmlr`
 285 class. For example, see Algorithm 2.

Algorithm 2: Moore's Shortest Path

Given a connected graph G , where the length of each edge is 1:

1. Set the label of vertex s to 0
2. Set $i = 0$
3. Locate all unlabelled vertices adjacent to a vertex labelled i and label them $i + 1$
4. If vertex t has been labelled,
 - the shortest path can be found by backtracking, and the length is given by the label of t .
 - otherwise
 - increment i and return to step 3

286 Pseudo code can be displayed using the
 287 `algorithm2e` environment. This is defined by
 288 the `algorithm2e` package (which is automatically

loaded) so check the `algorithm2e` documentation for
 further details.⁶ For an example, see Algorithm 3.

Algorithm 3: Computing Net Activation

Input: $x_1, \dots, x_n, w_1, \dots, w_n$
Output: y , the net activation
 $y \leftarrow 0$;
for $i \leftarrow 1$ **to** n **do**
 | $y \leftarrow y + w_i * x_i$;
end

6. Description Lists

The `jmlr` class also provides a description-like environ-
 ment called `altdescription`. This has an argument
 that should be the widest label in the list. Compare:

add A method that adds two variables.

differentiate A method that differentiates a func-
 tion.

with

add A method that adds two
 variables.

differentiate A method that differentiates
 a function.

7. Theorems, Lemmas etc

The following theorem-like environments are prede-
 fined by the `jmlr` class: `theorem`, `example`, `lemma`,
`proposition`, `remark`, `corollary`, `definition`,
`conjecture` and `axiom`. You can use the `proof` en-
 vironment to display the proof if need be, as in The-
 orem 1.

Theorem 1 (Eigenvalue Powers) *If λ is an
 eigenvalue of B with eigenvector ξ , then λ^n is an
 eigenvalue of B^n with eigenvector ξ .*

Proof *Let λ be an eigenvalue of B with eigenvector
 ξ , then*

$$B\xi = \lambda\xi$$

6. Either `texdoc algorithm2e` or [http://www.ctan.org/
 pkg/algorithm2e](http://www.ctan.org/pkg/algorithm2e)

315 *premultiply by B :*

$$\begin{aligned} BB\xi &= B\lambda\xi \\ \Rightarrow B^2\xi &= \lambda B\xi \\ &= \lambda\lambda\xi && \text{since } B\xi = \lambda\xi \\ &= \lambda^2\xi \end{aligned}$$

316 *Therefore true for $n = 2$. Now assume true for $n = k$:*

$$B^k\xi = \lambda^k\xi$$

317 *premultiply by B :*

$$\begin{aligned} BB^k\xi &= B\lambda^k\xi \\ \Rightarrow B^{k+1}\xi &= \lambda^k B\xi \\ &= \lambda^k\lambda\xi && \text{since } B\xi = \lambda\xi \\ &= \lambda^{k+1}\xi \end{aligned}$$

318 *Therefore true for $n = k+1$. Therefore, by induction,*
 319 *true for all n . ■*

320 **Lemma 2 (A Sample Lemma)** *This is a lemma.*

321 **Remark 3 (A Sample Remark)** *This is a re-*
 322 *mark.*

323 **Corollary 4 (A Sample Corollary)** *This is a*
 324 *corollary.*

325 **Definition 5 (A Sample Definition)** *This is a*
 326 *definition.*

327 **Conjecture 6 (A Sample Conjecture)** *This is*
 328 *a conjecture.*

329 **Axiom 7 (A Sample Axiom)** *This is an axiom.*

330 **Example 1 (An Example)** *This is an example.*

331 8. Color vs Grayscale

332 It's helpful if authors supply grayscale versions of
 333 their images in the event that the article is to be
 334 incorporated into a black and white printed book.
 335 With external PDF, PNG or JPG graphic files,
 336 you just need to supply a grayscale version of the
 337 file. For example, if the file is called `myimage.png`,
 338 then the gray version should be `myimage-gray.png`
 339 or `myimage-gray.pdf` or `myimage-gray.jpg`. You
 340 don't need to modify your code. The `jmlr` class checks

341 for the existence of the grayscale version if it is print
 342 mode (provided you have used `\includegraphics`
 343 and haven't specified the file extension).

344 You can use `\ifprint` to determine which mode
 345 you are in. For example, in Figure 1, the purple el-
 346 lipse represents an input and the yellow ellipse repre-
 347 sents an output. Another example: **important text!**

348 You can use the class option `gray` to see how the
 349 document will appear in gray scale mode. **Colored**
 350 **text** will automatically be converted to gray scale in
 351 print mode.

352 The `jmlr` class loads the `xcolor` package, so you can
 353 also define your own colors. For example: **XYZ**.

354 The `xcolor` class is loaded with the `x11names` op-
 355 tion, so you can use any of the `x11` predefined colors
 356 (listed in the `xcolor` documentation⁷).

357 9. Citations and Bibliography

358 The `jmlr` class automatically loads `natbib` and auto-
 359 matically sets the bibliography style, so you don't
 360 need to use `\bibliographystyle`. This sample file
 361 has the citations defined in the accompanying Bib-
 362 TeX file `jmlr-sample.bib`. For a parenthetical cita-
 363 tion use `\citep`. For example (**Guyon and Elisseeff,**
 364 **2003**). For a textual citation use `\citet`. For exam-
 365 ple **Guyon et al. (2007)**. Both commands may take a
 366 comma-separated list, for example **Guyon and Elis-**
 367 **seeff (2003); Guyon et al. (2007)**.

368 These commands have optional arguments and
 369 have a starred version. See the `natbib` documenta-
 370 tion for further details.⁸

371 The bibliography is displayed using
 372 `\bibliography`.

373 Acknowledgments

374 Acknowledgments go here *but should only appear in*
 375 *the camera-ready version of the paper if it is ac-*
 376 *cepted*. Acknowledgments do not count toward the
 377 paper page limit.

378 References

379 I. Guyon and A. Elisseeff. An introduction to variable
 380 and feature selection. *JMLR*, 3:1157–1182, March
 381 2003.

7. either `texdoc xcolor` or <http://www.ctan.org/pkg/xcolor>

8. Either `texdoc natbib` or <http://www.ctan.org/pkg/natbib>

382 I. Guyon, C. Aliferis, and A. Elisseeff. Causal feature
383 selection. Technical report, Clopinet, 2007.

384 **Appendix A. First Appendix**

385 This is the first appendix.

386 **Appendix B. Second Appendix**

387 This is the second appendix.