

# ML4H 2024 Template: Findings 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 **Findings Track** for the Machine Learning for Health (ML4H) symposium 2024. Please follow the instructions below:

- The submission in the Findings Track is limited to 4 pages (excluding references and appendices).
- 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](https://ahli.cc/ml4h)

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## 59 2. Introduction

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

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

83 NOTE:

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

### 86 2.1. Sub-sections

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

#### 88 2.1.1. SUB-SUB-SECTIONS

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

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

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

## 97 3. Cross-Referencing

98 Always use `\label` and `\ref` (or one of the com-  
 99 mands described below) when cross-referencing.  
 100 For example, the next section is Section 4 but you

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

101 can also refer to it using Section 4. The `jmlr` class  
 102 provides some convenient cross-referencing com-  
 103 mands: `\sectionref`, `\equationref`, `\tableref`,  
 104 `\figureref`, `\algorithmref`, `\theoremref`,  
 105 `\lemmaref`, `\remarkref`, `\corollaryref`,  
 106 `\definitionref`, `\conjectureref`, `\axiomref`,  
 107 `\exampleref` and `\appendixref`. The argument of  
 108 these commands may either be a single label or a  
 109 comma-separated list of labels. Examples:

110 Referencing sections: Section 4 or Sections 2 and 4  
 111 or Sections 2, 4, 6.1 and 6.2.

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

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

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

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

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

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

## 4. Equations

125 The `jmlr` class loads the `amsmath` package, so you can  
 126 use any of the commands and environments defined  
 127 there. (See the `amsmath` documentation for further  
 128 details.<sup>2</sup>)

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

$$E = mc^2$$

131 or you can use the `displaymath` environment:

$$E = mc^2$$

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

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

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

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

137 Multi-lined numbered equations should be dis-  
138 played using the `align` environment.<sup>3</sup> For example:

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

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

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

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

$$= x^2 - 1$$

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

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

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

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

#### 149 4.1. Operator Names

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

154 `\DeclareMathOperator{\var}{var}`

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

## 159 5. Vectors and Sets

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

## 164 6. Floats

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

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

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

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

185 or

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

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

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

### 190 6.1. Tables

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

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

200 If you really want vertical lines as well, you can't  
201 use the `booktabs` commands as there'll be some un-  
202 wanted gaps. Instead you can use L<sup>A</sup>T<sub>E</sub>X's `\hline`,  
203 but the rows may appear a bit cramped. You can add  
204 extra space above or below a row using `\abovestrut`  
205 and `\belowstrut`. For example, see Table 4. How-  
206 ever, you might want to read the `booktabs` documen-  
207 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

<b>Dataset</b>	<b>Result</b>
Data1	0.12345
Data2	0.67890
Data3	0.54321
Data4	0.09876

Table 3: A Table With Horizontal Lines

<b>Dataset</b>	<b>Result</b>
Data1	0.12345
Data2	0.67890
Data3	0.54321
Data4	0.09876

Table 4: A Table With Horizontal and Vertical Lines

<b>Dataset</b>	<b>Result</b>
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` documentation<sup>4</sup>.

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}`).

## 6.2. 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.

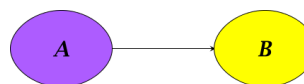


Figure 1: Example Image

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>

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

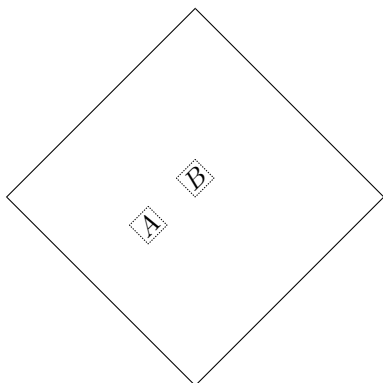


Figure 2: Image Created Using L<sup>A</sup>T<sub>E</sub>X Code

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

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

### 243 6.2.1. SUB-FIGURES

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

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

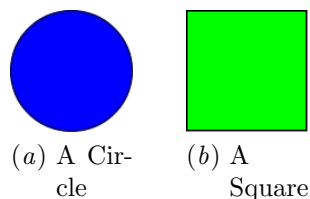


Figure 3: An Example With Sub-Figures.

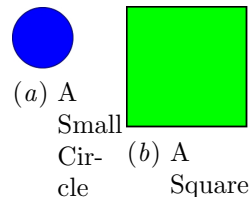


Figure 4: Another Example With Sub-Figures.

### 6.3. Sub-Tables

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

Table 5: An Example With Sub-Tables

<i>(a)</i>		<i>(b)</i>	
A	B	C	D
1	2	3	4
		5	6

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

### 6.4. Algorithms

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

Table 6: Another Example With Sub-Tables

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

278 ments. For example, see Algorithm 1. Note that  
 279 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  $\epsilon$  is a specified stopping criteria, stop.

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

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

loaded) so check the `algorithm2e` documentation for  
 further details.<sup>6</sup> 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 ← 0;
for i ← 1 to n do
  | y ← y + w_i * x_i;
end

```

---

## 7. 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.

## 8. 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  $\lambda$  is an  
 eigenvalue of  $B$  with eigenvector  $\xi$ , then  $\lambda^n$  is an  
 eigenvalue of  $B^n$  with eigenvector  $\xi$ .*

**Proof** *Let  $\lambda$  be an eigenvalue of  $B$  with eigenvector  
 $\xi$ , then*

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

---

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

314 *premultiply by  $B$ :*

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

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

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

316 *premultiply by  $B$ :*

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

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

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

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

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

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

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

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

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

## 330 9. Color vs Grayscale

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

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

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

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

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

353 The `xcolor` class is loaded with the `x11names` op-  
 354 tion, so you can use any of the `x11` predefined colors  
 355 (listed in the `xcolor` documentation<sup>7</sup>).

## 356 10. Citations and Bibliography

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

367 These commands have optional arguments and  
 368 have a starred version. See the `natbib` documenta-  
 369 tion for further details.<sup>8</sup>

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

## 372 Acknowledgments

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

## 377 References

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

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

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

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

383 **Appendix A. First Appendix**

384 This is the first appendix.

385 **Appendix B. Second Appendix**

386 This is the second appendix.