

054 Authors' names are set in boldface, and each name is placed above its corresponding address. The
055 lead author's name is to be listed first, and the co-authors' names are set to follow. Authors sharing
056 the same address can be on the same line.

057 Please pay special attention to the instructions in section 4 regarding figures, tables, acknowledg-
058 ments, and references.

060 There will be a strict upper limit of 10 pages for the main text of the initial submission, with unlim-
061 ited additional pages for citations.

062

063 3 HEADINGS: FIRST LEVEL

064

065 First level headings are in small caps, flush left and in point size 12. One line space before the first
066 level heading and 1/2 line space after the first level heading.

067

068 3.1 HEADINGS: SECOND LEVEL

069

070 Second level headings are in small caps, flush left and in point size 10. One line space before the
071 second level heading and 1/2 line space after the second level heading.

072

073 3.1.1 HEADINGS: THIRD LEVEL

074

075 Third level headings are in small caps, flush left and in point size 10. One line space before the third
076 level heading and 1/2 line space after the third level heading.

077

078 4 CITATIONS, FIGURES, TABLES, REFERENCES

079

080 These instructions apply to everyone, regardless of the formatter being used.

081

082 4.1 CITATIONS WITHIN THE TEXT

083

084 Citations within the text should be based on the `natbib` package and include the authors' last names
085 and year (with the "et al." construct for more than two authors). When the authors or the publication
086 are included in the sentence, the citation should not be in parenthesis using `\citet{}` (as in "See
087 Hinton et al. (2006) for more information."). Otherwise, the citation should be in parenthesis using
088 `\citep{}` (as in "Deep learning shows promise to make progress towards AI (Bengio & LeCun,
089 2007).").

090 The corresponding references are to be listed in alphabetical order of authors, in the REFERENCES
091 section. As to the format of the references themselves, any style is acceptable as long as it is used
092 consistently.

093

094 4.2 FOOTNOTES

095

096 Indicate footnotes with a number¹ in the text. Place the footnotes at the bottom of the page on which
097 they appear. Precede the footnote with a horizontal rule of 2 inches (12 picas).²

098

099 4.3 FIGURES

100

101 All artwork must be neat, clean, and legible. Lines should be dark enough for purposes of repro-
102 duction; art work should not be hand-drawn. The figure number and caption always appear after the
103 figure. Place one line space before the figure caption, and one line space after the figure. The figure
caption is lower case (except for first word and proper nouns); figures are numbered consecutively.

104 Make sure the figure caption does not get separated from the figure. Leave sufficient space to avoid
105 splitting the figure and figure caption.

106

107 ¹Sample of the first footnote

²Sample of the second footnote

108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161

Table 1: Sample table title

PART	DESCRIPTION
Dendrite	Input terminal
Axon	Output terminal
Soma	Cell body (contains cell nucleus)

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

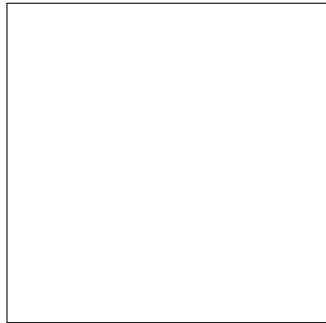


Figure 1: Sample figure caption.

4.4 TABLES

All tables must be centered, neat, clean and legible. Do not use hand-drawn tables. The table number and title always appear before the table. See Table 1.

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

5 DEFAULT NOTATION

In an attempt to encourage standardized notation, we have included the notation file from the textbook, *Deep Learning* Goodfellow et al. (2016) available at https://github.com/goodfeli/dlbook_notation/. Use of this style is not required and can be disabled by commenting out `math_commands.tex`.

Numbers and Arrays

162	a	A scalar (integer or real)
163	\mathbf{a}	A vector
164	\mathbf{A}	A matrix
165	\mathbf{A}	A tensor
166	\mathbf{A}	A tensor
167	\mathbf{I}_n	Identity matrix with n rows and n columns
168	\mathbf{I}	Identity matrix with dimensionality implied by context
169	\mathbf{I}	Identity matrix with dimensionality implied by context
170	$\mathbf{e}^{(i)}$	Standard basis vector $[0, \dots, 0, 1, 0, \dots, 0]$ with a 1 at position i
171	$\mathbf{e}^{(i)}$	Standard basis vector $[0, \dots, 0, 1, 0, \dots, 0]$ with a 1 at position i
172	$\text{diag}(\mathbf{a})$	A square, diagonal matrix with diagonal entries given by \mathbf{a}
173	\mathbf{a}	A scalar random variable
174	\mathbf{a}	A scalar random variable
175	\mathbf{a}	A vector-valued random variable
176	\mathbf{a}	A vector-valued random variable
177	\mathbf{A}	A matrix-valued random variable
178	\mathbf{A}	A matrix-valued random variable

Sets and Graphs

179		
180	\mathbb{A}	A set
181	\mathbb{R}	The set of real numbers
182	\mathbb{R}	The set of real numbers
183	$\{0, 1\}$	The set containing 0 and 1
184	$\{0, 1, \dots, n\}$	The set of all integers between 0 and n
185	$\{0, 1, \dots, n\}$	The set of all integers between 0 and n
186	$[a, b]$	The real interval including a and b
187	$(a, b]$	The real interval excluding a but including b
188	$(a, b]$	The real interval excluding a but including b
189	$\mathbb{A} \setminus \mathbb{B}$	Set subtraction, i.e., the set containing the elements of \mathbb{A} that are not in \mathbb{B}
190	$\mathbb{A} \setminus \mathbb{B}$	Set subtraction, i.e., the set containing the elements of \mathbb{A} that are not in \mathbb{B}
191	\mathcal{G}	A graph
192	\mathcal{G}	A graph
193	$\text{Pa}_{\mathcal{G}}(x_i)$	The parents of x_i in \mathcal{G}

Indexing

194		
195	a_i	Element i of vector \mathbf{a} , with indexing starting at 1
196	a_i	Element i of vector \mathbf{a} , with indexing starting at 1
197	a_{-i}	All elements of vector \mathbf{a} except for element i
198	$A_{i,j}$	Element i, j of matrix \mathbf{A}
199	$A_{i,j}$	Element i, j of matrix \mathbf{A}
200	$\mathbf{A}_{i,:}$	Row i of matrix \mathbf{A}
201	$\mathbf{A}_{i,:}$	Row i of matrix \mathbf{A}
202	$\mathbf{A}_{:,i}$	Column i of matrix \mathbf{A}
203	$\mathbf{A}_{i,j,k}$	Element (i, j, k) of a 3-D tensor \mathbf{A}
204	$\mathbf{A}_{i,j,k}$	Element (i, j, k) of a 3-D tensor \mathbf{A}
205	$\mathbf{A}_{:,:,i}$	2-D slice of a 3-D tensor
206	\mathbf{a}_i	Element i of the random vector \mathbf{a}

Calculus

207
208
209
210
211
212
213
214
215

216	$\frac{dy}{dx}$	Derivative of y with respect to x
217	$\frac{\partial y}{\partial x}$	Partial derivative of y with respect to x
218	$\nabla_{\mathbf{x}} y$	Gradient of y with respect to \mathbf{x}
219	$\nabla_{\mathbf{X}} y$	Matrix derivatives of y with respect to \mathbf{X}
220	$\nabla_{\mathbf{x}}^2 f(x)$ or $\mathbf{H}(f)(\mathbf{x})$	Tensor containing derivatives of y with respect to \mathbf{X}
221	$\frac{\partial f}{\partial \mathbf{x}}$	Jacobian matrix $\mathbf{J} \in \mathbb{R}^{m \times n}$ of $f : \mathbb{R}^n \rightarrow \mathbb{R}^m$
222	$\int f(\mathbf{x}) d\mathbf{x}$	The Hessian matrix of f at input point \mathbf{x}
223	$\int_{\mathbb{S}} f(\mathbf{x}) d\mathbf{x}$	Definite integral over the entire domain of \mathbf{x}
224		Definite integral with respect to \mathbf{x} over the set \mathbb{S}
225		
226		
227		
228		
229		
230		
231		
232		
233		
234		
235		
236		
237		
238		
239		
240		
241		
242		
243		
244		
245		
246		
247		
248		
249		
250		
251		
252		
253		
254		
255		
256		
257		
258		
259		
260		
261		
262		
263		
264		
265		
266		
267		
268		
269		

Probability and Information Theory

233	$P(a)$	A probability distribution over a discrete variable
234	$p(a)$	A probability distribution over a continuous variable, or over a variable whose type has not been specified
235	$a \sim P$	Random variable a has distribution P
236	$\mathbb{E}_{x \sim P}[f(x)]$ or $\mathbb{E}f(x)$	Expectation of $f(x)$ with respect to $P(x)$
237	$\text{Var}(f(x))$	Variance of $f(x)$ under $P(x)$
238	$\text{Cov}(f(x), g(x))$	Covariance of $f(x)$ and $g(x)$ under $P(x)$
239	$H(x)$	Shannon entropy of the random variable x
240	$D_{\text{KL}}(P Q)$	Kullback-Leibler divergence of P and Q
241	$\mathcal{N}(\mathbf{x}; \boldsymbol{\mu}, \boldsymbol{\Sigma})$	Gaussian distribution over \mathbf{x} with mean $\boldsymbol{\mu}$ and covariance $\boldsymbol{\Sigma}$

Functions

249	$f : \mathbb{A} \rightarrow \mathbb{B}$	The function f with domain \mathbb{A} and range \mathbb{B}
250	$f \circ g$	Composition of the functions f and g
251	$f(\mathbf{x}; \boldsymbol{\theta})$	A function of \mathbf{x} parametrized by $\boldsymbol{\theta}$. (Sometimes we write $f(\mathbf{x})$ and omit the argument $\boldsymbol{\theta}$ to lighten notation)
252	$\log x$	Natural logarithm of x
253	$\sigma(x)$	Logistic sigmoid, $\frac{1}{1 + \exp(-x)}$
254	$\zeta(x)$	Softplus, $\log(1 + \exp(x))$
255	$\ \mathbf{x}\ _p$	L^p norm of \mathbf{x}
256	$\ \mathbf{x}\ $	L^2 norm of \mathbf{x}
257	x^+	Positive part of x , i.e., $\max(0, x)$
258	$\mathbf{1}_{\text{condition}}$	is 1 if the condition is true, 0 otherwise

270 6 FINAL INSTRUCTIONS
271

272 Do not change any aspects of the formatting parameters in the style files. In particular, do not modify
273 the width or length of the rectangle the text should fit into, and do not change font sizes (except
274 perhaps in the REFERENCES section; see below). Please note that pages should be numbered.
275

276 7 PREPARING POSTSCRIPT OR PDF FILES
277

278 Please prepare PostScript or PDF files with paper size “US Letter”, and not, for example, “A4”. The
279 `-t letter` option on `dvips` will produce US Letter files.
280

281 Consider directly generating PDF files using `pdflatex` (especially if you are a MiKTeX user).
282 PDF figures must be substituted for EPS figures, however.

283 Otherwise, please generate your PostScript and PDF files with the following commands:
284

```
285 dvips mypaper.dvi -t letter -Ppdf -G0 -o mypaper.ps
286 ps2pdf mypaper.ps mypaper.pdf
287
```

288 7.1 MARGINS IN LATEX
289

290 Most of the margin problems come from figures positioned by hand using `\special` or other
291 commands. We suggest using the command `\includegraphics` from the `graphicx` package.
292 Always specify the figure width as a multiple of the line width as in the example below using `.eps`
293 `graphics`

```
294 \usepackage[dvips]{graphicx} ...
295 \includegraphics[width=0.8\linewidth]{myfile.eps}
296
```

297 or

```
298 \usepackage[pdftex]{graphicx} ...
299 \includegraphics[width=0.8\linewidth]{myfile.pdf}
300
```

301 for `.pdf` graphics. See section 4.4 in the `graphics` bundle documentation (<http://www.ctan.org/tex-archive/macros/latex/required/graphics/grfguide.ps>)
302

303 A number of width problems arise when LaTeX cannot properly hyphenate a line. Please give
304 LaTeX hyphenation hints using the `\-` command.
305

306 AUTHOR CONTRIBUTIONS
307

308 If you’d like to, you may include a section for author contributions as is done in many journals. This
309 is optional and at the discretion of the authors.
310

311 ACKNOWLEDGMENTS

312 Use unnumbered third level headings for the acknowledgments. All acknowledgments, including
313 those to funding agencies, go at the end of the paper.
314

315 REFERENCES
316

317 Yoshua Bengio and Yann LeCun. Scaling learning algorithms towards AI. In *Large Scale Kernel*
318 *Machines*. MIT Press, 2007.
319

320 Ian Goodfellow, Yoshua Bengio, Aaron Courville, and Yoshua Bengio. *Deep learning*, volume 1.
321 MIT Press, 2016.

322 Geoffrey E. Hinton, Simon Osindero, and Yee Whye Teh. A fast learning algorithm for deep belief
323 nets. *Neural Computation*, 18:1527–1554, 2006.

324
325
326
327
328
329
330
331
332
333
334
335
336
337
338
339
340
341
342
343
344
345
346
347
348
349
350
351
352
353
354
355
356
357
358
359
360
361
362
363
364
365
366
367
368
369
370
371
372
373
374
375
376
377

A APPENDIX

You may include other additional sections here.