Guide to Using SIAM's SIURO LaTeX Style

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Abstract. Documentation is given for use of the SIAM SIURO LaTeX and BibTeX macros. Instructions and suggestions for compliance with SIAM style standards are also included. SIAM style standards are recommended but not required for SIURO. Familiarity with standard LaTeX commands is assumed.

1. Introduction. This file is documentation for the SIAM SIURO LaTeX style, including how to typeset the main document, the BibTeX file, and any supplementary material. More information about SIAM's editorial style can be found in the style manual, available at https://www.siam.org/journals/pdf/stylemanual.pdf. The major changes in the SIAM SIURO class are summarized in Appendix A. The SIAM SIURO LaTeX files can be found at https://www.siam.org/journals/auth-info.php. The files that are distributed are given below.

- `siuro210301.cls` (required): Main SIAM SIURO LaTeX class file.
- `siamplain.bst` (required): Bibliographic style file for BibTeX.
- `siuro_docsiam.pdf`: Documentation (this file).
- `references.bib`: BibTeX database for this documentation and examples.
- `siuro_article.tex`: Template for article.
- `siuro_supplement.tex`: Template for supplement.

To use these files, put `siuro210301.cls` and `siamplain.bst` in the directory with your paper or, alternatively, into your LaTeX and BibTeX paths, respectively. The outline of a SIAM LaTeX article is shown in Example 1. Templates are provided and discussed in more detail in section 12.

2. Class options. Class options can be included in the bracketed argument of the command, separated by commas. The possible class options are:

- `final` — Sets format options so that the paper is ready for publication. Included by default and should not be changed.
- `supplement` — Specifies that the file is a supplement and not the main document, causing changes in the appearance of the title and numbering; see section 11 for details.

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Example 1: Document outline

```
\documentclass{siuro210301}
% Preamble: packages and macro definitions go here.
% Preamble: define title, authors, headers here.
\begin{document}
\maketitle
% Abstract goes here.
% Main body goes here.
% Appendices goes here (optional).
% Acknowledgements go here (optional).
% Bibliography goes here.
\end{document}
```

3. Front matter. The title and author parts are formatted using the standard `\title`, `\author`, and `\maketitle` commands as described in Lamport [8]. The title and author should be declared in the preamble. If there is more than one author, each additional author should be preceded by the `\and` command. The addresses are added via `\thanks`. Each author's thanks should specify their address. The header for this file was produced by the code in Example 2, including an example of a shared footnote. Each thanks produces a footnote, so the footnote of the second author is #3. The command `\headers{title}{authors}` command, with the title (possibly shortened to fit) and the authors' names, creates the page headers, automatically converted to uppercase.

Example 2: Title and authors in preamble

```
\title{Guide to Using SIAM's SIURO \LaTeX\ Style}

\author{Dianne Doe\thanks{Imagination Corp., Chicago, IL (\email{ddoe@imag.com},
    \url{http://www.imag.com/\string~ddoe/}).}
\and Paul T. Frank\thanks{Department of Applied Math, Fictional University,
    Boise, ID (\email{ptfrank@fictional.edu}, \email{jesmith@fictional.edu}).}
\and Jane E. Smith\footnotemark[3]}

% Use one of the following formats to list the project advisor. Including the
    project
% advisor's affiliation and/or contact information is optional.
\dedication{\small\textit{Project advisor: Albert Einstein}}

%\dedication{\small\textit{Project advisor: Albert Einstein\thanks{Institute for
    Advanced Study, Princeton, NJ.}}}

%\dedication{\small\textit{Project advisor: Albert Einstein\thanks{Institute for
    Advanced Study, Princeton, NJ (\email{siuro@siam.org}).}}}

\headers{Guide to Using SIAM'S SIURO \LaTeX\ Style}{Dianne Doe, Paul T. Frank,
    and Jane E. Smith}
```

Note the use of the `\string` command in the URL for the tilde; this is only necessary inside the `\thanks` command. Following the author and title is the abstract designated using the `abstract` environment. The abstract for this document are specified in Example 3.

Example 3: Abstract

```
\newcommand{\BibTeX}{{\scshape Bib}\TeX\xspace} % <- Preamble
\begin{abstract}
Documentation is given for use of the SIAM SIURO \LaTeX\ and \BibTeX\
macros.  Instructions and suggestions for compliance with SIAM style
standards are also included. SIAM style standards are recommended but
not required for SIURO.  Familiarity with standard \LaTeX\ commands
is assumed.
\end{abstract}
```

A more complete example, including a PDF supplement, that uses the included files `ex_article.tex` and `ex_supplement.tex` are discussed in section 12. The example files can be used as a starting point for producing a document.

4. Cross references and hyperlinks. SIAM now supports cross references and hyperlinks via the `cleveref` and `hyperef` packages, which are loaded by the class file.

4.1. Cleveref. SIAM strongly recommends using the commands provided by the `cleveref` package for cross referencing. The package is automatically loaded and already customized to adhere to SIAM's style guidelines. To create a cross reference, use the command `\cref` (inside sentence) or `\Cref` (beginning of a sentence) in place of the object name and `\ref`. The `cleveref` package enhances LaTeX's cross-referencing features, allowing the format of cross references to be determined automatically according to the "type" of cross reference (equation, section, etc.) and the context in which the cross reference is used. So, the package *automatically* inserts the object name as well as the appropriate hyperlink; see Example 4. It may require two LaTeX compilations for the references to show up correctly. Additional examples are shown in the sections below for equations, tables, figures, sections, etc.

Example 4: Advantage of using cleveref

```
The normal way to get a cross reference with a hyperlink requires a
lot of typing: \hyperref[thm:mvt]{Theorem~\ref*{thm:mvt}}.
The \texttt{cleveref} package gets both the name and hyperlink
automatically using a single macro: \cref{thm:mvt}.
It also handles multiple references with the same macro, such as
\cref{thm:mvt,fig:pgfplots,fig:testfig}.
```

The normal way to get a cross reference with a hyperlink requires a lot of typing: Theorem 6.1. The `cleveref` package gets both the name and hyperlink automatically using a single macro: Theorem 6.1. It also handles multiple references with the same macro, such as Theorem 6.1 and Figures 1 and 2.

4.2. Hyperef. Hyperlinks are created with the `\href` and `\url` commands, as shown in Example 5. SIAM has also defined the `\email` command, as shown in Example 2.

Example 5: Creating hyperlinks

```
The \href{https://www.siam.org}{SIAM homepage} has general information.
There are times when the author may want to specify
the location explicitly instead by using \url{https://www.siam.org}.
```

The SIAM homepage has general information. There are times when the author may want to specify the location explicitly instead by using https://www.siam.org.

Note that homepage links via `\url` in the `\thanks` environment require special formatting for the tilde (~) character. The formatting is used in the template and shown in section 3.

5. Math and equations. Here we show some example equations, with numbering, and examples of referencing the equations. SIAM macros now includes the package `amsmath` by default, and we include some of its features as well, although the reader should consult the package user manual for further guidance [1, 4]. Several of the example are adapted from Mittlebach and Goossen's guide to LaTeX [9].

Example 6 is a straightforward example of inline mathematics equations that does not use any special packages or features.

Example 6: Inline math

```
The following shows an example of math in text:
Let $S=[s_{ij}]$ ($1\leq i,j\leq n$) be a $(0,1,-1)$-matrix of order $n$.
```

The following shows an example of math in text: Let $S = [s_{ij}]$ $(1 \leq i, j \leq n)$ be a $(0, 1, -1)$-matrix of order n.

In Example 7, we show the recommended method for getting blackboard fonts using the `amsfonts` package. This is not loaded by default and must be included in the preamble.

Example 7: Blackboard math

```
\usepackage{amsfonts} % <- Preamble
Blackboard bold characters, such as $\mathbb{C}$ and $\mathbb{R}$,
should be created with the \texttt{amsfonts} package, although this
is not included by default.
```

Blackboard bold characters, such as $\mathbb{C}$ and $\mathbb{R}$, should be created with the `amsfonts` package, although this is not included by default.

Example 8 shows the `smallmatrix` environment for an inline matrix from the `amsmath` package, which is included by default.

Example 8: Inline matrix

```
Matrices of no more than two rows appearing in text can be created
as shown in the next example:
$B = \bigl[ \begin{smallmatrix} B_{11} & B_{12} \\
  B_{21} & B_{22} \end{smallmatrix} \bigr]$.
```

Matrices of no more than two rows appearing in text can be created as shown in the next example: $B = \left[\begin{smallmatrix} B_{11} & B_{12} \\ B_{21} & B_{22} \end{smallmatrix}\right]$.

Bigger matrices can be rendered with environments from the `amsmath` package, such as `bmatrix` and `pmatrix` used in Example 9.

Example 9: Creating matrices

```
Display matrices can be rendered using environments from \texttt{amsmath}:
\begin{equation}\label{eq:matrices}
  S=\begin{bmatrix}1&0\\0&0\end{bmatrix}
  \quad\text{and}\quad
  C=\begin{pmatrix}1&1&0\\1&1&0\\0&0&0\end{pmatrix}.
\end{equation}
\Cref{eq:matrices} shows some example matrices.
```

Display matrices can be rendered using environments from `amsmath`:

$$S = \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix} \quad \text{and} \quad C = \begin{pmatrix} 1 & 1 & 0 \\ 1 & 1 & 0 \\ 0 & 0 & 0 \end{pmatrix}. \tag{5.1}$$

Equation (5.1) shows some example matrices.

Example 10 shows how to use the `\DeclareMathOperator` command from the `amsopn` package to declare the `\Range` macro. (This example also uses the `braket` package for the `\set` macro, but this is not necessarily recommended by SIAM.)

Example 10: Declaring math operators

```
\usepackage{braket,amsfonts,amsopn} % <- Preamble
\DeclareMathOperator{\Range}{Range} % <- Preamble
An example of a math operator:
\begin{equation}\label{eq:range}
  \Range(A) = \set{ y \in \mathbb{R}^n | y = Ax }.
\end{equation}
```

An example of a math operator:

$$\operatorname{Range}(A) = \{\, y \in \mathbb{R}^n \mid y = Ax \,\}. \tag{5.2}$$

Example 11 shows how to use the `align` environment from `amsmath` to easily align multiple equations.

Example 11: Aligned equations

```
\Cref{eq:a,eq:b,eq:c} show three aligned equations.
\begin{align}
  f &= g, \label{eq:a} \\
  f' &= g', \quad\text{and} \label{eq:b} \\
  \mathcal{L}f &= \mathcal{L}g \label{eq:c}.
\end{align}
```

Equations (5.3)–(5.5) show three aligned equations.

$$f = g, \tag{5.3}$$

$$f' = g', \quad \text{and} \tag{5.4}$$

$$\mathcal{L}f = \mathcal{L}g. \tag{5.5}$$

Another way to number a set of equations is the `subequations` environment from `amsmath`, as shown in Example 12.

Example 12: Subequations

```
We calculate the Fr\'{e}chet derivative of $F$ as follows:
\begin{subequations}
\begin{align}
  F'(U,V)(H,K)
  &= \langle R(U,V),H\Sigma V^{T} + U\Sigma K^{T} -
  P(H\Sigma V^{T} + U\Sigma K^{T})\rangle \label{eq:aa} \\
  &= \langle R(U,V),H\Sigma V^{T} + U\Sigma K^{T}\rangle
  \nonumber \\
  &= \langle R(U,V)V\Sigma^{T},H\rangle +
  \langle \Sigma^{T}U^{T}R(U,V),K^{T}\rangle. \label{eq:bb}
\end{align}
\end{subequations}
\Cref{eq:aa} is the first line, and \cref{eq:bb} is the last line.
```

We calculate the Fréchet derivative of F as follows:

$$\begin{aligned} F'(U,V)(H,K) &= \langle R(U,V), H\Sigma V^T + U\Sigma K^T - P(H\Sigma V^T + U\Sigma K^T)\rangle \\ &= \langle R(U,V), H\Sigma V^T + U\Sigma K^T\rangle \end{aligned} \tag{5.6a}$$

$$= \langle R(U,V)V\Sigma^T, H\rangle + \langle \Sigma^T U^T R(U,V), K^T\rangle. \tag{5.6b}$$

Equation (5.6a) is the first line, and (5.6b) is the last line.

For an equation split over multiple lines, Example 13 shows the usage of the `multline` environment provided by `amsmath`.

Example 13: Equation split across lines

```
We claim that the projection $g(U,V)$ is given by the pair of matrices:
\begin{multline} \label{eq:ml}
  g(U,V) = \biggl( \frac{R(U,V)V\Sigma^{T}U^{T}
    - U\Sigma V^{T}R(U,V)^{T}}{2}U,\\
  \frac{R(U,V)^{T}U\Sigma V^{T}-V \Sigma^{T}U^{T}R(U,V)}{2}V \biggr).
\end{multline}
```

We claim that the projection $g(U,V)$ is given by the pair of matrices:

$$g(U,V) = \left(\frac{R(U,V)V\Sigma^T U^T - U\Sigma V^T R(U,V)^T}{2}U, \frac{R(U,V)^T U\Sigma V^T - V\Sigma^T U^T R(U,V)}{2}V\right). \tag{5.7}$$

6. Theorem-like environments. SIAM loads the `ntheorem` package and uses it to define the following theorem-like environments: `theorem`, `lemma`, `corollary`, `definition`, and `proposition`. SIAM also defines a `proof` environment that automatically inserts the symbol "■" at the end of any proof, even if it ends in an equation environment. *Note that the document may need to be compiled twice for the mark to appear.* Some of the calculus examples were adapted from [3]. Example 14 shows usage of the `theorem` environment. An optional argument can be used to name the theorem. Example 15 illustrates a corollary, without a name, and the proof environment.

Example 14: Theorem

```
\begin{theorem}[Mean Value Theorem]\label{thm:mvt}
  Suppose $f$ is a function that is continuous on the closed interval
  $[a,b]$.  and differentiable on the open interval $(a,b)$.
  Then there exists a number $c$ such that $a < c < b$ and
  \begin{displaymath}
    f'(c) = \frac{f(b)-f(a)}{b-a}.
  \end{displaymath}
  In other words, $f(b)-f(a) = f'(c)(b-a)$.
\end{theorem}
```

Theorem 6.1 (Mean Value Theorem). *Suppose f is a function that is continuous on the closed interval $[a,b]$. and differentiable on the open interval (a,b). Then there exists a number c such that $a < c < b$ and*

$$f'(c) = \frac{f(b) - f(a)}{b - a}.$$

In other words, $f(b) - f(a) = f'(c)(b - a)$.

Example 15: Corollary and proof

```
\begin{corollary}
  Let $f(x)$ be continuous and differentiable everywhere. If $f(x)$
  has at least two roots, then $f'(x)$ must have at least one root.
\end{corollary}
\begin{proof}
  Let $a$ and $b$ be two distinct roots of $f$.
  By \cref{thm:mvt}, there exists a number $c$ such that
  \begin{displaymath}
    f'(c) = \frac{f(b)-f(a)}{b-a} = \frac{0-0}{b-a} = 0.
  \end{displaymath}
\end{proof}
```

Corollary 6.2. *Let $f(x)$ be continuous and differentiable everywhere. If $f(x)$ has at least two roots, then $f'(x)$ must have at least one root.*

Proof. Let a and b be two distinct roots of f. By Theorem 6.1, there exists a number c such that

$$f'(c) = \frac{f(b) - f(a)}{b - a} = \frac{0 - 0}{b - a} = 0.$$

■

SIAM also defines commands to create your own theorem- and remark-like environments:

- `newsiamthm` — Small caps header, italized body.
- `newsiamremark` — Italics header, roman body.

Each command takes two arguments. The first is the environment name, and the second is the name to show in the document. These commands should be used instead of `\newtheorem`. Examples 16 and 17 shows how to use the commands above, including how to specify the plural version for `cleveref` if it is unusual.

Example 16: New theorem-like environment

```
\newsiamthm{claim}{Claim} % <- Preamble
\newsiamremark{hypothesis}{Hypothesis} % <- Preamble
\crefname{hypothesis}{Hypothesis}{Hypotheses} % <- Preamble
\begin{claim}\label{cl:constant}
  If $f'(x) = 0$ for all $x \in (a,b)$ then $f(x)$ is constant on $(a,b)$.
\end{claim}
\begin{hypothesis}\label{hyp1}
The function $f$ is continuously differentiable.
\end{hypothesis}
\begin{hypothesis}\label{hyp2}
The random variable is normally distributed.
\end{hypothesis}
```

Claim 6.3. *If $f'(x) = 0$ for all $x \in (a, b)$ then $f(x)$ is constant on (a, b).*

Hypothesis 6.4. The function f is continuously differentiable.

Hypothesis 6.5. The random variable is normally distributed.

Example 17: References

```
We can reference multiple types of objects with a single reference:
\cref{cl:constant,thm:mvt,hyp1}.
```

We can reference multiple types of objects with a single reference: Claim 6.3, Theorem 6.1, and Hypothesis 6.4.

7. Tables. Table captions should go above the tables. Example 18 shows the code to generate a Table 1. A more complicated example is shown in Example 19, which generates Table 2. This example uses subfloats via the `subfig` package, as well as special column options from the `array` package.

Example 18: Example table.

```
\begin{table}[tbhp]
\footnotesize
  \caption{Example table}\label{tab:simpletable}
\begin{center}
  \begin{tabular}{|c|c|c|} \hline
   Species & \bf Mean & \bf Std.~Dev. \\ \hline
    1 & 3.4 & 1.2 \\
    2 & 5.4 & 0.6 \\ \hline
  \end{tabular}
\end{center}
\end{table}
```

Table 1
Example table

Species	**Mean**	**Std. Dev.**
1	3.4	1.2
2	5.4	0.6

Example 19: Example table with subtables.

```
\usepackage{array} % <- Preamble
\usepackage[caption=false]{subfig} % <- Preamble
\newcolumntype{R}{>{$}r<{$}}  %
\newcolumntype{V}[1]{>{[\;}*{#1}{R@{\;\;}}R<{\;]}} %
\begin{table}[tbhp]
\footnotesize
 \captionsetup{position=top} %<- Needed for using subtables created with the subfig package
  \caption{Example table adapted from Kolda and Mayo \rm{\cite{KoMa14}}.}\label{tab:KoMa14}
\begin{center}
  \subfloat[$\beta=1$]{
    \begin{tabular}{|r|R|V{3}|c|r@{\,$\pm$\,}l|} \hline
occ. & \multicolumn{1}{c|}{$\lambda$} & \multicolumn{4}{c|}{$\mathbf{x}$} &
fevals &  \multicolumn{2}{c|}{time (sec.)}\\ \hline
 718 & 11.3476 &  0.5544 &  0.3155 &  1.2018 &  0.0977 &   45 & 0.17 & 0.06 \\ \hline
 134 &  3.7394 &  0.2642 & -1.1056 &  0.2657 & -0.3160 &   31 & 0.12 & 0.05 \\ \hline
   4 & \multicolumn{6}{c|}{\emph{--- Failed to converge ---}} & 0.21 & 0.10 \\ \hline
 \end{tabular}}

  \subfloat[$\beta=-1$]{
    \begin{tabular}{|r|R|V{3}|c|r@{\,$\pm$\,}l|} \hline
occ. & \multicolumn{1}{c|}{$\lambda$} & \multicolumn{4}{c|}{$\mathbf{x}$} &
fevals &  \multicolumn{2}{c|}{time (sec.)}\\ \hline
  72 & -1.1507 &  0.2291 &  0.6444 &  0.3540 & -0.8990 &   34 & 0.14 & 0.06 \\ \hline
 624 & -6.3985 &  0.1003 &  0.1840 &  0.5305 &  1.2438 &   48 & 0.19 & 0.08 \\ \hline
   2 & \multicolumn{6}{c|}{\emph{--- Failed to converge ---}} & 0.23 & 0.02 \\ \hline
 \end{tabular}}
\end{center}
\end{table}
```

Table 2
Example table adapted from Kolda and Mayo [7].

occ.	λ	$\mathbf{x}$	fevals	time (sec.)
718	11.3476	$[\,0.5544 \quad 0.3155 \quad 1.2018 \quad 0.0977\,]$	45	0.17 ± 0.06
134	3.7394	$[\,0.2642 \quad -1.1056 \quad 0.2657 \quad -0.3160\,]$	31	0.12 ± 0.05
4	— *Failed to converge* —			0.21 ± 0.10

(a) $\beta = 1$

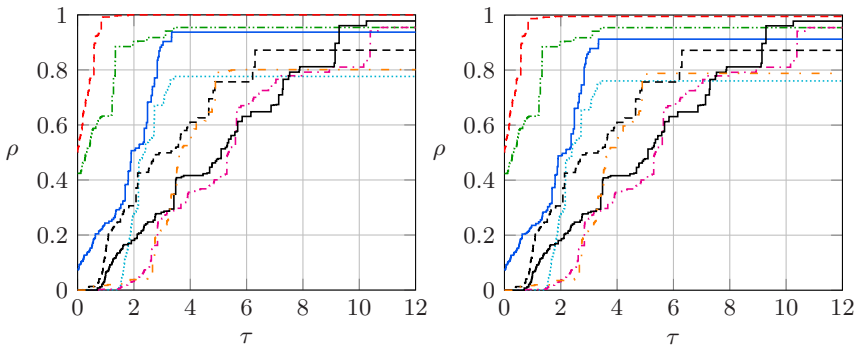
occ.	λ	$\mathbf{x}$	fevals	time (sec.)
72	-1.1507	$[\,0.2291 \quad 0.6444 \quad 0.3540 \quad -0.8990\,]$	34	0.14 ± 0.06
624	-6.3985	$[\,0.1003 \quad 0.1840 \quad 0.5305 \quad 1.2438\,]$	48	0.19 ± 0.08
2	— *Failed to converge* —			0.23 ± 0.02

(b) $\beta = -1$

8. Figures. It is recommended that all figures be generated in high resolution. The Encapsulated postscript (EPS) format is still an acceptable option, but SIAM also allows high-resolution PDF, JPEG, and PNG figures. If working with EPS images and using `pdflatex`, we recommend the package `epstopdf` to automatically convert EPS images to PDF for inclusion in PDF documents created by `pdflatex`. Please note that `epstopdf` requires `texlive-font-utils` which may not be part of a standard LaTeX installation. Example 20 shows the code to generate Figure 1. This example uses the `graphicx` package for the `\includegraphics` command.

Example 20: Example figure with subfigures and external files

```
\usepackage{graphicx,epstopdf} % <- Preamble
\usepackage[caption=false]{subfig} % <- Preamble
\begin{figure}[tbhp]
  \centering
  \subfloat[$\epsilon_{\max}=5$]{\label{fig:a}\includegraphics{lexample_fig1}}
  \subfloat[$\epsilon_{\max}=0.5$]{\label{fig:b}\includegraphics{lexample_fig2}}
  \caption{Example figure using external image files.}
  \label{fig:testfig}
\end{figure}
```



(a) $\epsilon_{\max} = 5$ (b) $\epsilon_{\max} = 0.5$

Figure 1. *Example figure using external image files.*

Another option for figures is a graphics-generator that is platform- and format-independent. PGF is a TeX macro package for generating such graphics and works together with the most important TeX backend drivers, including pdftex and dvips. The user-friedly syntax layer called TikZ. Here we show an example using `PGFPLOTS`, useful for drawing high-quality plots directly in LaTeX. Example 21 and Example 22 shows the data and code, respectively, to generate Figure 2, adapted from [5].

Example 21: Example data file (data.dat)

```
d2_dof  d2_l2_err  d3_dof d3_l2_err
5       8.312e-02  7      8.472e-02
17      2.547e-02  31     3.044e-02
49      7.407e-03  111    1.022e-02
129     2.102e-03  351    3.303e-03
321     5.874e-04  1023   1.039e-03
769     1.623e-04  2815   3.196e-04
1793    4.442e-05  7423   9.658e-05
4097    1.207e-05  18943  2.873e-05
9217    3.261e-06  47103  8.437e-06
```

Example 22: Example TikZ/PGF for platform-independent graphics.

```
\usepackage{pgfplots} % <- Preamble
\begin{figure}[tbhp]
  \centering
  \begin{tikzpicture}
    \begin{loglogaxis}[height=2.75in, grid=major,
      xlabel={Degrees of Freedom}, ylabel={$L_2$ Error},
      legend entries={$d=2$,$d=3$}]
      \addplot table [x=d2_dof,y=d2_l2_err] {data.dat};
      \addplot table [x=d3_dof,y=d3_l2_err] {data.dat};
    \end{loglogaxis}
  \end{tikzpicture}
  \caption{Example \texttt{PGFPLOTS} figure.}
  \label{fig:pgfplots}
\end{figure}
```

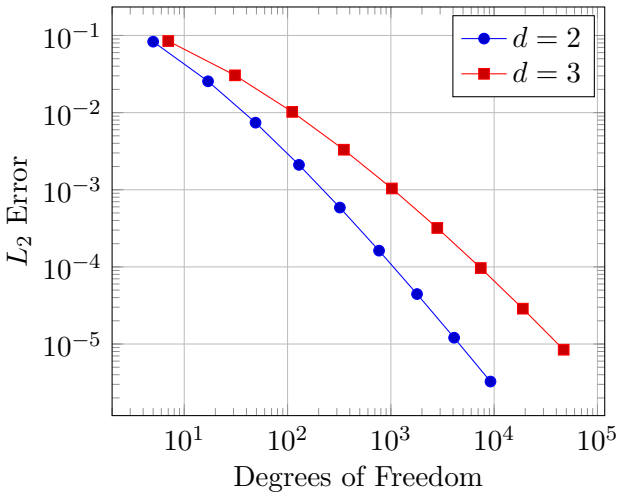


Figure 2. *Example PGFPLOTS figure.*

9. Algorithms. SIAM automatically includes the `algorithm` package in the class definition. This provides the float environment. Users have the choice of `algpseudocode`,

`algorithmic`, and other packages for actually formatting the algorithm. For example, Algorithm 9.1 is produced by the code in Example 23. In order to reference lines within the algorithm, we need to tell the `cleveref` package how to do the referencing, which is the second line of Example 23. Then we can use the code `\cref{line3}` to produce Line 3.

Example 23: Example algorithm

```
\usepackage{algorithmic} % <- Preamble
\Crefname{ALC@unique}{Line}{Lines} % <- Preamble
\begin{algorithm}
\caption{Build tree}
\label{alg:buildtree}
\begin{algorithmic}[1]
\STATE{Define $P:=T:=\{ \{1\},\ldots,\{d\}$\}}
\WHILE{$\#P > 1$}
\STATE\label{line3}{Choose $C^\prime\in\mathcal{C}_p(P)$ with $C^\prime :=
    \operatorname{argmin}_{C\in\mathcal{C}_p(P)} \varrho(C)$}
\STATE{Find an optimal partition tree $T_{C^\prime}$ }
\STATE{Update $P := (P{\setminus} C^\prime) \cup \{ \bigcup_{t\in C^\prime} t \}$}
\STATE{Update $T := T \cup \{ \bigcup_{t\in\tau} t : \tau\in T_{C^\prime}{\setminus}
    \mathcal{L}(T_{C^\prime})\}$}
\ENDWHILE
\RETURN $T$
\end{algorithmic}
\end{algorithm}
```

Algorithm 9.1 Build tree

1: Define $P := T := \{\{1\}, \ldots, \{d\}\}$
2: **while** $\#P > 1$ **do**
3: Choose $C' \in \mathcal{C}_p(P)$ with $C' := \operatorname{argmin}_{C\in\mathcal{C}_p(P)} \varrho(C)$
4: Find an optimal partition tree $T_{C'}$
5: Update $P := (P\backslash C') \cup \{\bigcup_{t\in C'} t\}$
6: Update $T := T \cup \{\bigcup_{t\in\tau} t : \tau \in T_{C'}\backslash\mathcal{L}(T_{C'})\}$
7: **end while**
8: **return** T

10. Sections. Sections are denoted using standard LaTeX section commands, i.e., `\section`, `\subsection`, etc. If you wish to end the section title with something other that a period (the default), you have to add the command `\nopunct` at the end of the title.

Appendices are created with the normal sectioning commands, following the command `\appendix`. Titles of appendices created with `\section` are preceded by the word "Appendix," but not the subsections or appendices created with `\section*`. Unlike normal sections, appendix sections may be sensitive to blank lines following the declaration, causing a new paragraph rather than the text immediately following the appendix title. This can be corrected by removing and blank lines. Any numbered, labeled sections can be referenced using `\cref`, including those without a title. Section titles are automatically inserted into the table of contents and converted to bookmarks; see Appendix B.5 for handling special characters.

The acknowledgments section comes immediately before the references and after any appendices. It should be declared by `\section*{Acknowledgments}`.

11. Supplemental material. SIURO authors are encouraged to submit Supplementary Materials to complement their articles. This might include additional figures or examples, animations, data sets used in the paper, computer code used to generate figures or tables, or other materials that are necessary to fully document the research contained in the paper or to facilitate the readers' ability to understand and extend the work.

The class option `supplement` should be used in the supplemental LaTeX file provided for creating PDF supplemental material. The supplement should have the same title and authors as the main document. The title is modified automatically by the SIAM class file so that it is preceded by the text "Supplementary Materials", followed by a colon. The numbering is modified so that all sections, equations, figures, tables, algorithms, and so on to start with "SM". A supplement does have sections but does not have an abstract or appendices. References are optional for a supplement. A template is provide, as discussed in section 12.

12. Template. The files `ex_article.tex` and `ex_supplement.tex` provide templates that can be used for creating a SIURO LaTeX document with an optional supplement.

13. Bibliography. The SIAM BibTeX style file `siamplain.bst` includes the special keys listed below:

- `doi`: Digital object identifier, a unique alphanumeric string
- `url`: Web address, usually impermanent
- `urldate`: Date that the web address was last accessed
- `eprint`: Archive identifier, a unique alphanumeric string
- `eprintclass`: Archive class
- `archive`: Archive URL, defaults to https://arXiv.org/abs
- `archivepreprint`: Archive name, defaults to "arXiv".
- `eid`: Article ID, if there are no page numbers
- `pagetotal`: Total number of pages, for use with article ID

Every entry type has been set up to include an optional link to a DOI, a URL, and/or an archive preprint reference. Additionally, the `article` entry supports an Article ID, `eid`, and number of pages, `pagetotal`. To use this, include the following code in your LaTeX source code: `\bibliographystyle{siamplain}`.

13.1. DOI. A digital object identifier (DOI) is a unique alphanumeric string that provides a persistent link to its location on the Internet. The publisher assigns a DOI when an article is published and made available electronically. Using the `doi` field in BibTeX to specify it, as shown for [7] in Example 24; observe the new `doi` field which produces a hyperlink in the citation. Do not include the full URL, i.e., https://doi.org/ preceding the DOI.

Example 24: Example article in BibTeX

```
@Article{KoMa14,
  title =        {An Adaptive Shifted Power Method for Computing
                  Generalized Tensor Eigenpairs},
  author =       {Tamara G. Kolda and Jackson R. Mayo},
  doi =          {10.1137/140951758},
  journal =      {SIAM Journal on Matrix Analysis and Applications},
  number =       4,
  volume =       35,
  year =         2014,
  month =        dec,
  pages =        {1563--1581},
}
```

13.2. URL. Generally, the DOI is preferred to the `url` field, since the DOIs should be permanent references. For that reason, it is good practice to specify the last date that the URL was accessed, which is specified by the optional `urldate` field. Reference [6] produced by Example 25 shows an example of using these fields.

Example 25: Example with the URL field in BibTeX

```
@Misc{Hi14,
  author =       {Nick Higham},
  title =        {A Call for Better Indexes},
  howpublished = {SIAM Blogs},
  year =         2014,
  month =        nov,
  url =          {http://blogs.siam.org/a-call-for-better-indexes/},
  urldate =      {2015-04-05}
}
```

13.3. Preprint servers such as arXiv. More and more manuscripts are available on preprint servers. In fact, SIAM's publication policy explicitly allows the final accepted version of any article to be posted on a preprint server such as arXiv.

For an arXiv paper, the `eprint` field is used to specify the identifier. The optional `eprintclass` field specifies the class. Example 26 shows the BibTeX for [11].

Example 26: Example arXiv reference in BibTeX

```
@Misc{PeKoPi14,
  title = {Accelerating Community Detection by Using {K}-core Subgraphs},
  author =       {Chengbin Peng and Tamara G. Kolda and Ali Pinar},
  eprint =       {1403.2226},
  year =         2014,
  month =        mar,
  eprintclass =  {math.NA}
}
```

Other preprint servers are supported as well, but these require specification of the fields

`archive` and `archiveprefix`. In this case, the target URL is formed by concatenating the `archive`, a forward slash (/), and the `eprint`; and the text for the hyperlink is formed by concatenating the `archiveprevix`, a colon (:), and the `eprint`. Example 27 shows the code to generate [12], including the preprint from PubMed. Note that this example has both the journal citation as well as the link for the preprint.

Example 27: Example PubMed reference in BibTeX

```
@Article{WoZhMeSh05,
  author =       {Woessner, Donald E. and Zhang, Shanrong and
                  Merritt, Matthew E. and Sherry, A. Dean},
  title = {Numerical Solution of the {Bloch} Equations Provides Insights
                  into the Optimum Design of {PARACEST} Agents for {MRI}},
  journal =      {Magnetic Resonance in Medicine},
  doi =          {10.1002/mrm.20408},
  volume =       53,
  number =       4,
  month =        apr,
  year =         2005,
  pages =        {790--799},
  archiveprefix = {PubMed},
  archive =      {https://www.ncbi.nlm.nih.gov/pubmed},
  eprint =       {15799055}
}
```

13.4. Article ID. Some journals use an article ID rather than page numbers. The field `eid` specifies the article ID. The optional field `pagetotal` can say the number of pages in the document. An example of an article using these fields is shown in Example 28 for citation [10].

Example 28: Example article ID reference in BibTeX

```
@Article{Ne03,
  title =        {Properties of Highly Clustered Networks},
  author =       {Newman, M. E. J.},
  doi =          {10.1103/PhysRevE.68.026121},
  journal =      {Phys. Rev. E},
  volume =       {68},
  year =         {2003},
  eid =          {026121},
  pagetotal =    6,
  month =        aug,
}
```

13.5. Software citations. SIAM encourages software citations, both related technical publications as well as the software itself. A citation to a software package may look something like what is shown in Example 29 for citation [2]. Notice the double braces around the `author` key; else, it would appear as "C. D. Team".

Example 29: Example software reference in BibTeX

```
@misc{clawpack,
  title =        {Clawpack Software},
  author =       {{Clawpack Development Team}},
  url =          {http://www.clawpack.org},
  urldate =      {2015/05/14},
  note =         {Version 5.2.2},
  year =         2015
}
```

Appendix A. Summary of major changes.

Here we summarize the major changes in the latest version of the SIAM SIURO LaTeX and BibTeX classes:

- Creation of the SIURO LaTeX class file, examples, and supporting documentation.

Appendix B. Special modifications.

B.1. Labeling objects sequentially. SIAM recommends numbering objects by section number. However, if you prefer to number objects sequentially (e.g., Figure 5 would indicate the fifth figure appearing in the paper regardless of which section it is in), add the code from Example 30 as documentclass options (e.g., `\documentclass[final,onefignum,onetabnum]{siuro210301}`).

Example 30: Labeling objects sequentially

```
oneeqnum % equations
onetabnum % tables
onefignum % figures
onealgnum % algorithms
onethmnum % theorem environments
```

B.2. Appendices with no title. The SIAM style manual [13] allows for an appendix that is numbered (by a letter) but has no title. We have a special command to create such an appendix: `\appendixnotitle`. This is equivalent to a `\section` command in the appendix except that it has no arguments.

B.3. Changing the font of algorithm titles. Currently, the algorithm title font matches the figure and table title fonts. To make the algorithm title font appear as small caps, insert the code in Example 31 into the preamble.

Example 31: Changing algorithm title font

```
\makeatletter
\renewcommand{\ALG@name}{\sc Algorithm}
\makeatother
```

B.4. Changing title of proof. To change the title of a proof to, say, "Proof of main theorem," simply use an optional argument as shown in Example 32.

Example 32: Altered proof environment

```
\begin{proof}[Proof of main theorem]
We now show...
\end{proof}
```

B.5. Special instructions for PDF bookmarks. Section titles are automatically inserted into the table of contents and therefore used as PDF bookmarks. Some special symbols may not correctly render. In that case, you can define alternate text as shown in Example 33, using the `\texorpdfstring` command provided by the `hypertex` package. In this example, the default bookmark would be "Discussion of Z = X Y"; instead, it is replaced by "Discussion of Z = X union Y."

Example 33: PDF bookmarks for symbols in section titles

```
\section{Discussion of \texorpdfstring{{\boldmath$Z=X \cup Y$}}{Z = X union Y}}
```

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[13] *SIAM style manual: For journals and books*, 2013, https://www.siam.org/journals/pdf/stylemanual.pdf.