

# LaTeX

## Best practices and tips

- **[Smart quotes]**
  - Single quote: do not write `'model tree'` write ``model tree'`.
  - Double quote: do not write `"model tree"` write ``"model tree"'`.
- **[Large Numbers]**
  - Do not write `54,000` write `54{,}000`
- **[Hint for breaking words at the end of line]**
  - Use `\-` within a word to give latex a hint on where to break words if needed. This is a common problem when a word is too long and already contains a hyphen; LaTeX often puts such words over the margin.
    - `multi-disciplinary`: write `multi-disci\-plinary` to allow hyphenation.
- **[Preventing overflow lines]**
  - If you see LaTeX going over the margin (overfull lines), use the `sloppypar` environment.
    - `\begin{sloppypar}`  
`... your text goes here ...`  
`\end{sloppypar}`
- **[Positioning floats]**
  - Always keep figures and tables on top of the page using `[t]`. This makes the readability of text smoother, since a figure in between text interrupts reading flow.
    - `\begin{figure}[t]`
- **[Center align floats]**
  - Make all tables and figures center aligned using `\centering`.
- **[Algorithm pseudocode]**
  - Use a space-saving package such as `algorithm2e` with appropriate options:
    - `\usepackage[linesnumbered, vlined, boxed, ruled]{algorithm2e}`
    - Line numbers can be referred to easily in text with `linesnumbered` option.
- **[Non-breaking space]**
  - Use the tilde (`~`) character to make sure two words are not separated by a line break. Always use it in the following cases.
    - Before citation
      - `SQuID~\cite{squid}`
    - After numbers in text:
      - `Our contribution is two-fold: (1)~it is awesome, and (2)~it is efficient.`
    - Before Figure, Section, etc:
      - `Figure~\ref{fig:graph}`
      - `Section~\ref{sec:overview}`
- **[Spacing before parentheses]**
  - A space precedes parentheses or square brackets to separate it from the previous text.
    -  Our `approach(see details in the Appendix)...`
    -  Our `approach (see details in the Appendix)...`

- **[Emphasize, not bold]**
  - Do not use bold words in the middle of text, emphasize instead.
    - `This is \emph{very} important.`
  - Do not use `\textit` to emphasize, use `\emph`.
- **[Equation without numbering]**
  - Do not put numbers on equations or math expressions unless you are referring to them later. You can achieve this by using `$$` at the beginning and at the end of the math expression or equation (if one line) or by using `equation*` or `align*` environment (if multi line).
    - `$$`  

$$(a + b)^2 = a^2 + 2 \cdot a \cdot b + b^2$$
`$$`  
or, equivalently  
`\[`  

$$(a + b)^2 = a^2 + 2 \cdot a \cdot b + b^2$$
`\]`
    - `\begin{equation*}` % or `\begin{align*}`  

$$(a + b)^2 = a^2 + 2 \cdot a \cdot b + b^2$$
`\end{equation*}` % or `\end{align*}`
- **[Macro]**
  - It is often very helpful to define a macro for something which can be changed later such as the name of the tool.
    - `\newcommand{\system}{SQuID\xspace}`
  - Note the use of `\xspace` at the end of the macro. It puts a space after the word when appropriate and not when the word is the last word of a line. Include `xspace` package.
    - `\usepackage{xspace}`
- **[Running out of symbols]**
  - Try [mathematical fonts](#)
    - `\mathcal`, `\mathbb`
- **[Space between/before paragraphs]**
  - Want vertical space between paragraphs? Don't use `\vspace`, use
    - `\smallskip`, `\medskip`, `\bigskip`
  - Want horizontal space before paragraph? Don't use `\hspace`, use
    - `\indent`, `\quad`
  - Don't want any space (indentation) before paragraph? Use
    - `\noindent`
- **[Resize an entire table/figure]**
  - `\resizebox{.5\textwidth}{!}`  
`{`  
`\begin{something}`  
`something`  
`\end{something}`  
`}`
- **[Line and text width]**
  - When specifying width of a float, avoid fixed values (e.g., 5 cm), rather use fractions of `\linewidth` or `\textwidth`
    - `0.5\linewidth`

## Compression hacks

- Use `\looseness-1` before a paragraph that is overflowed by one word, you may get lucky and LaTeX might reduce one line (no guarantee though!).
  - ⚠ Make sure you don't use this by default. Sometimes it has the opposite effect. So test it for specific paragraphs and only when you are in the process of compressing.
- Try moving figures to some other place to gain some space.
- If allowed, the `times` font package can save space.
  - `\usepackage{times}`
  - ⚠ SIGMOD does not allow it.
- `\mbox` helps in some cases to prevent break in paper title or section title.
  - ⚠ Use caution when using it, it does not respect margins.

## Tables

- [Creating LaTeX tables online](#)
  - Nice UI for customizing tables
  - Select *booktabs table style*
  - Useful feature: import from latex code
- [Small guide to making nice tables](#)
- **[Cell spanning multiple columns]**
  - `\multicolumn{number of cols}{align}{text} % align: l,c,r`
    - e.g., `\multicolumn{2}{c}{Multi-column-text}`
- **[Cell spanning multiple rows]**
  - `\usepackage{multirow}`  
`\multirow{number rows}{width}{text}`
    - e.g. `\multirow{2}{*}{Multi-row-text}`
- **[Lines spanning multiple columns]**
  - `\cline{st-en} % st: start column index, en: end column index`
- **[Professional look of horizontal lines]**
  - `\hline` gives horizontal line, but for more professional looking tables, consider
    - `\toprule, \midrule, \bottomrule`
  - Requires `booktabs` package
- **[Fixed-width column]**
  - `\begin{tabular}{|p{4cm}|p{5cm}|}`
  - This will make the cells left-aligned. If you don't want that, for individual cells, use
    - `\multicolumn{1}{align}{text}`
- **[Remove space to the vertical edge]**
  - `\begin{tabular}{@{}l|l|@{}}`






# Plots

## Useful Libraries



- **[Lower-level]** (more control, need to read through documentation)
  - [matplotlib](#)
  - [Vega/ Vega-Lite](#) (declarative grammar, support for interactive plots)
  - [D3.js](#) (javascript library, usually interactive)
- **[High-level]** (easier start, good-looking predefined templates, but less control)
  - [seaborn](#) (matplotlib-based)
  - [altair](#) (Vega-based)

## Best practices and tips

- Always keep in mind that anyone can read your paper using a *grayscale* printed version.
- Be careful using, e.g., red and green together, in consideration of people with color blindness: see [this](#) for a more complete discussion.
- Choose *vector graphics* (e.g., svg, pdf) over compressed image format (jpg, png) whenever possible.
- Use *log-scale* when lines in the plot are too close/far from each other.
- Use visibly distinguishable cues while plotting multiple lines/points:

- Size 
- Color 
- Marker 
- Linestyle 
- Fill pattern 

# Paper Writing

- **[Caption]**
  - Always try to make the caption of your figures and tables informative. What is the key takeaway of the figure/table?
    -  **Comparison between SQuID and DluQS.**
    -  **SQuID achieves more precision than DluQS in 70% of the cases, while DluQS achieves better recall in 60% of the cases.**
- **[Algorithm pseudocode comments]**
  - Use in-code comments liberally.
- **[Emphasis and parentheses]**
  - As a matter of style, use emphasis in text sparingly. Mostly use it when defining a new term for the first time. A forward reference to a new term often uses quotes:
    - **our goal is to support “atomic” transactions, which we define in the next section.**
  - Then, in the next section:
    - **An *atomic* transaction is ...**
  - Avoid overuse of parentheses, which can look cluttered and distracting.

- **[Revision color-coding]**
  - If allowed, color-code revised text by reviewer.
- **[Camera-ready]**
  - Ask your advisor if they want to add any grant acknowledgement.
  - Always choose License over Copyright.
  - If you are submitting your source, make sure you have stripped out all comments. You don't want anyone else to see your and your collaborators' conversation in your tex file!
    - You can use [this](#) for arXiv submission.

## Other Useful Tools/Services

- **[Cluster SSH tool]**
  - [csshX](#) - Cluster SSH tool for Mac OS X
  - [ClusterSSH](#) - Cluster SSH tool for Linux
  - On swarm2 or gypsum, where our directory is located at a Network File System (NFS), this tool can issue identical computing tasks simultaneously on different nodes and save the results to the same directory (in the interacting mode via "srun").
  - To handle slight differences among nodes (e.g., to run tasks with different configurations on different nodes, or to specify the node name to distinguish computing tasks), you can play a trick by using predetermined environment variables (at ~/.bashrc or ~/.zshrc).
    - ssh to and manipulate on multiple swarm2 nodes simultaneously.
    - `csshx chenghao@swarm2.cs.umass.edu chenghao@swarm2.cs.umass.edu`
- **[Notebooks]**
  - [Jupyter Notebook](#)
  - [Colaboratory](#)
  - Quick demo interface: [Jupyter Lab ipywidget](#)
- **[Organizing research process]**
  - Keep track of experiments: [Airtable](#)
  - Scientific workflow management systems: [VisTrails](#)
  - Mind Mapping: [Free Mind](#)
  - Time tracking and management: [Toggl](#)
  - [Empirical Evaluation Guidelines](#)
- **[Writing help]**
  - [CICS Writing Center](#)