MCM/ICM LaTeX Quick Start Guide

Practical Template for Practice

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Abstract

Abstract is the most critical part of the MCM paper. The judges may decide whether to advance our paper based solely on this summary.

This is a practice area for the abstract. You need to learn how to bold key data. For example: The accuracy of our model reached **98.5%**.

In the abstract, we usually summarize the problem, our methods (e.g., Random Forest, Differential Equations), and key results. Keep it concise and powerful.

1 Introduction

Hi there! This is a standard LaTeX section title. In most science concerned areas, you will be required to translate your logic into text. LaTeX is not difficult; it is essentially "Word with formatting codes."

2 Editor Shortcuts (Like Word)

Good news! In modern editors (like Overleaf), you can use familiar shortcuts:

- **Bold (`Ctrl+B`)**: Select text and press Ctrl+B. It automatically wraps text in `\textbf{...}`.
- *Italic (`Ctrl+I`)*: Select text and press Ctrl+I. It wraps text in `\textit{...}`.
- **Comment (`Ctrl+/`)**: Quickly comment out a line of code so it doesn't run.
- **Jump to Code (Double Click)**: If you see a typo in the PDF preview on the right, **double-click** the text. The editor will jump to the exact line in the code on the left.

3 Colors & Highlights

Using colors can help emphasize key conclusions or distinguish different models.

- **Basic Colors**: You can use standard names like red, blue, green, orange.
- **Custom HTML Colors**: If you want a specific shade (e.g., Bilibili Blue), use the HTML hex code:

  This text uses the exact color code #00AEEC.

  Code: `\color[HTML]{00AEEC} Your Text...`

  Remember to enclose the area of texts you want to make it that color, or the rest part will be turned that color.

4 Special Characters (Must Escape!)

Some characters are **keywords** in LaTeX. You cannot just type them; you must add a backslash (\) before them to ”escape” their special meaning.

Table 1: Reserved Characters Cheat Sheet

Symbol	What it does in Code	How to type it in Text
%	Starts a comment (invisible)	\% (e.g., 98%)
$	Starts Math Mode	\$ (e.g., $100)
&	Separates table columns	\& (e.g., R&D)
#	Macro parameter	\# (e.g., #1)
_	Subscript (X_i)	_ (e.g., file_name)
{ }	Groups code blocks	\{ \}
\	Is the escape character itself	\textbackslash

Note: The double backslashes stand for changing the line.

And if you want to use a pair of quotation marks, do not just type it using Shift and that single quotation marks. Please use “ ” (see in the code) instead.

5 Document Structure (Hierarchy)

In a long paper (20+ pages), we need clear hierarchy to organize our content.

5.1 This is a Subsection (Level 2)

Subsections are used to break down the main section. For example, under “Data Processing”, you might have subsections like “Data Cleaning” and “Feature Selection”.

5.1.1 This is a Sub-subsection (Level 3)

This is used for very specific details. It will appear as 2.1.1.

Paragraph Level If you need a 4th level, use `\paragraph`. It usually has no number, just bold text at the start.

6 Lists & Nesting

6.1 Standard Lists

When listing Assumptions or Conclusions, we use lists:

- Assumption 1: The data provided is authentic and reliable.
- Assumption 2: External environmental factors do not change drastically.

6.2 Customizing Lists with ‘enumitem‘

This is very useful for formatting. The symbol * works as a placeholder for the number counter.

(a) First sub-point (Data Collection).

(b) Second sub-point (Data Cleaning).

Model A: **Linear Regression** (Corresponds to Model A)

Model B: **XGBoost** (Corresponds to Model B)

Step 1. **Initialize**: Load the dataset into Python.

Step 2. **Process**: Handle missing values using interpolation.

Step 3. **Analyze**: Run the correlation matrix.

6.3 Nested Lists (Mixing Levels)

You can put a list inside another list. LaTeX handles the indentation and numbering automatically.

1. **First Main Point** (Level 1: 1, 2, 3...)
   - Detail A (Level 2: Bullet points)
   - Detail B
     (a) Specific Action i (Level 3: a, b, c... or i, ii...)
     (b) Specific Action ii
2. **Second Main Point**
   (a) Sub-process 1 (Level 2: a, b, c...)
   (b) Sub-process 2

7 Mathematics & Symbols Cheat Sheet

Although there is always someone who can handle complex formulas, you need to know how to write simple variable references.

7.1 Inline vs Display

- **Inline**: $E = mc^2$ (Use single dollar signs)
- **Display**: (Use equation environment for numbering)

$$Y = \beta_0 + \beta_1 X_1 + \epsilon \tag{1}$$

$$Y = \beta_0 + \beta_1 X_1 + \epsilon$$

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- Also, if there some formulas require multiple lines. Use align environment. (align* makes the numbering disappear.)

$$\begin{aligned} \text{Loss} &= \frac{1}{\frac{1}{a_1} + \frac{1}{a_2}} \\ &= \frac{a_1 a_2}{a_1 + a_2} \end{aligned}$$

7.2 Common Math Symbols Table

Table 2: Common LaTeX Mathematical Symbols (Copy & Paste)

Category	Symbol	LaTeX Code
Greek Letters	α, β, γ	`\alpha, \beta, \gamma`
	θ, λ, π	`\theta, \lambda, \pi`
	Δ, Σ, Ω	`\Delta, \Sigma, \Omega`
Operations	$\sum_{i=1}^{n} x_i$	`\sum_{i=1}^{n} x_i`
	$\int_a^b f(x)dx$	`\int_{a}^{b} f(x) dx`
	$\frac{a}{b}$	`\frac{a}{b}`
	$\sqrt{x}$	`\sqrt{x}`
	$x \cdot y$ or $x \times y$	`x \cdot y` or `x \times y`
Relations	$\neq, \approx, \leq, \geq$	`\neq, \approx, \leq, \geq`
	∞	`\infty`
Sets/Logic	$x \in A$	`x \in A`
	$A \subset B$	`A \subset B`
	$\forall x, \exists y$	`\forall x, \exists y`

8 Advanced Tables (The Hard Part)

Tables can be tricky. Here is how to handle complex layouts.

8.1 Column Alignment & Widths

When defining `\begin{tabular}{l c r p{3cm}}`, the letters mean:

- **l**: Left align (Auto width, no wrapping).
- **c**: Center align (Auto width, no wrapping).
- **r**: Right align (Auto width, no wrapping).
- **p{width}**: **Critical for text!** It sets a fixed width (e.g., 3cm or 0.5\textwidth) and **wraps text automatically**. Use this if your table is too wide!
- Also toprule, midrule, bottomrule are used for generating horizontal line in the table, and | is used for generating vectoring line in the table (To be used in the table env. settings like {|c|c|c|} showing the following table.

1	2	3
4	5	6

8.2 Merging Cells & Width Control Example

This example shows how to merge cells and handle long text.

Table 3: Complex Table with Merged Cells and Wrapped Text

Performance Metrics Summary		
Model	**Year**	**Description (Long Text)**
Alpha	2023	Initial version. Fast but low accuracy.
	2024	Improved version.
Beta	2025	This is a very long description. By using `p{6cm}`, this text will automatically wrap to the next line instead of stretching the table off the page.

9 Advanced Layout Control (Alignment & Positioning)

This section explains how to control where your images and tables appear.

9.1 Centering (`\centering`)

Always use the `\centering` command inside your `figure` or `table` environment. Without it, the content will stick to the left margin, which looks unprofessional.

9.2 Positioning Parameters: [htbp] vs [H]

LaTeX uses "Floats" for images, meaning it decides the best place for them. You can suggest locations using brackets `[...]`.

- **h (here)**: Try to place it approximately here in the text.
- **t (top)**: Top of the page.
- **b (bottom)**: Bottom of the page.
- **p (page)**: On a dedicated page for figures/tables.
- **Combination [htbp]**: The Gold Standard. It tells LaTeX: "Try here first, then top, then bottom, then a separate page."
- **H (Force Here)**: Requires `\usepackage{float}`. This is the "Shut up and put it here" command. Use it if LaTeX keeps moving your image to the wrong page.

10 Figures Example

If you are responsible for visualization. You will generate and insert many EPS or PNG images, especially the .eps ones which are always used in professional essays.

Figure 1: Trend Analysis (Forced Position)

11 Spacing, Indentation & Page Limits

11.1 Page Limits (Crucial!)

For the MCM/ICM contest, the hard limit is usually **25 pages**.

- This includes the Summary Sheet, Memo, Tables, Figures, Reference List, and Appendices. **Do not exceed 25 pages**, or you may be disqualified.
- If your paper is too long, move code to a GitHub link or cut down the Appendix.

11.2 Paragraph Indentation

LaTeX automatically indents the first line of a new paragraph (except the first paragraph of a section).

- To force NO indentation: Start the paragraph with `\noindent`.
- To force indentation: Start with `\indent`.

Example: This paragraph uses `\noindent`, so it starts flush left.

11.3 Manual Spacing Control

Sometimes the layout is too tight or too loose.

- **Vertical Space**: Use `\vspace{1cm}` to add 1cm of empty space between paragraphs.
- **The "Space Stealing" Trick**: If you are over the page limit, use negative space to pull things closer! E.g., `\vspace{-0.5cm}`.
- **Horizontal Space**: Use `\hspace{1cm}` to add space inside a line.

12 Special Tips

1. **Don't Panic**: If you see red compilation errors, 90% of the time it's because you missed a closing brace `}` or forgot to write `\end{...}`.
2. **EPS Format**: When exporting charts, always save as `.eps`. In Python: `plt.savefig('name.eps')`.
3. **Comments**: Use the `%` symbol in the code to write comments for yourself. They won't show up in the PDF.
4. **YOU ARE NOT ALONE.** All your teammates are here to help you and your 24 hours' friend - AI Agents.

Any problems that are not listed above. You can **"Report an issue"**.