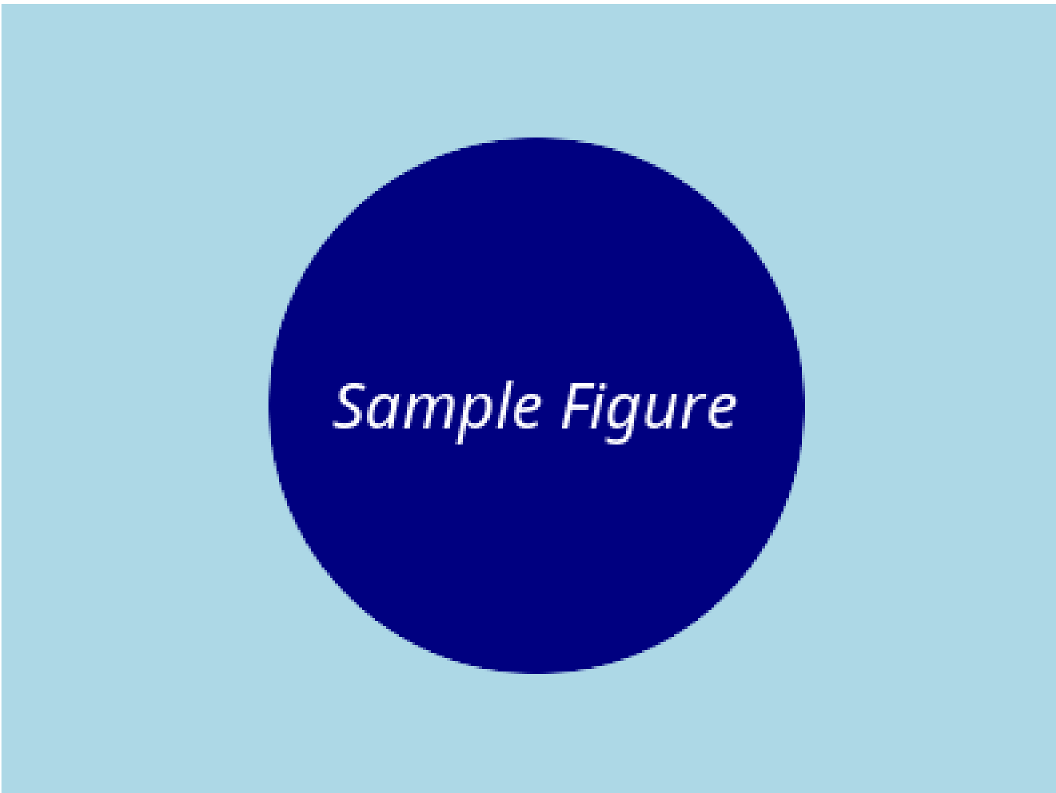
Graphical Abstract

Showcasing All Available Features

Alan Lujan, Christopher Carroll



Highlights

Showcasing All Available Features

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- MyST Markdown enables reproducible scientific writing
- Seamless export to multiple journal formats
- Rich mathematical and scientific notation support

A Comprehensive Guide to MyST Markdown with Elsevier CAS Templates

Showcasing All Available Features

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ABSTRACT

This article demonstrates MyST Markdown integration with Elsevier's CAS templates, showcasing typography, math, cross-references, admonitions, proofs, tables, figures, and code blocks.

1. Introduction

This document demonstrates the full integration of MyST Markdown (Cockett, Purvis and others, 2023) with Elsevier's CAS templates. MyST provides a powerful authoring experience while maintaining compatibility with traditional LaTeX journal requirements (Lamport, 2004).

1.1. Background

Scientific publishing has traditionally relied on LaTeX for high-quality typesetting (Smith and Johnson, 2020). However, the learning curve and complexity of LaTeX can be a barrier for many researchers. MyST Markdown bridges this gap by providing:

1. A familiar Markdown syntax based on CommonMark (Gruber, 2004)
2. Rich scientific features (equations, citations, cross-references)
3. Export to multiple formats including PDF via LaTeX

Reproducible research workflows have become increasingly important, with tools like Jupyter Notebooks (Kluyver, Ragan-Kelley and others, 2016) enabling literate programming approaches.

> **Note**
> **About this document**: This article serves as both a comprehensive guide and a test file for the Elsevier CAS MyST template. Every feature demonstrated here should render correctly in both the web preview and PDF exports.

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We know what we are, but know not what we may be.

Figure 1: *

William Shakespeare, Hamlet

The important thing is not to stop questioning. Curiosity has its own reason for existing.

In the middle of difficulty lies opportunity.

Figure 2: *

Albert Einstein

2. Typography Features

This section demonstrates MyST Markdown typography features and how they render in the PDF output.

2.1. Inline Formatting

Standard inline formatting includes **bold text**, *italic text*, and `inline code`. You can also use ~~strikethrough text~~ and underlined text for special emphasis.

For chemical formulas, use subscripts: H_2O, CO_2, $C_6H_{12}O_6$. For ordinals and exponents, use superscripts: the 4th of July, 1st place, $x^2 + y^2 = r^2$.

2.2. Line Breaks

The world's shortest poem demonstrates line breaks:
Fleas
Adam
Had 'em.
—Strickland Gillilan

2.3. Quotations

Block quotes are useful for highlighting important passages:

2.4. Definition Lists

MyST supports definition lists for glossaries or term explanations:

MyST Markedly Structured Text, a markdown flavor for scientific writing

LaTeX A document preparation system for high-quality typesetting

jtex A Jinja-based templating system for LaTeX documents

CAS Content Acquisition System, Elsevier's journal template system

2.5. Footnotes

MyST supports footnotes[1] which are automatically numbered and placed at the end of the document. You can have multiple footnotes[2] throughout your text.

2.6. Task Lists

Task lists can track progress (rendered as bullet points in LaTeX):

- Create template structure
- Add typography examples
- Add math demonstrations
- Add proof environments
- Submit to journal
- Celebrate publication!

3. Mathematical Content

The templates support full LaTeX math with custom macros defined in frontmatter.

3.1. Inline Mathematics

Inline math like $E = mc^2$ or $\mathbb{E}[X] = \mu$ works seamlessly. Using our custom macros: for $x \in \mathbb{R}$, we have $\mathrm{Var}(X) = \mathbb{E}[X^2] - (\mathbb{E}[X])^2$.

3.2. Display Equations

The quadratic formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \tag{1}$$

Maxwell's equations in differential form:

$$\begin{aligned} \nabla \cdot \mathbf{E} &= \frac{\rho}{\varepsilon_0} \\ \nabla \cdot \mathbf{B} &= 0 \\ \nabla \times \mathbf{E} &= -\frac{\partial \mathbf{B}}{\partial t} \\ \nabla \times \mathbf{B} &= \mu_0 \mathbf{J} + \mu_0 \varepsilon_0 \frac{\partial \mathbf{E}}{\partial t} \end{aligned} \tag{2}$$

The Bellman equation for dynamic programming:

$$V(s) = \max_a \left\{ R(s,a) + \gamma \sum_{s'} P(s'|s,a) V(s') \right\} \tag{3}$$

Equations can be cross-referenced: see (1) for the quadratic formula and (2) for Maxwell's equations.

4. Proofs and Theorems

MyST supports formal mathematical environments using proof directives. These are essential for mathematical and theoretical papers.

4.1. Definitions

Definition 4.1 (Convergent Sequence)**.** *A sequence (a_n) in $\mathbb{R}$ is said to be convergent if there exists a number $L \in \mathbb{R}$ such that for every $\varepsilon > 0$, there exists $N \in \mathbb{N}$ such that for all $n > N$:*

$$|a_n - L| < \varepsilon \tag{4}$$

We write $\lim_{n\to\infty} a_n = L$.

Definition 4.2 (Continuous Function)**.** *A function $f : \mathbb{R} \to \mathbb{R}$ is continuous at a point c if for every $\varepsilon > 0$, there exists $\delta > 0$ such that:*

$$|x - c| < \delta \implies |f(x) - f(c)| < \varepsilon \tag{5}$$

4.2. Theorems

Theorem 4.1 (Squeeze Theorem)**.** *Let (a_n), (b_n), and (c_n) be sequences such that $a_n \le b_n \le c_n$ for all $n \ge N_0$. If*

$$\lim_{n\to\infty} a_n = \lim_{n\to\infty} c_n = L \tag{6}$$

then $\lim_{n\to\infty} b_n = L$.

Theorem 4.2 (Fundamental Theorem of Calculus)**.** *Let f be continuous on $[a,b]$ and let F be defined by $F(x) = \int_a^x f(t)\,dt$. Then:*

1. *F is continuous on $[a,b]$*
2. *F is differentiable on (a,b) and $F'(x) = f(x)$*
3. *$\int_a^b f(x)\,dx = F(b) - F(a)$*

[1] This is a footnote demonstrating the feature. Footnotes can contain **formatted text** and even `code`.

[2] Another footnote with additional information. Footnotes are essential for academic writing.

4.3. Proofs

Proof. Proof of Theorem 4.1. Let $\varepsilon > 0$ be given. Since $a_n \to L$ and $c_n \to L$, there exist $N_1, N_2 \in \mathbb{N}$ such that:

- $|a_n - L| < \varepsilon$ for all $n > N_1$
- $|c_n - L| < \varepsilon$ for all $n > N_2$

Let $N = \max\{N_0, N_1, N_2\}$. For $n > N$, we have:

$$L - \varepsilon < a_n \leq b_n \leq c_n < L + \varepsilon \tag{7}$$

Thus $|b_n - L| < \varepsilon$, completing the proof. □

4.4. Lemmas and Corollaries

Lemma 4.3 (Triangle Inequality)**.** *For all $x, y \in \mathbb{R}$, we have $|x + y| \leq |x| + |y|$.*

Corollary 4.3.1. *If (b_n) is squeezed between two sequences converging to zero, then $b_n \to 0$.*

4.5. Remarks and Examples

Remark 4.1. *The proof directives (Definition 4.1, Theorem 4.1) are automatically numbered and can be cross-referenced throughout the document.*

Example 4.1 (Convergent Sequence)**.** *The sequence $a_n = \frac{1}{n}$ converges to 0. For any $\varepsilon > 0$, choose $N > \frac{1}{\varepsilon}$. Then for $n > N$:*

$$\left|\frac{1}{n} - 0\right| = \frac{1}{n} < \frac{1}{N} < \varepsilon \tag{8}$$

5. Admonitions

Admonitions (callouts) are useful for highlighting important information. MyST supports many types:

> **Note**
> This is a note admonition. Use it to highlight supplementary information that readers should be aware of.

> **Warning**
> This is a warning. Use it to alert readers about potential pitfalls or important caveats in your methodology.

> **Tip**
> Tips can provide helpful suggestions for readers applying your methods.

> **Important**
> Important information that readers must not miss should go in this type of admonition.

Table 1
Comparison of numerical methods

Method	Accuracy	Speed	Memory
Baseline	85.2%	Fast	Low
Proposed	**92.1%**	Medium	Medium
Ensemble	94.3%	Slow	High
Oracle	98.5%	N/A	N/A

> **Hint**
> Hints can be hidden in dropdowns! Click to reveal.
> This hint contains the secret formula: $e^{i\pi} + 1 = 0$

> **Caution**
> Caution: Proceed carefully when implementing this algorithm with large datasets.

> **Attention**
> Attention: New methodology introduced in this section differs from previous work.

> **Danger**
> **Danger**: Do not run this code in production without proper testing!

> **Error**
> Error: This approach will fail if the input matrix is singular.

> **See Also**
> For more information on MyST Markdown features, visit the MyST documentation.

6. Code Blocks

Code blocks with syntax highlighting are supported:

As shown in Program 3, code can be captioned, numbered, and cross-referenced.

Multiple languages are supported:

7. Tables

7.1. Markdown Tables

MyST tables convert cleanly to LaTeX:

Results are summarized in Table 1.

7.2. List Tables

List tables provide an alternative syntax useful for complex content:

Table 2
Dataset characteristics

Dataset	Training Samples	Test Samples	Features	Classes
MNIST	60,000	10,000	784	10
CIFAR-10	50,000	10,000	3,072	10
ImageNet	1,281,167	50,000	150,528	1,000

Table 3
Experimental results

Model	Accuracy	Precision	Recall	F1-Score
Logistic Regression	0.82	0.81	0.83	0.82
Random Forest	0.89	0.88	0.90	0.89
Neural Network	0.94	0.93	0.95	0.94
Transformer	0.97	0.96	0.97	0.97

Table 4
Comprehensive table showcasing CAS template features

Category		**Measurements**		
Type	Description (details)	Status	Value	Count
Group A	Item 1	Yes	12.34	100
	Item 2	Yes	5.67	250
	Item 3	–	89.01	50
Group B	Item 4	Yes	23.45	175
	Item 5	–	6.78	320

Features: `booktabs` *rules*, `multirow` *row spanning*, `makecell` *line breaks*, `dcolumn` *decimal alignment*, `array` *column formatting*.

7.3. CSV Tables

7.4. Raw LaTeX Tables

For complex tables requiring advanced features, use raw LaTeX blocks. The CAS templates include `booktabs`, `multirow`, `makecell`, `array`, and `dcolumn` packages:

8. Figures and Images

As shown in Figure 5, the template properly handles figure placement and captions.

9. Cross-References Summary

This document demonstrates various cross-reference capabilities:

- **Equations**: (1), (2), (3)
- **Figures**: Figure 5
- **Tables**: Table 1, Table 2, Table 3
- **Code**: Program 3, Program 4
- **Theorems**: Theorem 4.1, Theorem 4.2
- **Definitions**: Definition 4.1, Definition 4.2
- **Lemmas**: Lemma 4.3
- **Corollaries**: Corollary 4.3.1
- **Examples**: Example 4.1
- **Sections**: Introduction, Typography

10. Discussion

This approach enables researchers to write in MyST Markdown while producing publication-ready documents that meet Elsevier's submission requirements.

10.1. Advantages

1. **Reproducibility**: Source files are plain text and version-controllable
2. **Flexibility**: Single source exports to HTML, PDF, and other formats
3. **Modern tooling**: Integration with Jupyter, VS Code, and other tools
4. **Rich features**: Full LaTeX math, cross-references, and citations

10.2. Limitations

> **Warning**
> Some MyST features render only in HTML output. For PDF, consider using LaTeX-compatible alternatives.

11. Conclusion

The Elsevier CAS MyST template provides a modern workflow for scientific writing while maintaining compatibility with traditional journal submission systems. This document has demonstrated:

- Typography: formatting, footnotes, definition lists
- Mathematics: inline, display, custom macros
- Formal environments: definitions, theorems, proofs, examples
- All admonition types
- Multiple table formats
- Code blocks with syntax highlighting
- Figures with cross-referencing
- Citations and bibliography

For questions or contributions, please visit the template repository.

Table 5
Supplementary parameters

Parameter	Value	Unit
Alpha	0.05	-
Beta	1.23	m/s
Gamma	456	kg

Appendix

A. Supplementary Methods

This appendix provides additional methodological details that support the main text.

A.1. *Data Processing*

The data was processed using standard procedures as described in the literature.

B. Additional Tables

CRediT authorship contribution statement

Alan Lujan: Conceptualization, Methodology, Software, Writing – original draft. **Christopher Carroll:** Supervision, Writing – review editing.

References

Cockett, R., Purvis, S., others, 2023. Myst Markdown: Technical Communication for the Modern Era. Journal of Open Source Software 8, 1–10. doi:10.21105/joss.05000.

Gruber, J., 2004. Markdown. https://daringfireball.net/projects/markdown/. URL: https://daringfireball.net/projects/markdown/. accessed: 2024-01-01.

Kluyver, T., Ragan-Kelley, B., others, 2016. Jupyter Notebooks: A Publishing Format for Reproducible Computational Workflows, in: Positioning and Power in Academic Publishing, IOS Press. pp. 87–90.

Lamport, L., 2004. LaTeX: A Document Preparation System. 2nd ed., Addison-Wesley, Boston.

Smith, J., Johnson, M., 2020. Modern Scientific Publishing Workflows. Scientometrics 125, 2145–2160. doi:10.1007/s11192-020-03456-7.

```python
import numpy as np
from typing import Tuple

def quadratic_formula(a: float, b: float, c: float) -> Tuple[float, float]:
    """Solve ax^2 + bx + c = 0 using the quadratic formula."""
    discriminant = b**2 - 4*a*c
    if discriminant < 0:
        raise ValueError("No real solutions")
    x1 = ( -b + np.sqrt(discriminant)) / (2*a)
    x2 = ( -b - np.sqrt(discriminant)) / (2*a)
    return x1, x2

# Example usage
roots = quadratic_formula(1, -5, 6)
print(f"Roots: {roots}")  # Output: (3.0, 2.0)
```

Figure 3: Example Python implementation of the quadratic formula

```julia
function quadratic_formula(a, b, c)
    discriminant = b^2 - 4*a*c
    x1 = ( -b + sqrt(discriminant)) / (2*a)
    x2 = ( -b - sqrt(discriminant)) / (2*a)
    return x1, x2
end
```

Figure 4: Julia implementation

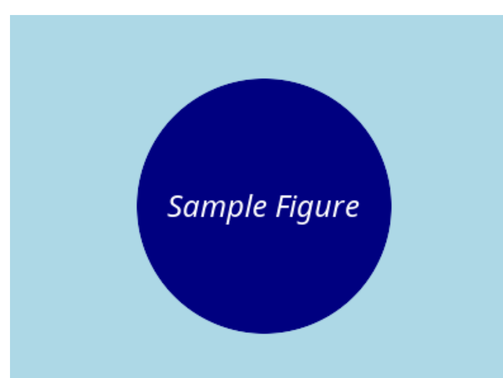

Figure 5: A sample figure demonstrating image support in the template. This figure shows a placeholder image that would typically contain research results or visualizations. Figures are automatically numbered and can be cross-referenced.