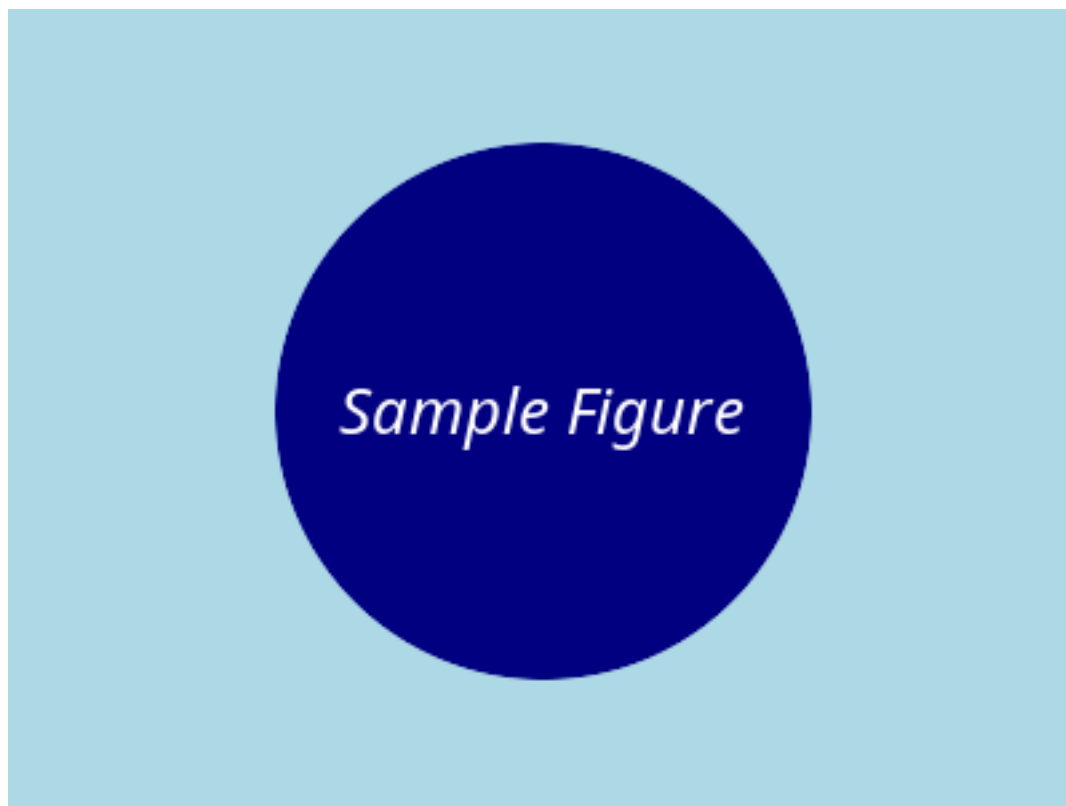


# Graphical Abstract

## Feature Reference and Template Examples

Alan E. Lujan, Christopher D. Carroll, Matthew N. White



# Highlights

## **Feature Reference and Template Examples**

Alan E. Lujan, Christopher D. Carroll, Matthew N. White

- 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

Feature Reference and Template Examples

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## 1. Introduction

This document demonstrates the full integration of MyST Markdown (Cockett, Purves, Koch and Morrison, 2024) with Elsevier's CAS templates. MyST provides a powerful authoring experience while maintaining compatibility with traditional LaTeX journal requirements (Lamport, 1994).

### 1.1. Background

Scientific publishing has traditionally relied on LaTeX for high-quality typesetting (Krewinkel and Winkler, 2017). 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, Pérez, Granger, Bussonnier, Frederic, Kelley, Hamrick, Grout, Corlay, Ivanov, Avila, Abdalla, Willing and Jupyter Development Team, 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.

## 2. Typography Features

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

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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

## 2.1. 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<sub>2</sub>O, CO<sub>2</sub>, C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>. For ordinals and exponents, use superscripts: the 4<sup>th</sup> of July, 1<sup>st</sup> 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<sup>1</sup> which are automatically numbered and placed at the end of the document. You can have multiple footnotes<sup>2</sup> 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

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<sup>1</sup>This is a footnote demonstrating the feature. Footnotes can contain **formatted text** and even `code`.

<sup>2</sup>Another footnote with additional information. Footnotes are essential for academic writing.

- 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  $\text{Var}(X) = \mathbb{E}[X^2] - (\mathbb{E}[X])^2$ .

#### 3.2. Display Equations

The quadratic formula:

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

Maxwell's equations in differential form:

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

The Bellman equation for dynamic programming:

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

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  $n > N$ :*

$$|a_n - L| < \varepsilon \quad (4)$$

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

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

$$|x - c| < \delta \implies |f(x) - f(c)| < \varepsilon \quad (5)$$

## 4.2. Theorems

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

$$\lim_{n \rightarrow \infty} a_n = \lim_{n \rightarrow \infty} c_n = L \quad (6)$$

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

**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.  $\int_a^b f(x) dx = F(b) - F(a)$

## 4.3. Proofs

*Proof. Proof of Theorem 4.1.* Let  $\varepsilon > 0$  be given. Since  $a_n \rightarrow L$  and  $c_n \rightarrow L$ , 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:

$$L - \varepsilon < a_n \leq b_n \leq c_n < L + \varepsilon \quad (7)$$

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  $b_n \rightarrow 0$ .*

## 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  $n > N$ :*

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

## 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.

**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. Algorithms

For algorithm pseudocode, use raw LaTeX blocks with the `algorithm` and `algorithmic` environments:  
The `algorithm` environment provides a float with caption and label for cross-referencing.

```

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

```

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

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### Algorithm 1 Binary Search

---

**Require:** Sorted array  $A[1..n]$ , target value  $x$

**Ensure:** Index  $i$  such that  $A[i] = x$ , or  $-1$  if not found

```

1:  $low \leftarrow 1$ 
2:  $high \leftarrow n$ 
3: while  $low \leq high$  do
4:    $mid \leftarrow \lfloor (low + high) / 2 \rfloor$ 
5:   if  $A[mid] = x$  then
6:     return  $mid$ 
7:   else if  $A[mid] < x$  then
8:      $low \leftarrow mid + 1$ 
9:   else
10:     $high \leftarrow mid - 1$ 
11:   end if
12: end while
13: return  $-1$ 

```

---

## 8. Tables

### 8.1. Markdown Tables

MyST tables convert cleanly to LaTeX:

Results are summarized in Table 1.

### 8.2. List Tables

List tables provide an alternative syntax useful for complex content:

**Table 1**  
Comparison of numerical methods

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

**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

### 8.3. CSV Tables

### 8.4. Raw LaTeX Tables

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

**Table 4**  
Comprehensive table showcasing CAS template features

Type	Category	Measurements		
	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

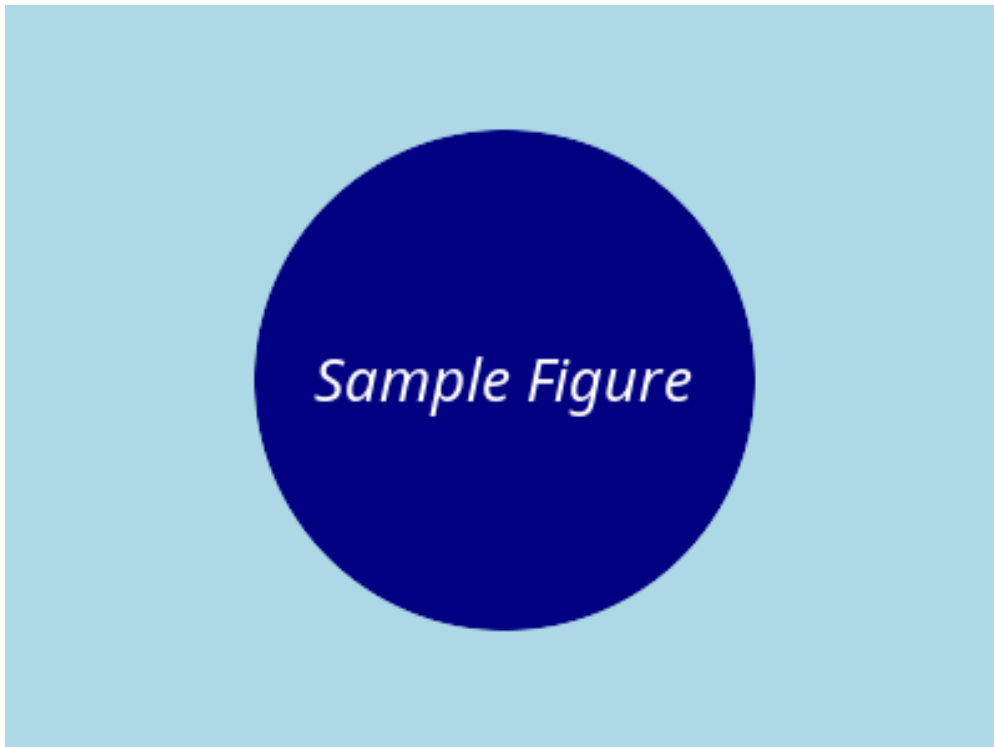
Features: `booktabs` rules, `multirow` row spanning, `makecell` line breaks, `dcolumn` decimal alignment, `array` column formatting.

## 9. Figures and Images

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

## 10. Cross-References Summary

This document demonstrates various cross-reference capabilities:



**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.

- **Equations:** (1), (2), (3)
- **Figures:** Figure 5
- **Tables:** Table 1, Table 2, Table 3
- **Code:** Program 3, Program 4
- **Algorithms:** Algorithm 1 (via raw LaTeX `\ref{alg:binary-search}`)
- **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

## 11. Discussion

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

**Table 5**  
Supplementary parameters

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

### 11.1. 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

### 11.2. Limitations

#### Warning

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

## 12. 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.

## 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 E. Lujan:** Conceptualization, Methodology, Software, Writing – original draft. **Christopher D. Carroll:** Supervision, Writing – review editing. **Matthew N. White:** Methodology, Software.

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