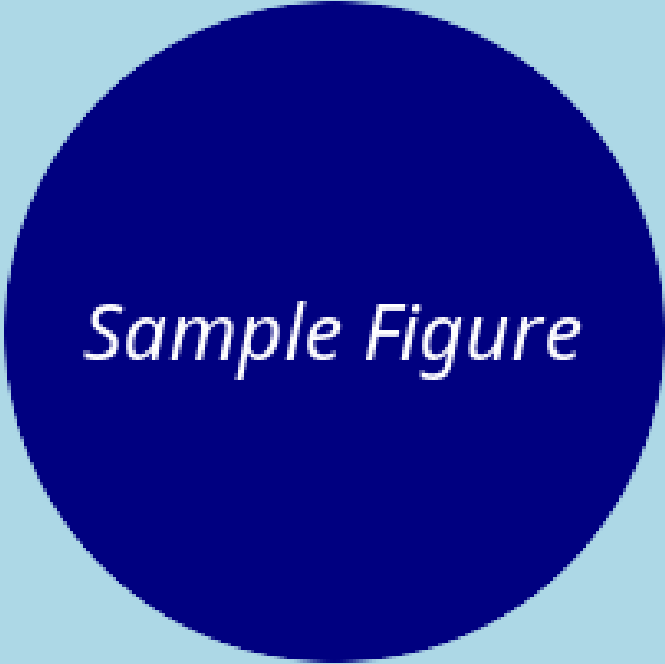


Graphical Abstract

Feature Reference and Template Examples

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

A large, solid dark blue circle is centered on a light blue rectangular background. Inside the circle, the words "Sample Figure" are written in a white, italicized serif font.

Sample Figure

Highlights

Feature Reference and Template Examples

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

MyST Markdown with the Elsevier CAS and elsarticle Classes^{*}

Feature Reference and Template Examples

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ABSTRACT

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

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). The template renders to PDF for camera-ready submission and to HTML for the project website; author identifiers (ORCID) and persistent links (DOI) propagate through both pipelines.

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 authors who write outside it day to day. 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 is both a feature reference and a test file for the Elsevier MyST template. Every feature shown here should render correctly in the web preview and in all six PDF exports, under CAS and elsarticle alike.

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 ~~striktrough text~~ and underlined text for special emphasis.

For chemical formulas, use subscripts: H₂O, CO₂, C₆H₁₂O₆. 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:

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

Figure 0: 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 0: Albert Einstein

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 Complex Article Service, the Elsevier workflow the cas-sc and cas-dc classes target

2.5. Footnotes

MyST supports footnotes¹ which are automatically numbered and placed at the end of the document. You can have multiple footnotes² 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 $\mathbb{E}[X] = \mu$ sets in running text without extra markup. Using our custom macros: for $x \in \mathbb{R}$, we have $\text{Var}(X) = \mathbb{E}[X^2] - (\mathbb{E}[X])^2$ and $\text{Cov}(X, Y) = \mathbb{E}[XY] - \mathbb{E}[X]\mathbb{E}[Y]$.

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

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

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, where the policy is the maximizing action $a^*(s) = \text{argmax}_a \{R(s, a) + \gamma \sum_{s'} P(s'|s, a)V(s')\}$:

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

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. $\square$

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

Use a warning to alert readers about pitfalls or 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:

```
import numpy as np
from typing import Tuple

def quadratic_formula(a: float, b: float, c: float) -> Tuple[
    """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 1: Example Python implementation of the quadratic formula

As shown in Program 1, code can be captioned, numbered, and cross-referenced.

Multiple languages are supported:

```
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 2: Julia implementation**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

7. Algorithms

For algorithm pseudocode, use raw LaTeX blocks with the `algorithm` and `algorithmic` environments:

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  $-1$ 
```

The algorithm environment provides a float with caption and label for cross-referencing.

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:

8.3. CSV Tables

8.4. Raw LaTeX Tables

For complex tables requiring advanced features, use raw LaTeX blocks. The CAS templates include

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

booktabs, multirow, makecell, array, and dcolumn packages:

Table 4

Table features: multi-column headers, aligned decimals, and stacked cells

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.

9. Figures and Images

As shown in Figure 3, the template properly handles figure placement and captions.

10. Cross-References Summary

This document demonstrates various cross-reference capabilities:

- **Equations:** (1), (2), (3)
- **Figures:** Figure 3
- **Tables:** Table 1, Table 2, Table 3
- **Code:** Program 1, Program 2

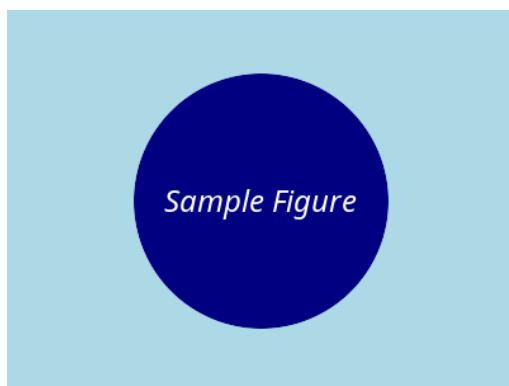


Figure 3: A sample figure demonstrating image support in the template. This figure shows a placeholder image that would typically contain research results or visualizations. Figures are automatically numbered and can be cross-referenced.

- **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.

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:

Table 5
Supplementary parameters

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

- 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.

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.

This paragraph cites Mittelbach and Goossens (2004), a work no other section cites. It is here to keep the appendix on the bibliography-harvesting path: while this file was pulled in through `parts.appendix`, a citation made here reached the `.tex` and never the `.bib`, and no build step reported anything.

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.

Declaration of generative AI and AI-assisted technologies in the manuscript preparation process

During the preparation of this work the authors used no generative AI or AI-assisted technologies. This statement exercises the `ai_declaration` part, which the template renders as an unnumbered section between the CRediT statement and the references.

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- Alan E. Lujan develops open-source computational tools for economics at Johns Hopkins University and Econ-ARK.
- Christopher D. Carroll is a professor of economics at Johns Hopkins University and leads the Econ-ARK initiative for reproducible heterogeneous-agent macroeconomics.