An Example Article*

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Abstract

This is an example LaTeX article. This can be used as a template for new articles. Abstracts must be able to stand alone and so cannot contain citations to the paper's references, equations, etc. An abstract must consist of a single paragraph and be concise. Because of online formatting, abstracts must appear as plain as possible. Any equations should be inline.

Keywords: example, LaTeX, Numerical methods

2000 Mathematics Subject Classification: 65L60, 65L05, 65L70.

1 Introduction

The introduction introduces the context and summarizes the manuscript. It is importantly to clearly state the contributions of this piece of work. The next two paragraphs are text filler, generated by the `lipsum` package.

$$\lim_{n\to\infty}\left(1+\frac{1}{n}\right)^n = e. \tag{1.1}$$

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$$\begin{cases} -\Delta u = \cos 3x \sin \pi y, & (x,y) \in G = (0,\pi)\times(0,1), \\ u(x,0) = u(x,1) = 0, & 0 \leqslant x \leqslant \pi, \\ u_x(0,y) = u_x(\pi,y) = 0, & 0 \leqslant y \leqslant 1. \end{cases} \tag{1.2}$$

This is an example of quoting an equation (1.2).

The paper is organized as follows. Our main results are in 2, our new algorithm is in 3, experimental results are in 4, and the conclusions follow in 6.

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2 Main results

We interleave text filler with some example theorems and theorem-like items.

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This is a citation example [2].

Here we state our main result as 2.1.

Theorem 2.1 (LDL^T Factorization [1])**.** *If $A \in \mathbb{R}^{n\times n}$ is symmetric and the principal submatrix $A(1:k, 1:k)$ is nonsingular for $k = 1 : n-1$, then there exists a unit lower triangular matrix L and a diagonal matrix*

$$D = \operatorname{diag}(d_1, \dots, d_n),$$

such that $A = LDL^T$. The factorization is unique.

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Theorem 2.2 (Mean Value Theorem)**.** *Suppose f is a function that is continuous on the closed interval $[a, b]$. and differentiable on the open interval (a, b). Then there exists a number c such that $a < c < b$ and*

$$f'(c) = \frac{f(b) - f(a)}{b - a}.$$

In other words,

$$f(b) - f(a) = f'(c)(b - a).$$

Remark 2.1. Observe that 2.1, 2.2 correctly mix references to multiple labels.

Corollary 2.1. *Let $f(x)$ be continuous and differentiable everywhere. If $f(x)$ has at least two roots, then $f'(x)$ must have at least one root.*

Proof. Let a and b be two distinct roots of f. By 2.2, there exists a number c such that

$$f'(c) = \frac{f(b) - f(a)}{b - a} = \frac{0 - 0}{b - a} = 0.$$

□

Note that it may require two LaTeX compilations for the proof marks to show.

Display matrices can be rendered using environments from `amsmath`:

$$S = \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix} \quad \text{and} \quad C = \begin{pmatrix} 1 & 1 & 0 \\ 1 & 1 & 0 \\ 0 & 0 & 0 \end{pmatrix}. \tag{2.1}$$

Equation 2.1 shows some example matrices.

We calculate the Fréchet derivative of F as follows:

$$
\begin{aligned}
F'(U,V)(H,K) &= \langle R(U,V), H\Sigma V^T + U\Sigma K^T - P(H\Sigma V^T + U\Sigma K^T)\rangle \qquad (2.2a)\\
&= \langle R(U,V), H\Sigma V^T + U\Sigma K^T\rangle\\
&= \langle R(U,V)V\Sigma^T, H\rangle + \langle \Sigma^T U^T R(U,V), K^T\rangle. \qquad (2.2b)
\end{aligned}
$$

2.2a is the first line, and 2.2b is the last line.

3 Algorithm

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Lemma 3.1. *This is lemma environment.*

Theorem 3.1. *This is theorem environment.*

Our analysis leads to the algorithm in 1.

Algorithm 1 Build tree

Define $P := T := \{\{1\}, \ldots, \{d\}\}$
while $\#P > 1$ **do**
  Choose $C' \in \mathcal{C}_p(P)$ with $C' := \mathrm{argmin}_{C \in \mathcal{C}_p(P)} \varrho(C)$
  Find an optimal partition tree $T_{C'}$
  Update $P := (P \backslash C') \cup \{\bigcup_{t \in C'} t\}$
  Update $T := T \cup \{\bigcup_{t \in \tau} t : \tau \in T_{C'} \backslash \mathcal{L}(T_{C'})\}$
end while
return T

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4 Experimental results

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Example 1. This is example environment.

Figure 4.1 shows some example results.

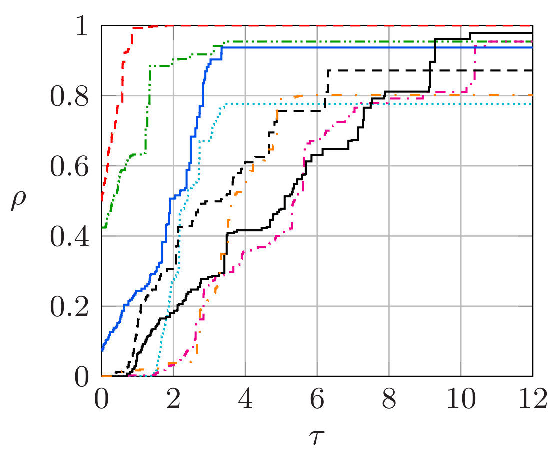

Figure 4.1: Example figure using external image files.

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5 Discussion of $Z = X \cup Y$

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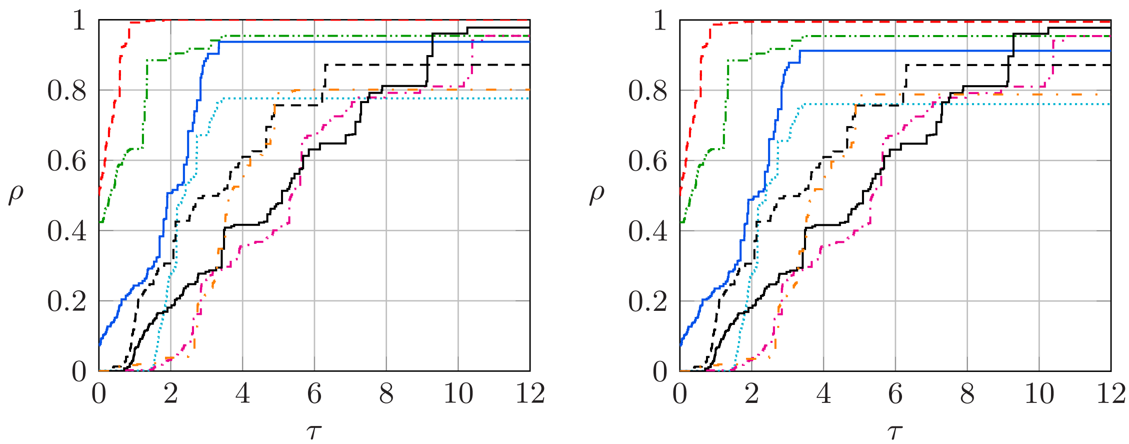

Figure 4.2: Left: Caption 1, Right: Caption 2.

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6 Conclusions

Some conclusions here.

A An example appendix

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Lemma A.1. *Test Lemma.*

This is a equation in appendix.

$$a^2 + b^2 = c^2. \tag{A.1}$$

Acknowledgments

We would like to acknowledge the assistance of volunteers in putting together this example manuscript and supplement.

References

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