

## An Example Article\*

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4   **Abstract.** This is an example SIAM L<sup>A</sup>T<sub>E</sub>X article. This can be used as a template for new articles. Abstracts  
5   must be able to stand alone and so cannot contain citations to the paper's references, equations,  
6   etc. An abstract must consist of a single paragraph and be concise. Because of online formatting,  
7   abstracts must appear as plain as possible. Any equations should be inline.

## 8 Key words. example, L<sup>A</sup>T<sub>E</sub>X

**9 MSC codes.** 68Q25, 68R10, 68U05

10     **1. Introduction.** The introduction introduces the context and summarizes the manu-  
11 script. It is importantly to clearly state the contributions of this piece of work. The next two  
12 paragraphs are text filler, generated by the `lipsum` package.

13 Nam dui ligula, fringilla a, euismod sodales, sollicitudin vel, wisi. Morbi auctor lorem non  
14 justo. Nam lacus libero, pretium at, lobortis vitae, ultricies et, tellus. Donec aliquet, tortor  
15 sed accumsan bibendum, erat ligula aliquet magna, vitae ornare odio metus a mi. Morbi ac  
16 orci et nisl hendrerit mollis. Suspendisse ut massa. Cras nec ante. Pellentesque a nulla. Cum  
17 sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Aliquam  
18 tincidunt urna. Nulla ullamcorper vestibulum turpis. Pellentesque cursus luctus mauris.

19 Nulla malesuada porttitor diam. Donec felis erat, congue non, volutpat at, tincidunt triste-  
20 tique, libero. Vivamus viverra fermentum felis. Donec nonummy pellentesque ante. Phasellus  
21 adipiscing semper elit. Proin fermentum massa ac quam. Sed diam turpis, molestie vitae,  
22 placerat a, molestie nec, leo. Maecenas lacinia. Nam ipsum ligula, eleifend at, accumsan nec,  
23 suscipit a, ipsum. Morbi blandit ligula feugiat magna. Nunc eleifend consequat lorem. Sed  
24 lacinia nulla vitae enim. Pellentesque tincidunt purus vel magna. Integer non enim. Praesent  
25 euismod nunc eu purus. Donec bibendum quam in tellus. Nullam cursus pulvinar lectus.  
26 Donec et mi. Nam vulputate metus eu enim. Vestibulum pellentesque felis eu massa.

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

**2. Main results.** We interleave text filler with some example theorems and theorem-like items.

31 Quisque ullamcorper placerat ipsum. Cras nibh. Morbi vel justo vitae lacinia tincidunt  
32 ultrices. Lorem ipsum dolor sit amet, consectetur adipiscing elit. In hac habitasse platea  
33 dictumst. Integer tempus convallis augue. Etiam facilisis. Nunc elementum fermentum wisi.  
34 Aenean placerat. Ut imperdiet, enim sed gravida sollicitudin, felis odio placerat quam, ac

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35 pulvinar elit purus eget enim. Nunc vitae tortor. Proin tempus nibh sit amet nisl. Vivamus  
36 quis tortor vitae risus porta vehicula.

37 Here we state our main result as [Theorem 2.1](#); the proof is deferred to [section SM2](#).

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

41 
$$D = \text{diag}(d_1, \dots, d_n)$$

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

43 Suspendisse vel felis. Ut lorem lorem, interdum eu, tincidunt sit amet, laoreet vitae, arcu.  
44 Aenean faucibus pede eu ante. Praesent enim elit, rutrum at, molestie non, nonummy vel,  
45 nisl. Ut lectus eros, malesuada sit amet, fermentum eu, sodales cursus, magna. Donec eu  
46 purus. Quisque vehicula, urna sed ultricies auctor, pede lorem egestas dui, et convallis elit  
47 erat sed nulla. Donec luctus. Curabitur et nunc. Aliquam dolor odio, commodo pretium,  
48 ultricies non, pharetra in, velit. Integer arcu est, nonummy in, fermentum faucibus, egestas  
49 vel, odio.

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

53 
$$f'(c) = \frac{f(b) - f(a)}{b - a}.$$

54 In other words,

55 
$$f(b) - f(a) = f'(c)(b - a).$$

56 Observe that [Theorems 2.1](#) and [2.2](#) and [Corollary 2.3](#) correctly mix references to multiple  
57 labels.

58 **Corollary 2.3.** *Let  $f(x)$  be continuous and differentiable everywhere. If  $f(x)$  has at least  
59 two roots, then  $f'(x)$  must have at least one root.*

60 **Proof.** Let  $a$  and  $b$  be two distinct roots of  $f$ . By [Theorem 2.2](#), there exists a number  $c$   
61 such that

62 
$$f'(c) = \frac{f(b) - f(a)}{b - a} = \frac{0 - 0}{b - a} = 0.$$
 ■

63 Note that it may require two L<sup>A</sup>T<sub>E</sub>X compilations for the proof marks to show.

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

65 (2.1) 
$$S = \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix} \quad \text{and} \quad C = \begin{pmatrix} 1 & 1 & 0 \\ 1 & 1 & 0 \\ 0 & 0 & 0 \end{pmatrix}.$$

66 Equation (2.1) shows some example matrices.

67 We calculate the Fréchet derivative of  $F$  as follows:

68 (2.2a) 
$$F'(U, V)(H, K) = \langle R(U, V), H\Sigma V^T + U\Sigma K^T - P(H\Sigma V^T + U\Sigma K^T) \rangle$$

69 
$$= \langle R(U, V), H\Sigma V^T + U\Sigma K^T \rangle$$

70 (2.2b) 
$$= \langle R(U, V)V\Sigma^T, H \rangle + \langle \Sigma^T U^T R(U, V), K^T \rangle.$$

72 Equation (2.2a) is the first line, and (2.2b) is the last line.

73 **3. Algorithm.** Sed gravida lectus ut purus. Morbi laoreet magna. Pellentesque eu wisi.  
 74 Proin turpis. Integer sollicitudin augue nec dui. Fusce lectus. Vivamus faucibus nulla nec  
 75 lacus. Integer diam. Pellentesque sodales, enim feugiat cursus volutpat, sem mauris dignissim  
 76 mauris, quis consequat sem est fermentum ligula. Nullam justo lectus, condimentum sit amet,  
 77 posuere a, fringilla mollis, felis. Morbi nulla nibh, pellentesque at, nonummy eu, sollicitudin  
 78 nec, ipsum. Cras neque. Nunc augue. Nullam vitae quam id quam pulvinar blandit. Nunc  
 79 sit amet orci. Aliquam erat elit, pharetra nec, aliquet a, gravida in, mi. Quisque urna enim,  
 80 viverra quis, suscipit quis, tincidunt ut, sapien. Cras placerat consequat sem. Curabitur ac  
 81 diam. Curabitur diam tortor, mollis et, viverra ac, tempus vel, metus.

82 Our analysis leads to the algorithm in [Algorithm 3.1](#).

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### Algorithm 3.1 Build tree

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```

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

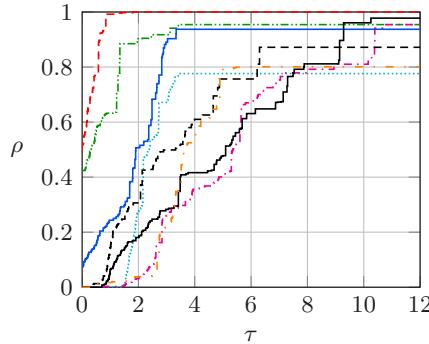
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83 Curabitur ac lorem. Vivamus non justo in dui mattis posuere. Etiam accumsan ligula  
 84 id pede. Maecenas tincidunt diam nec velit. Praesent convallis sapien ac est. Aliquam  
 85 ullamcorper euismod nulla. Integer mollis enim vel tortor. Nulla sodales placerat nunc. Sed  
 86 tempus rutrum wisi. Duis accumsan gravida purus. Nunc nunc. Etiam facilisis dui eu sem.  
 87 Vestibulum semper. Praesent eu eros. Vestibulum tellus nisl, dapibus id, vestibulum sit amet,  
 88 placerat ac, mauris. Maecenas et elit ut erat placerat dictum. Nam feugiat, turpis et sodales  
 89 volutpat, wisi quam rhoncus neque, vitae aliquam ipsum sapien vel enim. Maecenas suscipit  
 90 cursus mi.

91 **4. Experimental results.** Quisque facilisis auctor sapien. Pellentesque gravida hendrerit  
 92 lectus. Mauris rutrum sodales sapien. Fusce hendrerit sem vel lorem. Integer pellentesque  
 93 massa vel augue. Integer elit tortor, feugiat quis, sagittis et, ornare non, lacus. Vestibulum  
 94 posuere pellentesque eros. Quisque venenatis ipsum dictum nulla. Aliquam quis quam non  
 95 metus eleifend interdum. Nam eget sapien ac mauris malesuada adipiscing. Etiam eleifend  
 96 neque sed quam. Nulla facilisi. Proin a ligula. Sed id dui eu nibh egestas tincidunt. Sus-  
 97 pendisse arcu.

98     Figure 1 shows some example results. Additional results are available in the supplement  
 99 in Table 1.



**Figure 1.** Example figure using external image files.

100     Table 1 shows additional supporting evidence.

**Table 1**  
Example table.

Species	Mean	Std. Dev.
1	3.4	1.2
2	5.4	0.6

101     Maecenas dui. Aliquam volutpat auctor lorem. Cras placerat est vitae lectus. Curabitur  
 102 massa lectus, rutrum euismod, dignissim ut, dapibus a, odio. Ut eros erat, vulputate ut,  
 103 interdum non, porta eu, erat. Cras fermentum, felis in porta congue, velit leo facilisis odio,  
 104 vitae consectetur lorem quam vitae orci. Sed ultrices, pede eu placerat auctor, ante ligula  
 105 rutrum tellus, vel posuere nibh lacus nec nibh. Maecenas laoreet dolor at enim. Donec molestie  
 106 dolor nec metus. Vestibulum libero. Sed quis erat. Sed tristique. Duis pede leo, fermentum  
 107 quis, consectetur eget, vulputate sit amet, erat.

108     **5. Discussion of  $Z = X \cup Y$ .** Curabitur nunc magna, posuere eget, venenatis eu, vehicula  
 109 ac, velit. Aenean ornare, massa a accumsan pulvinar, quam lorem laoreet purus, eu sodales  
 110 magna risus molestie lorem. Nunc erat velit, hendrerit quis, malesuada ut, aliquam vitae,  
 111 wisi. Sed posuere. Suspendisse ipsum arcu, scelerisque nec, aliquam eu, molestie tincidunt,  
 112 justo. Phasellus iaculis. Sed posuere lorem non ipsum. Pellentesque dapibus. Suspendisse  
 113 quam libero, laoreet a, tincidunt eget, consequat at, est. Nullam ut lectus non enim consequat  
 114 facilisis. Mauris leo. Quisque pede ligula, auctor vel, pellentesque vel, posuere id, turpis. Cras  
 115 ipsum sem, cursus et, facilisis ut, tempus euismod, quam. Suspendisse tristique dolor eu orci.  
 116 Mauris mattis. Aenean semper. Vivamus tortor magna, facilisis id, varius mattis, hendrerit  
 117 in, justo. Integer purus.

118     **6. Conclusions.** Some conclusions here.

119     **Appendix A. An example appendix.** Aenean tincidunt laoreet dui. Vestibulum ante  
 120 ipsum primis in faucibus orci luctus et ultrices posuere cubilia Curae; Integer ipsum lectus,

121 fermentum ac, malesuada in, eleifend ut, lorem. Vivamus ipsum turpis, elementum vel, hen-  
122 drerit ut, semper at, metus. Vivamus sapien tortor, eleifend id, dapibus in, egestas et, pede.  
123 Pellentesque faucibus. Praesent lorem neque, dignissim in, facilisis nec, hendrerit vel, odio.  
124 Nam at diam ac neque aliquet viverra. Morbi dapibus ligula sagittis magna. In lobortis.  
125 Donec aliquet ultricies libero. Nunc dictum vulputate purus. Morbi varius. Lorem ipsum  
126 dolor sit amet, consectetur adipiscing elit. In tempor. Phasellus commodo porttitor magna.  
127 Curabitur vehicula odio vel dolor.

128     **Lemma A.1.** *Test Lemma.*

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

131

## REFERENCES

132 [1] G. H. GOLUB AND C. F. VAN LOAN, *Matrix Computations*, The Johns Hopkins University Press, Baltimore,  
133                  4th ed., 2013.