

1 **AN EXAMPLE ARTICLE\***

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3 **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  
4 articles. Abstracts must be able to stand alone and so cannot contain citations to the paper's  
5 references, equations, etc. An abstract must consist of a single paragraph and be concise. Because  
6 of online formatting, abstracts must appear as plain as possible. Any equations should be inline.

7 **Key words.** example, L<sup>A</sup>T<sub>E</sub>X

8 **AMS subject classifications.** 68Q25, 68R10, 68U05

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

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

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

28 The paper is organized as follows. Our main results are in [section 2](#), our new  
29 algorithm is in [section 3](#), experimental results are in [section 4](#), and the conclusions  
30 follow in [section 6](#).

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

33 Quisque ullamcorper placerat ipsum. Cras nibh. Morbi vel justo vitae lacus  
34 tincidunt ultrices. Lorem ipsum dolor sit amet, consectetur adipiscing elit. In hac  
35 habitasse platea dictumst. Integer tempus convallis augue. Etiam facilisis. Nunc  
36 elementum fermentum wisi. Aenean placerat. Ut imperdiet, enim sed gravida sollici-  
37 tudin, felis odio placerat quam, ac pulvinar elit purus eget enim. Nunc vitae tortor.  
38 Proin tempus nibh sit amet nisl. Vivamus quis tortor vitae risus porta vehicula.

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

40 **THEOREM 2.1** (*LDL<sup>T</sup> Factorization [1]*). *If  $A \in \mathbb{R}^{n \times n}$  is symmetric and the*

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41 *principal submatrix*  $A(1 : k, 1 : k)$  *is nonsingular for*  $k = 1 : n - 1$ , *then there exists a*  
 42 *unit lower triangular matrix*  $L$  *and a diagonal matrix*

$$43 \quad D = \text{diag}(d_1, \dots, d_n)$$

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

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

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

$$55 \quad f'(c) = \frac{f(b) - f(a)}{b - a}.$$

56 *In other words,*

$$57 \quad f(b) - f(a) = f'(c)(b - a).$$

58 *Observe that* **Theorems 2.1** *and* **2.2** *and* **Corollary 2.3** *correctly mix references to*  
 59 *multiple labels.*

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

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

$$64 \quad f'(c) = \frac{f(b) - f(a)}{b - a} = \frac{0 - 0}{b - a} = 0. \quad \square$$

65 *Note that it may require two* L<sup>A</sup>T<sub>E</sub>X *compilations for the proof marks to show.*  
 66 *Display matrices can be rendered using environments from* **amsmath**:

$$67 \quad (2.1) \quad S = \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix} \quad \text{and} \quad C = \begin{pmatrix} 1 & 1 & 0 \\ 1 & 1 & 0 \\ 0 & 0 & 0 \end{pmatrix}.$$

68 *Equation* (2.1) *shows some example matrices.*

69 *We calculate the Fréchet derivative of*  $F$  *as follows:*

$$70 \quad (2.2a) \quad F'(U, V)(H, K) = \langle R(U, V), H\Sigma V^T + U\Sigma K^T - P(H\Sigma V^T + U\Sigma K^T) \rangle$$

$$71 \quad \quad \quad = \langle R(U, V), H\Sigma V^T + U\Sigma K^T \rangle$$

$$72 \quad (2.2b) \quad \quad \quad = \langle R(U, V)V\Sigma^T, H \rangle + \langle \Sigma^T U^T R(U, V), K^T \rangle.$$

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

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

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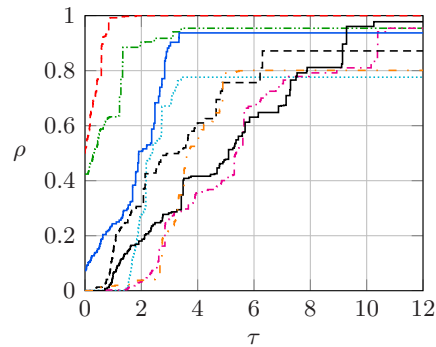
86 Curabitur ac lorem. Vivamus non justo in dui mattis posuere. Etiam accumsan  
 87 ligula id pede. Maecenas tincidunt diam nec velit. Praesent convallis sapien ac est.  
 88 Aliquam ullamcorper euismod nulla. Integer mollis enim vel tortor. Nulla sodales  
 89 placerat nunc. Sed tempus rutrum wisi.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

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

101 [Figure 1](#) shows some example results. Additional results are available in the  
 102 supplement in [Table SM1](#).

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

111 **5. Discussion of  $Z = X \cup Y$ .** Curabitur nunc magna, posuere eget, vene-  
 112 natis eu, vehicula ac, velit. Aenean ornare, massa a accumsan pulvinar, quam lorem

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

113 laoreet purus, eu sodales magna risus molestie lorem. Nunc erat velit, hendrerit quis,  
 114 malesuada ut, aliquam vitae, wisi. Sed posuere. Suspendisse ipsum arcu, scelerisque  
 115 nec, aliquam eu, molestie tincidunt, justo. Phasellus iaculis. Sed posuere lorem non  
 116 ipsum. Pellentesque dapibus. Suspendisse quam libero, laoreet a, tincidunt eget, con-  
 117 sequat at, est. Nullam ut lectus non enim consequat facilisis. Mauris leo. Quisque  
 118 pede ligula, auctor vel, pellentesque vel, posuere id, turpis. Cras ipsum sem, cursus  
 119 et, facilisis ut, tempus euismod, quam. Suspendisse tristique dolor eu orci. Mauris  
 120 mattis. Aenean semper. Vivamus tortor magna, facilisis id, varius mattis, hendrerit  
 121 in, justo. Integer purus.

122 **6. Conclusions.** Some conclusions here.

123 **Appendix A. An example appendix.** Aenean tincidunt laoreet dui. Vestibulo  
 124 ante ipsum primis in faucibus orci luctus et ultrices posuere cubilia Curae; Integer  
 125 ipsum lectus, fermentum ac, malesuada in, eleifend ut, lorem. Vivamus ipsum turpis,  
 126 elementum vel, hendrerit ut, semper at, metus. Vivamus sapien tortor, eleifend id,  
 127 dapibus in, egestas et, pede. Pellentesque faucibus. Praesent lorem neque, dignissim  
 128 in, facilisis nec, hendrerit vel, odio. Nam at diam ac neque aliquet viverra. Morbi  
 129 dapibus ligula sagittis magna. In lobortis. Donec aliquet ultricies libero. Nunc dictum  
 130 vulputate purus. Morbi varius. Lorem ipsum dolor sit amet, consectetur adipiscing  
 131 elit. In tempor. Phasellus commodo porttitor magna. Curabitur vehicula odio vel  
 132 dolor.

133 LEMMA A.1. *Test Lemma.*

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

136 REFERENCES

137 [1] G. H. GOLUB AND C. F. VAN LOAN, *Matrix Computations*, The Johns Hopkins University Press,  
 138 Baltimore, 4th ed., 2013.