Evidence that Adaptive Online Textbook Utilization May Lead to Higher Grade Performance

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Motivation: Student Perspective

How can I do better?

Did you read?

How do professors usually respond?

• Study more
• Practice problems
• Other activities that almost certainly involve a textbook
Would be nice to have proof that reading is useful
Motivation: Professor Perspective

MECH 105
Problem Solving

Enrollment:
50 (Fall)
200+ (Spring)

Solution:
SmartBook Adaptive e-Text

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Options are nice
BUT I'm busy

What should I concentrate on?
Study Details

• n = 200 \( \text{(fun coincidence!)} \)

• Aggregated Spring 2018 \( \text{(large enrollment)} \)
  and Fall 2018 \( \text{(small enrollment)} \)
  • Looked at time reading book vs final course grade
  • \textit{Did not investigate difference between semesters}

• Linear Regression \( \text{(Time vs Final Grade)} \)

• Two Sample Unpaired T-Test \( \text{(HTC vs LTC)} \)
Are the students reading the book? Does it matter?

Mean Reading Time
343 Minutes

Only 23 Minutes per chapter

Idea: Maybe the time reading correlates to grade performance?
Is there a correlation between reading and grade performance?

Short answer: No

Idea 2.0: Maybe the students that read more have better grade performance?
Split class into two groups: HTC and LTC

Mean Reading Time
343 minutes

HTC read more than the mean
Avg HTC = 443 minutes

LTC read less than the mean
Avg LTC = 286 minutes
Limitations

• “No Duh” factor
• Left the computer on
• Mean threshold arbitrary
• Data only on one textbook with one professor
Conclusion:

Reading the textbook *may* help improve student performance.

At least that is what I am going to be telling my students. (Next ASEE, does that intervention help?)
10

LU Factorization

CHAPTER OBJECTIVES

The primary objective of this chapter is to acquaint you with LU factorization. Specific objectives and topics covered are:

- Understanding that LU factorization involves decomposing the coefficient matrix into two triangular matrices that can then be used to efficiently evaluate different right-hand-side vectors.
- Knowing how to express Gauss elimination as an LU factorization.
- Given an LU factorization, knowing how to evaluate multiple right-hand-side vectors.
A two-step strategy (see Fig. 10.1) for obtaining solutions can be based on Eqs. (10.3), (10.7), and (10.8):

1. **LU factorization step.** \([A]\) is factored or “decomposed” into lower \([L]\) and upper \([U]\) triangular matrices.

2. **Substitution step.** \([L]\) and \([U]\) are used to determine a solution \([x]\) for a right-hand side \([b]\). This step itself consists of two steps. First, Eq. (10.8) is used to generate an intermediate vector \([d]\). Then the result is substituted into Eq. (10.3), which can be solved by back substitution.

This section is highlighted because it contains topics that are especially important for you.
Identify the upper triangular matrix and lower triangular matrix for the following system of equations using the LU factorization method: (Check all that apply.)

\[-2y + x + z = 2\]
\[4x - 6y + 6z = -2\]
\[-6x - 3y - 10z = 9\]

Check all that apply.

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<th>L</th>
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Do you know the answer?

- I know it
- Think so
- Unsure
- No idea
Although it certainly represents a sound way to solve such systems, it becomes inefficient when solving equations with the same coefficients $[A]$, but with different right-hand-side constants $[b]$. Recall that Gauss elimination involves two steps: forward elimination and back substitution (Fig. 9.3). As we learned in Sec. 9.2.2, the forward-elimination step comprises the bulk of the computational effort. This is particularly true for large systems of equations.

**LU factorization methods separate the time-consuming elimination of the matrix $[A]$ from the manipulations of the right-hand side $[b]$. Thus, once $[A]$ has been “factored” or “decomposed,” multiple right-hand-side vectors can be evaluated in an efficient manner.**

By now, you have demonstrated that you have a deep understanding of the topics in this section!
Adaptive Assignment Reports

LearnSmart

Review detailed reports to better measure student progress, comprehension and retention.
This report shows how much the learners studied in each chapter. The completion can be larger than what is seen in their Assignment completion if the learner studied after due date or forgot to update results by opening the assignment. It can also in rare cases be larger if the learner studied this material in a previous course.

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<th>Chapter 1, Mathematical Modelling</th>
<th>Chapter 2, MATLAB Fundamentals</th>
<th>Chapter 3, Programming with MATLAB</th>
<th>Chapter 4, Roundoff and Truncation Error</th>
<th>Chapter 5, Roots: Bracketing Methods</th>
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Hidden to protect student anonymity