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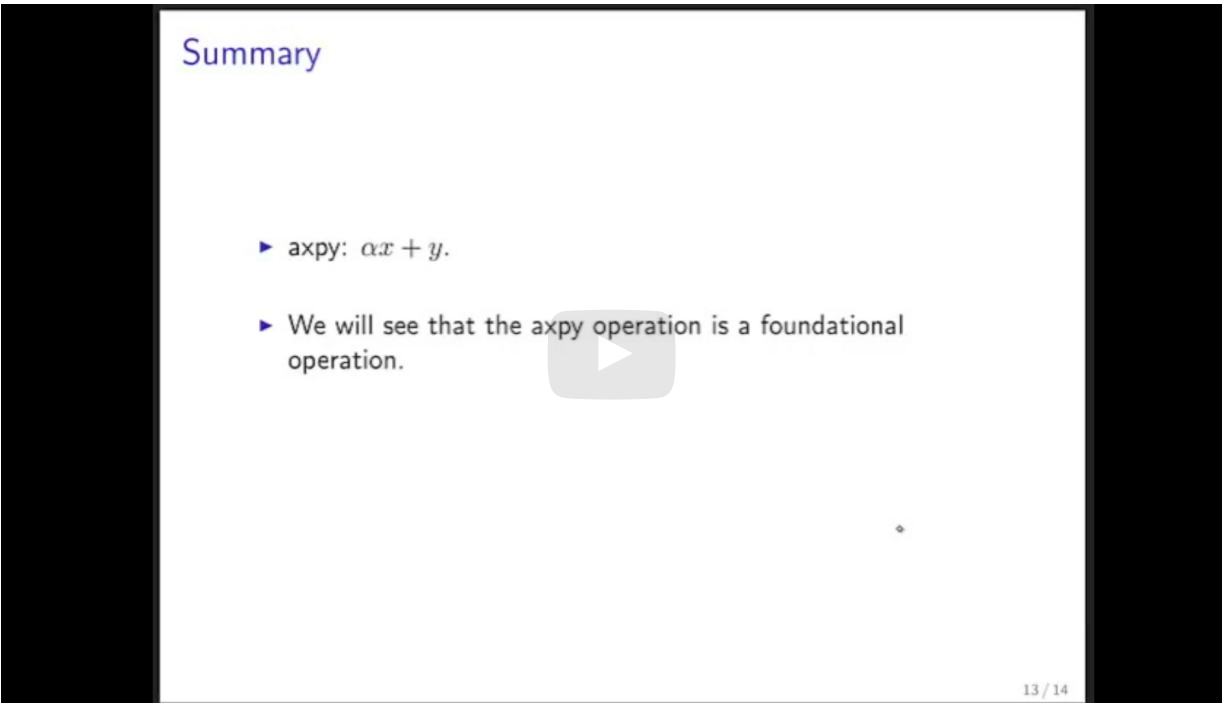
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1.4.1 Scaled Vector Addition (AXPY)

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Week 1 due Oct 5, 2023 03:12 IST Completed

1.4.1 Scaled Vector Addition (AXPY)



And as usual, we need to put a loop around that so this is done for all components zero to n minus 1.

In summary, we just introduced the axpy operation, alpha times x plus y.

And we will see that the axpy operation is going to be a foundational operation.

It will recur over and over and over again as we go through our course.

▶ 3:49 / 3:49

▶ 2.0x

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Reading Assignment

0 points possible (ungraded)
Read Unit 1.4.1 of the notes. [\[LINK\]](#)

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🗨️ [it's been easy so far](#)

Thank you so much, I didnt know anything about vectors

2

🗨️ [AXPY = Slope](#)

🧮 Calculator

-

The equation of axpy is a slope of a line. Conceptualizing this I will say it can be use to construct a diagonal line which is vector addition, horizo...	
? Linear algebra for Computer Science	2
Hi, I find the LAFF is more CS based. Learning the algorithm and cost is fun, and I am fine with these temporarily. I am wondering if I have no CS...	
? MATLAB	3
I want to make sure I am not missing anything. At what point in the course will we use MATLAB? Should I be following up in MATLAB?	
? mempos	4
regarding the mempos of axpy,, why is this $3n + 1$, not $4n + 1$? I assumed that reading x and y ($2n$), then the operation αx stores one tempora...	
Unit 1.4.1 Video 1 at 3:05 -	4

How to count flops and memops

So, the number of memory operations we have to do is then $3n + 1$.

And the number of floating point operations that we need to perform is 2 times n .

Now, often we will sort of say: well, this plus one, if n is large enough, is insignificant

and therefore we would say it is approximately $3n$ memory operations.

And that is really all there is to it.

3:06 / 3:06

2.0x

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Homework 1.4.1.1

2/2 points (graded)

What is the cost of axpy operation?

How many memops?

- (a) $3n + 1$ (b) $3n^2 + n$ (c) $2n^3 + n$ (d) $3n^2 - 2n - 1$

a

✓ Answer: a

How many flops?

- (a) $2n - 2$ (b) $2n^2 + n$ (c) $2n + 3$ (d) $2n$

d

✓ Answer: d

Answer:

The AXPY operation requires $3n + 1$ memops and $2n$ flops. The reason is that α is only brought in from memory once and kept in a register for reuse. To fully understand this, you need to know a little bit about computer architecture. (Perhaps a video on this?)

- By combining the scaling and vector addition into one operation, there is the opportunity to reduce the number of memops that are incurred separately by the SCALE and ADD operations

Calculator

the number of memops that are incurred separately by the SCALE and ADD operations.

- “Among friends” we will say that the cost is $3n$ memops since the one extra memory operation (for bring α in from memory) is negligible.
- For those who understand “Big-O” notation, the cost of the AXPY operation is $O(n)$. However, we tend to want to be more exact than just saying $O(n)$. To us, the coefficient in front of n is important.

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