Linear Algebra for Computer Science

Lecture 1a

Introduction and Logistics

Linear Algebra for Computer Science

- 3 credits, 32 sessions
- Saturday, Wednesday, 13:30-15:30
- Lab:
- Instructor: Behrooz Nasihatkan
- Email: nasihatkon@kntu.ac.ir
- Office: Room 402

Exam Dates

- Midterm Exam: Thursday, 25 Aban, 9:00-12:00
- Final Exam: Sunday, 24 Dey, 10:30-12:30

Grading

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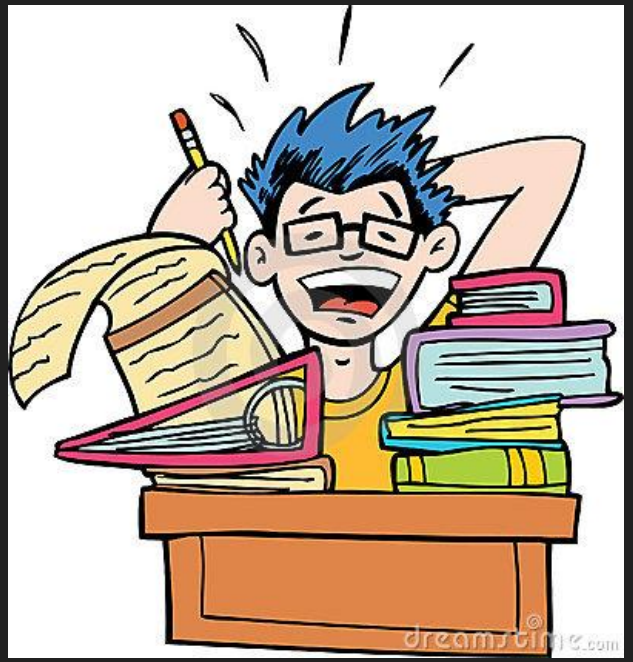
- Weekly Lab Sessions (~ 3 points)
- Homework (~ 1.5 points)
- Projects (~ 2.5 points)

- Midterm Exam (~ 6 points)
- Final Exam (~ 7 points)



Ask Questions

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Special Needs

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How to get help

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How to give feedback?

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Anonymous form: https://goo.gl/zPxBAS

Join the Telegram channel

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t.me/lakntu4021

My Telegram Channel

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t.me/behrooznasihatkon

What is considered cheating?

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- Homework

Homework/Projects

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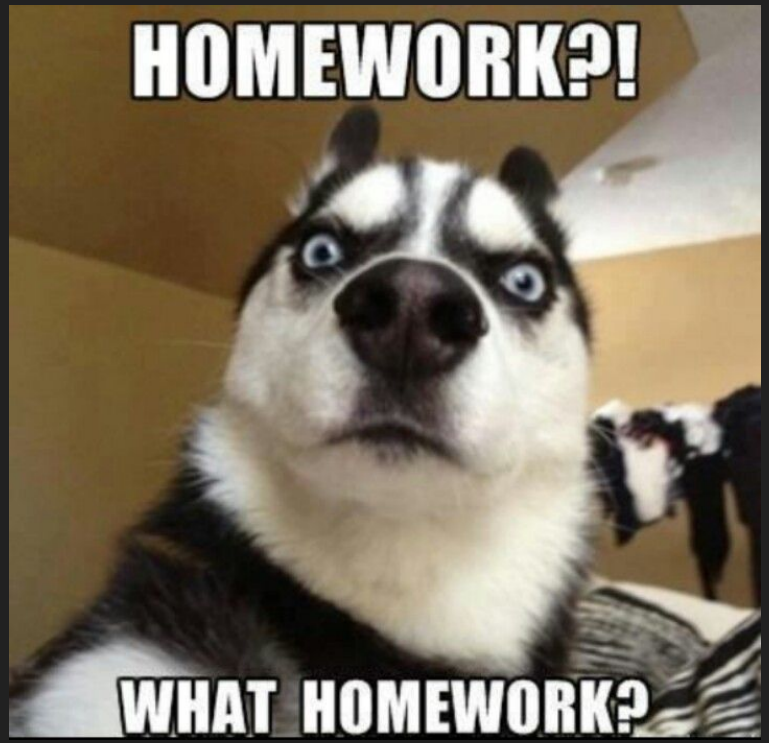
- 

Why Linear Algebra for CS students?

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Why Linear Algebra for CS students?

- Machine Learning
- Data Science
- Computer Vision
- Natural Language Processing
- Neural Nets/Deep Learning
- etc.

Prerequisites

- Math
  - Calculus/Multivariate Calculus
- Programming
  - Python
  - C++

Next

- Probability and Statistics
- Optimization
- Estimation theory
- ...
- Data Analysis / Machine Learning

Next

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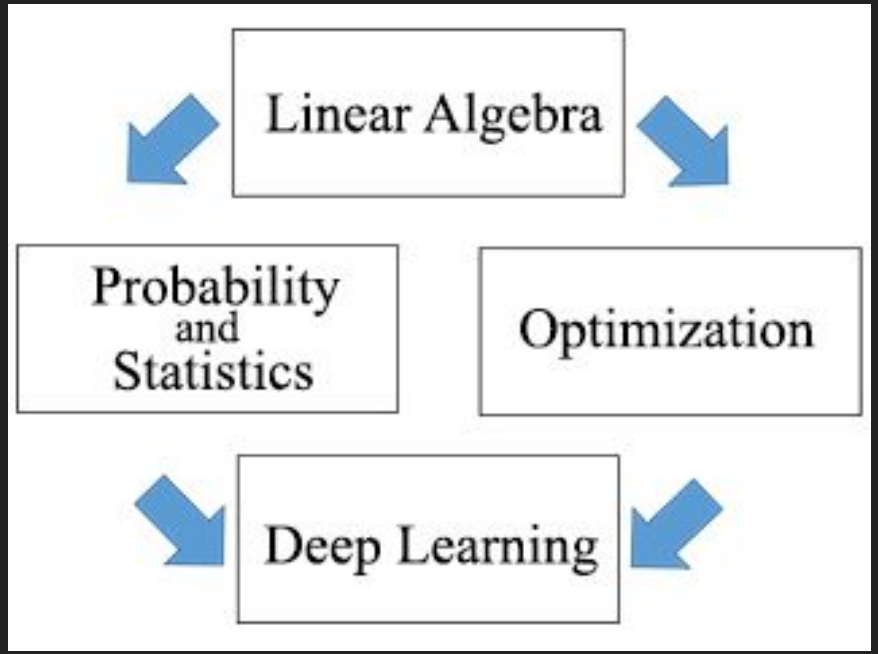

https://ocw.mit.edu/courses/18-065-matrix-methods-in-data-analysis-signal-processing-and-machine-learning-spring-2018/

References

- Linear Algebra, Geometry and Computation
  - https://www.cs.bu.edu/fac/crovella/cs132-book/landing-page.html
- Mathematics for Machine Learning
  - https://mml-book.github.io/
- Part I of the Deep Learning book
  - https://www.deeplearningbook.org/

Online Courses

- Linear Algebra (Gilbert Strang)
  - https://www.youtube.com/watch?v=ZK3O402wf1c&list=PL49CF3715CB9EF31D
- Matrix Methods in Data Analysis, Signal Processing, and Machine Learning (by Gilbert Strang)
  - https://ocw.mit.edu/courses/mathematics/18-065-matrix-methods-in-data-analysis-signal-processing-and-machine-learning-spring-2018/index.htm
  - https://www.youtube.com/watch?v=Cx5Z-OslNWE&list=PLUl4u3cNGP63oMNUHXqIUcrkS2PivhN3k
- Mathematics for Machine Learning: Linear Algebra
  - https://www.coursera.org/learn/linear-algebra-machine-learning
- 18.06 Linear Algebra, Spring 2020
  - https://github.com/mitmath/1806/blob/master/summaries.md

Other useful resources

- Essence of linear Algebra
  - https://www.youtube.com/playlist?list=PLZHQObOWTQDPD3MizzM2xVFitgF8hE_ab
- Mathematical Tools for Data Science
  - https://cds.nyu.edu/math-tools/
- A 2020 Vision of Linear Algebra, Spring 2020 (Strang)
  - https://ocw.mit.edu/resources/res-18-010-a-2020-vision-of-linear-algebra-spring-2020/
  - https://www.youtube.com/playlist?list=PLUl4u3cNGP61iQEFiWLE21EJCxwmWvvek
- Math the Beautiful
  - https://www.youtube.com/c/MathTheBeautiful/playlists
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Programming Languages

- Matlab
- C++
- Python
- R
- Julia
- ...

Programming Languages

- Matlab
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- **Python**
- R
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- ...

Linear Algebra Libraries

- BLAS implementations (OpenBLAS, BLIS, Intel MKL, cuBLAS)
- Lacpack
- Eigen
- Python/Numpy (numpy.linalg, scipy.linalg)
- TensorX

- Look:
  - https://en.wikipedia.org/wiki/List_of_numerical_libraries
  - https://en.wikipedia.org/wiki/Comparison_of_linear_algebra_libraries

Linear Algebra for CS/CE students