CS 111

INTRODUCTION TO COMPUTATIONAL SCIENCE

OCTOBER 1, 2020

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CONTACT INFO + OFC HRS ON GAUCHOSPACE

AND PIAZZA: use it a lot!!

AND GRADESCOPE

COURSE LOGISTICS

- LIVE ZOOM LECTURES THU 12:30-1:45
  posted after class
- PRERECORDED VIDEO SEGMENTS
  for THE before class time
- SECTIONS THURSDAY PM
  (NO SECTIONS TODAY)

- 9 Homeworks (Monday – Sunday)
  - LOWEST 2 grades DROPPED
  - 50% of course grade
  - (may work with 1 partner)
- 9 Quizzes (24 hr Mon-Tue noon)
  - LOWEST 2 DROP
  - 50% of course grade
  - (not this Mon)
- No midterms or final exams.

READ GSPACE FOR DETAILS AND RULES

SOFTWARE ETC

→ Python, numpy, scipy, matplotlib

→ Jupyter notebooks

TAs will show you how to set up in first section (next Thu)

- mostly not major coding
- probably one fair-sized programming HW

READING

- Assigned every week **IMPORTANT!**
- Lots of online readings; many **NCM** book by Moler. (uses MATLAB not Python)

NO SECTIONS TODAY

NO QUIZ MONDAY

FIRST HW ON MONDAY

WATCH VIDEOS ON TUE

READ NCM 2.1-2.6

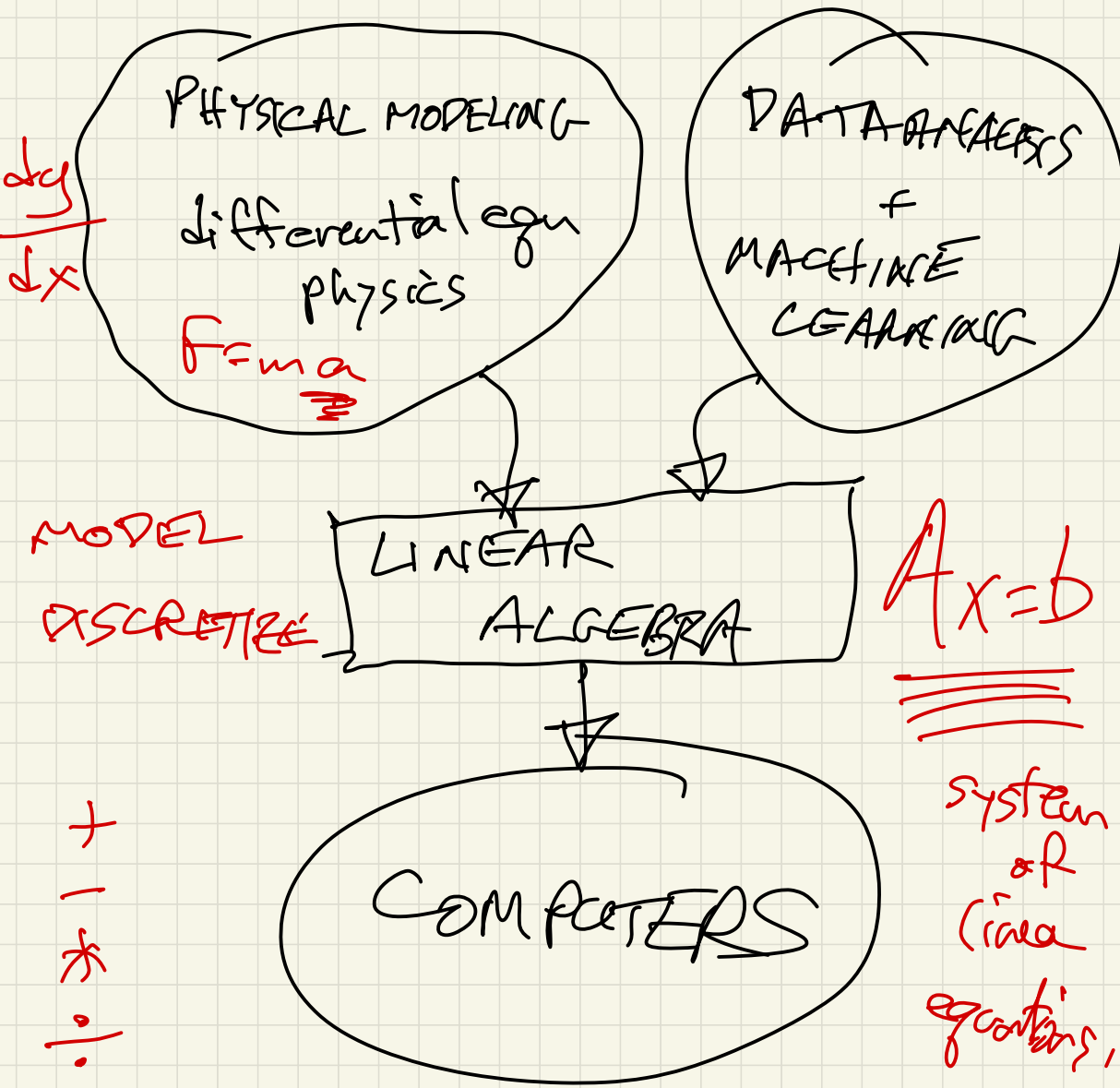
Clinear eqns & Gaussian elimination

WHAT'S THE COURSE ABOUT?

ALGORITHMS FOR THE PROBLEMS OF CONTINUOUS MATHEMATICS

CS130AB: ALGS FOR DISCRETE MATHEMATICS.
SORTING, LINKED LISTS, TREES, GRFS
ANALYZE RUN TIME $O(n \log n)$ etc

CS111: ALGS FOR COMPUTING WITH REAL NUMBERS:
DIFF. EQNS. PROBABILITY, DATA.
(FLOATING POINT ARITHMETIC)
ANALYZE BOTH RUN TIME AND ACCURACY!


PHYSICAL MODELING
differential eqn
physics
F=ma
dy/dx
DATA ANALYSIS
+
MACHINE
LEARNING
MODEL
DISCRETIZE
LINEAR
ALGEBRA
Ax=b
system
of
linear
equations
COMPUTERS
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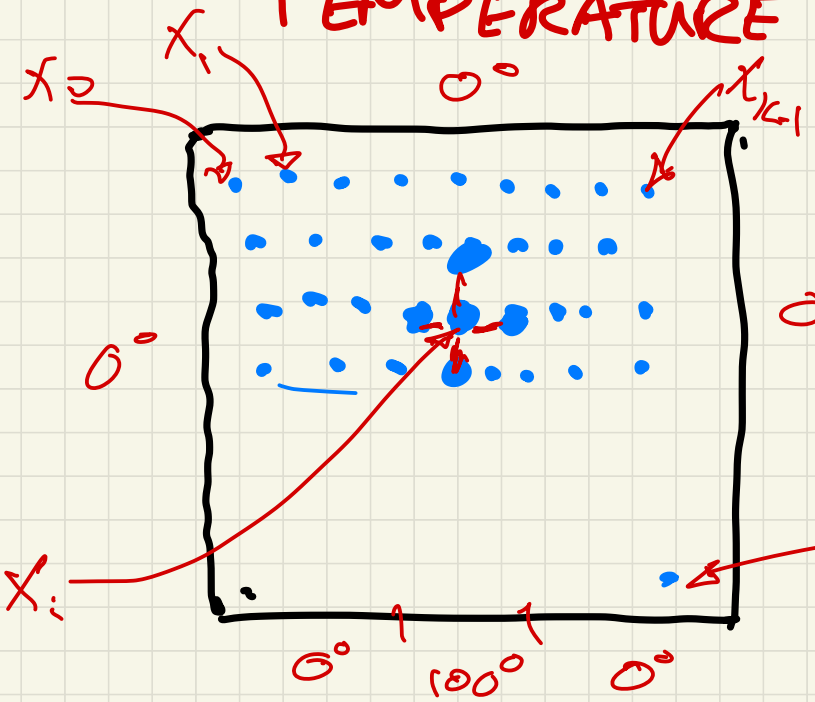
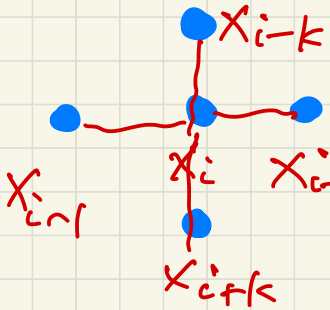
TEMPERATURE PROBLEM



DISCRETIZE

$k \times k$ grid of points

$n = k^2$



Physics:

temp at a point is the average of the temps at neighboring points.

$$x_i = \frac{1}{4}(x_{i-k} + x_{i-1} + x_{i+1} + x_{i+k})$$

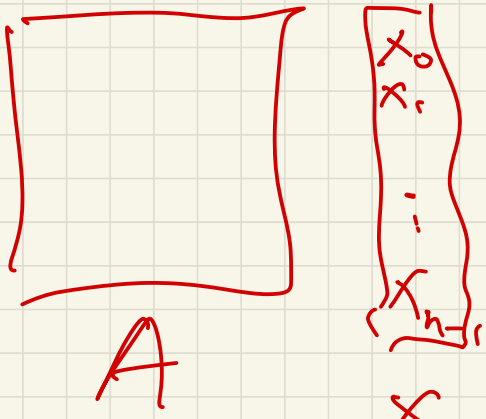
$$-x_{i-k} - x_{i-1} + 4x_i - x_{i+1} - x_{i+k} = 0$$

$$-x_{i-k} - x_{i-1} + 4x_i - x_{i+1} - x_{i+k} = 0$$

An eqn for $i = 0$
$i = 1$
$\vdots$
$i = n-1-(k^2-1)$

n eqns
in n unknowns

$0 \le i \le n-1$



$$Ax = b$$