



Matrixology (Linear Algebra)

MATH 122; Deliverator: Prof. Peter Dodds
Tuesday and Thursday, 10:05 am to 11:20 am in Perkins 107
@matrixologyvox #FallMatrixology2016

Basic stuff:

Instructor: Prof. Peter Dodds.

Lecture room: Perkins 107

Meeting times: Tuesday and Thursday, 10:05 am to 11:20 am

Office: Farrell Hall, second floor, Trinity Campus.

E-mail: peter.dodds@uvm.edu

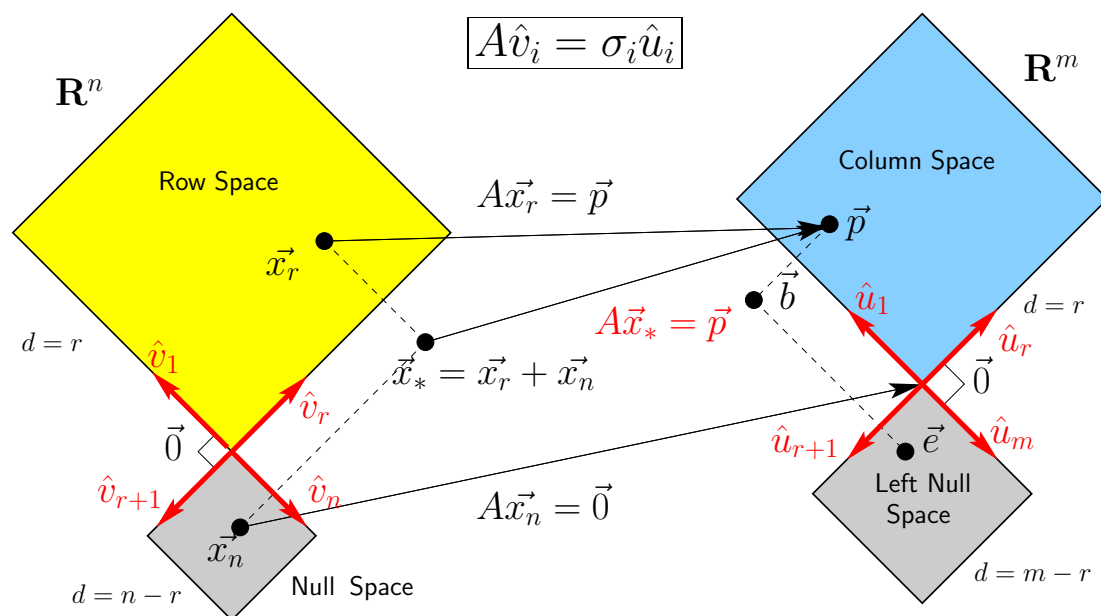
Office hours: 9:00 am to 11:55 am Wednesdays.

Course website:

<http://www.uvm.edu/pdodds/teaching/courses/2016-08UVM-122>

Textbook: "Introduction to Linear Algebra" (3rd or 4th or 5th edition) by Gilbert Strang (published by Wellesley-Cambridge Press).

Course Objectives: To deeply understand the equation $A\vec{x} = \vec{b}$, the Fundamental Theorem of Linear Algebra, why it's good to have a small Left Null Space, and the following picture:



Note: The study of linear algebra may bring about happiness.

Grading breakdown:

1. **Mini-levels (10%)—In-class quizzes.**
2. **Levels (40%)**—All levels (assignments) will be of equal weight and will be 1 week take home affairs. The lowest assignment score will be dropped and the average of the remainder taken (Note: the last assignment *cannot be dropped* from the average). There will be ten of these pleasurable experiences. Clarity in writing and presentation will be taken into account in grading.
3. **Challenge levels (30%)**—Three 75 minutes tests distributed throughout the course, all of equal weighting.
4. **Final Boss Level (20%)**—Three hours of pure happiness with linear algebra.
5. **Homework (0%)**—Problems will be assigned from the textbook at the end of most lectures. Doing these exercises will be most beneficial and will increase happiness. Problems presenting difficulty will be discussed in the following class as time permits, or in office hours.
6. **General existence (0%)**—it is extremely desirable that students attend class, and class presence will be taken into account if a grade is borderline.
7. **Attendance of office hours (0%)**—students are requested to attend at least one session of office hours during the course (again, the borderline grade issue is to be kept in mind here).

Grades:	A+	97–100	B+	87–89	C+	77–79	D+	67–69
	A	93–96	B	83–86	C	73–76	D	63–66
	A-	90–92	B-	80–82	C-	70–72	D-	60–62

Schedule: The course will mainly cover chapters 1 through 6 of the textbook and some of chapter 7. Some topics may be omitted, others added.

Week # (dates)	Tuesday	Thursday
1 (8/30 and 9/01)	$\mathbb{A}\vec{x} = \vec{b}$	$\mathbb{A}\vec{x} = \vec{b} + \text{Level 1}$
2 (9/06 and 9/08)	$\mathbb{A}\vec{x} = \vec{b}$	$\mathbb{A}\vec{x} = \vec{b} + \text{Level 2}$
3 (9/13 and 9/15)	$\mathbb{A}\vec{x} = \vec{b}$	$\mathbb{A}\vec{x} = \vec{b} + \text{Level 3}$
4 (9/20 and 9/22)	$\mathbb{A}\vec{x} = \vec{b}$ and review	<i>Challenge Level 1</i>
5 (9/27 and 9/29)	Big picture	Big picture + Level 4
6 (10/04 and 10/06)	Big picture	Big picture + Level 5
7 (10/11 and 10/13)	Big picture	Big picture + Level 6
8 (10/18 and 10/20)	Big picture	<i>Challenge Level 2</i>
9 (10/25 and 10/27)	Normal equation	Gram-Schmidt Process + Level 7
10 (11/01 and 11/03)	Eigenstuff	Eigenstuff + Level 8
11 (11/08 and 11/10)	Determinants	Determinants + Level 9
12 (11/15 and 11/17)	Eigenstuff	textitChallenge Level 3
13 (11/22 and 11/24)	Thanksgiving	Thanksgiving
14 (11/29 and 12/01)	Positive Definite Matrices + Level 10	SVD
15 (12/06)	SVD	SVD

Final Boss Level: Thursday, December 15, 1:30 pm to 4:15 pm, in Perkins 107.

Topics to be covered:

- Everything about the Matrix Equation $A\vec{x} = \vec{b}$,
- The Fundamental Theorem of Linear Algebra,
- Systems of Linear Equations,
- Geometric Interpretation Thereof,
- Gauss-Jordan Elimination,
- Matrix Operations,
- Null Space (Right then Left), Column Space, Row Space,
- Least-Squares Approximations,
- Inverses,
- Determinants,
- Cramer's Rule,
- Cofactors,
- Singularity,
- Eigenthings including the heroic Eigenvalues and Eigenvectors,
- Diagonalization,
- Linear Transformations,
- Inner (Dot) Products,
- Cross Products,
- Change of Basis,
- Gram-Schmidt Process,
- LU Factorization,
- QR Factorization,
- Vector Spaces,
- Projections,
- Representations of Graphs and Networks,
- The Joys of Singular Value Decomposition.

Important dates:

1. Classes run from Tuesday, August 30 to Friday, December 9.
2. Add/Drop, Audit, Pass/No Pass deadline—Monday, September 12.
3. Last day to withdraw—Monday, October 31 (Sadness!).
4. Reading and Exam period—Saturday, December 10 to Friday, December 16.

Do check your zoo account for updates regarding the course.

Academic assistance: Anyone who requires assistance in any way (as per the ACCESS program or due to athletic endeavors), please see or contact me as soon as possible.

Being good people: First, in class there will be no electronic gadgetry, no cell phones, no beeping, no text messaging, etc. You really just need your brain, some paper, and a writing implement here (okay, and Matlab—see below). Those who beep in an annoying fashion will be fined one organic banana by the lecturer. Second, I encourage you to email me questions, ideas, comments, etc., about the class but request that you please do so in a respectful fashion. Finally, as in all UVM classes, **Academic honesty** will be expected and departures will be dealt with appropriately. See <http://www.uvm.edu/cs/es/> for guidelines.

Late policy: Unless in the case of an emergency (a real one) or if an absence has been predeclared and a make-up version sorted out, assignments that are not turned in on time or tests that are not attended will be given 0%.

Computing: Students are encouraged to use Matlab to check their work. (Matlab is short for Matrix Laboratory and is the natural choice for linear algebra). I will talk about MatLab in class. Note that for any assignment problem, written details of calculations will be required.