



Matrixology (Linear Algebra)

MATH 124; Deliverator: Prof. Peter Dodds
Tuesday and Thursday, 1:00 pm to 2:15 pm in Angell B112
@matrixologyvox #SpringMatrixology2015

Basic stuff:

Instructor: Prof. Peter Dodds.

Lecture room: Angell B112

Meeting times: Tuesday and Thursday, 1:00 pm to 2:15 pm

Office: Farrell Hall, second floor, Trinity Campus.

E-mail: peter.dodds@uvm.edu

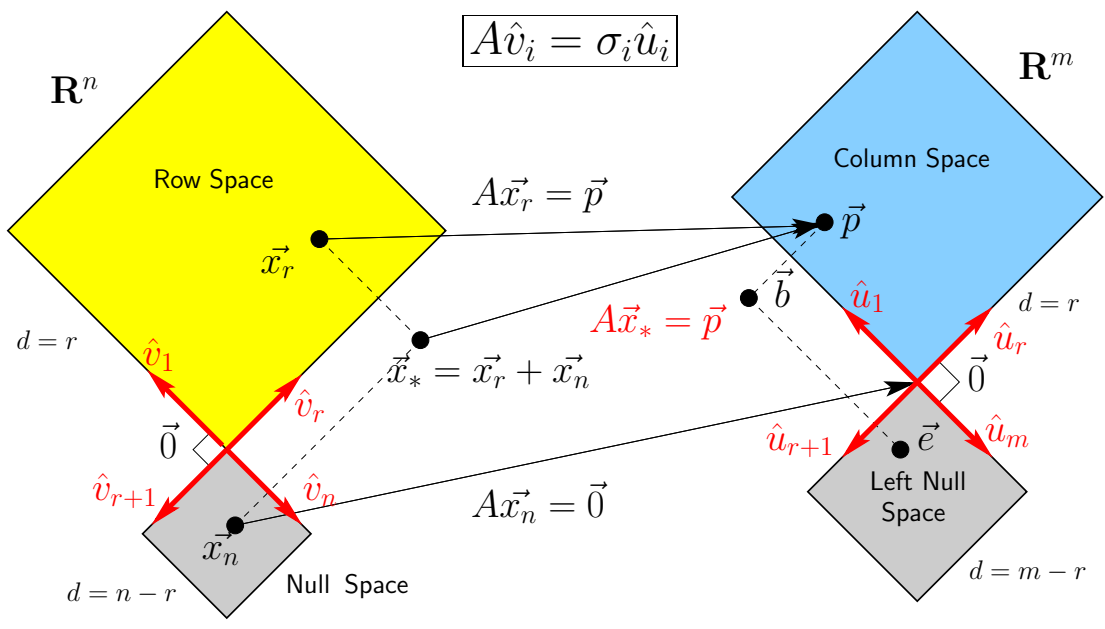
Office hours: 12:30 to 3:00 pm Mondays.

Course website:

<http://www.uvm.edu/~pdodds/teaching/courses/2015-01UVM-124>

Textbook: "Introduction to Linear Algebra" (3rd or 4th 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. **Assignments (40%)**—All 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.
2. **Midterm exams (35%)**—Three 75 minutes tests distributed throughout the course, all of equal weighting.
3. **Final exam (25%)**—Three hours of pure happiness with linear algebra.
4. **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.
5. **General existence (0%)**—it is extremely desirable that students attend class, and class presence will be taken into account if a grade is borderline.
6. **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 (1/13 and 1/15)	$\mathbb{A}\vec{x} = \vec{b}$	$\mathbb{A}\vec{x} = \vec{b}$ + Level 1
2 (1/20 and 1/22)	$\mathbb{A}\vec{x} = \vec{b}$	$\mathbb{A}\vec{x} = \vec{b}$ + Level 2
3 (1/27 and 1/29)	$\mathbb{A}\vec{x} = \vec{b}$	$\mathbb{A}\vec{x} = \vec{b}$ + Level 3
4 (2/3 and 2/5)	$\mathbb{A}\vec{x} = \vec{b}$ and review	<i>Challenge Level 1</i>
5 (2/10 and 2/12)	Big picture	Big picture + Level 4
6 (2/17 and 2/19)	Big picture	Big picture + Level 5
7 (2/24 and 2/26)	Big picture	Big picture + Level 6
– (3/3 and 3/5)	Spring recess	Spring recess
8 (3/10 and 3/12)	Big picture	The Normal Equation
9 (3/17 and 3/19)	<i>Challenge Level 2</i>	Gram-Schmidt Process
10 (3/24 and 3/26)	Eigenstuff + Level 7	Eigenstuff
11 (3/31 and 4/2)	Determinants + Level 8	Determinants
12 (4/7 and 4/9)	Eigenstuff + Level 9	Eigenstuff
13 (4/14 and 4/16)	Eigenstuff	SVD
14 (4/21 and 4/23)	<i>Challenge Level 3</i> + Level 10	SVD
15 (4/28)	SVD	—

Final Boss Level: Monday, May 4, 1:30 pm to 4:15 pm, in Angell B112.

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 Monday, January 12 to Wednesday, April 29.
2. Add/Drop, Audit, Pass/No Pass deadline—Monday, January 26.
3. Last day to withdraw—Monday, March 27.
4. Reading and Exam period—Thursday, April 30 to Friday, May 8.

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/cses/> 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.