September 23, 2016

Intro to Matrix Methods

In this class:

- *The importance of matrix methods in applications*
- *Surprising places that matrix methods arise*
- *Why matrix multiplication shows up so often in problems*
- *(And why linear systems show up so often too!)*

Next class

Matrix Multiplication
G&C – Chapter 2 + Chapter 7

Next next class

Solving Ax = b
G&C – Chapter 7

Matrix methods

Matrix multiplication	$\mathbf{AB} = \mathbf{C}$
Linear systems	$\mathbf{Ax} = \mathbf{b}$
Eigenvalue problems	$\mathbf{Ax} = \lambda\mathbf{x}$

Everything in the world can be explained by a matrix, and we see how deep the rabbit hole goes

The talk ends, you believe -- whatever you want to.

Image from rockysprings, deviantart, CC share-alike

Gene Golub

Charles van Loan

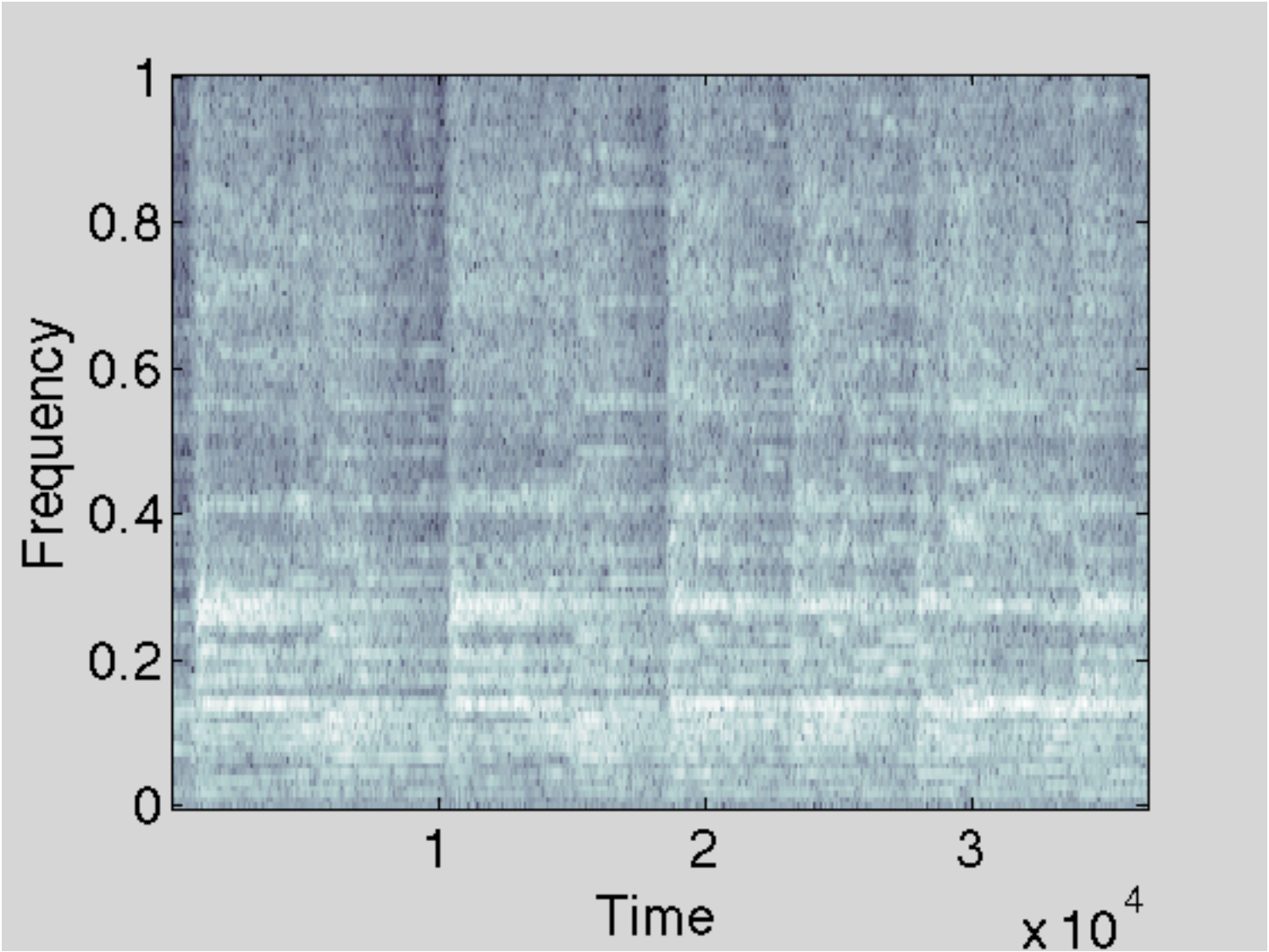
MATRIX COMPUTATIONS

4TH EDITION

Matrix methods are everywhere!

… let's play "stump the prof!" …

Example MP3s



These are just matrix-vector products

“

These two filter banks are simple

conceptually, but real mammoths mathematically – at least the synthesis filter bank. We will treat them as black boxes.”

http://blog.bjrn.se/2008/10/lets-build-mp3-decoder.html

http://physbam.stanford.edu/~fedkiw/

http://physbam.stanford.edu/~fedkiw/animations/buoyancy.mp4

A cornerstone of scientific simulations.

(In Unit 3, we'll use Matrix Methods heavily!)

Outline of topics

Matrix multiplication

Solving linear systems

Conditioning – Floating point v2!

Least squares problems

Eigenvalue problems

Iterative methods