Lecture 24:
The End...

Outline:

1) Course Review: putting it all together

2) The Future: two great directions

A) Linear PDE's: from the discrete to the continuous
(finite dimensional to infinite dimensional vector spaces)

B) Scientific Computation & Numerical methods:
from the continuous to the discrete

Course Overview: the big picture: short form

subject:	Linear Systems	Least Squares	Eigen Problems
Equations:	$A\underline{x}=\underline{b}$	$A^TA\underline{x}=A^T\underline{b}$	$A\underline{x}=\lambda\underline{x}$
Algorithms:	Elimination (Gauss,GJordan)	Gram-Schmidt	factor $P(\lambda)=\lvert A-\lambda I\rvert$ Find $N(A-\lambda_i I)$
Factorizations:	$PA=LU$ $PA=LDL^T$ $A=CC^T$	$A = QR$	$AS = S\Lambda$ $A = S\Lambda S^{-1}$ $A = Q\Lambda Q^T$ $A = U\Sigma V^T$
Theory:	Invertibility and A^{-1} Vector Spaces/Subspaces 4 Subspaces of A General solutions to $A\underline{x}=\underline{b}$	Orthogonality Projections Projection Matrices Q Matrices	Eigenvalues/Eigenvec The Determinant Diagonalization Symmetric Matrices The SVD
Applications:	Solving Linear systems e.g. Spring Block	Least Squares fitting of functions Finding Projections	Matrix Powers A^n Iterative Maps: e.g. Fibonacci Dynamical Systems e.g. R&J Total Least Squares EOF Analysis

Course Overview: the big picture: short form

subject: Linear Systems

Equations: $A\underline{x}=\underline{b}$

Algorithms: Elimination (Gauss,GJordan)

Factorizations:
$PA=LU$
$PA=LDL^T$
$A=CC^T$

Theory:
Invertibility and A^{-1}
Vector Spaces/Subspaces
4 Subspaces of A
General solutions to $A\underline{x}=\underline{b}$

Applications:
Solving Linear systems
e.g. Spring Block

Course Overview: the big picture: short form

subject: Least Squares

Equations: $A^TA\underline{x}=A^T\underline{b}$

Algorithms: Gram-Schmidt

Factorizations: $A = QR$

Theory:
Orthogonality
Projections
Projection Matrices
Q Matrices

Applications:
Least Squares fitting of functions
Finding Projections

Course Overview: the big picture: short form

subject: Eigen Problems

Equations: $A\underline{x}=\lambda\underline{x}$

Algorithms: factor $P(\lambda)=|A-\lambda I|$
Find $N(A-\lambda_i I)$

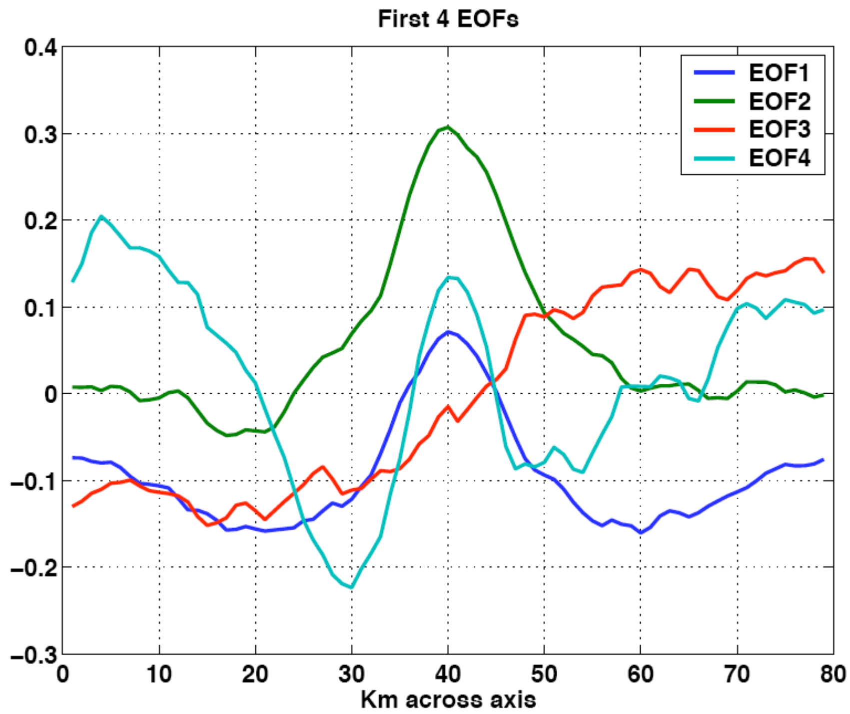
Factorizations: $AS = S\Lambda$
$A = S\Lambda S^{-1}$
$A = Q\Lambda Q^T$
$A = U\Sigma V^T$

Theory:
Eigenvalues/Eigenvectors
The Determinant
Diagonalization
Symmetric Matrices
The SVD

Applications: Matrix Powers A^n
Iterative Maps:
e.g. Fibonacci
Dynamical Systems
e.g. R&J
Total Least Squares
EOF Analysis

The Future, Part I: From discrete to Continous (PDE's)

First 4 EOF's



The Future, Part II: From Continuous to discrete, Numerical methods and scientific computing