Quiz #1 Preparation Guide

Orthogonal Projector

- What is an orthogonal projector?
- What is an orthogonal matrix?
- Suppose we have a unit vector v. What is the orthogonal projector that projects to range(v)?
- Suppose we have an ortho-normal matrix Q (with orthogonal and normalized columns). What is the orthogonal projector that projects to range(Q)?
- Suppose we have a matrix A. What is the orthogonal projector that projects to range(A)?

Householder Reflector and QR factorization

- How does Householder reflector accomplish QR factorization?
- Given a vector x, what is the Householder reflector that maps x to the first axis?
- What's the FLOP count of Householder QR factorization?

Conditioning and Backward Stability

- What's conditioning & backward stability?
- Why is forward error bounded by backward error times κ?
- Is the simple running sum algorithm for computing inner product of two vectors $x^T y = \sum_{i=1}^{n} x_i y_i$ backward stable?

LU factorization

- How to use LU factorization to solve a linear system?
- How to use LU factorization to invert a square non-singular matrix A?
- What's the cost of LU factorization? How does it compare to Householder QR factorization on the same matrix?

QR Algorithm for Eigenvalue Decomposition

- How does QR algorithm work?
- What's the cost of one iteration in QR algorithm?
- What's the convergence rate of QR algorithm?