

Abbreviated List of Topics Since Exam 1

You can have 30 sq inches of notes- Either as the front and back of a 3×5 card, or as one side of 5×6 sheet, etc. You may also use a calculator (you will only need it for arithmetic).

- Understand the process of gradient descent, and be able to compute the directional derivative.
- Data Clustering
 - K-means clustering: Be able to do a simple example by hand. Also, understand how LBG works.
 - Neural Gas: Know the update rule and the heuristics behind it.
- Statistics (mean, median, variance, covariance, covariance matrix, correlation coefficient, centering and double centering data). We had some exercises with the covariance and correlation coefficient.
- Linear Regression (line of best fit): Find the line of best fit, understand what the normal equations are and how they are used. Know what the error is that we're minimizing.
- Linear Neural Networks
 - Widrow-Hoff algorithm: Data scaling example from the homework.
 - Batch Algorithm: Solve using the normal equations (also see below) and be able to solve using Matlab's "slash" command.
- Working with orthogonal or orthonormal vectors.

Find the coordinates of $\mathbf{x}$ with respect to a given basis.

Know how to project a vector $\mathbf{x}$ into a given subspace.

Know that vectors have two representations: One given by the basis, and the other given by the coordinates.
- The Four Fundamental Subspaces

Given matrix A , find bases for the row space, column space and null space of A (we typically don't work with the null space of A^T very often).
- Projections

Vector onto a vector; Vector onto a subspace (orthonormal column vectors); Vector onto the column space of A (non-orthogonal columns). Find the distance from a vector to a plane (or subspace).
- Eigenvalues and Eigenvectors (to be determined)
- The Singular Value Decomposition (to be determined)