COMPUTER SCIENCE

UNIT I WEEK 5, TUESDAY MAY 15TH + THURSDAY MAY 17TH

WWW.CITA.UTORONTO.CA/~WOODFORD

WOODFORD@CITA.UTORONTO.CA

FINAL PROJECTS

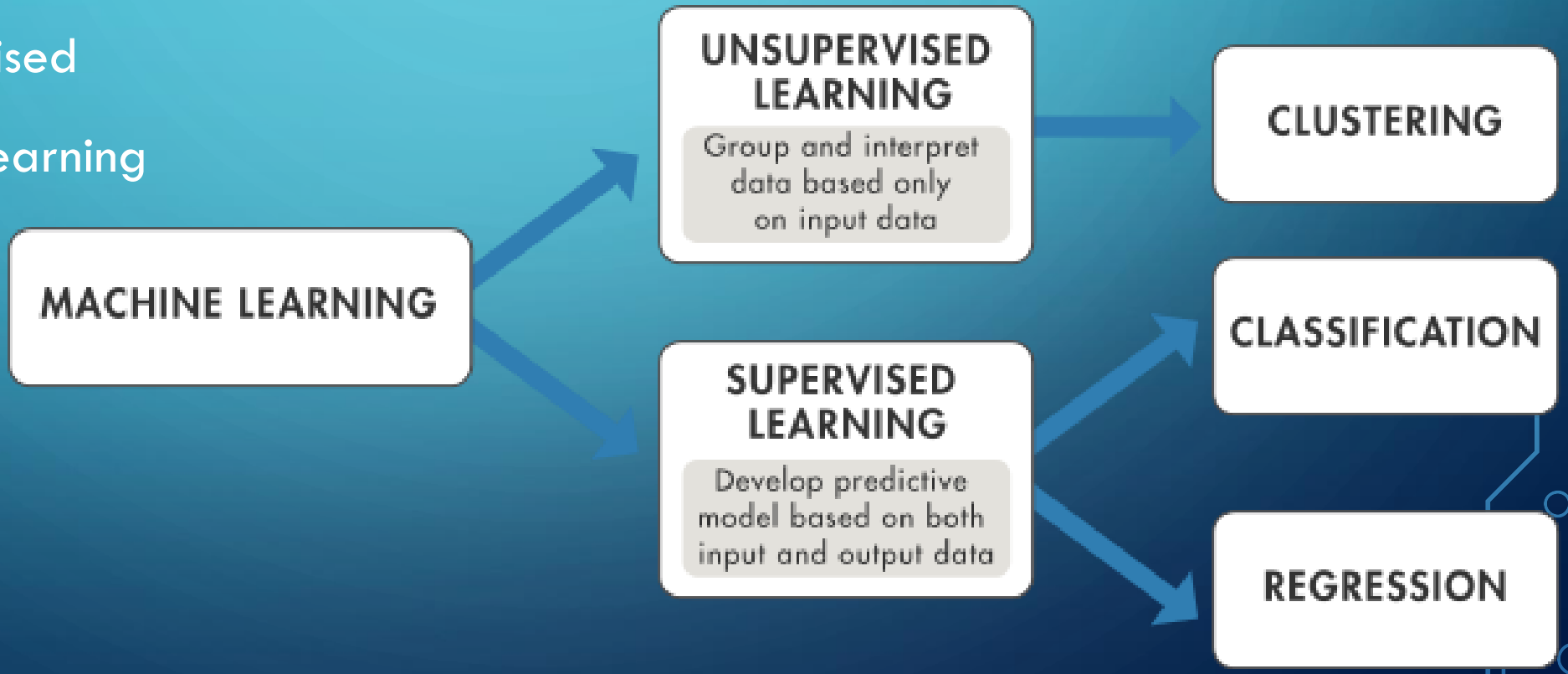
- 3 different project descriptions, you need to:
  - Complete the coding, using all of the skills we've learned
  - Write user documentation
  - Write a report
  - Give a 10 minute presentation showcasing your work (last day of classes, June 5th)
- Due dates:
  - ~~Pick your project (1 of the 3 given): April 3rd – tell me in person or in email!~~
  - **Update your github account regularly as you add sources, make changes, and code.**
  - Submit Report, code, supporting documents: June 4th at midnight
  - Give presentation: June 5th in class

STUDENT-LED LESSONS

- The last 2-3 classes will be based on what YOU want to learn about relating to Computer Science.
- Aim for 1/3 -½ class per student, maximum of 2 topics per student.
- **Send your topics to me by May 15th . Looking at May 24, 29 for topic discussions.**

TYPES OF MACHINE LEARNING

- Supervised
- Unsupervised
- Semi-supervised
- Reinforced learning



SUPERVISED MACHINE LEARNING TECHINQUES

- Classification: support vector machine (SVM), boosted and bagged decision trees, k-nearest neighbour, naïve bayes, discriminant analysis, logistic regression, neural networks.

- Regression: linear model, nonlinear model, regularization, stepwise regression, boosted and bagged decision trees, neural networks, adaptive neuro-fuzzy learning.

UNSUPERVISED MACHINE LEARNING TECHNIQUES

- Clustering: k-means and k-mediods, hierarchical clustering, Gaussian misture models, hidden Markov models, self-organizing maps, fuzzy c-means clustering, subtractive clustering

POPULAR METHODS

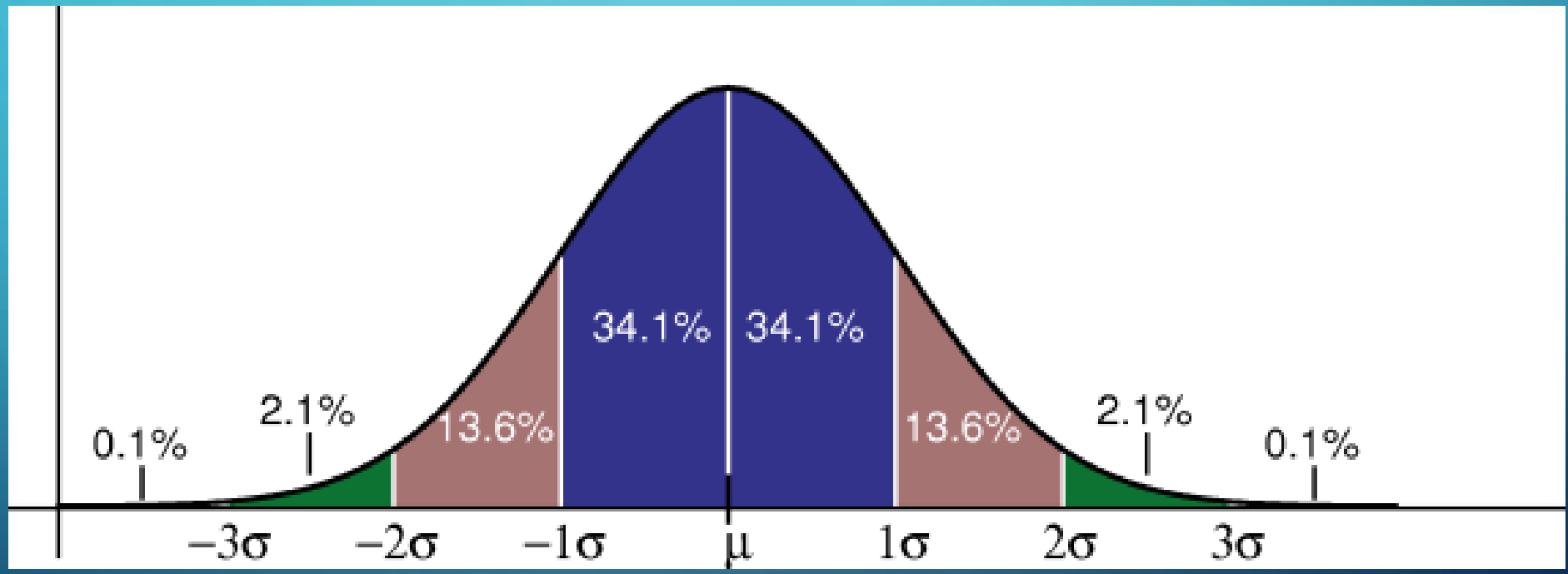
- Support Vector Machines (SVM)
- Bagged and Boosted Decision Trees
- K-nearest neighbour
- Linear Regression
- Logistic Regression
- Naïve Bayes
- Linear Discriminant Analysis
- K-means
- Dimensionality reduction
- Neural Networks

NAÏVE BAYES

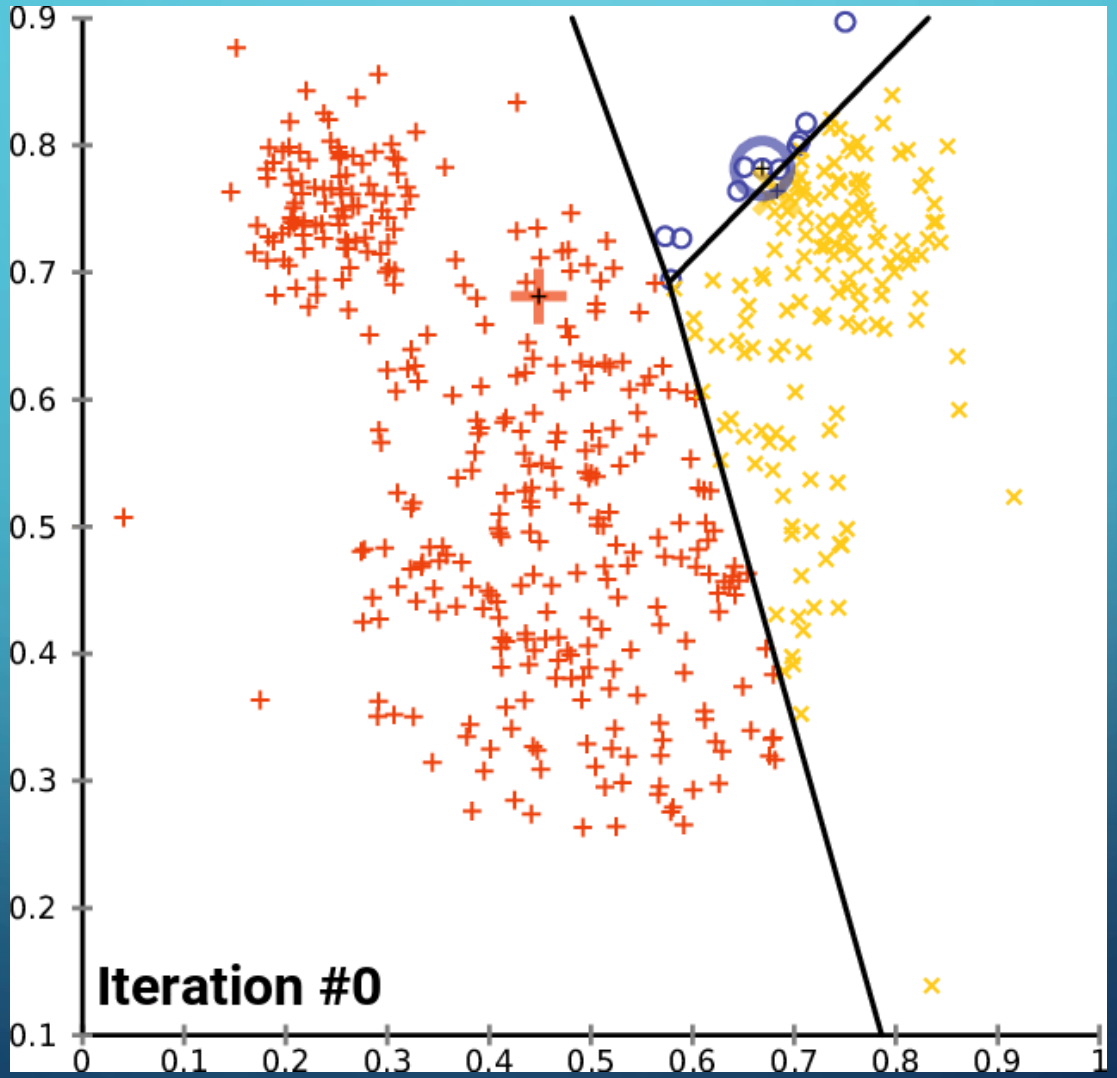
- Bayes' Theorem:

$$P(h|d) = \frac{P(d|h) * P(h)}{P(d)}$$

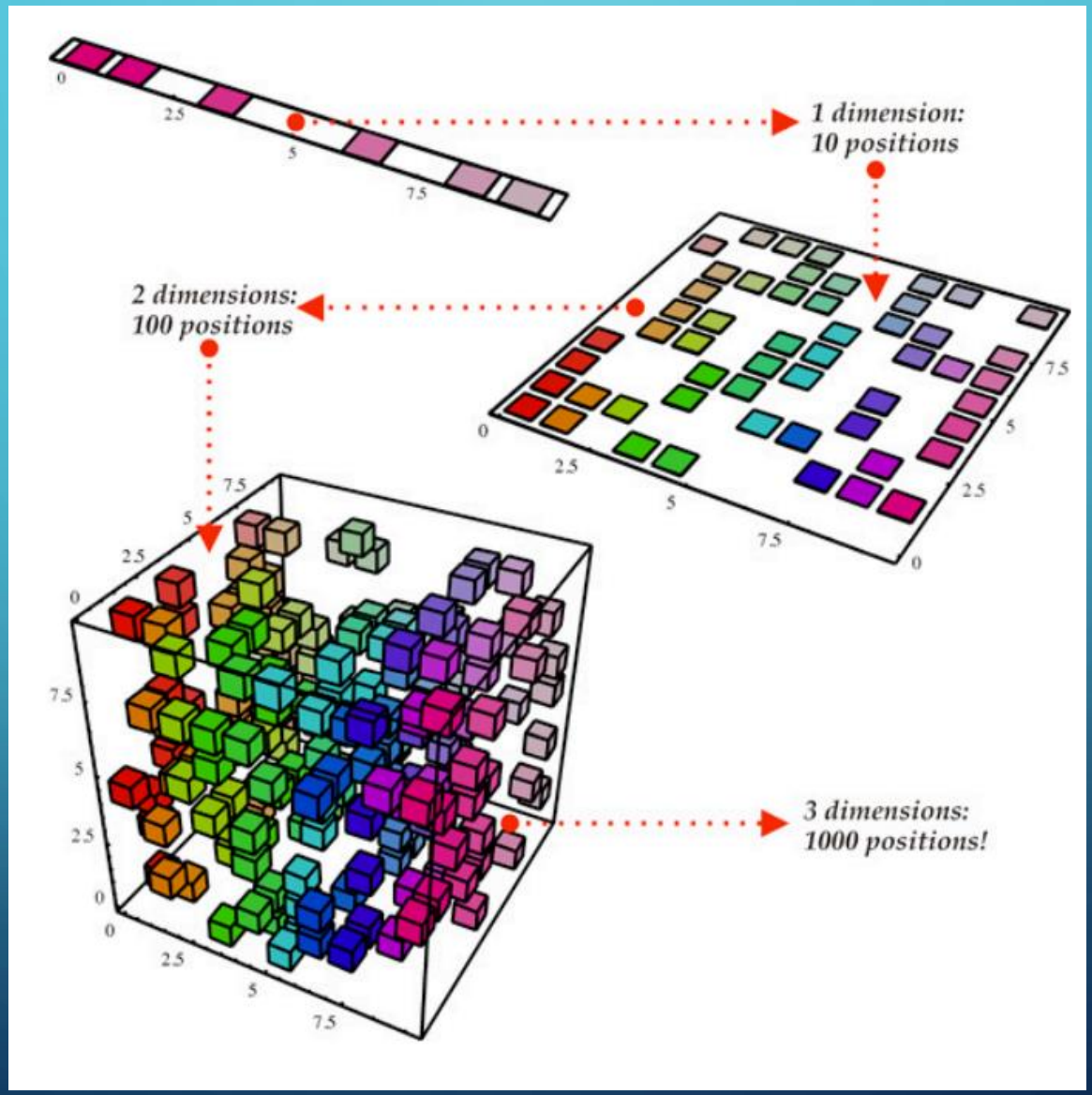
LINEAR DISCRIMINANT ANALYSIS



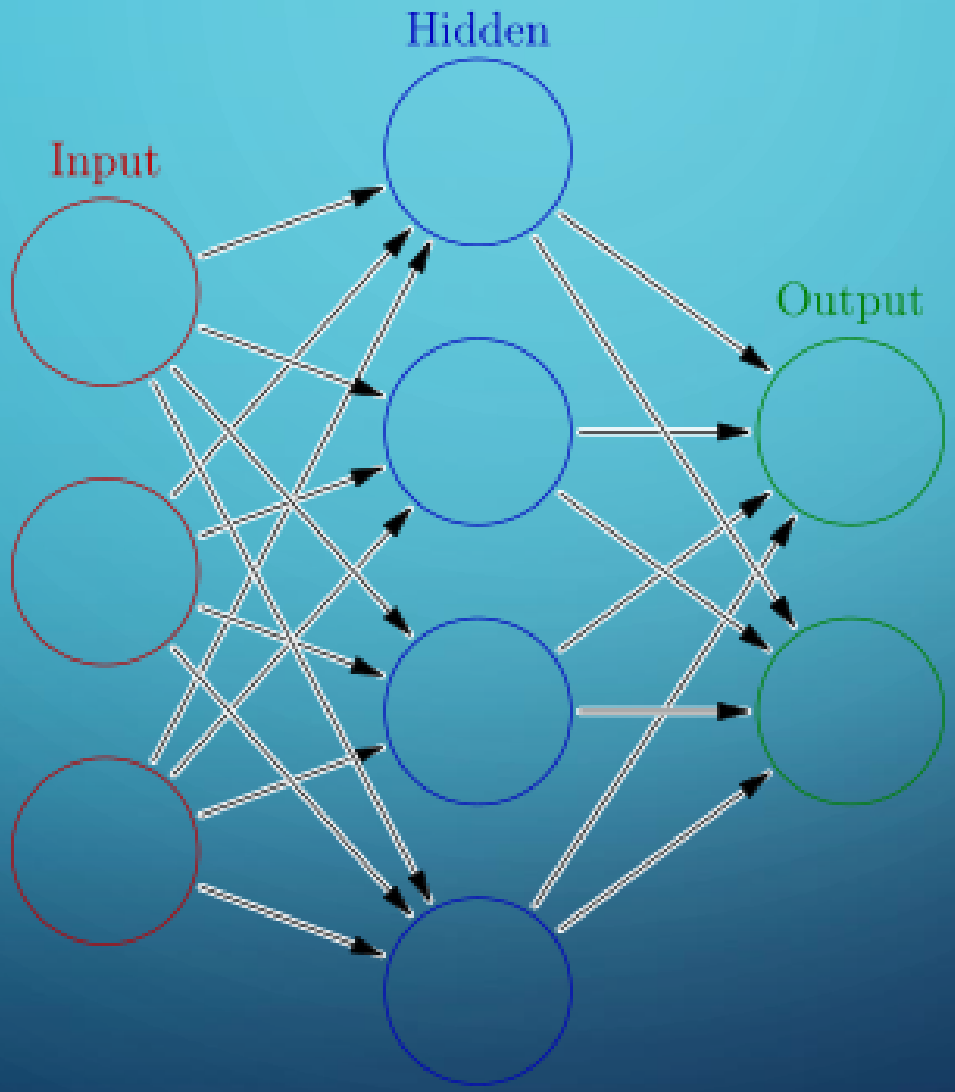
K-MEANS



DIMENSIONALITY REDUCTION



NEURAL NETWORKS



REFERENCES AND RESOURCES

- https://developers.google.com/machine-learning/crash-course/prereqs-and-prework
- https://machinelearningmastery.com/naive-bayes-for-machine-learning/
- http://blog.aylien.com/naive-bayes-for-dummies-a-simple-explanation/
- https://machinelearningmastery.com/linear-discriminant-analysis-for-machine-learning/
- https://arxiv.org/abs/1511.04707
- https://www.datascience.com/blog/k-means-clustering
- https://www.analyticsvidhya.com/blog/2015/07/dimension-reduction-methods/
- http://www.turingfinance.com/artificial-intelligence-and-statistics-principal-component-analysis-and-self-organizing-maps/
- https://www.doc.ic.ac.uk/~nd/surprise_96/journal/vol4/cs11/report.html
- https://www.youtube.com/watch?v=aircAruvnKk
- http://neuralnetworksanddeeplearning.com/ ← free book!
- https://towardsdatascience.com/the-mostly-complete-chart-of-neural-networks-explained-3fb6f2367464 ← nice charts for various ANNs