**IN402 Unit 4 Seminar**

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* Support Vector Machine (SVM)
  + Support Vector Regression (SVR)
    - A regression extension of SVM
    - Finds hyperplane that maximizes the margin around the predicted values
    - Can handle both linear and non-linear relationships
* Generalized Linear Model (GLM)
  + Extend linear regression
  + Allows the dependent variable to follow a distribution other than the normal distribution
  + Can handle various types of data
    - Binary
    - Count (Poisson Regression)
    - Categorical
* We should not keep adding more and more predictors to the model
  + The model should be as concise as possible
  + There are trade-offs
    - More variables can help make predictions more accurate to real world observations
    - The model can become too bulky and cumbersome to use if too many predictors are used, though
    - We must find the best combination of the right number of predictors and accuracy
  + We should look for co-linearity between variables to reduce the number needed
    - Reduces redundancy
* Lasso-regression
  + Can be used to handle co-linearity
  + Adds penalty term and shrinks some coefficients to zero
  + Leads to sparse models
* Elastic net regression
  + rarely seen
  + Combines ridge and lasso regression
  + Effective with data sets that have a large number of features
* Decision trees
  + Non-parametric regression method
  + Splits the data based on feature values to make predictions
  + Handles both continuous and categorical data
  + Used in ensemble methods
    - Random forest
    - Gradient Boosting
* SVR Kernel Functions
  + Linear kernel
    - Simplest function
    - Used when the relationship between the features and the target variable is linear
  + Polynomial Kernel
    - Can model non-linear relationships
    - More flexible
    - Degree of the polynomial can be adjusted to control the complexity of the model
  + RBF Kernel
    - AKA Gaussian
    - Popular choice for SVR
    - More flexible than polynomial kernels
  + Sigmoid kernel
    - Less common than the linear kernel
    - Can model non-linear relationships
    - Less flexible than RBF
* Hyperplane
  + A plane that is 3 dimensions or more
  + Becomes a line when reduced to 2 dimensions
    - Straight line or curved
      * Curved is a polynomial relationship
* Bayesian regression
  + Incorporates prior knowledge or beliefs about the data
  + Similar to getting second and third opinions from different doctors
* Frequencies
  + Traditional statistics
  + Different mindset than Bayesian
* Neural Networks
  + Gained popularity recently
  + Can capture complex patterns
  + Requires large amounts of resources for training
* SVM Python
  + Use kernel argument to get the different versions
  + Ex: clf = svm.SVC(kernel=’linear’)
* SVM
  + Hyperplane is reduced to line or curve in 2D space
  + No standard way to draw the line
    - We look to maximize the margin of the observations/classes
* Datacamp.com SVM tutorial
  + SVM Offers high accuracy compared to other classifiers
  + Can handle non-linear input spaces
  + Uses in face and intrusion detection
  + Included in the scikit-learn Python package
* SVM is an algorithm
  + Classifier separates data points using a line or hyperplane
  + Considered a discriminative classifier
  + The hyperplane is generated in an iterative manner
    - Minimizes error
* Support Vectors
  + Data point which are closest to the hyperplane
* Margin
  + The gap between the two lines on the closest class points
  + Calculated as the perpendicular from the line to support vectors or closest points
  + Large margins are better than smaller margins
* Inseparable planes
  + Transform data to find the linear relationship
  + z = x2 + y2
* Logistic regression in Python
  + Works with binary response variables
    - Y value is zero or one
    - Data most likely needs to be transformed to support this
  + X variable can be any value