Shiny App Walkthrough

Simulation

1. Start at QDA:
   1. See that intersections of densities is roughly where decision boundaries lie and that they are quadratic
2. Set lambda = 0.5
   1. We’ve begun to pool some covariance and the quadratic decision boundaries our slowing unfolding into linear
3. Set lambda = 1
   1. Now we are at LDA, single intersection on the gaussians leading to a linear boundary
4. Set gamma = 1
   1. Causes rotation in the linear boundary (this is the effect of adding scalar covariance to the diagonal)
   2. Predictions now characterized by the means of the mixture densities
   3. Independent LDA which is same contours for each group.
   4. Assumes independence of predictors in a group
5. Set lambda = 0.5
   1. Moving towards independent QDA, so we see linear boundaries curving into quadratics.
6. Set lambda = 0
   1. Now at independent QDA, creates contours that are circular with different volumes
   2. Here in terms of decision boundary adding to the diagonal resulted in more circular decision boundaries when compared to QDA, which should make sense it’s a diagonal covariance matrix

EDA

* Malignant and benign has pretty distinct boundaries and values are distributed fairly normal
* Measurements:
  + radius\_mean: The average of tumor radius.
  + texture\_mean: The average of texture values for the tumor.
  + perimeter\_mean: The average perimeter of the tumor.
  + area\_mean: The average area of the tumor.
  + smoothness\_mean: The average smoothness of the tumor boundary.
  + compactness\_mean: The average compactness of the tumor, indicating how closely the tumor cells are packed together.
  + concavity\_mean: The average severity of concave portions of the contour of the tumor.
  + concave.points\_mean: The average number of concave portions of the tumor contour.
  + symmetry\_mean: The average symmetry of the tumor.
  + fractal\_dimension\_mean: The average fractal dimension of the tumor, which characterizes the complexity of the tumor boundary.

PCA & NMF

* PCA
  + PC1 loads heavy in:
    - Concave.points\_mean
    - Comcavity\_mean
  + It’s a concavity vector
  + PC2 loads heavy in
    - Radius mean
    - Perimeter mean
    - Area mean
  + It’s tumor Shape vector
  + More pooling of covariance, some amount of diagonal added
* NMF
  + V2 loads heavy in concavity
  + V3 loads heavy in shape again and fractal\_dimension\_mean
  + Independent QDA