Comp 551 Assignment 3
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All Parameter tested are 0.00001, 0.0001, 0.001, 0.01, 0.1, 1, 10, 100, 1000 and 10000.

Yelp

Validation f1-measure

- Best Bernoulli Naive Bayes validation f1-measure: 0.413109637653621
  - Obtained at alpha = 0.01
- Best Gaussian Naive Bayes validation f1-measure: 0.29237439463776815
- Best SVM Bag of words validation f1-measure: 0.48780633736872003
  - Obtained at C = 0.01
- Best SVM Bag of frequency validation f1-measure: 0.4882976993661879
  - Obtained at C = 100
- Best Decision Tree Bag of words validation f1-measure: 0.34872356922850845
  - Obtained at max depth of 10
- Best Decision Tree Bag of frequency validation f1-measure: 0.3907368652210626
  - Obtained at max depth of 10

Training f1-measure

- Bernoulli Naive Bayes training f1-measure at best alpha: 0.7502393423348799
- Gaussian Naive Bayes training f1-measure: 0.8077916059661376
- SVM Bag of words training f1-measure at best C: 0.8408856489275267
- SVM Bag of frequency training f1-measure at best C: 0.8795874257831433
- Decision Tree Bag of words training f1-measure at best max depth: 0.4981599437858736
- Decision Tree Bag of frequency training f1-measure at best max depth: 0.523773079475586

Test f1-measure

- Random classifier test f1-measure: 0.23746167753661265
- Majority classifier test f1-measure: 0.18238490007401925
- Bernoulli Naive Bayes test f1-measure at best alpha: 0.4281582001950195
- Gaussian Naive Bayes test f1-measure: 0.31125108465640666
- SVM Bag of words test f1-measure at best C: 0.4943772600025794
- SVM Bag of frequency test f1-measure at best C: 0.4958803703811586
- Decision Tree Bag of words test f1-measure at best max depth: 0.35160149692692766
- Decision Tree Bag of frequency test f1-measure at best max depth: 0.36699717695337747

IMDB

Validation f1-measure

- Best Bernoulli Naive Bayes validation f1-measure: 0.8426650700722068
  - Obtained at alpha = 0.1

- Best Gaussian Naive Bayes validation f1-measure: 0.7513922734965905
- Best SVM Bag of words validation f1-measure: 0.8747957881303126
  - Obtained at C = 0.01
- Best SVM Bag of frequency validation f1-measure: 0.8785929875309597
  - Obtained at C = 100
- Best Decision Tree Bag of words validation f1-measure: 0.7105956664444624
  - Obtained at max depth of 10
- Best Decision Tree Bag of frequency validation f1-measure: 0.701489066096874
  - Obtained at max depth of 10

Training f1-measure

- Bernoulli Naive Bayes training f-measure at best alpha: 0.870294063564018
- Gaussian Naive Bayes training f-measure: 0.8621070566038361
- SVM Bag of words training f-measure at best C: 0.9632663360636912
- SVM Bag of frequency training f-measure at best C: 0.9460661371559866
- Decision Tree Bag of words training f-measure at best max depth: 0.7594146771119565
- Decision Tree Bag of frequency training f-measure at best max depth: 0.7662780306255659

Test f1-measure

- Random classifier test f1-measure: 0.2506872783776246
- Bernoulli Naive Bayes test f-measure at best alpha: 0.5283347652692814
- Gaussian Naive Bayes test f-measure: 0.6862657359207126
- SVM Bag of words test f-measure at best C: 0.8692383427790609
- SVM Bag of frequency test f-measure at best C: 0.8741199981873279
- Decision Tree Bag of words test f-measure at best max depth: 0.7124566274296956
- Decision Tree Bag of frequency test f-measure at best max depth: 0.7083284152893591

Comments:
2&3. All three classifiers do better than majority classifier or random classifier, with SVM having the best performance around 0.49 and decision tree classifier having the worst performance around 0.35. Representation does not impact much within the same type of classifier except in Naïve Bayes: Bernoulli has a much better performance than Gaussian.

4. In general, all three classifiers do better in IMDB dataset. SVM still has the best performance but this Naïve Bayes has the worst. Again, representation doesn't impact much except in Naïve Bayes, although this time, Gaussian has a much higher f1-measure than Bernoulli.