Using the wine dataset:

- Train 2 SVM classifiers to predict the type of wine using a subset of the other 13 variables. You may choose the subset based on previous analysis. One using a linear kernel and another of your choice.
  - Use tune.svm to find the optimum C and gamma values.

```
> cat("\n[Linear SVM] Best C =", svm.linear$cost, "\n")

[Linear SVM] Best C = 0.0625

> cat("\n[RBF SVM] Best C =", svm.rbf$cost, " | Best gamma =", svm.rbf$gamma, "\n")

[RBF SVM] Best C = 0.5  | Best gamma = 0.125
>
================ TRAIN ================
> cat("\nLinear SVM Confusion Matrix:\n"); print(res.lin.tr$cm); print(res.lin.tr$metrics)

Linear SVM Confusion Matrix:
      Predicted
Actual  1  2  3
     1 40  2  0
     2  0 50  0
     3  0  1 33
      class precision recall      f1
1         1    1.0000 0.9524 0.9756
2         2    0.9434 1.0000 0.9709
3         3    1.0000 0.9706 0.9851
4 macro_avg    0.9811 0.9743 0.9772
> cat("\nRBF SVM Confusion Matrix:\n");    print(res.rbf.tr$cm); print(res.rbf.tr$metrics)
```

```
> cat("\nRBF SVM Confusion Matrix:\n");    print(res.rbf.tr$cm); print(res.rbf.tr$metrics)

RBF SVM Confusion Matrix:
      Predicted
Actual  1  2  3
     1 41  1  0
     2  0 49  1
     3  0  1 33
      class precision recall      f1
1         1    1.0000 0.9762 0.9880
2         2    0.9608 0.9800 0.9703
3         3    0.9706 0.9706 0.9706
4 macro_avg    0.9771 0.9756 0.9763
```

- Choose another classification method (kNN, Random Forest, etc.) and train a classifier based on the same features.

```
> cat("\nRandom Forest Confusion Matrix:\n"); print(res.rf.tr$cm);  print(res.rf.tr$metrics)

Random Forest Confusion Matrix:
      Predicted
Actual  1  2  3
     1 42  0  0
     2  0 50  0
     3  0  0 34
      class precision recall f1
1         1         1      1  1
2         2         1      1  1
3         3         1      1  1
4 macro_avg         1      1  1
```

- Compare the performance of the 2 models (Precision, Recall, F1)

```
==== Test Macro-Average (Precision / Recall / F1) ====
> print(cmp)
              precision recall     f1
SVM-linear       0.9512 0.9365 0.9416
SVM-RBF          0.9815 0.9841 0.9823
RandomForest     0.9815 0.9841 0.9823
```

The RBF SVM and Random Forest achieved comparable performance (macro F1 ≈ 0.98), outperforming the Linear SVM (F1 ≈ 0.94). This suggests nonlinear models better capture the complex relationships among selected wine features.