How do we classify data for three classes with SVM?

Suppose we have k classes. We have the

1. One vs. all approach: we form k new datasets where in each dataset the k-th class has label 0 (or -1) and all other classes have label 1. We then create k classifiers for each dataset. We classify a test datapoint x by picking the class with the largest w^Tx+w_0.
2. All vs. all approach: here we form k choose 2 classifiers. For each pair of classes (i,j) we create a new dataset where data points from class i have label 0 (or -1) and points from class j have label 1. We learn k choose 2 classifiers on each dataset. We classify a test point as the majority prediction of the k choose 2 classifiers.
3. Tree based approach. Suppose we have four classes C1, C2, C3, and C4. In the tree based approach we decide to partition the classes into two sets. Suppose that set is {C1,C3}, {C2, C4}. We then build a classifier to separate C1 and C3 from C2 and C4. We then recurse this idea to the smaller subsets until we have just one class left at each tree leave.