ML Toolbox

Over- and Under-Sampling

Over- and under-sampling

Dealing with class imbalance in model training

- Post-hoc adjustments of class composition in training data
- Over-sampling
  - Sample cases of the minority class with replacement
- Under-sampling
  - Draw a random sample of the majority class
- Create synthetic minority instances
- **Hybrid techniques**

→ Evaluation data should still reflect class imbalance

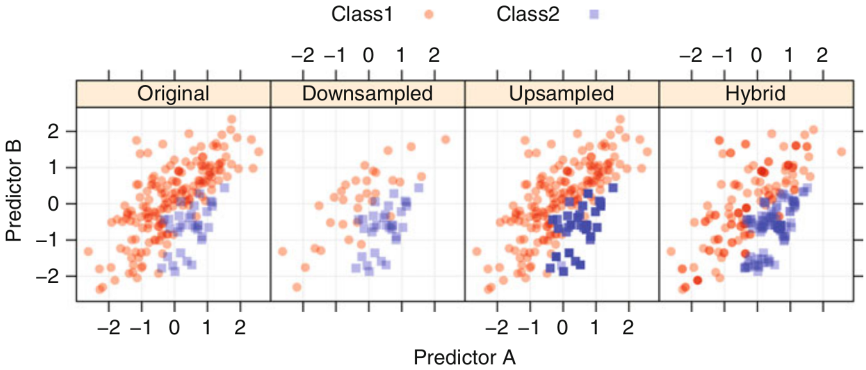
SMOTE

A synthetic minority over-sampling technique (SMOTE)

1. Initialize SMOTE
   - Set the number of neighbors K, number of iterations N
2. For each minority instance T and N
   1. Find the K nearest neighbors of the minority instance
   2. Sample one of the K nearest neighbors
   3. Multiply the distance between the sampled neighbor and T by a random number $\{0, 1\}$
   4. Create a synthetic minority instance at the coordinate of step 3
3. Optional: Combine w. down-sampling of the majority class

Comparison

Figure: Down-sampling, up-sampling, SMOTE[1]



[1] Kuhn and Johnson (2013)

Software Resources

Resources for R

- `caretEnsemble`
  1. Create a list of caret models via `caretList`
  2. Combine with `caretEnsemble` or `caretStack`
- `SuperLearner`, `subsemble`
- `smotefamily`, `DMwR`

References

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