Improving Nearest Neighbor Classification using Ensembles of Evolutionary Generated Prototype Subsets

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Prototype selection (PS)
- Preprocessing step: select a subset of useful learning instances
- Remove noise and redundancy
- Commonly used with nearest-neighbor classification

State-of-the-art: genetic PS algorithms
High reduction + high prediction performance of subsequent classifier

Drawback
Many candidate subsets are constructed, but only one is used in the end

Subsets that are not globally optimal could still perform well in certain regions
\rightarrow use a diverse ensemble of well-performing prototype subsets

Ensemble of Evolutionary Generated Prototype Subsets (EEGPS)

Training data

Prototype sets encountered by genetic PS method

Portion of best-performing subsets

Diverse ensemble members

Test element

Classification with weighted voting

Ensemble members are weighted based on their performance in the neighborhood of the test element

Summary of results

Framework evaluated for 4 genetic PS algorithms:
- Significantly better classification performance within EEGPS
- Fewer generations are needed to obtain improvements
- Increase in computational cost is negligible
- Other genetic approaches can be easily plugged in

EEGPS: intelligent use of the work performed by a genetic PS method to boost its performance at a minimal cost