SHOGUN - A Large Scale Machine Learning Toolbox

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We have developed R-bindings for our machine learning toolbox SHOGUN, which features algorithms for hidden markov models, regression and classification problems. SHOGUN's focus is on Support Vector Machines, but also implements a number of linear methods like Linear Discriminant Analysis, Linear Programming Machines and Perceptrons. It provides a generic SVM interface enabling the choice between fifteen different SVM optimizers as back-ends, among them the state of the art LibSVM [1] and SVMlight [4], SVMOcas [3] or Liblinear [2]. The SVMs can be easily combined with more than 35 different kernel functions (see http://www.shogun-toolbox.org/doc). Moreover, it offers options for using precomputed kernels and easily allows the integration of custom kernels. One of SHOGUN’s key features is the combined kernel to construct weighted linear combinations of multiple kernels that may even be defined on different input domains and learned using Multiple Kernel Learning (MKL) algorithms, e.g., [3][7]. Input feature objects can be dense or sparse vectors of strings, integers (8, 16, 32 or 64 bit; signed or unsigned), or floating point numbers (32 or 64 bit), and can be converted into different feature types. Chains of “pre-processors” (e.g., subtracting the mean) can be attached to each feature object allowing on-the-fly pre-processing. Finally, several commonly used performance measures for evaluation (e.g., area under ROC) are implemented.

A central aspect in the design of SHOGUN was to enable large-scale learning. We implemented auxiliary routines that allow faster computation of combinations of kernel elements that lead to significant speedups during training and evaluation [6] enabling us to solve several large-scale learning problems in biological sequence analysis [3][6][8] involving millions of sequences. Furthermore, linear SVMs can be efficiently trained by computing feature spaces on-the-fly, even allowing to mix sparse, dense and other data types.

All of SHOGUN’s core functions are encapsulated in a library (libshogun) and are easily accessible and extendible by C++ application developers. Built around SHOGUN’s core we provide two types of R interfaces: A modular interface created with SWIG [1] and a static interface. However, note that interfaces are available from C++ to other languages, such as Python, Octave and Matlab™. SHOGUN’s source code is freely available under the GNU General Public License at http://www.shogun-toolbox.org

References
