PermonSVM
- supervised machine learning for binary classification problems
- solves dual soft-margin SVM problem
- designed for HPC platforms
- alternative to LIBLINEAR
- MPI LIBLINEAR
- uses PermonQP during training procedure
- SMALXE + solver for box constrained QP
- scalable up to tens of thousands of CPU cores, billions of unknowns
- specific modules
- PETSc extension

HIGGS dataset
Training set contains 2.05M data with 28 features, testing set contains 300k data. Achieved accuracy: 64.57% (PermonSVM), 44.72% (Multi-core LIBLINEAR), 59.65% (Tanhcore). 10,648 training epochs.

Workflow:
1. Perform Drop-Weight Test, scan fracture surface as point cloud and create mesh.
2. Extract normal vector characteristics of ground truth and train SVM.
3. Use SVM model to detect types of fractures on whole surface.

Ground truth supervised learning
Detections of brittle and ductile fractures on C60 shocked against A150 shocked.

URL dataset
Training set contains 2.4M data with 3.2M features. Achieved accuracy on training set: 50.51% (PermonSVM), 56.20% (Multi-core LIBLINEAR), 60.90% (Noncore). 4.permonQp
- framework for quadratic programming (QP)
- easy-to-use / HPC-oriented
- solves dual soft-margin QP problem
- QP problems, transforms, solvers
- automatic/manual choice of an appropriate solver

Nonparametric big data time series de-noising, modelling & clustering
- PERMON is used as inner QP solver in nonparametric time-series analysis in C++ developed by group of Ivan Kerenko (UfA Leiden).
- popular FEM-H1 methodology is based on elimination of regularized average clustering functional with respect to linear equality and box constraints
- the method identifies the locally stationary models on clusters and the parameters of these models
- the case of the problem is given by the number of clusters multiplied with the length of given time series
- long time series cannot be operated in one node, the PETSc parallel vectors and regularization matrices come into play

Linear elasticity problem

Contact problem