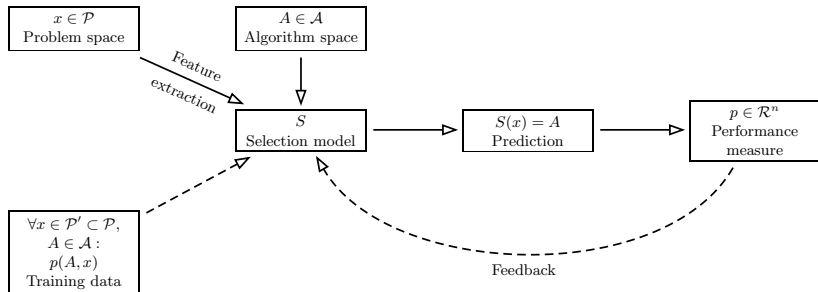


aslib: An Algorithm Selection Library

Bernd Bischl and Lars Kotthoff

29 September 2014

Algorithm Selection



Kotthoff, Lars. "Algorithm Selection for Combinatorial Search Problems: A Survey." AI Magazine, 2014.

- ▷ problem instance features, algorithm performance on instances, cost for feature computation, status of runs, partitioning into train/test
- ▷ ARFF format
- ▷ R package to read, process, convert (<https://github.com/berndbischl/coseal-alsel-benchmark-repo>)
- ▷ support for stochastic features and algorithms

Bernd Bischl, Pascal Kerschke, Lars Kotthoff, Marius Lindauer, Yuri Malitsky, Alexandre Fréchet, Holger Hoos, Frank Hutter, Kevin Leyton-Brown, Kevin Tierney, and Joaquin Vanschoren. “ASlib: A Benchmark Library for Algorithm Selection.” Under review.

Benchmark library

- ▷ currently 13 data sets/scenarios
- ▷ SAT, CSP, QBF, ASP, MAXSAT, OR
- ▷ includes data used frequently in the literature that you may want to evaluate your approach on
- ▷ more scenarios in the pipeline

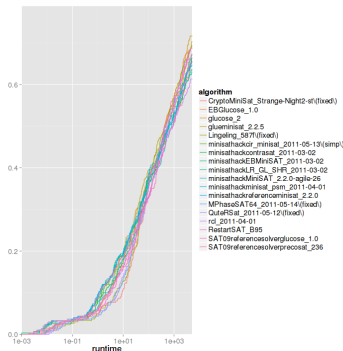
`http://aslib.net`

Algorithm Selection Benchmark Library

Task Name	Instances	Algorithms	Features	Type	Stoch. Feat.	Stoch. Alg.	Feature Costs
ASP-POTASSCO	1294	11	138	runtime	FALSE, max. reps = 1	FALSE, max. reps = 1	TRUE
CSP-2010	2024	2	86	runtime	TRUE, max. reps = 1	FALSE, max. reps = 1	FALSE
MAXSAT12-PMS	876	6	37	runtime	FALSE, max. reps = 1	FALSE, max. reps = 1	TRUE
PREMARSHALLING-ASTAR-2013	527	4	16	runtime	FALSE, max. reps = 1	FALSE, max. reps = 1	FALSE
QBF-2011	1368	5	46	runtime	FALSE, max. reps = 1	FALSE, max. reps = 1	FALSE
SAT11-HAND	296	15	115	runtime	FALSE, max. reps = 1	FALSE, max. reps = 1	TRUE
SAT11-JNDU	300	18	115	runtime	FALSE, max. reps = 1	FALSE, max. reps = 1	TRUE
SAT11-RAND	600	9	115	runtime	FALSE, max. reps = 1	FALSE, max. reps = 1	TRUE
SAT12-ALL	1614	31	115	runtime	FALSE, max. reps = 1	FALSE, max. reps = 1	TRUE
SAT12-HAND	767	31	115	runtime	FALSE, max. reps = 1	FALSE, max. reps = 1	TRUE
SAT12-JNDU	1167	31	115	runtime	FALSE, max. reps = 1	FALSE, max. reps = 1	TRUE
SAT12-RAND	1362	31	115	runtime	FALSE, max. reps = 1	FALSE, max. reps = 1	TRUE

Overview of algorithm performance

- ▷ runstatus
- ▷ performance plots
- ▷ (cumulative) density plots
- ▷ scatter plot for pairs of algorithms
- ▷ algorithm performance correlation



Selector performance comparison

- ▷ (basic) classification, regression, clustering selectors
- ▷ different machine learning techniques
- ▷ comparison to virtual best and single best

algo	model	succ	par10	mcp
baseline	vbs	0.843	8187.518	0.000
baseline	singleBest	0.670	16844.813	857.295
baseline	singleBestByPar	0.717	14605.904	718.386
baseline	singleBestBySuccesses	0.717	14605.904	718.386
classif	meta/AdaBoostM1	0.717	14713.518	685.975
classif	bayes/BayesNet	0.717	14713.518	685.975
classif	lazy/lBk	0.730	13975.956	548.414
classif	rules/OneR	0.707	15195.778	718.235
classif	trees/RandomTree	0.703	15288.122	660.579
classif	trees/J48	0.717	14817.880	590.137
classif	rules/JRip	0.717	14859.980	632.438
classif	classif.ctree	0.710	15030.375	702.832
classif	classif.ksvm	0.717	14666.165	638.623
classif	classif.naiveBayes	0.683	16293.808	766.265
classif	classif.randomForest	0.740	13513.452	535.909
classif	classif.rpart	0.713	14870.554	693.011
regr	regr.lm	0.733	13818.060	540.517
regr	regr.rpart	0.697	15610.789	683.247
regr	regr.randomForest	0.750	12941.271	413.728
regr	regr.earth	0.707	15211.937	734.395
cluster	EM	0.717	14713.518	685.975
cluster	FarthestFirst	0.713	14880.059	702.516
cluster	SimpleKMeans	0.717	14713.518	685.975

Points for discussion

- ▷ send us your data!
- ▷ tool support
- ▷ stochastic algorithm/feature runs
- ▷ Aslib/Aclib synergies
- ▷ integration with OpenML
- ▷ what to do with results?