

Module/framework/package	Name and brief description of algorithm	An example of a situation where using the provided GLM implementation provides superior performance compared to that of base R or its equivalent in Python (identify the equivalent in Python)
Base R	The Iteratively Reweighted Least Squares (IWLS) method applies weighted least squares regressions in a series to find optimal solutions for log-likelihood functions. Supports multiple families (e.g., Gaussian, Binomial, Poisson). The optimization process uses successive updates which lead to maximum likelihood estimate convergence.	IWLS provides efficient results for small datasets and also works well with medium-sized datasets that use simple statistical models. The computational requirements of this method become excessively high when working with either extensive datasets or complex high-dimensional data. L-BFGS in the logistic regression implemented by Scikit-learn together with Dask-ML's parallelized methods show superior efficiency when working with extensive datasets.
Big Data version of R	The biglm package together with ff and bigmemory and RcppParallel tools enable processing of datasets exceeding memory capacity. The optimization methods in Base R stay consistent but parallel computation and memory-efficient data handling improve their performance.	The system offers superior performance for handling datasets that exceed memory capacity which enables Base R scalability. In Python programmers use Dask or PySpark for equivalent functionality. Large datasets can receive incremental GLM fittings through biglm package implementation and distributed model fitting through Dask-ML.
Dask ML	The distributed data arrays benefit from scalable implementations through Alternating Direction Method of Multipliers (ADMM), Gradient Descent, L-BFGS	The system delivers enhanced performance on big distributed datasets because it utilizes parallel processing together with out-of-core computation capabilities.

	and Newton's Method. The package enables users to select from L1, L2 and ElasticNet regularizers. The software utilizes distributed computing power to achieve better results during large dataset processing.	Dask-ML provides superior functionality to scikit-learn because it distributes computations across multiple workers to process data exceeding memory capacity. The capability to work with high-dimensional and sparse datasets becomes more efficient through this approach.
Spark R	IRLS operates within the distributed computation framework of Apache Spark. The algorithm supports five statistical distribution families: Gaussian, Binomial, Poisson, Gamma and Tweedie. The system allows users to process large datasets at high speed and with scalability features.	The system delivers exceptional results when processing distributed data across a Spark cluster. Large datasets perform much better through SparkR due to its distributed capabilities which surpasses the scalability of Base R and scikit-learn. The fitting of complex GLMs becomes more efficient when operating on large clusters.
Spark optimization	Two optimization primitives called Stochastic Gradient Descent (SGD) and Limited-memory BFGS (L-BFGS) function specifically for massive machine learning operations. Supports various regularization techniques (L1, L2). The online learning process benefits from SGD but L-BFGS shows better performance for batch processing because of its quick convergence speed.	This algorithm proves optimal for distributed system training of large-scale models. L-BFGS achieves faster convergence than SGD when dealing with well-conditioned problems. Small batches enable optimal optimization of massive datasets to perform better than Base R's traditional execution.
Scikit-Learn	Gradient Descent, L-BFGS, Newton-CG, SAG, SAGA: Implements a variety of optimization algorithms for GLMs. The tool supports L1, L2 and ElasticNet regularization methods. The implementation with joblib allows parallel processing	The package works best for datasets of medium size and provides strong implementation capabilities alongside hyperparameter optimization features. The speed of Base R single-threaded execution improves when users apply

	that enhances execution speed when dealing with medium-scale datasets.	parallelization through joblib. Dask and Spark offer better scalability than this solution for processing extremely large datasets.
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