H2O4GPU

H2O4GPU Platform Powered by GPUs for Lightning-Fast Model Building

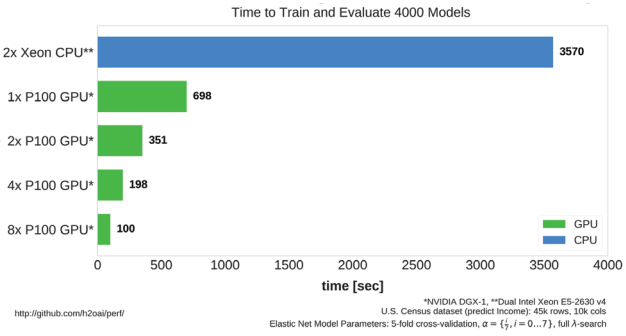
H2O4GPU is an open-source collection of GPU solvers created by H2O.ai. It builds on the easy-to-use scikit-learn API and its well-tested CPU-based algorithms. It can be used as a drop-in replacement for scikit-learn with support for GPUs on selected (and ever-growing) algorithms. H2O4GPU inherits all the existing scikit-learn algorithms and falls back to CPU algorithms when the GPU algorithm does not support an important existing scikit-learn class option.

Today, select algorithms are GPU-enabed. These include Gradient Boosting Machines (GBM's), Generalized Linear Models (GLM's), and K-Means Clustering.

Gradient Linear Model (GLM)

- Framework utilizes Proximal Graph Solver (POGS)
- Solvers include Lasso, Ridge Regression, Logistic Regression, and Elastic Net Regularization

Generalized Linear Modeling



SPECIFICATIONS

Software

- PC with Ubuntu 16.04+
- Install CUDA with bundled display drivers CUDA 8 or CUDA 9

Hardware

- Nvidia GPU with Compute Capability >= 3.5

H2O4GPU ROAD MAP

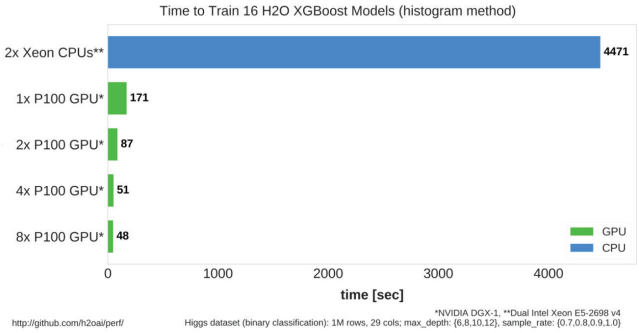
Coming Q4 2017

- k-Nearest Neighbors
- PCA
- SVD
- Quantiles
- Kalman Filters
- Sort
- Aggregator
- API Support:
  - R API for training & scoring
  - GOAI API support
  - Data.table
- Performance & Scalability:
  - Fastest single GPU performance
  - Multi GPU
  - Multi machine

Coming 2018–19

- Kernel Methods
- Recommendation Engines - Non-Negative Matrix Factorization Recommendation Engines - Bayesian Neural Nets
- MCMC Solver
- Time Series
- SVM
- Text Analysis-TF-IDF
- Text Analysis - Word2Vec
- Text Analysis -0oc2Vec
- Automatic K for K-means
- H20 GLM - Lasso
- Simulation Techniques
- Sampling Techniques
- Domain Specific Algorithms:
  - Life Sciences
  - Financial Services Underwriting
  - Sampling Techniques

Gradient Boosting Machines



- Improvements to original implementation of POGS:
  - Full alpha search
  - Cross Validation
  - Early Stopping
  - Added scikit-learn-like API
  - Supports multiple GPU's

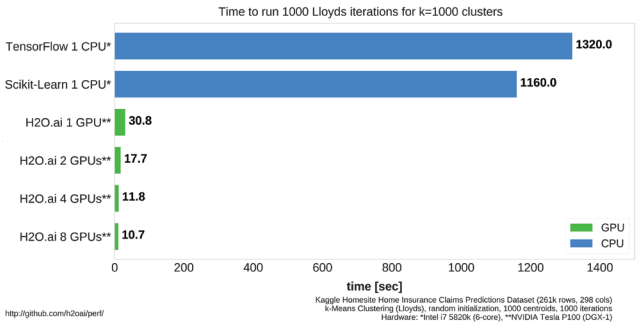
Gradient Boosting Machines

- Based on XGBoost
- Raw floating point data — binned into quantiles
- Quantiles are stored as compressed instead of floats
- Compressed quantiles are efficiently transferred to GPU
- Sparsity is handled directly with high GPU efficiency
- Multi-GPU enabled by sharing rows using NVIDIA NCCL AllReduce

k-Means Clustering

- Based on NVIDIA prototype of k-Means algorithm in CUDA
- Improvements to original implementation:
  - Significantly faster than scikit-learn implementation (50x) and other GPU implementations (5-10x)
  - Supports multiple GPU's

k-Means Clustering



RESOURCES

- **Github:** https://github.com/h2oai/h2o4gpu
- **FAQ:** https://github.com/h2oai/h2o4gpu/blob/master/FAQ.md

About H2O.ai

H2O.ai is focused on bringing AI to businesses through software. Its flagship product is H2O, the leading open source platform that makes it easy for financial services, insurance and healthcare companies to deploy machine learning and predictive analytics to solve complex problems. More than 12,000 organizations and 129,000+ data scientists depend on H2O for critical applications like predictive maintenance and operational intelligence. The company accelerates business transformation for 169 Fortune 500 enterprises, 8 of the world's 12 largest banks, 7 of the 10 largest auto insurance companies and all 5 major telecommunications providers.

Follow us on Twitter @h2oai. To learn more about H2O customer use cases, please visit http://www.h2o.ai/customers/. Join the Movement.

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