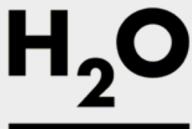


Agency Performance

Writing Premiums

Open Source



In-memory, distributed machine learning algorithms with H2O Flow GUI



H2O AI open source engine integration with Spark

- 100% open source – Apache V2 licensed
- Built for data scientists – interface using R, Python on H2O Flow (interactive notebook interface)
- Enterprise support subscriptions

H2O Driverless AI



Automatic feature engineering, machine learning and interpretability

- Enterprise commercial software
- Built for data scientists
- GUI-based interface for end-to-end data science
- Fully automated machine learning from ingest to deployment
- User licenses on a per seat basis annually

H2O Q



A new and innovative platform to make your own AI apps.

- Enterprise commercial software
- AI platform for business users
- Easy and intuitive platform to have AI answer your question



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H2O-3's AutoML

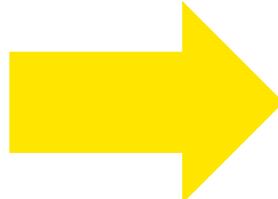
What's in the AutoML box?

- Works with Python / R / Java / H2O Flow
- Horizontally Scalable* and Time Based
- Hyperparameter Tuning (Random Grid)
- Algorithms:
 - XGBoostGBM
 - GBM
 - Deep Learning
 - Distributed Random Forests
 - GLM
 - Stacked Ensemble

* XGBoostGBM is turned off by default for multi-node

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 - Distributed Random Forests
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 - Stacked Ensemble



MOJO

* XGBoostGBM is turned off by default for multi-node

What's in the AutoML box?

H2O's AutoML can also be a helpful tool for the advanced user, by providing a simple wrapper function that performs a large number of modeling-related tasks that would typically require many lines of code, and by freeing up their time to focus on other aspects of the data science pipeline tasks such as data-preprocessing, feature engineering and model deployment.

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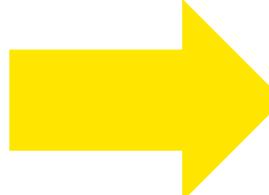
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Driverless AI

What's in the Driverless AI box?

- GUI based / Python & R Clients / BYOR
- Vertically Scaling / CPU & GPU based
- Hyperparameter Tuning (Evolutionary as part of GA)
- Feature Engineering / AutoDoc / Machine Learning Interpretability (Shapley / LIME)
- Algorithms:
 - XGBoostGBM / GBM
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 - TensorFlow (CNN)
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 - FTRL
 - Stacked Ensemble
- 
- Python
MOJO Java
MOJO C++
1 Click Deploy



Kaggle Dataset

Agency Premiums

Variable	Description
AGENCY_ID	A unique identifier associated with an application.
PRIMARY_AGENCY_ID	Numerical features
PROD_ABBR	Categorical features
PROD_LINE	Numerical features
STATE_ABBR	Target (numerical) / Optimize for M.A.E.e
STAT_PROFILE_DATE_YEAR	Integer
RETENTION_POLY_QTY	Integer
POLY_INFORCE_QTY	Integer
PREV_POLY_INFORCE_QTY	Integer
NB_WRTN_PREM_AMT	Real
WRTN_PREM_AMT	Target (Real)
... (more)	
PL_QUO_CT_TRANSACTNOW	

Reference: <https://www.kaggle.com/moneystore/agencyperformance>



H2O-3 AutoML Experiment

H2O-3 AutoML – 1 Hour Training

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Leaderboard

Stop Monitoring

MODELS

models sorted in order of mae, best first

	<i>model_id</i>	<i>mae</i>	<i>mean_residual_deviance</i>	<i>rmse</i>	<i>mse</i>	<i>rmsle</i>
0	XGBoost_1_AutoML_20200126_153739	2683.8662437947305	48055304.80764425	6932.193361963026	48055304.80764425	NaN

EVENT LOG

H2O-3 AutoML – 1 Hour Training

H₂O.ai

Leaderboard

Stop Monitoring

MODELS

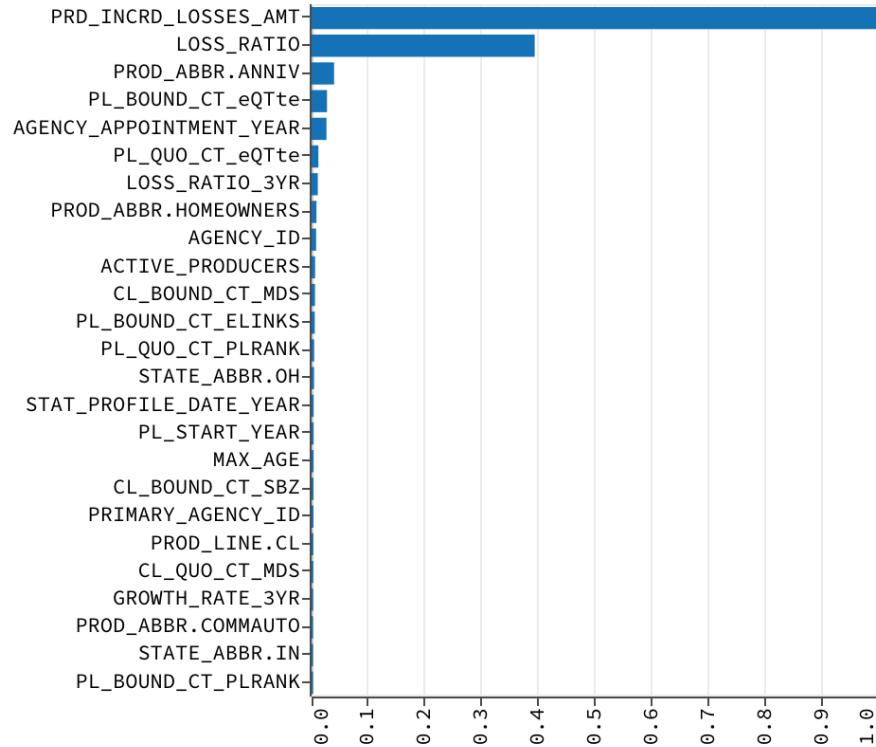
models sorted in order of mae, best first

	model_id	mae	mean_residual_deviance	rmse	mse	rmsle
0	XGBoost_1_AutoML_20200126_153739	2683.8662437947305	48055304.80764425	6932.193361963026	48055304.80764425	NaN

EVENT LOG

H2O-3 AutoML – Features

▼ VARIABLE IMPORTANCES



H2O-3 AutoML – 1 Hour Training w/ Folds

Leaderboard

Monitor Live

MODELS

models sorted in order of mae, best first

	model_id	mae	mean_residual_deviance	rmse	mse	rmsle
0	StackedEnsemble_AllModels_AutoML_20200128_171435	3661.294443847665	94376357.36240146	9714.749475020004	94376357.36240146	NaN
1	XGBoost_3_AutoML_20200128_171435	3697.151999736542	102781757.80253713	10138.13384220869	102781757.80253713	NaN
2	StackedEnsemble_BestOfFamily_AutoML_20200128_171435	3763.2494107699986	95853351.4999336	9790.472486041397	95853351.4999336	NaN
3	XGBoost_grid__1_AutoML_20200128_171435_model_2	3879.048312811359	121193055.15031584	11008.771736679611	121193055.15031584	NaN
4	XGBoost_1_AutoML_20200128_171435	4149.2270906491	156409911.9974652	12506.394844137347	156409911.9974652	NaN
5	XGBoost_2_AutoML_20200128_171435	4667.720617776581	168649843.14361936	12986.52544538451	168649843.14361936	NaN
6	XGBoost_grid__1_AutoML_20200128_171435_model_1	4683.560722372561	185060633.2236255	13603.699247764393	185060633.2236255	NaN
7	GBM_5_AutoML_20200128_171435	6135.29549185922	342890067.3794399	18517.291037822997	342890067.3794399	NaN
8	GBM_2_AutoML_20200128_171435	6426.011160030356	285467474.42389137	16895.782740787457	285467474.42389137	NaN
9	GBM_4_AutoML_20200128_171435	6549.037144854731	363116383.42181987	19055.6129112086	363116383.42181987	NaN
10	XGBoost_grid__1_AutoML_20200128_171435_model_3	6676.487142628055	427542548.665482	20677.102037410416	427542548.665482	NaN
11	GBM_3_AutoML_20200128_171435	6942.3039460469145	365676186.2198628	19122.661588279567	365676186.2198628	NaN
12	GBM_1_AutoML_20200128_171435	8010.405270091331	481615022.4198858	21945.729024570723	481615022.4198858	NaN
13	DRF_1_AutoML_20200128_171435	8766.719528004702	801647113.8970932	28313.373410759326	801647113.8970932	NaN
14	XRT_1_AutoML_20200128_171435	9275.987020439321	908645529.8223033	30143.747773332754	908645529.8223033	NaN
15	GBM_grid__1_AutoML_20200128_171435_model_1	12047.87900729233	1146882089.1935673	33865.647626962156	1146882089.1935673	NaN
16	DeepLearning_1_AutoML_20200128_171435	13491.612170825018	1540483012.071318	39248.9874018594	1540483012.071318	NaN

H2O-3 AutoML – 1 Hour Training w/ Folds

Leaderboard

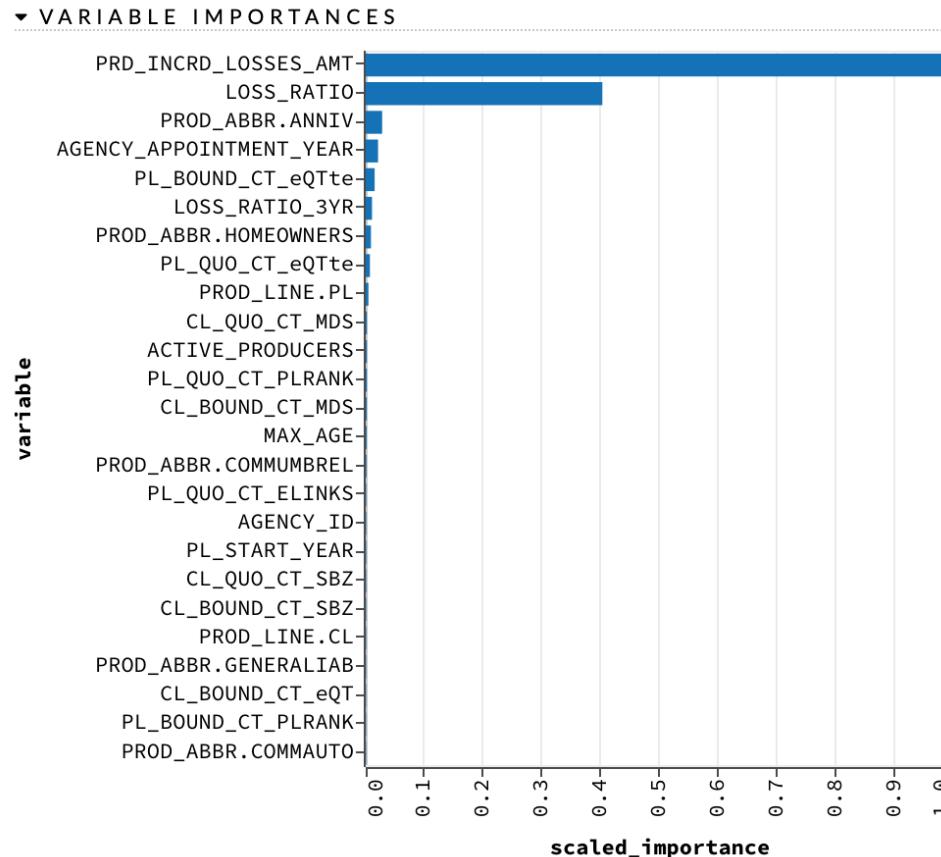
Monitor Live

MODELS

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0	StackedEnsemble_AllModels_AutoML_20200128_171435	3661.294443847665	94376357.36240146	9714.749475020004	94376357.36240146	NaN
1	XGBoost_3_AutoML_20200128_171435	3697.151999736542	102781757.80253713	10138.13384220869	102781757.80253713	NaN
2	StackedEnsemble_BestOfFamily_AutoML_20200128_171435	3763.2494107699986	95853351.4999336	9790.472486041397	95853351.4999336	NaN
3	XGBoost_grid__1_AutoML_20200128_171435_model_2	3879.048312811359	121193055.15031584	11008.771736679611	121193055.15031584	NaN
4	XGBoost_1_AutoML_20200128_171435	4149.2270906491	156409911.9974652	12506.394844137347	156409911.9974652	NaN
5	XGBoost_2_AutoML_20200128_171435	4667.720617776581	168649843.14361936	12986.52544538451	168649843.14361936	NaN
6	XGBoost_grid__1_AutoML_20200128_171435_model_1	4683.560722372561	185060633.2236255	13603.699247764393	185060633.2236255	NaN
7	GBM_5_AutoML_20200128_171435	6135.29549185922	342890067.3794399	18517.291037822997	342890067.3794399	NaN
8	GBM_2_AutoML_20200128_171435	6426.011160030356	285467474.42389137	16895.782740787457	285467474.42389137	NaN
9	GBM_4_AutoML_20200128_171435	6549.037144854731	363116383.42181987	19055.6129112086	363116383.42181987	NaN
10	XGBoost_grid__1_AutoML_20200128_171435_model_3	6676.487142628055	427542548.665482	20677.102037410416	427542548.665482	NaN
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15	GBM_grid__1_AutoML_20200128_171435_model_1	12047.87900729233	1146882089.1935673	33865.647626962156	1146882089.1935673	NaN
16	DeepLearning_1_AutoML_20200128_171435	13491.612170825018	1540483012.071318	39248.9874018594	1540483012.071318	NaN

H2O-3 AutoML – Features (Fold training)





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Driverless Experiments

Driverless Experiments

- Generate 4 Experiments
 - Experiment #1: 6/5/5 Default Settings
 - Experiment #2: 6/5/5 Default Settings + BYOR
 - Experiment #3: 6/5/5 Default Settings + State Folds
 - Experiment #4: 6/5/5 Default Settings + State Folds + BYOR
- Run on 1 GPU / Approximately 2 to 4 hours
- Compare Features Side by Side

Driverless Experiments

EXPERIMENTS

[COMPARE](#)[UNLINK ITEMS](#)[+ LINK EXPERIMENT](#)[NEW EXPERIMENT](#)

1. SELECT SCORING DATASET

1. Select Scoring Dataset

2. SELECT EXPERIMENTS

0 items selected.

3. SCORE DATASET ON EXPERIMENTS

[SCORE ITEMS](#)

SELECT SCORER FOR TEST SCORE

Select Scorer

<input type="checkbox"/>	Name	A	T	I	Scorer	Status	Train Time	Val. Score	Test Score	Test Time	<input type="checkbox"/>
<input type="checkbox"/>	1. Default	6	5	5	MAE	Completed	03:42:06	1504	NA	N/A	<input type="checkbox"/>
<input type="checkbox"/>	2. Default w/ R...	6	5	5	MAE	Completed	03:48:46	1469	NA	N/A	<input type="checkbox"/>
<input type="checkbox"/>	3. Default w/ F...	6	5	5	MAE	Completed	02:57:02	2248	NA	N/A	<input type="checkbox"/>
<input type="checkbox"/>	4. Default w/ F...	6	5	5	MAE	Completed	02:23:23	2627	NA	N/A	<input type="checkbox"/>

Driverless Experiments

EXPERIMENTS

[COMPARE](#)[UNLINK ITEMS](#)[+ LINK EXPERIMENT](#)[NEW EXPERIMENT](#)

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[SCORE ITEMS](#)

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<input type="checkbox"/>	Name	A	T	I	Scorer	Status	Train Time	Val. Score	Test Score	Test Time	<input type="checkbox"/>
<input type="checkbox"/>	1. Default	6	5	5	MAE	Completed	03:42:06	1504	NA	N/A	<input type="checkbox"/>
<input type="checkbox"/>	2. Default w/ R...	6	5	5	MAE	Completed	03:48:46	1469	NA	N/A	<input type="checkbox"/>
<input type="checkbox"/>	3. Default w/ F...	6	5	5	MAE	Completed	02:57:02	2248	NA	N/A	<input type="checkbox"/>
<input type="checkbox"/>	4. Default w/ F...	6	5	5	MAE	Completed	02:23:23	2627	NA	N/A	<input type="checkbox"/>

Driverless Experiments – Experiment Summary

Compare Experiments

EXPERIMENT SUMMARY: 2. Default w/ Recipe

Experiment: 2. Default w/ Recipe (812c1b5e-4052-11ea-a89f-0242ac110002)

Version: 1.8.1.1, 2020-01-26 19:31

Settings: 6/5/5, seed=743578395, GPUs enabled

Train data: finalapi_processed.csv (213328, 43)

Validation data: N/A

Test data: N/A

Target column: WRTN_PREM_AMT (regression, sqrt-transformed)

System specs: Docker/Linux, 60 GB, 8 CPU cores, 1/1 GPU

Max memory usage: 2.58 GB, 1.41 GB GPU

Recipe: AutoDL (84 iterations, 4 individuals)

Validation scheme: random, 1 internal holdout

Feature engineering: 9459 features scored (223 selected)

Timing:

Data preparation: 12.53 secs

Shift/Leakage detection: 13.91 secs

Model and feature tuning: 4993.94 secs (33 models trained)

Feature evolution: 6467.97 secs (100 of 104 models trained)

Final pipeline training: 2092.91 secs (10 models trained)

Python / MOJO scorer building: 25.54 secs / 114.75 secs

Validation score: MAE = 3166.566 +/- 29.42803 (baseline)

Validation score: MAE = 1468.914 +/- 48.29178 (final pipeline)

Test score: MAE = N/A

EXPERIMENT SUMMARY: 3. Default w/ Fold

Experiment: 2. Default w/ Fold (8f91ce0a-4052-11ea-a89f-0242ac110002)

Version: 1.8.1.1, 2020-01-26 18:40

Settings: 6/5/5, seed=830417389, GPUs enabled

Train data: finalapi_processed.csv (213328, 42)

Validation data: N/A

Test data: N/A

Target column: WRTN_PREM_AMT (regression, log-transformed)

System specs: Docker/Linux, 60 GB, 8 CPU cores, 1/1 GPU

Max memory usage: 1.9 GB, 1.46 GB GPU

Recipe: AutoDL (82 iterations, 4 individuals)

Validation scheme: random, 1 internal holdout

Feature engineering: 4155 features scored (121 selected)

Timing:

Data preparation: 20.45 secs

Shift/Leakage detection: 19.61 secs

Model and feature tuning: 2155.96 secs (30 of 33 models trained)

Feature evolution: 6100.33 secs (98 of 104 models trained)

Final pipeline training: 2202.54 secs (10 models trained)

Python / MOJO scorer building: 47.45 secs / 69.34 secs

Validation score: MAE = 4595.101 +/- 36.96112 (baseline)

Validation score: MAE = 2248.428 +/- 275.437 (final pipeline)

Test score: MAE = N/A

Driverless Experiments – Experiment Summary

Compare Experiments

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Validation score: MAE = 4595.101 +/- 36.96112 (baseline)

Validation score: MAE = 2248.428 +/- 275.437 (final pipeline)

Test score: MAE = N/A

Driverless Experiments - Variable Importance

VARIABLE IMPORTANCE

213_NumToCatTE:CL_END_YEAR:LOSS_RATIO:MONTHS:PRD_INCRD_LOSS...	1.00
142_InteractionDiv:LOSS_RATIO:PRD_INCRD_LOSSES_AMT	0.56
261_NumToCatTE:CL_END_YEAR:LOSS_RATIO:PRD_INCRD_LOSSES_AMT,0	0.30
293_NumCatTE:AGENCY_APPOINTMENT_YEAR:AGENCY_ID:CL_BOUND_CT...	0.29
145_NumToCatTE:LOSS_RATIO:MONTHS:PL_QUO_CT_TRANSACTNOW:PR...	0.07
355_InteractionMul:LOSS_RATIO:PRD_INCRD_LOSSES_AMT	0.01
91_NumCatTE:ACTIVE_PRODUCERS:AGENCY_ID:LOSS_RATIO:PL_BOUND...	0.01
180_NumCatTE:LOSS_RATIO:MONTHS:PL_QUO_CT_TRANSACTNOW:PRD_I...	0.01
406_InteractionSub:CL_END_YEAR:PRD_INCRD_LOSSES_AMT	0.00
182_ClusterDist4:LOSS_RATIO:MONTHS,0	0.00
389_YEOJOHNSON:LOSS_RATIO	0.00
182_ClusterDist4:LOSS_RATIO:MONTHS,1	0.00

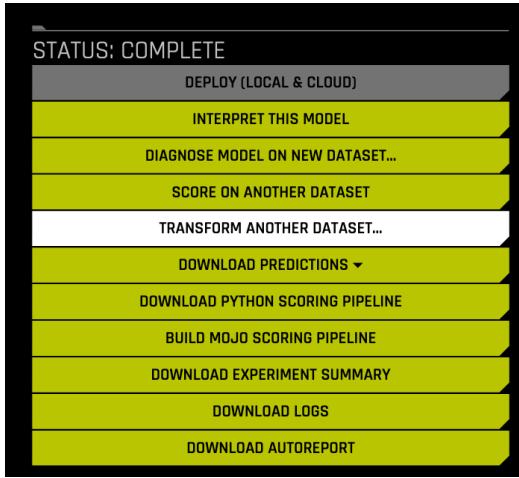
VARIABLE IMPORTANCE

238_NumToCatTE:AGENCY_ID:LOSS_RATIO:MONTHS:PRD_INCRD_LOSSE...	1.00
114_InteractionDiv:LOSS_RATIO:PRD_INCRD_LOSSES_AMT	0.44
188_NumToCatTE:LOSS_RATIO:MONTHS:PRD_INCRD_LOSSES_AMT,0	0.04
140_CVTE:AGENCY_ID:CL_QUO_CT_eQT:COMMISIONS_END_YEAR:MIN_AGE...	0.04
162_NumToCatTE:LOSS_RATIO:PL_BOUND_CT_eQTte,0	0.03
101_InteractionSub:LOSS_RATIO:PRD_INCRD_LOSSES_AMT	0.01
244 LOSS_RATIO	0.01
82_ClusterDist10:PRD_INCRD_LOSSES_AMT,9	0.01
102_CVCatNumEnc:COMMISIONS_END_YEAR:PL_BOUND_CT_eQTte:PROD...	0.01
106_ClusterDist8:LOSS_RATIO,0	0.00
66_CVTE:PROD_ABBR,0	0.00
102_CVCatNumEnc:COMMISIONS_END_YEAR:PL_BOUND_CT_eQTte:PROD...	0.00



Using Driverless AI Features in AutoML

Transform Dataset into Transformed Features



A	B	C	D	E	F
109_InteractionDiv:LOSS_RATIO:189_InteractionSub:LOSS_RATIO:I	52_NumToCatTE:LOSS_RATIO	55_NumCatTE:LOSS_RATIO	60_NumToCatTE:LOSS_RATIO	WRTN_PREM_AMT	
0	0	21.360285	21.259882	21.329409	6562.28
0	0	21.360208	21.260542	21.329409	6205.11
0	0	21.360285	21.259882	21.329845	5159.89
0.00020971	-8970.468409	21.374731	21.562307	21.364548	4768.49
0.000200477	-3525.213135	21.334133	21.616623	21.35139	4988.11
0	0	21.360208	21.259882	21.329954	4905.49

Load into AutoML and Run for 1 Hour

Leaderboard

Monitor Live

▼ MODELS

models sorted in order of mae, best first

	model_id	mae	mean_residual_deviance	rmse	mse	rmse
0	XGBoost_grid__1_AutoML_20200128_190923_model_5	2288.453139388171	45163608.44339454	6720.387521817067	45163608.44339454	Nan
1	StackedEnsemble_AllModels_AutoML_20200128_190923	2317.1087688255056	45956938.82264482	6779.154727740386	45956938.82264482	Nan
2	StackedEnsemble_BestOfFamily_AutoML_20200128_190923	2341.6173274204098	45905627.0730404	6775.3691466251785	45905627.0730404	Nan
3	XGBoost_2_AutoML_20200128_190923	2394.782287196682	50228400.2340675	7087.199745602455	50228400.2340675	Nan
4	XGBoost_grid__1_AutoML_20200128_190923_model_2	2396.055975073656	52459371.52154055	7242.884199097798	52459371.52154055	Nan
5	XGBoost_grid__1_AutoML_20200128_190923_model_1	2478.1741786531247	50763288.857441254	7124.836058285219	50763288.857441254	Nan
6	XGBoost_1_AutoML_20200128_190923	2481.8723502696294	47662890.53889758	6903.831583903071	47662890.53889758	Nan
7	XGBoost_3_AutoML_20200128_190923	2504.730895355198	46518535.67410209	6820.449814645812	46518535.67410209	Nan
8	XGBoost_grid__1_AutoML_20200128_190923_model_4	2593.036637529818	51261818.10754732	7159.73589649418	51261818.10754732	Nan
9	GBM_4_AutoML_20200128_190923	2693.956676998788	57254382.45922675	7566.662570726063	57254382.45922675	Nan

Load into AutoML and Run for 1 Hour (No Folds)

Leaderboard

Monitor Live

▼ MODELS

models sorted in order of mae, best first

	model_id	mae	mean_residual_deviance	rmse	mse	rmse
0	XGBoost_grid__1_AutoML_20200128_190923_model_5	2288.453139388171	45163608.44339454	6720.387521817067	45163608.44339454	Nan
1	StackedEnsemble_AllModels_AutoML_20200128_190923	2317.1087688255056	45956938.82264482	6779.154727740386	45956938.82264482	Nan
2	StackedEnsemble_BestOfFamily_AutoML_20200128_190923	2341.6173274204098	45905627.0730404	6775.3691466251785	45905627.0730404	Nan
3	XGBoost_2_AutoML_20200128_190923	2394.782287196682	50228400.2340675	7087.199745602455	50228400.2340675	Nan
4	XGBoost_grid__1_AutoML_20200128_190923_model_2	2396.055975073656	52459371.52154055	7242.884199097798	52459371.52154055	Nan
5	XGBoost_grid__1_AutoML_20200128_190923_model_1	2478.1741786531247	50763288.857441254	7124.836058285219	50763288.857441254	Nan
6	XGBoost_1_AutoML_20200128_190923	2481.8723502696294	47662890.53889758	6903.831583903071	47662890.53889758	Nan
7	XGBoost_3_AutoML_20200128_190923	2504.730895355198	46518535.67410209	6820.449814645812	46518535.67410209	Nan
8	XGBoost_grid__1_AutoML_20200128_190923_model_4	2593.036637529818	51261818.10754732	7159.73589649418	51261818.10754732	Nan
9	GBM_4_AutoML_20200128_190923	2693.956676998788	57254382.45922675	7566.662570726063	57254382.45922675	Nan



H₂O.ai

Reasons to Use

Reasons to use H2O-3 AutoML

H₂O.ai

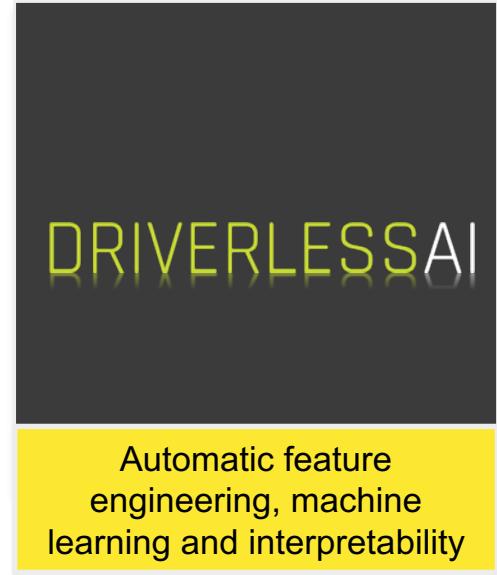
H₂O.ai

In-Memory, Distributed
Machine Learning Algorithms
with H2O Flow GUI

- Open Source
- High Degree of User Control
- In Memory & Distributed
- Web UI, Python Client, R Client
- Autogenerated Java Scoring Pipeline

Reasons to use Driverless AI

H₂O.ai



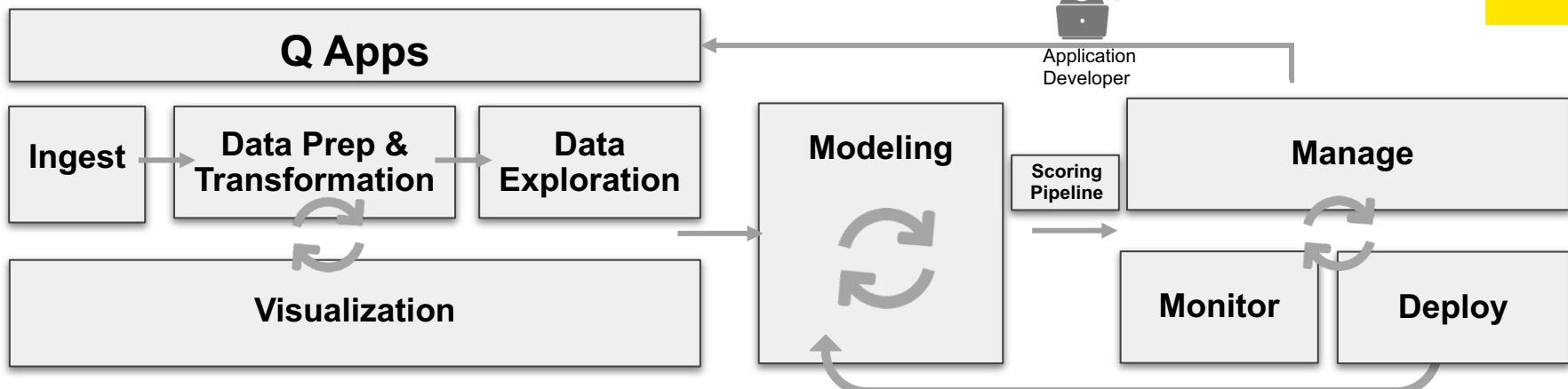
- Commercial license
- High degree of automation
- Optimized for GPU's
- Web UI, Python Client, R Client
- Feature Engineering + BYOR
- Autogenerated Java/Python/C++ Scoring Pipelines
- MLI + MLI Scoring Pipeline
- AutoDoc



Q

Automating Data Science and ML Workflows

H₂O.ai



Business Analyst



Data Scientist



devOps Engineer

H2O Q

H2O Driverless AI

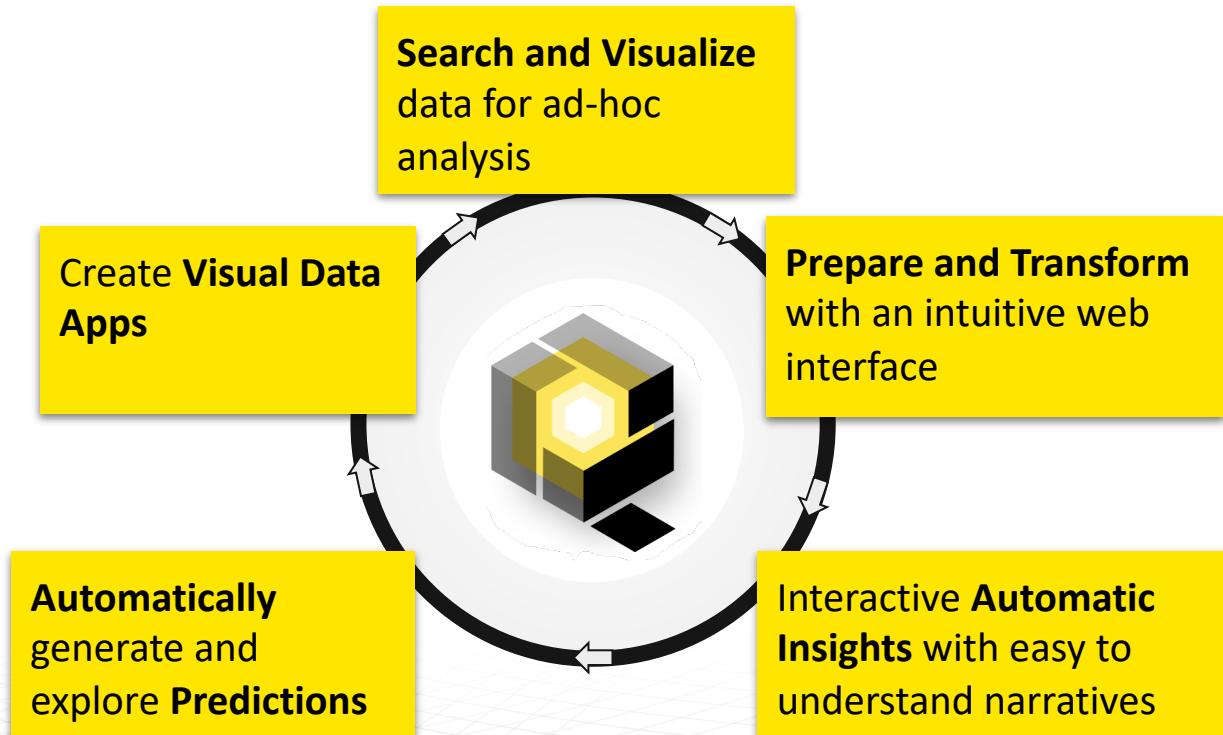
H2O ModelOps

H2O-3

H2O.ai Platform

Enterprise Puddle
Enterprise Stream

H2O Q is a New and Innovative AI Platform for Business



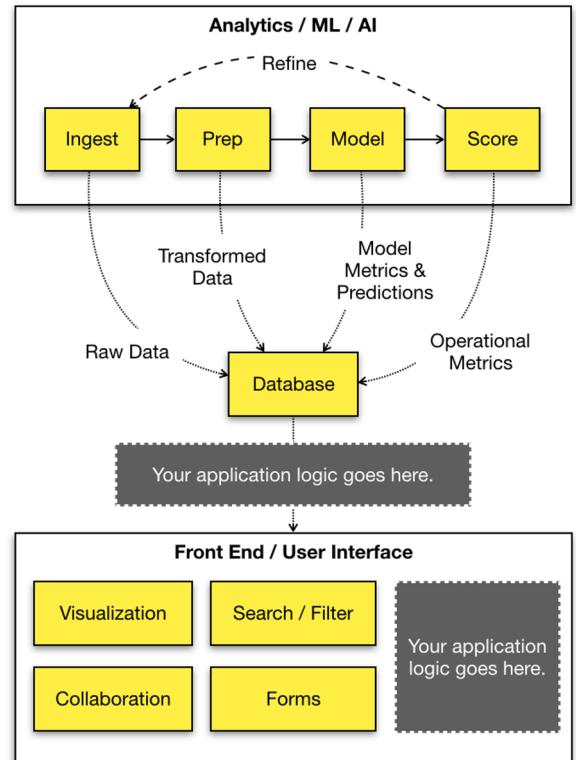
Provides:

- Large-scale analytical data storage
- High-performance analytical search + superior UX
- Beautiful, high-scale, ad-hoc, interactive, automatic visualizations
- Point-and-click ad-hoc data prep
- Automatic Machine Learning

Extensible back-end and front-end

- Using **100% pure Python!**
- No front-end programming!
- No need to reason about client-server / distributed architecture.

Deploy apps in Months Weeks Days Hours, Minutes!





Thank You

Thomas Ott

Github:

<https://github.com/tomott12345/Presentations>