IBM

meetup

Automating AI

with IBM AutoAI and Watson Studio

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IT Architect, IBM Hybrid Cloud

October 3rd 2019

3
OKT

Donnerstag, 3. Oktober 2019

Artificial Intelligence – quo vadis?

Veranstaltet von Benedikt K.
Von Technologietrends und Innovation für die Praxis @ Vienna
Öffentliche Gruppe

meetup

Technologietrends und Innovation für die Praxis @ Vienna

https://www.meetup.com/Technologietrends-und-Innovation-fur-die-Praxis/

AutoAI definitions from various sources

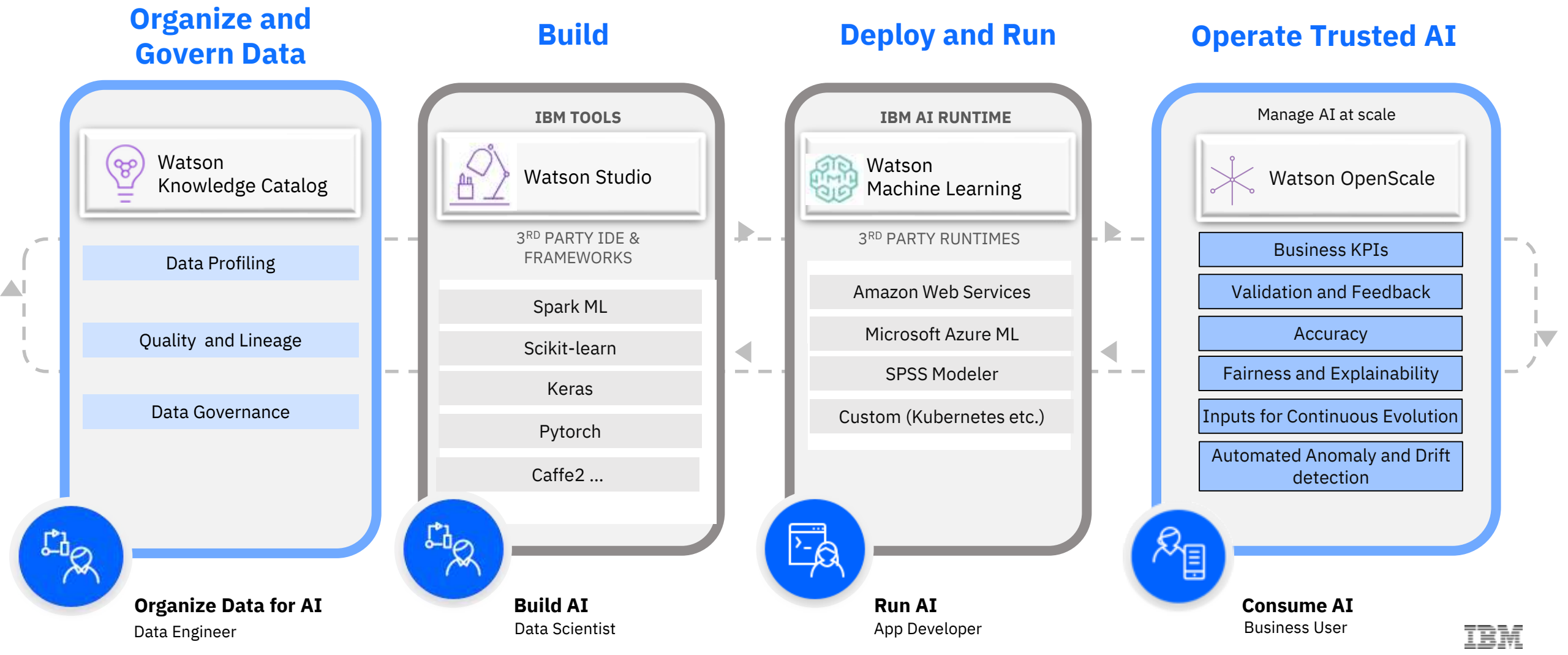
1. *Automated machine learning (AutoML) is the process of automating the end-to-end process of applying machine learning to real-world problems.* ***Wikipedia***

2. *AutoML is the capability to automatically ingest, clean, transform, and model with hyperparameter optimization* ***IBM***

3. *Auto ML services provide machine learning at the click of a button, or, at the very least, promise to keep algorithm implementation, data pipelines, and code, in general, hidden from view.* ***Blogger***

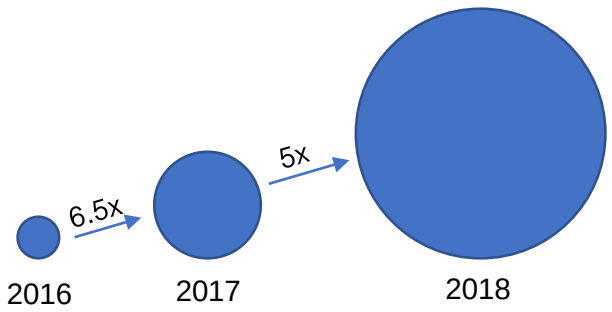
4. *Quite simply, it is the means by which your business can optimize resources, encourage collaboration and rapidly and dependably distribute data across the enterprise and use that data to predict, plan and achieve revenue goals.* ***Blogger***

IBM Watson operationalizes AI across the enterprise

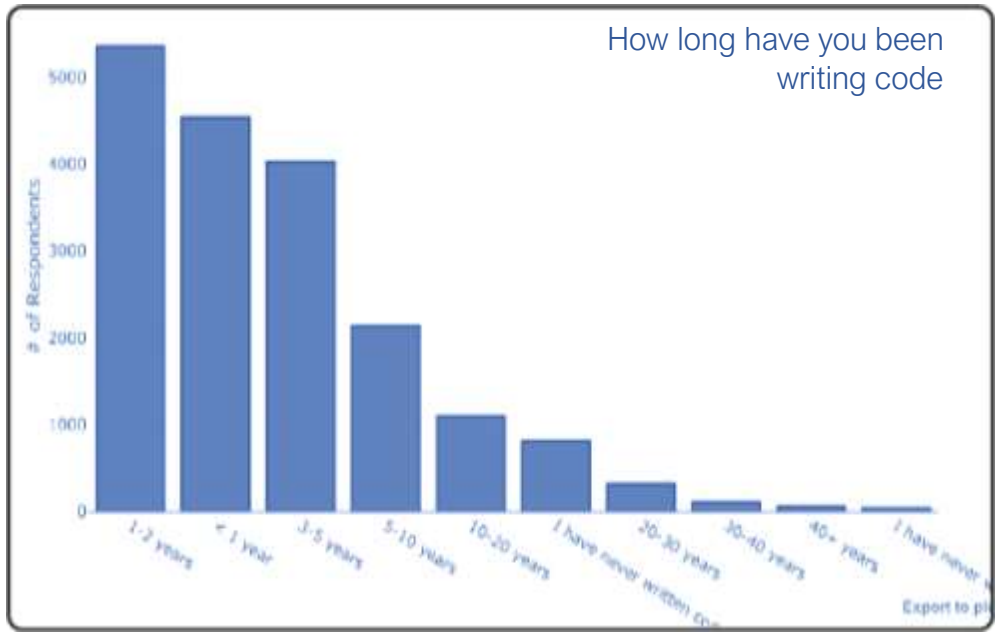


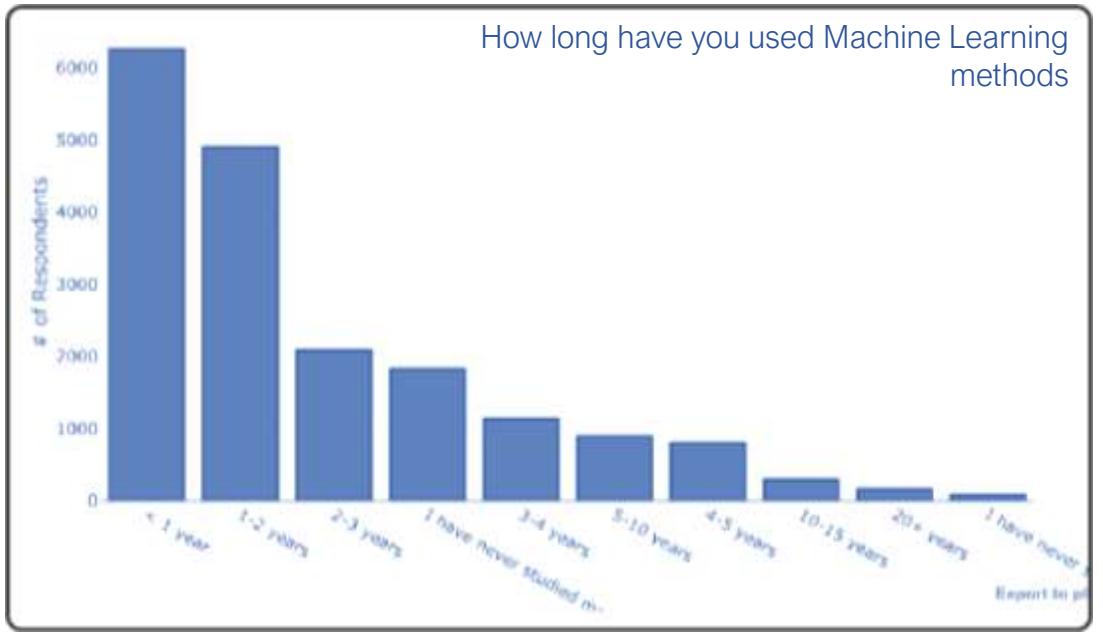
The Gap: Data scientists acknowledge lack of expertise

Data Scientist Jobs Explosion



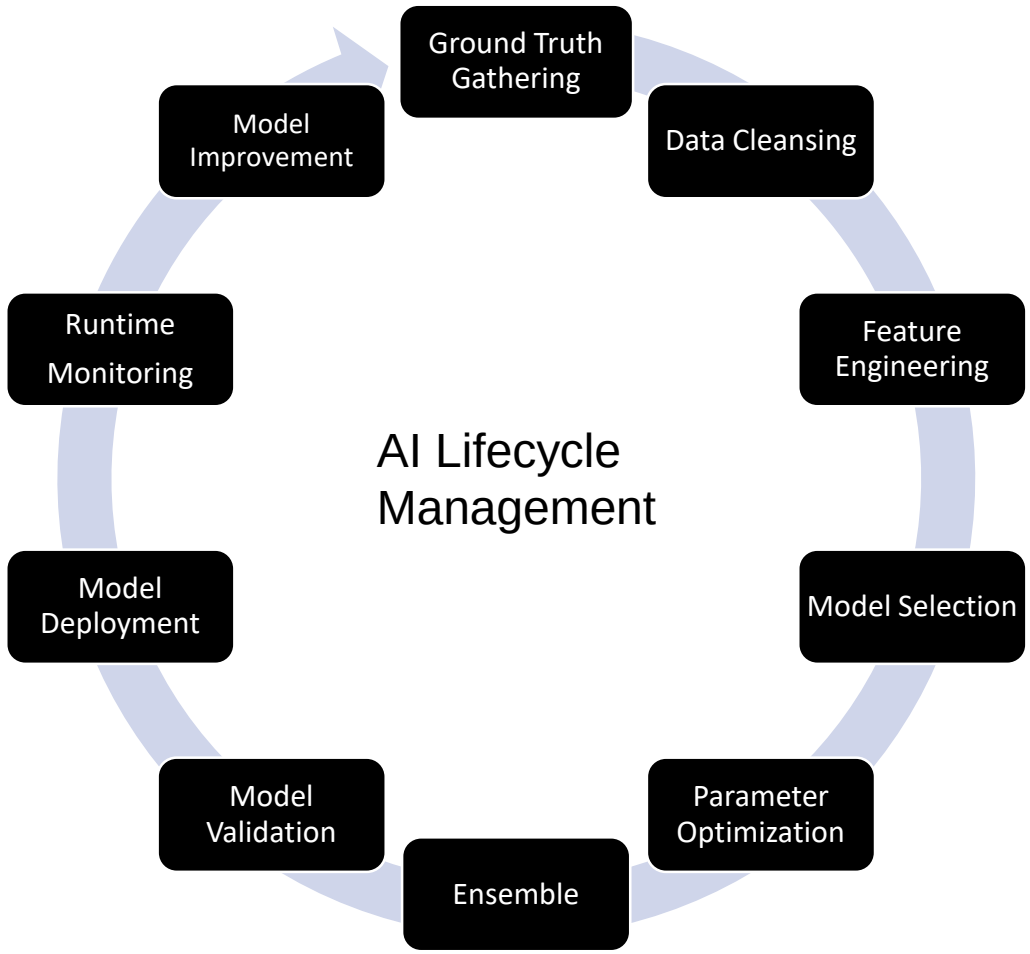
- ~50% of Data Scientist respondents on Kaggle said they had less than 2 years of experience on ML methods. Same for coding experience
- Significant percentage uptick in AI roles being adopted in vertical industries (LinkedIn 2018 jobs report) (again more domain/application knowledge, less ML and CS)

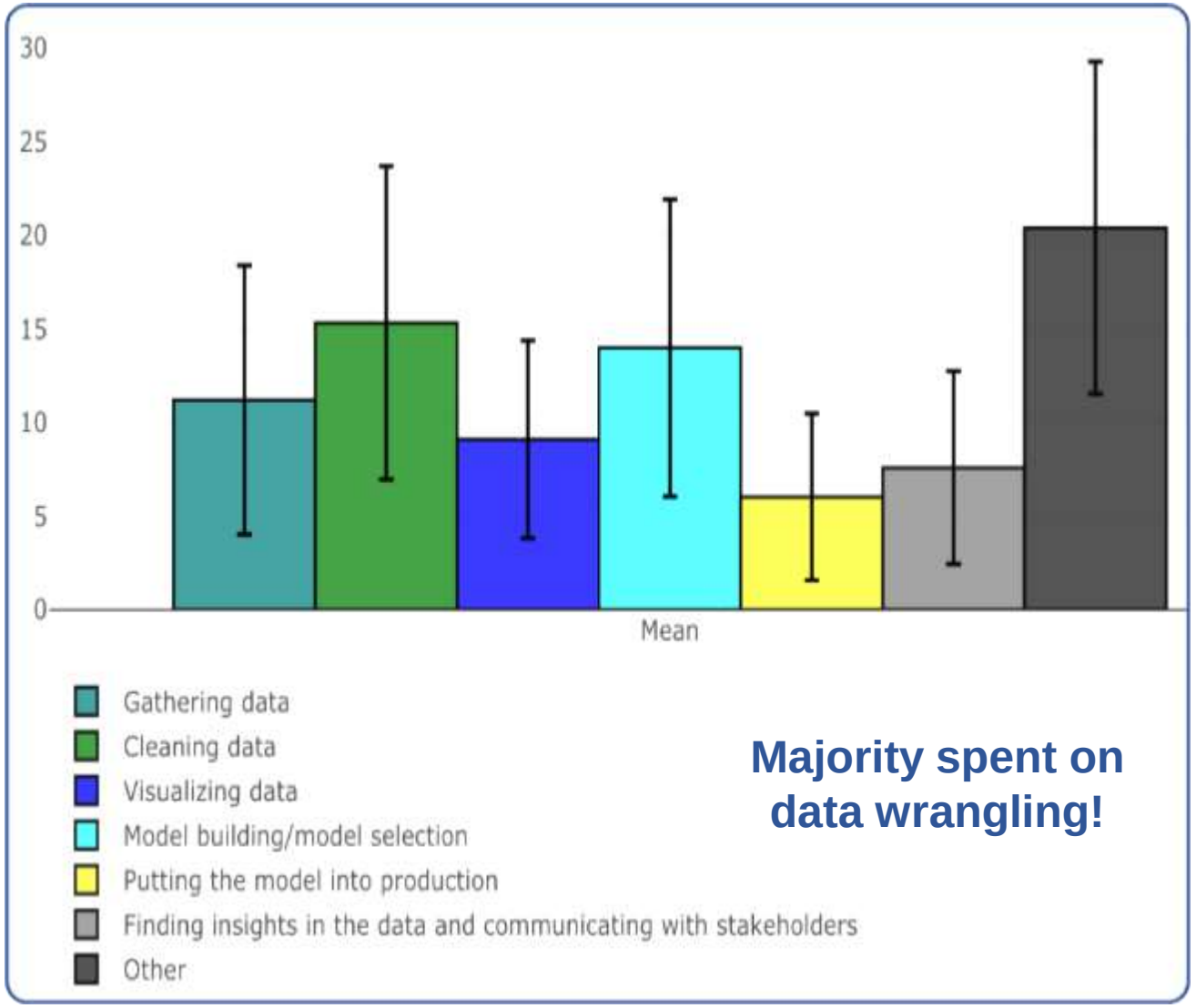




https://www.kaggle.com/paultimothymooney/2018-kaggle-machine-learning-data-science-survey
https://economicgraph.linkedin.com/research/linkedin-2018-emerging-jobs-report
https://economicgraph.linkedin.com/research/LinkedIns-2017-US-Emerging-Jobs-Report

Case for AI Automation: AI Workflow's Bigger & More Complex





Source: https://www.kaggle.com/paultimothymooney/2018-kaggle-machine-learning-data-science-survey

Why care about Automation?

*Coming up with features is **difficult**, **time-consuming**, requires **expert knowledge**.*
"Applied machine learning" is basically feature engineering.

-Andrew Ng

*...some machine learning projects succeed and some fail. What makes the difference? Easily the **most important factor** is the features used.*

- Pedro Domingos

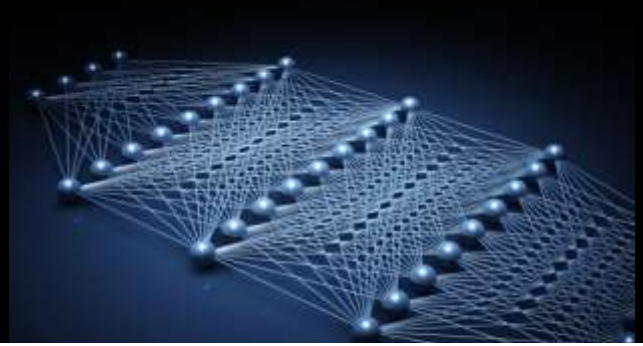
The algorithms we used are very standard for Kagglers. [...]
*We spent **most of our efforts** in feature engineering. [...]*

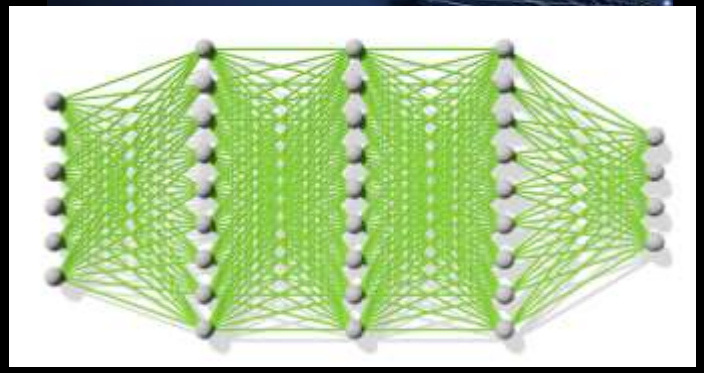
-Xavier Conort

Feature Engineering is essential,
difficult and costly.

AI for AI:
Livecycle of Automation of AI Development and Operation

AI Designing AI





Neural network
architecture and search

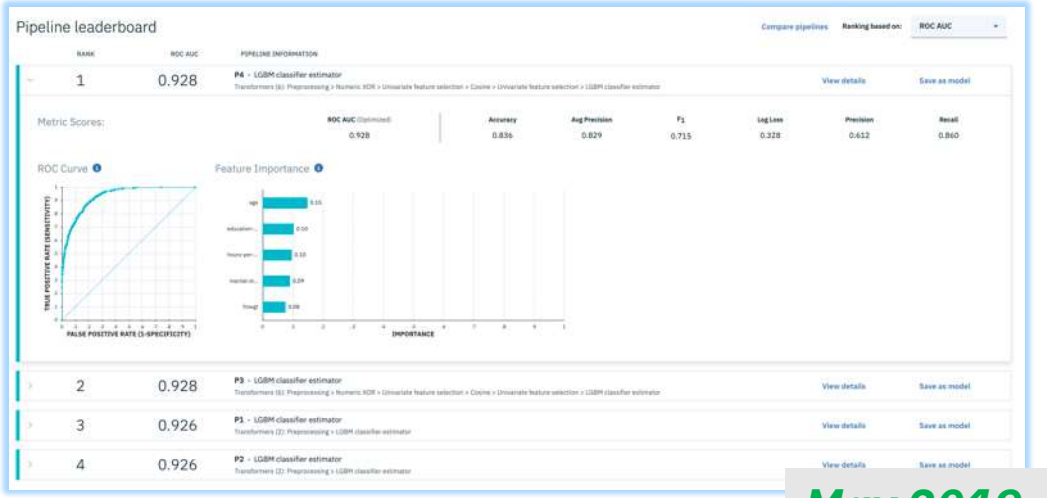
AI Optimizing AI

Lifecycle management
AI pipeline optimization
Decision optimization

AI Governing AI

Monitoring AI outcome with
trust and explainability

IBM's Portfolio for Automation of AI Development



May 2019

Transfer Learning

- Transfer knowledge learning in one deep learning system to apply to a different domain
- Featured in **Watson Visual Recognition or NLP Services**, available via Watson Studio

AutoAI Pipeline optimization

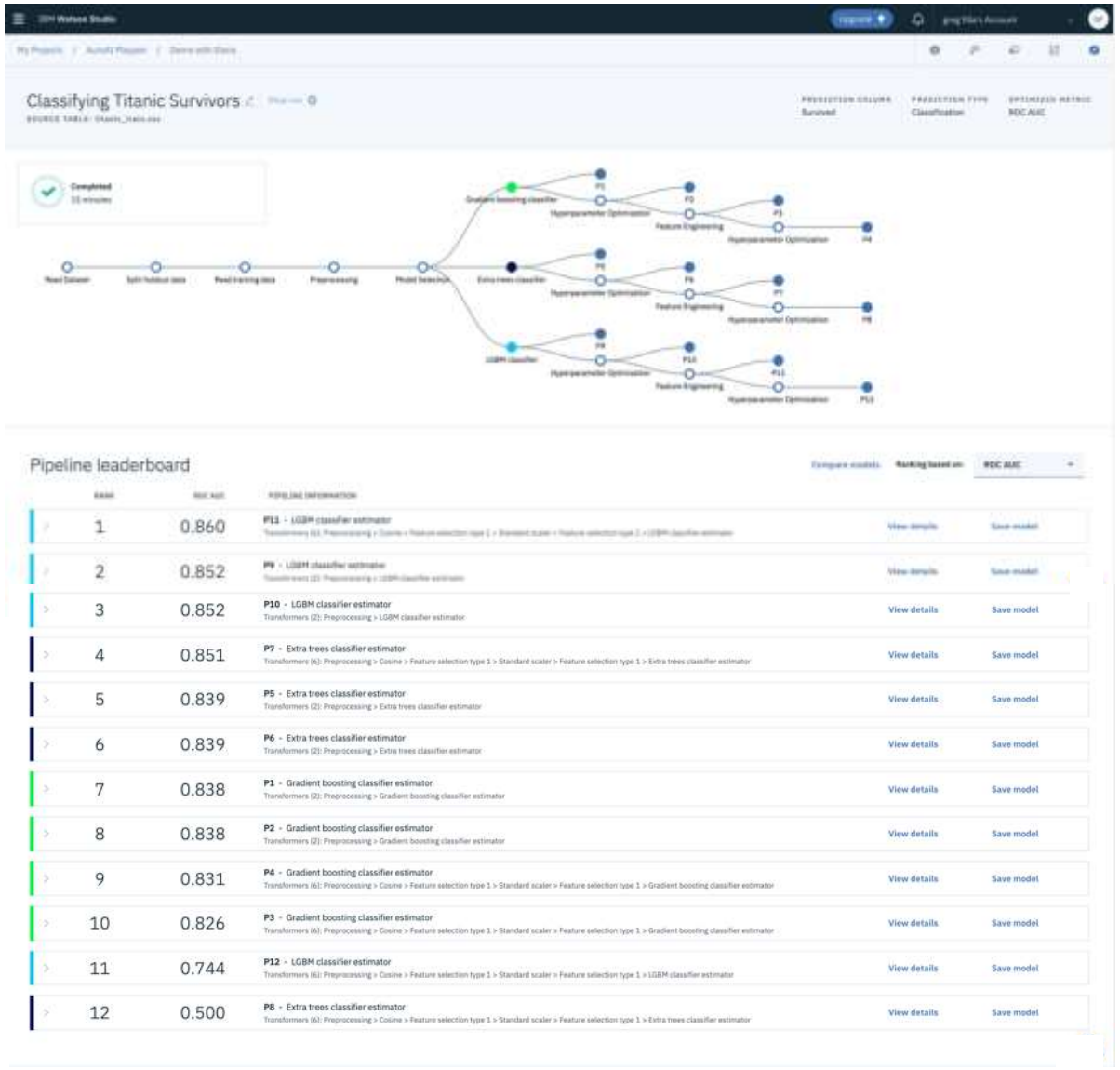
- Auto clean data, engineer features, and complete HPO to find the optimal end to end pipeline
- **AutoAI** as a feature of Watson Studio

Neural Network Search

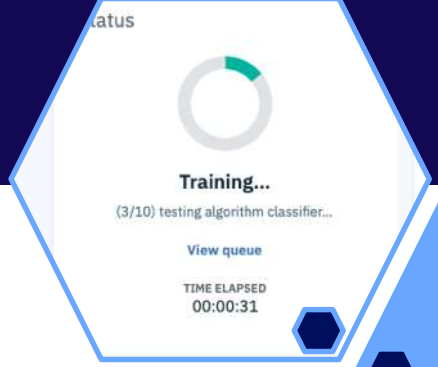
- Just bring data and automatically generate a custom deep neural network through searching the best architectures for the input data
- **NeuNetS** as a feature of Watson Studio, available in **Open Beta**

What does **“AutoAI with IBM Watson Studio”** do?

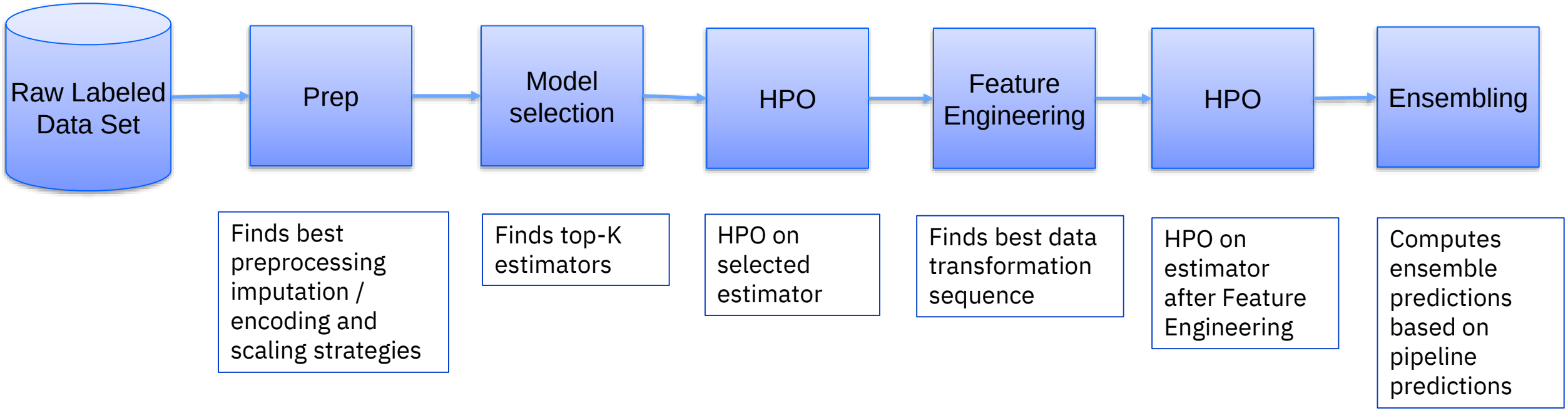
- Integrated with **Watson Studio** and **Watson Machine learning**
- Automatically ingest, clean, transform, and model with hyperparameter optimization
- Training feedback visualizations provide real-time results to see model performance
- One-click deployment to Watson Machine Learning



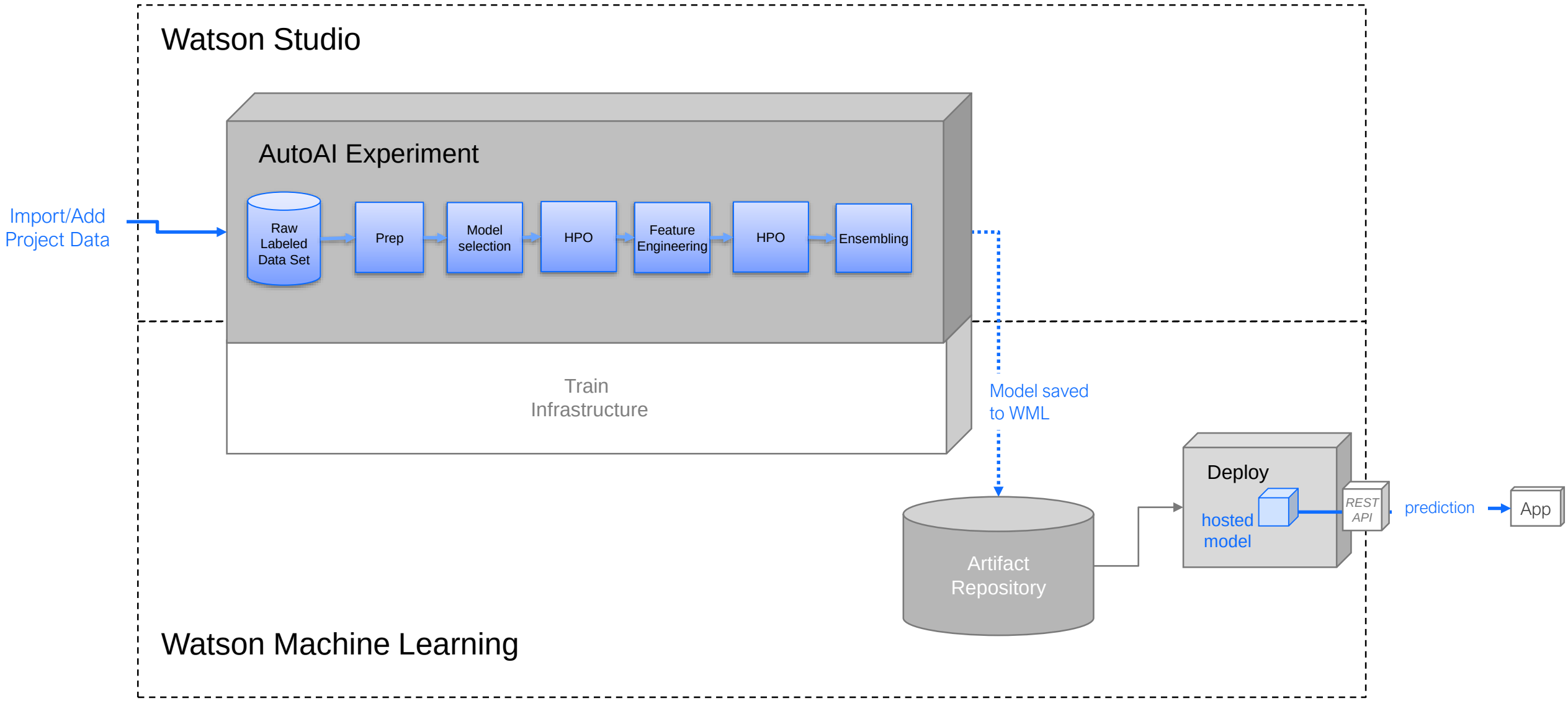
How does it work?



AutoAI Pipeline Optimization



How does it work?



AutoAI Classification Models (30)

AdaBoost	Bernoulli Naïve Bayes	Calibrated Classifier with Cross-Validation	Decision Tree	Extra Trees
Gaussian Naïve Bayes	Gaussian Process	Gradient Boosted Tree	Nearest Neighbor Analysis	Label Propagation
Label Spreading	LGBM	Linear Discriminant Analysis	Linear Support Vector	Logistic Regression with Cross-Validation
Logistic Regression	MLP Classifier	Multinomial Naïve Bayes	Nearest Centroid	Nu Support Vector
Passive Aggressive	Perceptron	Quadratic Discriminant Analysis	Radius Neighbors	Random Forest
Ridge Classifier with Cross-Validation	Ridge Classifier	SGD	Support Vector	XGBoost

AutoAI Regression Models (44)

AdaBoost	ARD	Bayesian Ridge	CCA	Decision Tree
Extra Trees	Elastic Net with Cross-Validation	Elastic Net	Gaussian Process	Gaussian Process Regression
Gradient Boosting	Huber	Nearest Neighbor Analysis	Kernel Ridge	Lars with Cross-Validation
Lars	Lasso with Cross-Validation	Lasso	Lasso Lars with Cross-Validation	Lasso Lars
Lasso Lars IC	LGBM	Linear Regression	Linear Support Vector	MLP
MultiTask Elastic Net CV	MultiTask Elastic Net	Multi Task Lasso CV	Multi Task Lasso	Nu SVR
Orthogonal Matching Pursuit with Cross-Validation	Orthogonal Matching Pursuit	Passive-Aggressive	PLS Canonical	PLS
Radius Neighbors	Random Forest	RANSAC	Ridge with Cross-Validation	Ridge
SGD	Support Vector	Theil-Sen	XGBoost	

User Benefits of using AutoAI

Build models faster

Automate data preparation and model development

Jump the skills gap

No coding? No problem – get started with a couple clicks

Discover more use cases

Supercharge collaboration with AI everywhere to disrupt and transform

Find signal from noise

Auto-feature engineering makes it easy to extract more predictive power from your data

Rank and explore models

Quickly compare candidate pipelines to find the best model for the job

Ready, set, deploy

Pipelines generated with AutoAI can be deployed to REST APIs with one click


Project
Sales Report
Target
Opportunity
Activity
Label
Interactive User
1,505
Realtime Dashboard
Marketing Chart
demo

Video 1

Get Started with AutoAI Today

- **Accelerate**
- **Automate**
- **Optimize**

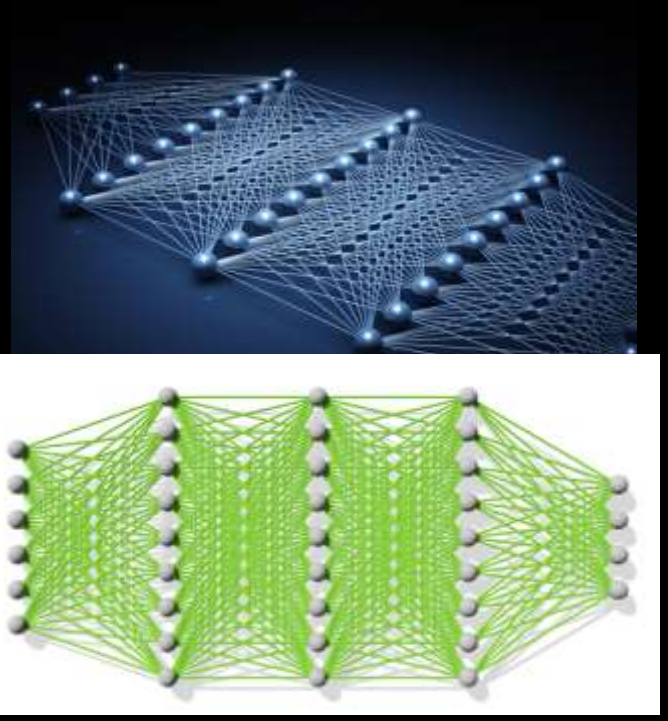
IBM Cloud
https://www.ibm.com/cloud/

IBM Watson Studio
https://www.ibm.com/cloud/watson-studio
https://dataplatform.cloud.ibm.com/

Documentation / Knowledge Center
https://dataplatform.cloud.ibm.com/docs/content/wsj/analyze-data/autoai-overview.html
AutoAI Samples
https://www.ibm.com/demos/collection/IBM-Watson-Studio-AutoAI/

AI for AI:

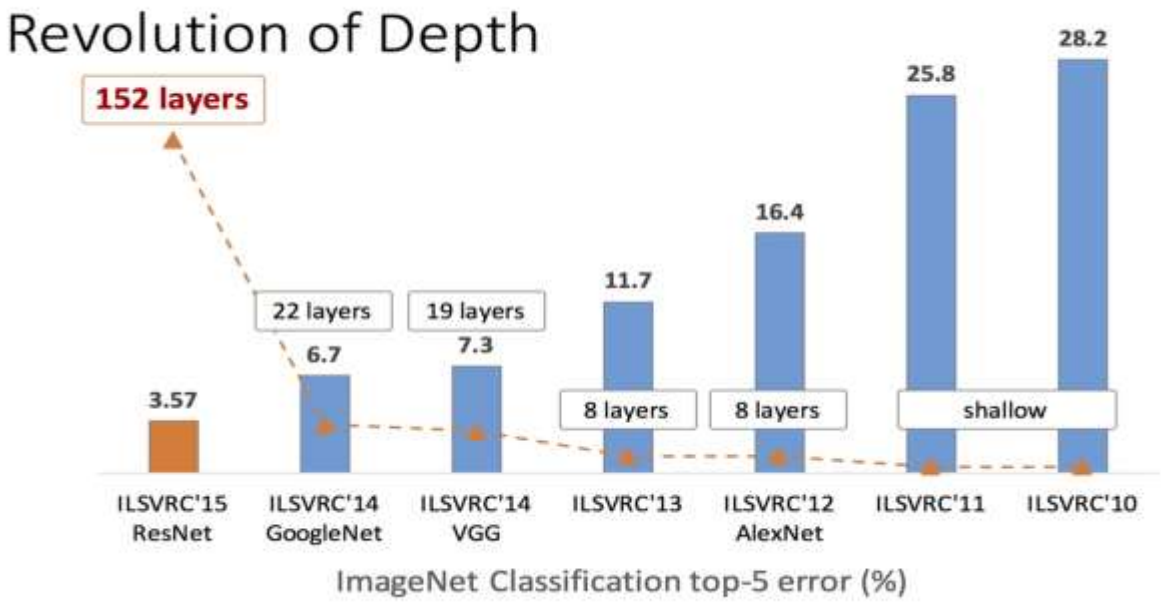
AI Designing AI



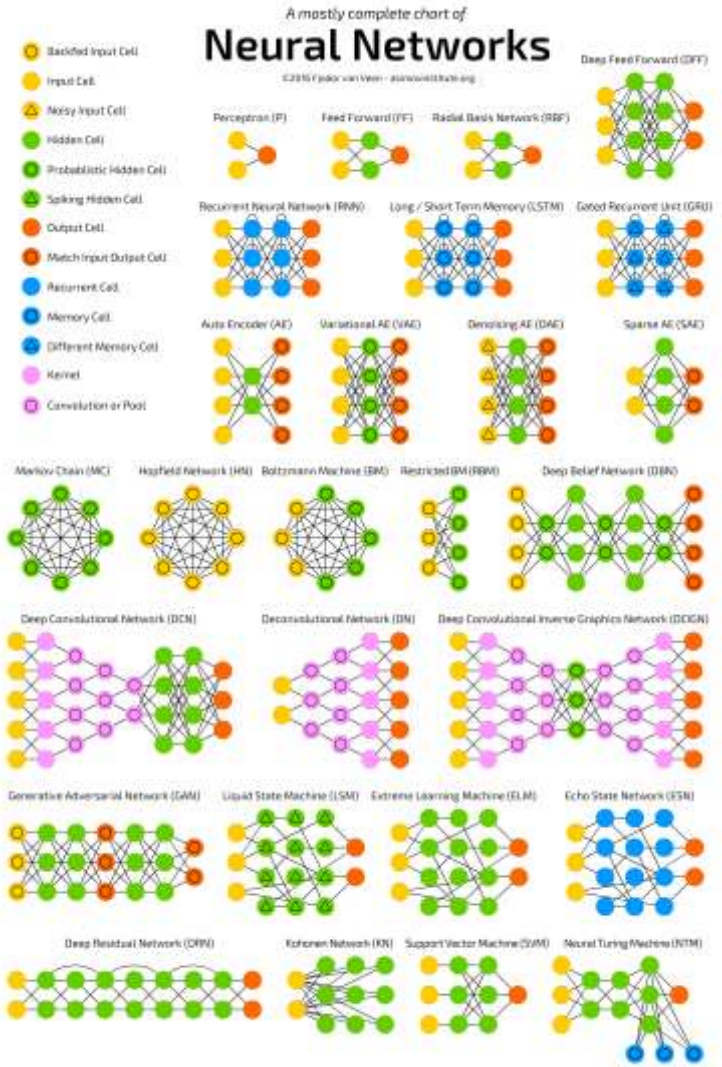
Neural network
architecture and search

Design of Neural Networks is challenging

- Highly skilled researchers/data-scientists are needed to hand-craft custom neural networks
- Hand-crafting complex networks is time-consuming, error prone, and does not scale with time and resources
- Neural networks continue to grow in size and complexity



Kaiming He, Xiangyu Zhang, Shaoqing Ren, & Jian Sun. "Deep Residual Learning for Image Recognition", CVPR



NeuNetS: Neural Network Synthesis

“NeuNetS is a new AI engine for Neural Network design, that automatically synthesize new neural network models or evolves and improves existing ones”

What NeuNetS does:

- Automatically generates the optimal neural networks for the given training data without any coding required
- Optimize the design of the network, the layer selection, and network evaluation
- Significantly decrease the time required to build and deliver AI to applications
- Allows you to easily tailor model accuracy, inference time and model size relative to the compute time required to generate it
- Generate models optimized for the target application including download to edge devices and enterprise applications.

https://arxiv.org/pdf/1901.06261.pdf
NEUNETS: AN AUTOMATED SYNTHESIS ENGINE FOR NEURAL NETWORK DESIGN

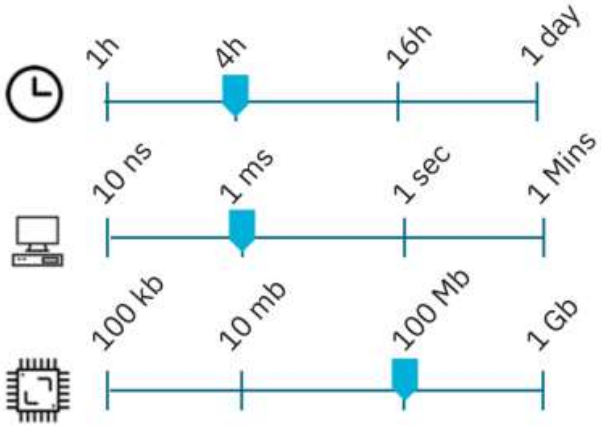
Neural Network Synthesis – Conceptual Design

1) USER INPUT

Dataset

Images, Text, …

Budget & requirements (hidden in beta)



2) AI AUTOMATION: FROM DATA PREPARATION TO MODEL SYNTHESIS

DATA PREPARATION

- Ingestion
- Cleansing
- Augmentation

MODELING

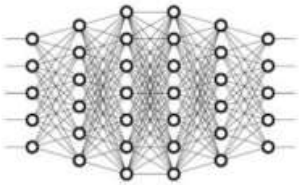
- Prediction
- Arch. Search
- Model selection

SYNTHESIS

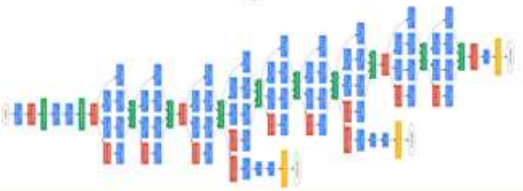
- Training
- HPO
- Validation

3) DEPLOY/DOWNLOAD MODEL

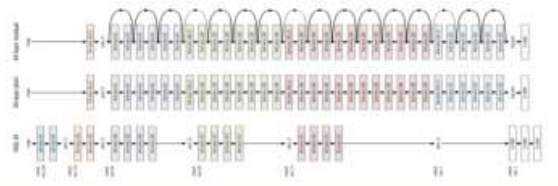
Example #1



Example #2

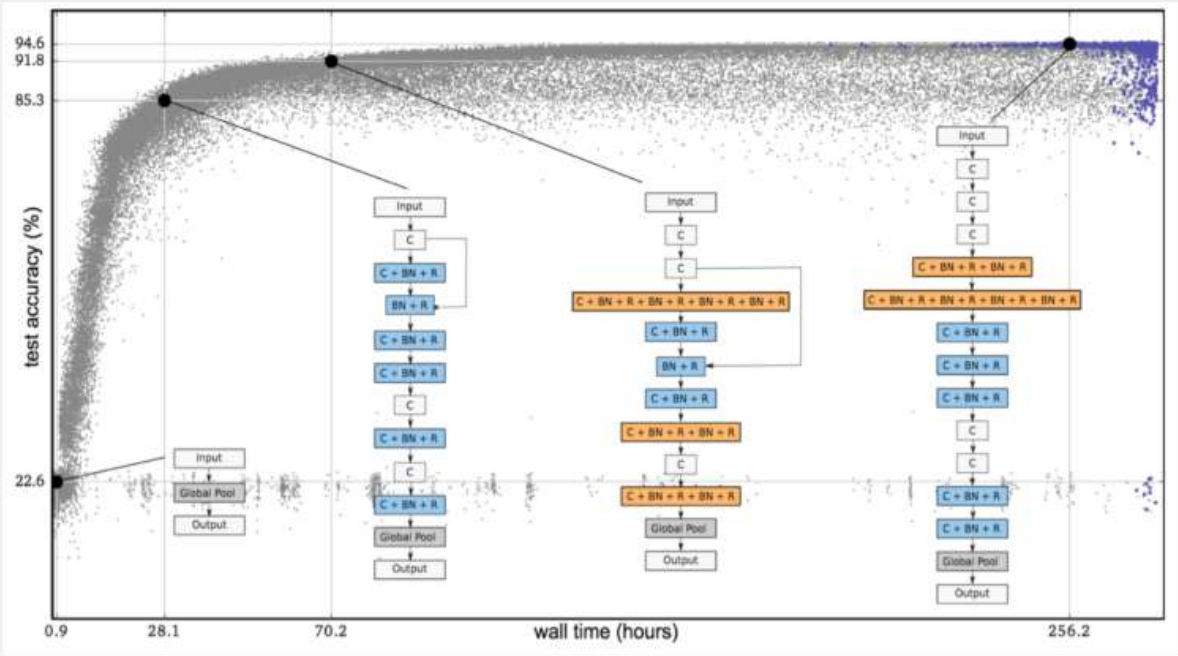


Example #3



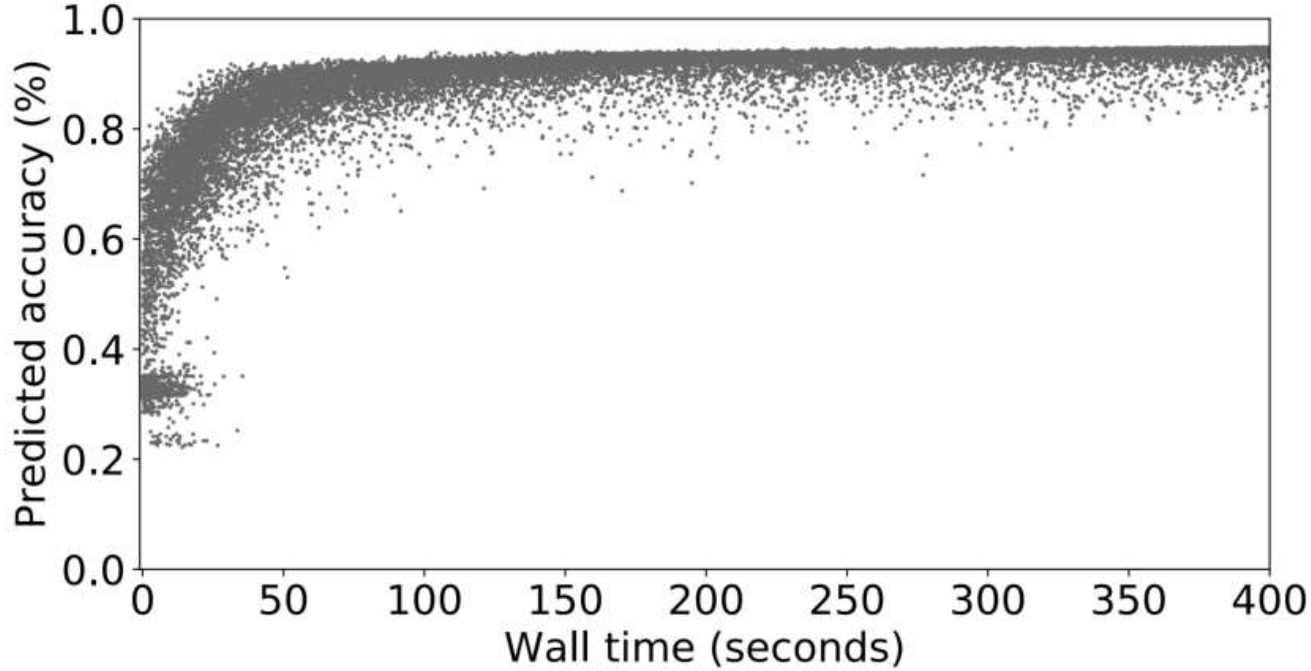
…

Classical LSE



- Search time: 256h
- Resources: 250 workers (~250-1000 GPUs)
- CIFAR-10 top accuracy: 94.6%
- CIFAR-100 top accuracy: 77%

TAPAS-NeuNetS



- Search time: 400s (2300x faster)
- Resources: 1 GPU (250-1000x less expensive
- CIFAR-10 top accuracy: 93.67% (1% worse)
- CIFAR-100 top accuracy: 81.01% (4% better)

SPEED UP ORDER: 1M (architecture discovery) / 100k (trained model)

AutoAI with IBM Watson Studio

Automates AI lifecycle management data prep, feature engineering, and hyper parameter optimization

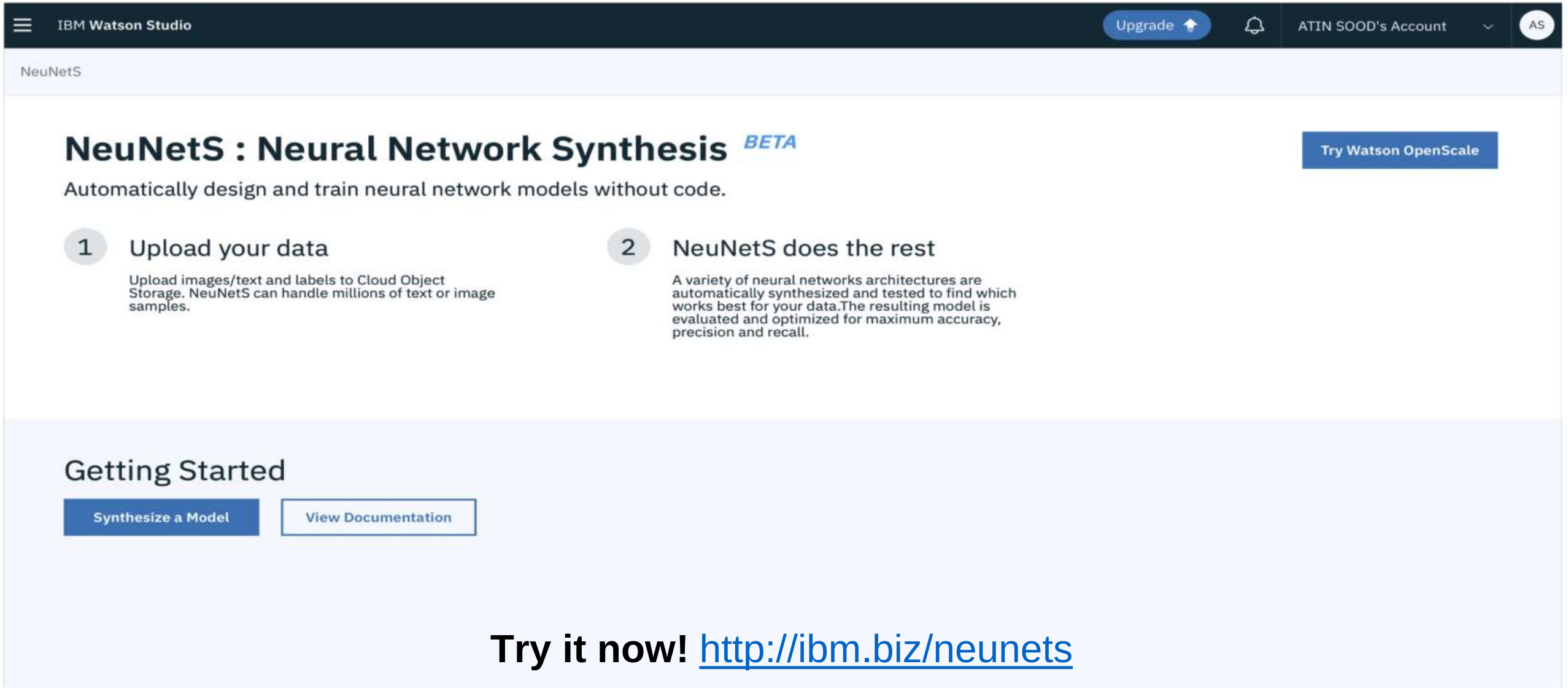
Makes experiments and neural network search easy

Is explainable, debiased and trusted

Making enterprise AI simple and scale

Paving a path toward industrialization of AI

Neural Network Synthesis – Open Beta (free)



Try it now! http://ibm.biz/neunets

Demo Walkthrough

Synthesize text or image classifier BETA

Define classifier details

Name

synthesize text network for stanford sentiment

Description

synthesize text network for stanford sentiment

Machine Learning Service Instance

pm-20-fg

Data type

Image Text From sample

TEXT
Stanford Sentiment

The Stanford Sentiment data set includes a set of more than 20000 move reviews for testing sentiment analysis.

TEXT
Rotten Tomatoes movie reviews

The dataset is comprised of tab-separated files with phrases from the Rotten Tomatoes archive of movie review comments.

Trained model connection

Results: results COS connection ... / result-bucket-for-n... Update

Your training data will be used by IBM for research, testing, and offering development related to AI OpenScale. If you do not want IBM to use your training data, check the box, and IBM will not use the training data associated with this submission.

Cancel Begin Synthesis

synthesize text network for stanford sentiment

Associated Service : pm-20-fg

Job accepted — Preprocessing — Synthesizing — Completed

Download model | Deploy model to Watson Machine Learning

Status

Your job was submitted successfully.

Data preprocessing is in progress and will continue even if you close the page.

Performance

Accuracy	Precision	Recall
-	-	-

Training data

Content type	text
Source bucket	synthesized-neural-network-sample-stanford-sentiment
Number of classes	-

Label statistics | Confusion matrix

Each label must have at least 250 samples to receive accurate precision and recall scores.

Your data is being preprocessed. Insights will display upon completion.

Elapsed time: 7 seconds

synthesize text network for stanford sentiment

Associated Service : pm-20-fg

Job accepted — Preprocessing — Synthesizing — Completed

Download model | Deploy model to Watson Machine Learning

Status

Preprocessing complete. You can review the label statistics.

Data synthesis is in progress and will continue even if you close the page.

Performance

Accuracy	Precision	Recall
-	-	-

Training data

Content type	text
Source bucket	synthesized-neural-network-sample-stanford-sentiment
Number of classes	6

Label statistics | Confusion matrix

Total training samples
153108

Total classes
6

Enter label filter value(s)

View validation samples

Sort highest to lowest

Highest training samples per class

Showing 5 of 6 total classes

Download all

Your model was successfully deployed. Click here to view deployment details.

synthesize text network for stanford sentiment

Associated Service : pm-20-fg

Job accepted — Preprocessing — Synthesizing — Completed

Download model | Deploy model to Watson Machine Learning

Status

Synthesizing complete. You can download or deploy your model.

Performance

Accuracy	Precision	Recall
66.4%	0.664	0.664

Training data

Content type	text
Source bucket	synthesized-neural-network-sample-stanford-sentiment
Number of classes	6

Label statistics | Confusion matrix

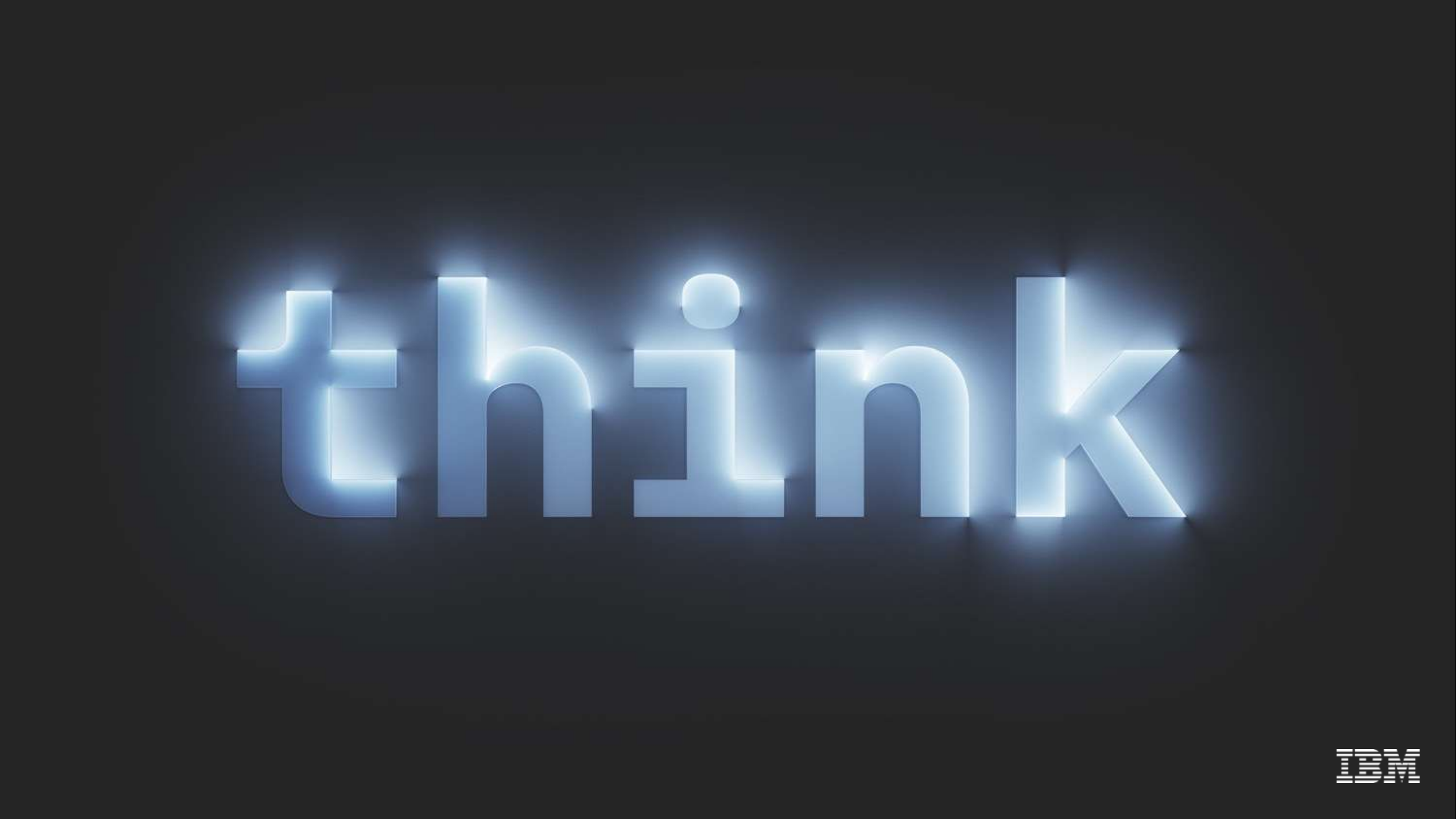
Here are the 5 most correct labels. You can type in up to 5 labels to view how the model classified those labels, or download the full confusion matrix table to see data for all the labels.

Enter label filter value(s)

View normalized data

Sort highest to lowest

Actual \ Predicted	neutral	positive	negative	very p...	very n...	Actual totals
neutral	14910	2210	1916	25	35	19096
positive	2294	5179	182	355	3	8013
negative	2236	245	4184	1	247	6913


think

Weiterführende IBM Veranstaltungen

18. Oktober 2019

IBM Data Science & AI Breakfast – erfolgreich für Ihr Geschäft nutzen
IBM Client Center, Obere Donaustrasse 95, 1020 Wien
9-12 Uhr

https://www.xing.com/events/ibm-datascience-ai-erfolgreich-geschaft-nutzen-2143419

6. November 2019

IBM Think Summit 2019 – Wien
MAK – Museum für angewandte Kunst, Stubenring 5, 1010 Wien
https://www.ibm.com/at-de/events/think-summit/

IBM Data Science & AI Breakfast

Am 18.10.2019 von 08:30-12:30h (Empfang ab 08:30-09:00h) findet unsere kostenlose Infoveranstaltung Breakfast
"IBM Data Science & AI - erfolgreich für Ihr Geschäft nutzen" inkl. Frühstück & Networking in unserer Geschäftsstelle IBM Wien / IBM Client Center statt,
zu welcher wir Sie und auch gerne Ihre Mitarbeiter / weitere Interessenten einladen möchten. Neuer im Programm: Deployment von Machine Learning Modellen und Verwendung in Kombination mit Watson Services - z.B. Chatbot, sowie IBM Watson Open Scale für mehr Transparenz und Kontrolle von in Prod befindlichen AI Modellen.

Auszug aus dem Programm:

Erfahren Sie an einem spannenden Vormittag mehr über

- neue Trends und Lösungen für DataScience und AI,
- wie Sie als Team Zeit für die Datenhaltung, Datenaufbereitung und Datenvisualisierung sparen können,
- um wertvolle Prognose-Modelle mittels der Ihren Skills entsprechenden Oberflächen (z.B. R-Studio oder visuelle Programmierung, etc.) zu erstellen,
- diese Modelle einfach zu deployen und anderen Anwendungen zur Verfügung zu stellen (REST-API),
- Prognose-Modelle mit weiteren Watson AI-Services zu kombinieren (z.B. Visual Recognition, Chatbots, etc.),
- Ihre in Produktion befindlichen Modelle zu überwachen und zu gewährleisten, dass die Ergebnisse Ihrer Modelle bei Erklärungsbedarf transparent und nachvollziehbar sind, (IBM Watson Open Scale)
- sowie wie dies On Premise, in einer hybriden Umgebung oder in der Public Cloud ermöglicht werden kann.

Eine vollständige Agenda finden Sie bitte unter XING auf:
https://www.xing.com/events/ibm-datascience-ai-erfolgreich-geschaft-nutzen-2143419

Ort: IBM Client Center, Obere Donaustrasse 95, 1020 Wien

Wir bitten um Anmeldung über XING oder per e-mail an **sabine.riegler@at.ibm.com**

Wir würden uns sehr freuen, wenn der Termin für Sie interessant und möglich wäre!