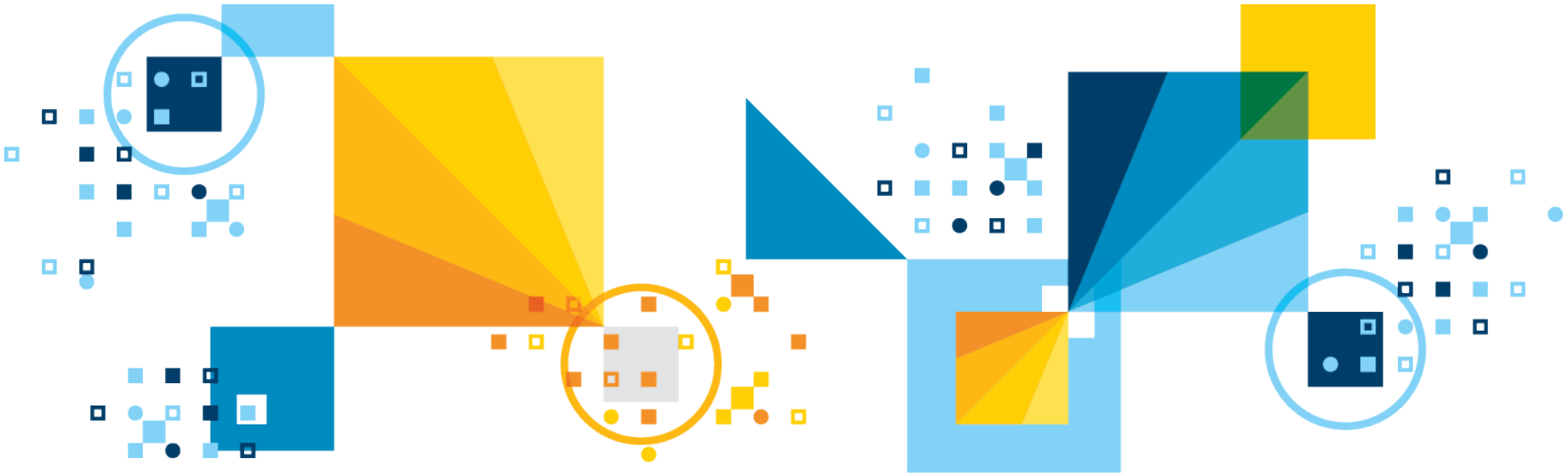
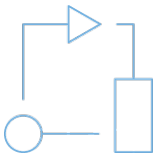
IBM Data Science Experience Overview



Contents

Introducing IBM Watson Data Platform

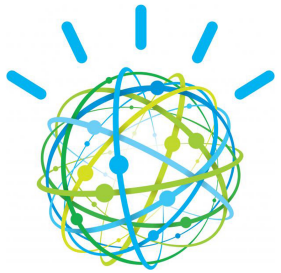
The first data and analytics platform for the Cognitive Business



Platform.

Method.

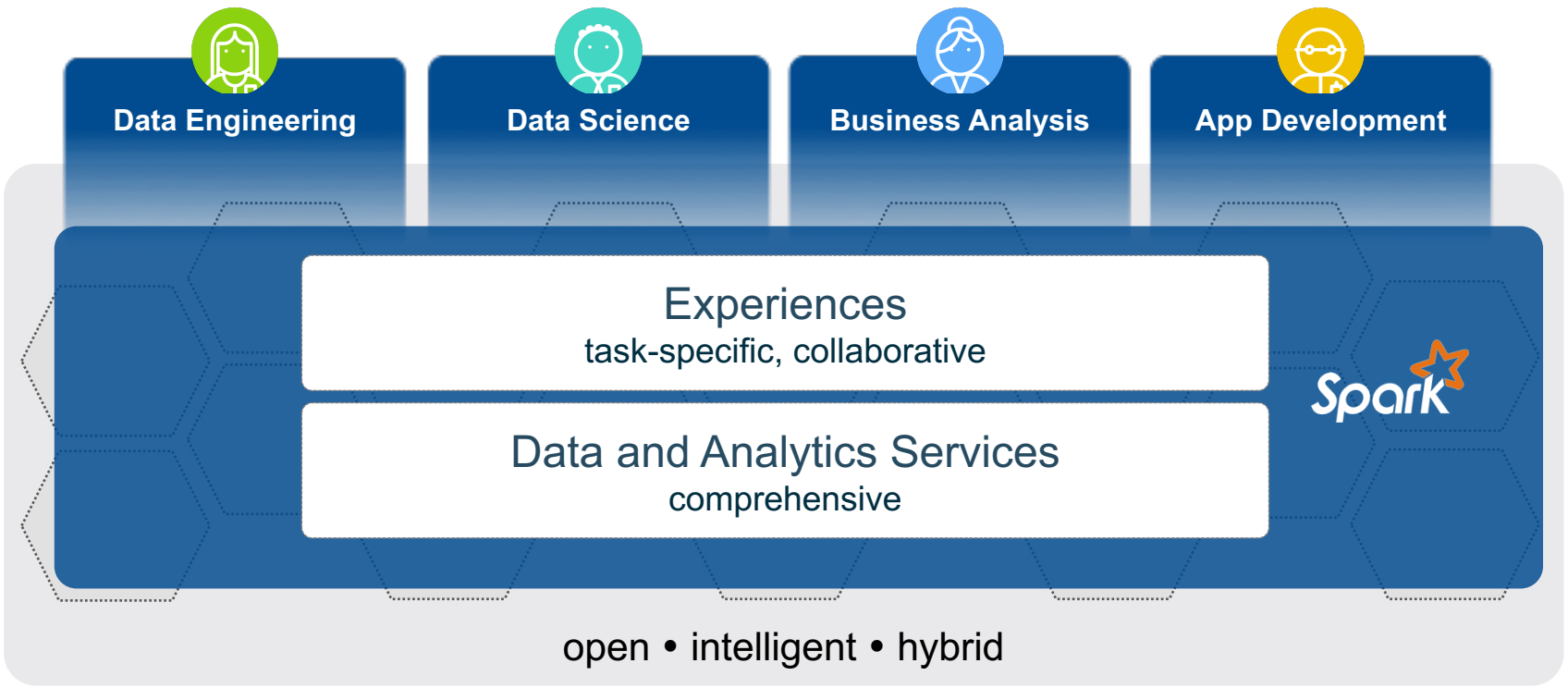
Ecosystem.



http://ibm.co/makedatasimple

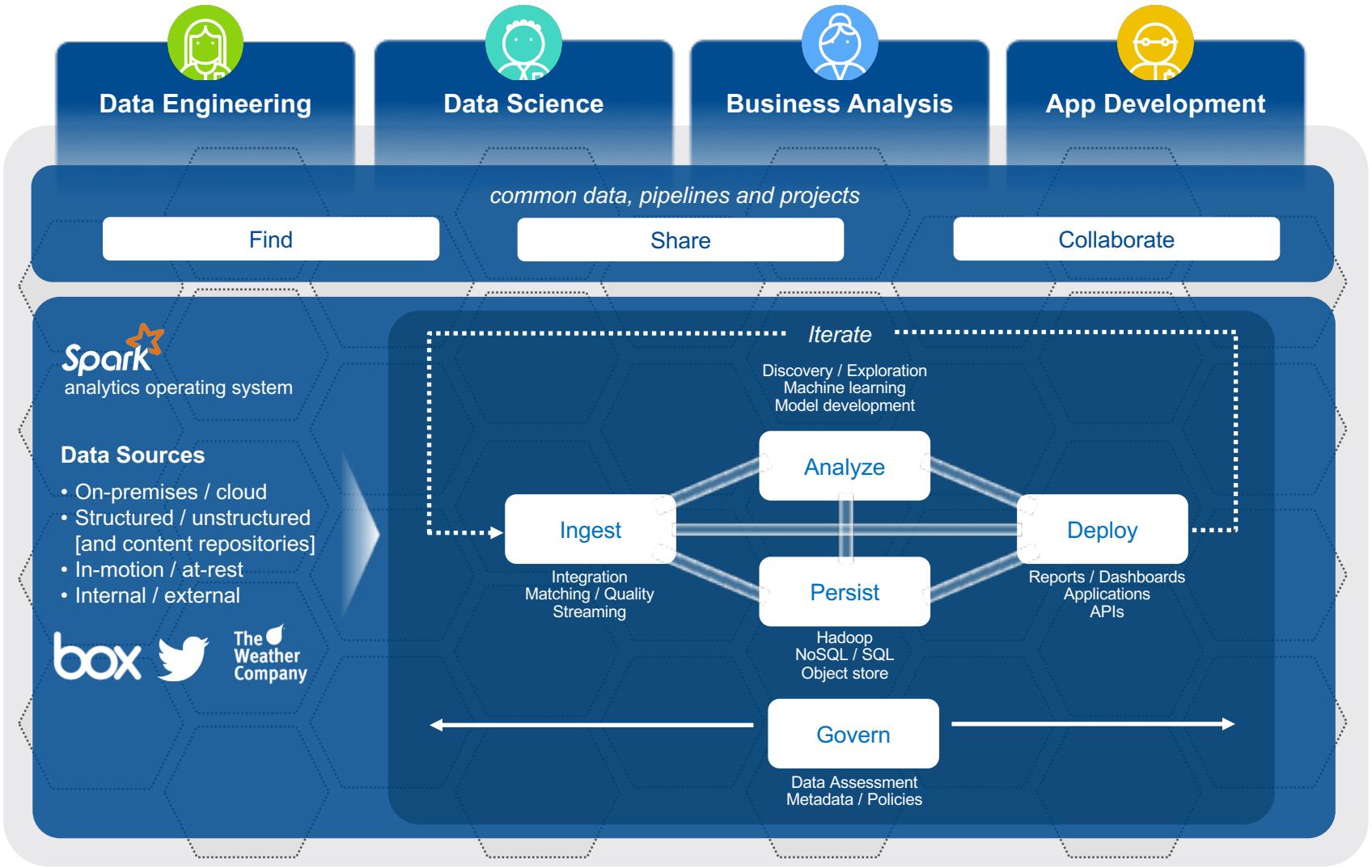
IBM Watson Data Platform

Experience New Ways To Put Data To Work



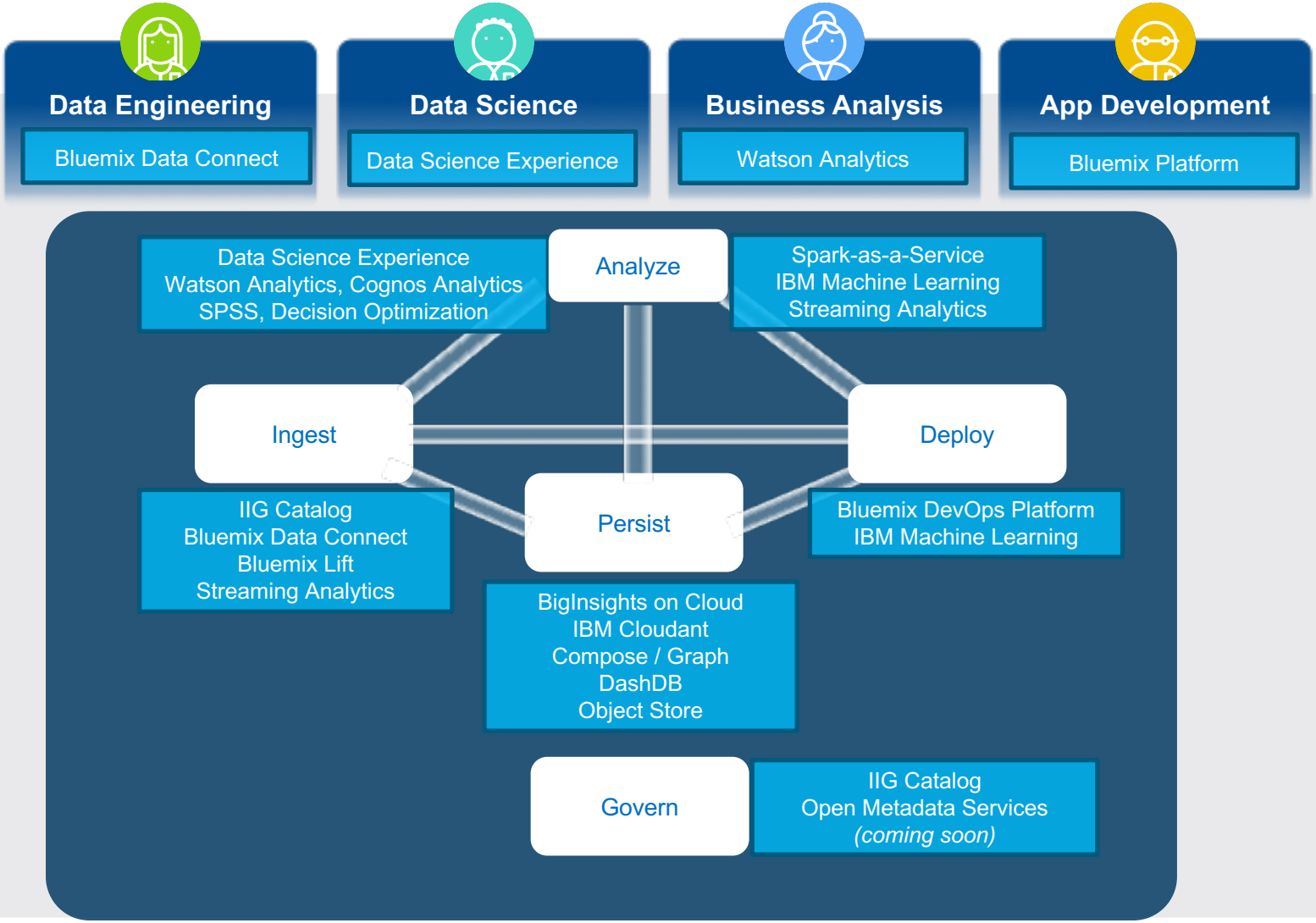
IBM Watson Data Platform

Connects Users to Data and Analytics



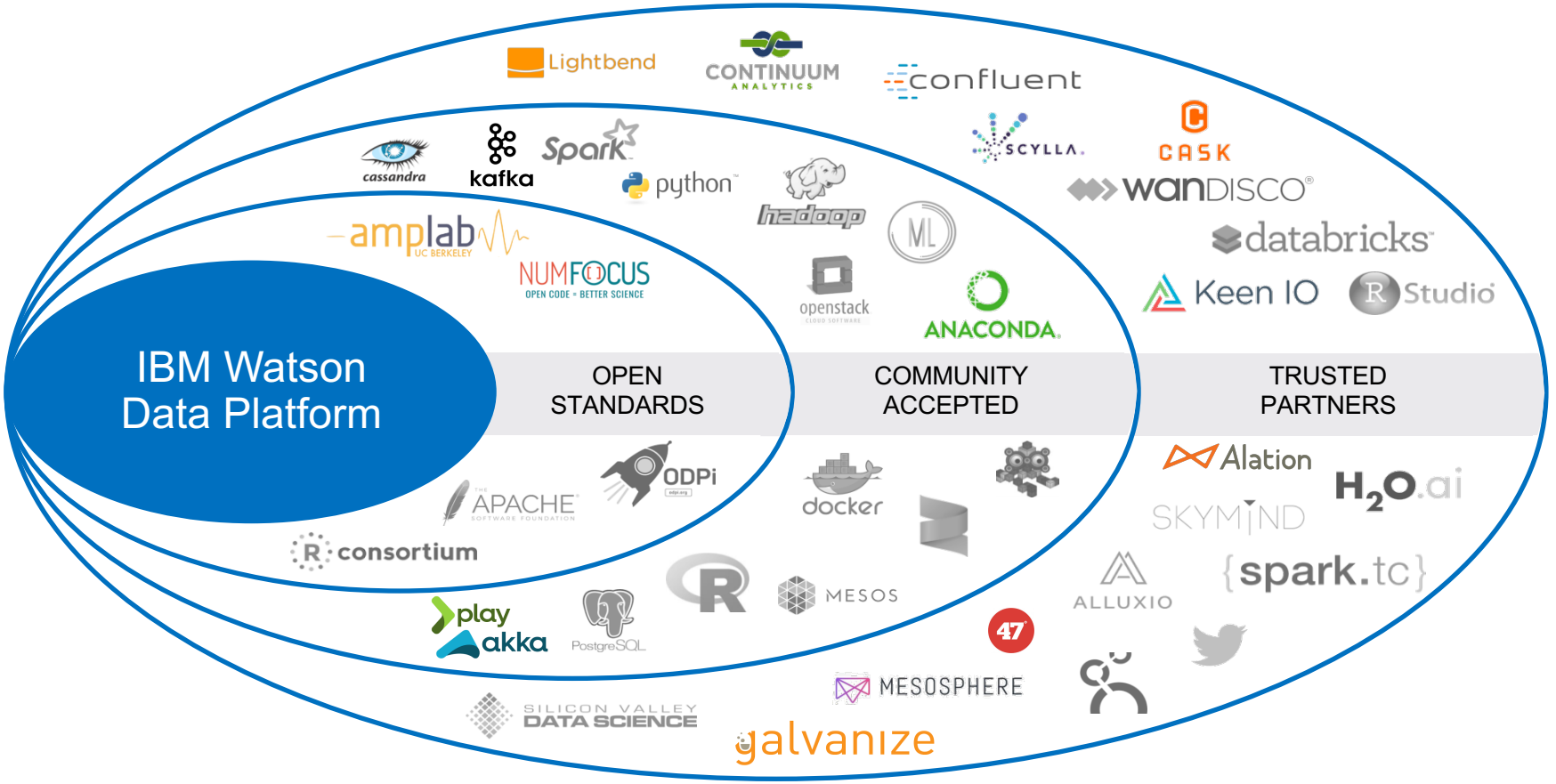
IBM Watson Data Platform

A closer look at what makes up the platform



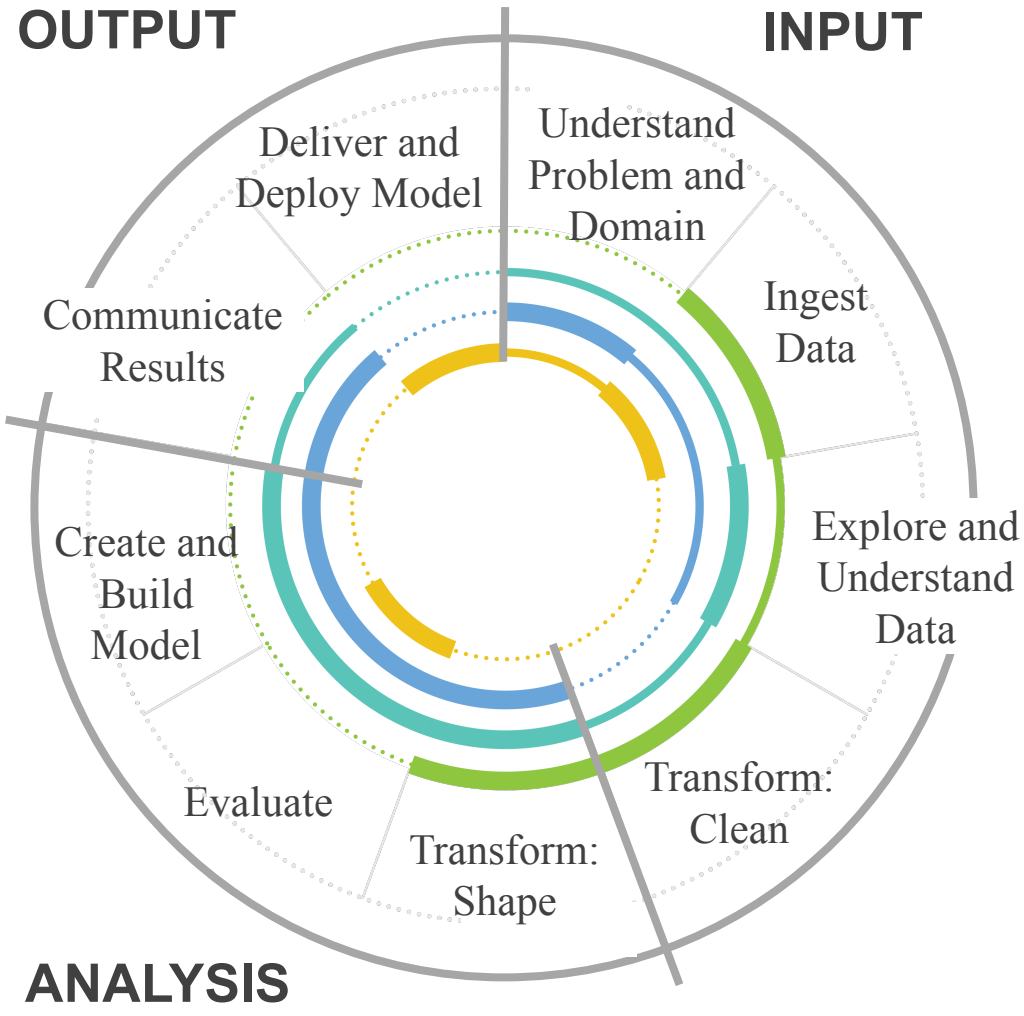
IBM Watson Data Platform Partner Ecosystem

The Open Community To Innovate Faster With Data



https://www.ibm.com/analytics/us/en/watson-data-platform/partners.html

Tailored Experiences and User Collaboration



Data Engineer
Architects how data is organized & ensures operability
Bluemix Data Connect

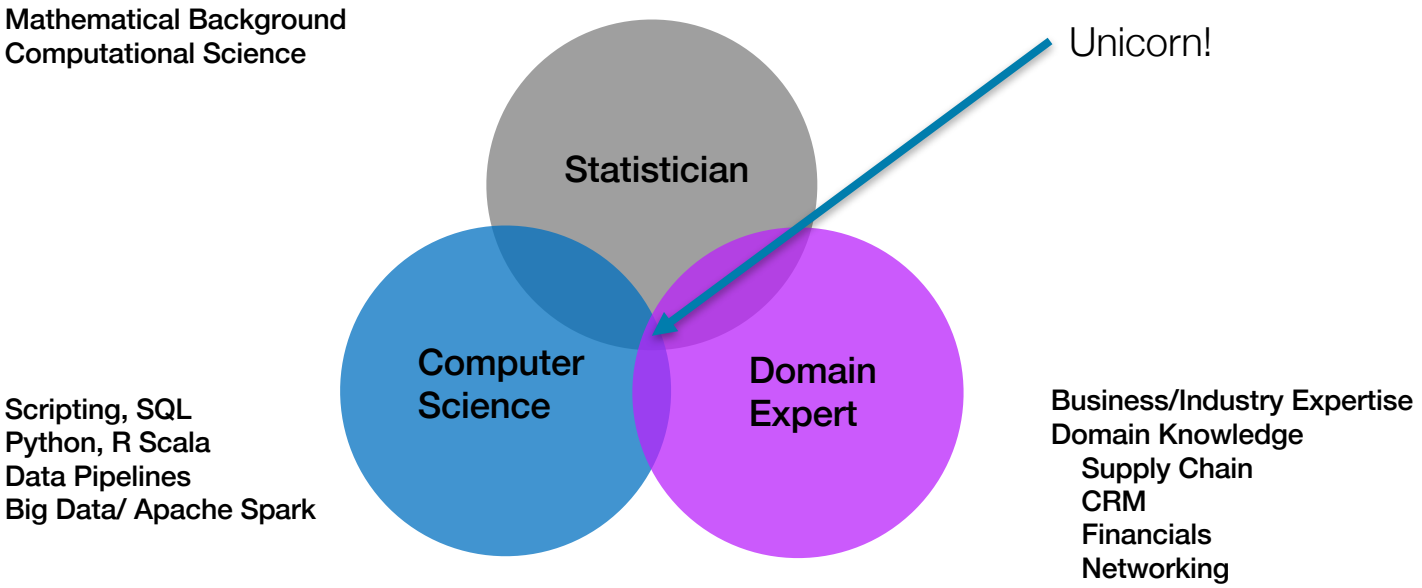
Data Scientist
Gets deep into the data to draw hidden insights for the business
Data Science Experience

Business Analyst
Works with data to apply insights to the business strategy
Watson Analytics

App Developer
Plugs into data and models & writes code to build apps
Bluemix

A Deeper look at a Data Scientist

Data Scientists Combine Skills across areas of Expertise



A Data Science Professional vary in a combinations of these skills

Data Scientist, Sexiest job in the 21st Century, but one of toughest…

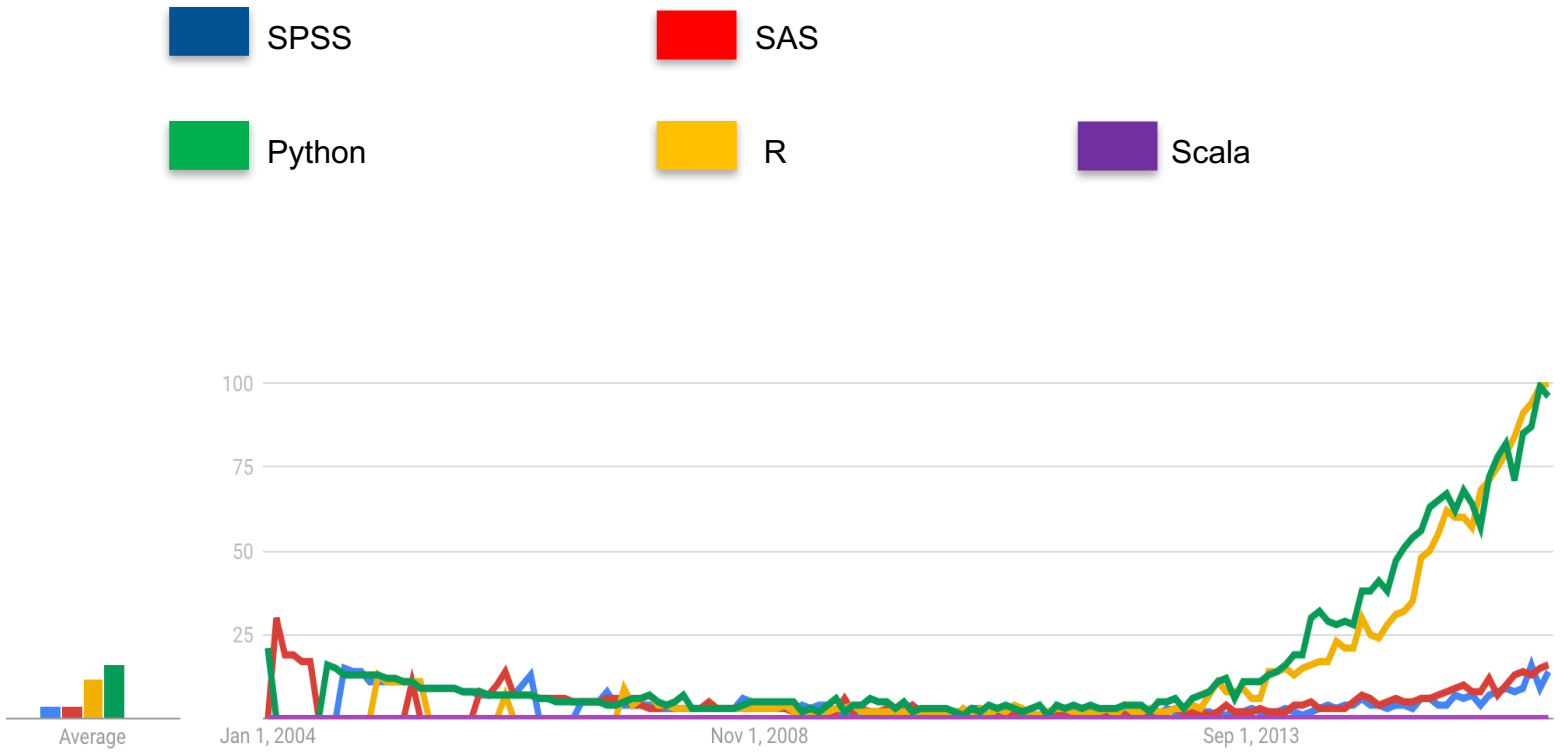
- **Rigid toolset**
  - Have to choose one and only one approach
  - Cannot easily connect all of the capabilities required
  - Difficult to navigate between the various tools used

- **Fragmented and time consuming**
  - Using multiple disjoint environments
  - Separate on-ramp/community for each tool/environment
  - Does not have meta data or data lineage

- **Analytical Silo**
  - Difficult to maintain and version control project assets
  - Limited means of collaborating with teams
  - Results are difficult to share

Data Science Platforms
Gartner February 2017 Magic Quadrant

Google Trends, *Open Source Data Science Technologies*



Trends in Google Searches (September 2nd 2016)

Open Source - Data Science Ecosystem

Introducing the Data Science Experience

Learn

Built-in learning to get started or go the distance with advanced tutorials

Create

The best of open source and IBM value-add to create state-of-the-art data products

Collaborate

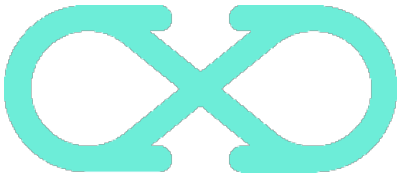
Community and social features that provide meaningful collaboration

External URL: http://datascience.ibm.com
Internal ZACS Page: https://ibm.biz/BdrDv5

IBM Data Science Experience

ALL YOUR TOOLS IN ONE PLACE

IBM Data Science Experience is an environment that brings together everything that a Data Scientist needs. It includes the most popular Open Source tools and IBM unique value-add functionalities with community and social features, integrated as a first class citizen to make Data Scientists more successful.



datascience.ibm.com

Core Attributes of the Data Science Experience

IBM Data Science Experience

Community

- Find tutorials and datasets
- Connect with Data Scientists
- Ask questions
- Read articles and papers
- Fork and share projects

Open Source

- Code in Scala/Python/R/SQL
- Jupyter Notebooks
- RStudio IDE and Shiny
- Apache Spark
- Your favorite libraries

IBM Added Value

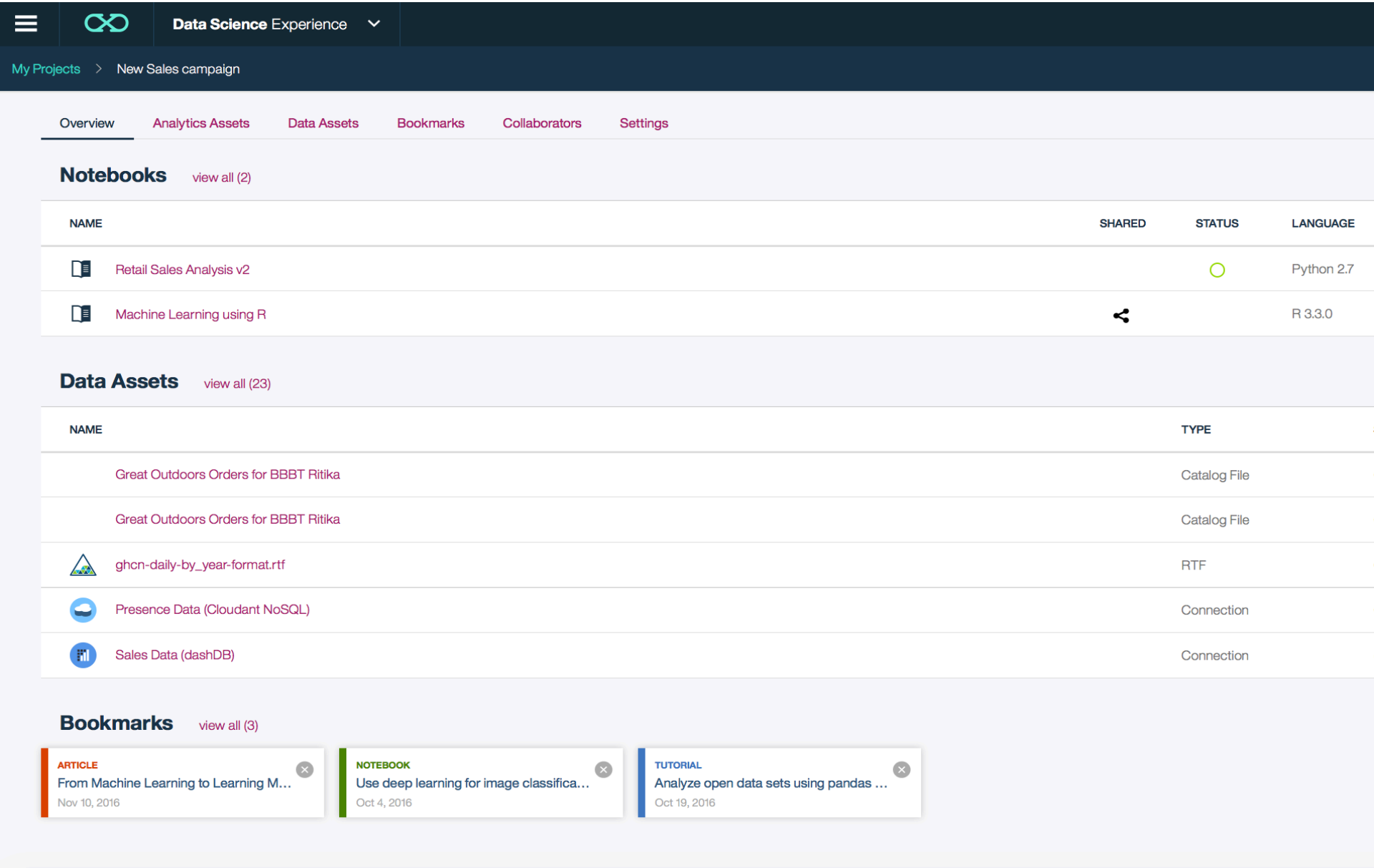
- IBM Machine Learning*
- **SPSS Modeler Canvas***
- Prescriptive Analytics - DOcplexcloud
- Projects and Version Control
- Managed Spark Service

Powered by IBM **Watson Data Platform**

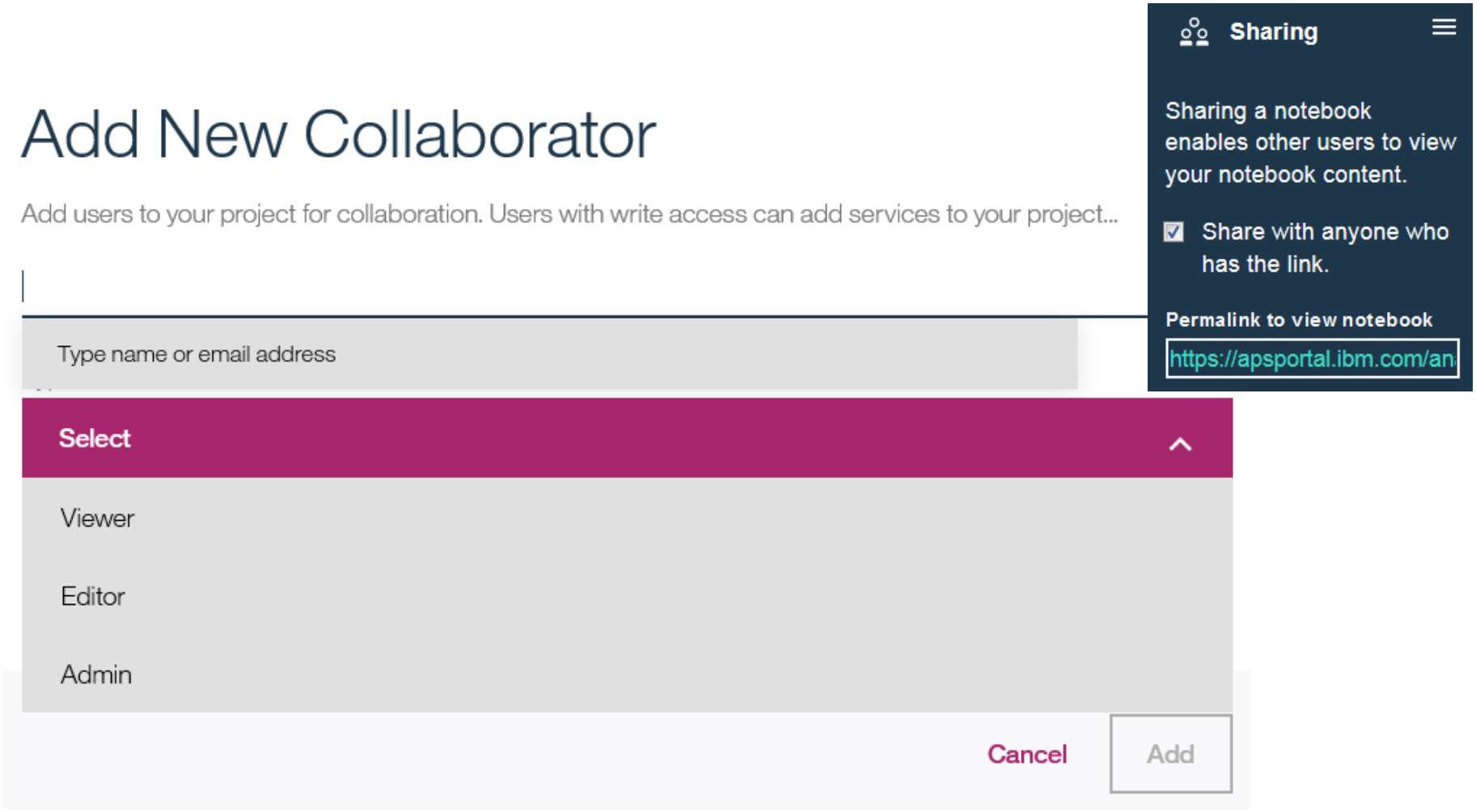
* Closed beta

IBM Data Science Experience
https://youtu.be/1HjzkLRdP5k

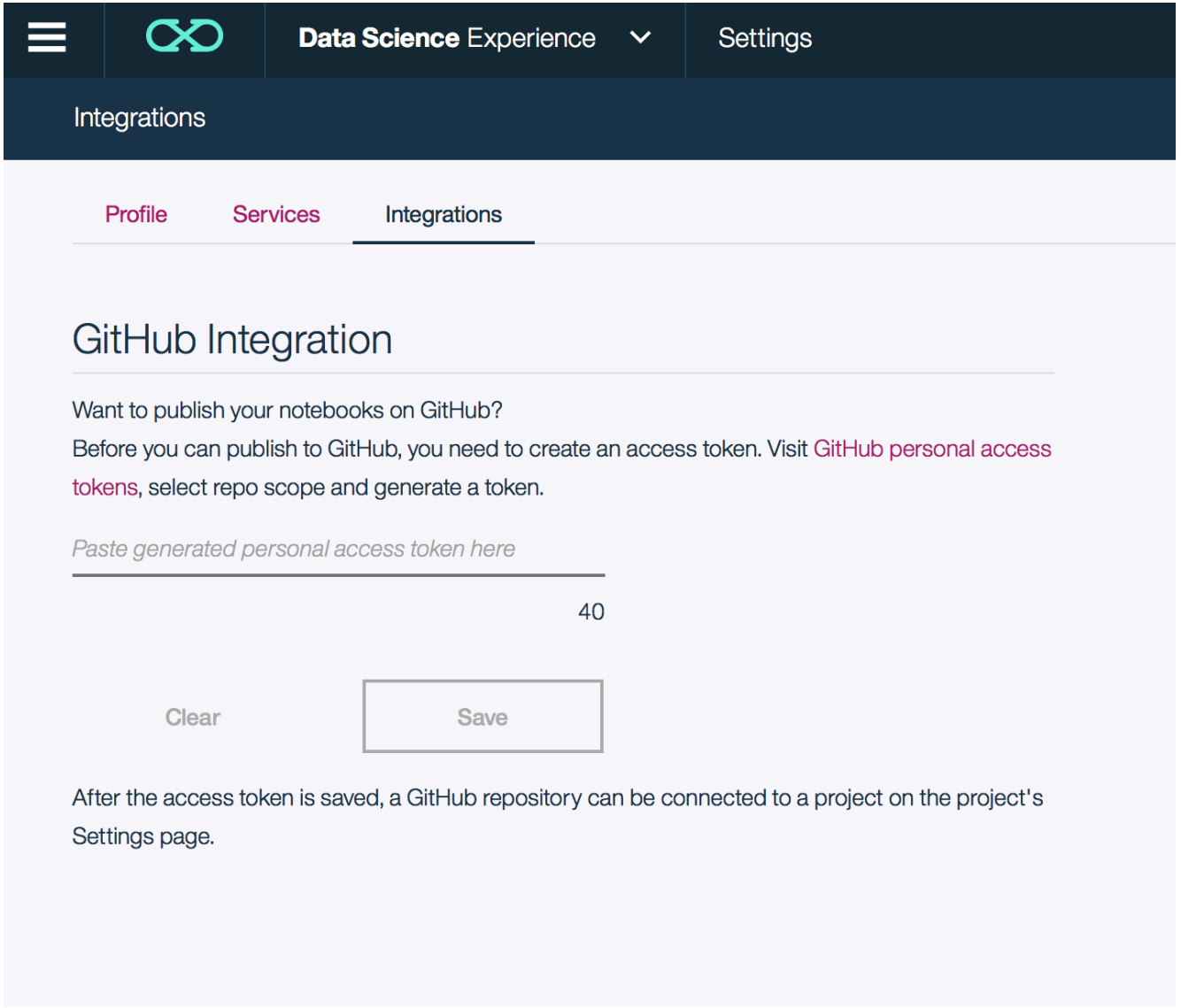
Collaborate Using Projects



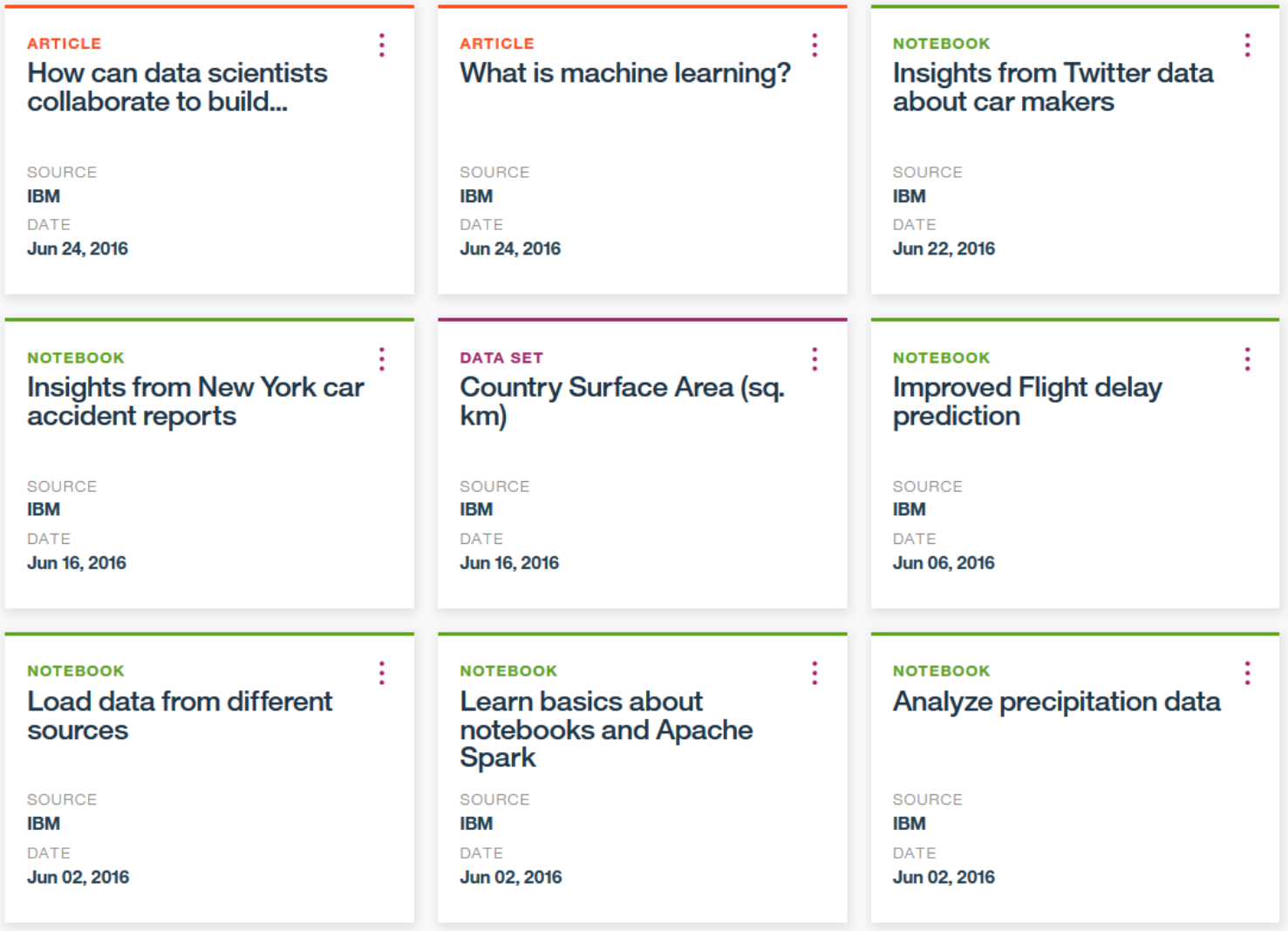
Features for sharing, forking, and reusing Project assets to increase your data science team's productivity



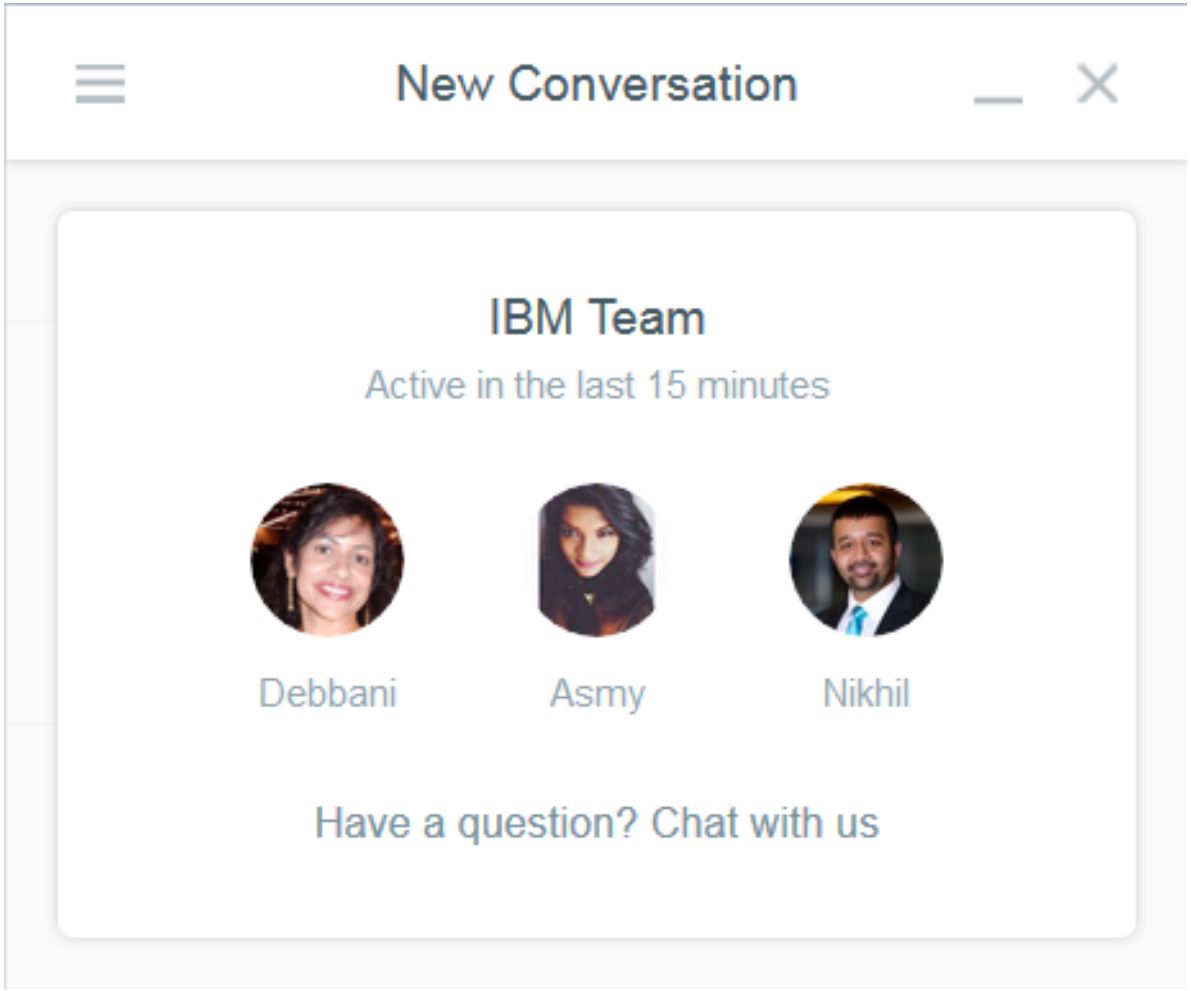
GitHub Integration



Community Cards provide in-context learning for users



Live chat on Intercom for support from the IBM team and to provide your feedback on how we can improve DSX



Integrated Jupyter Notebooks for interactive and collaborative development - seamless execution on Spark

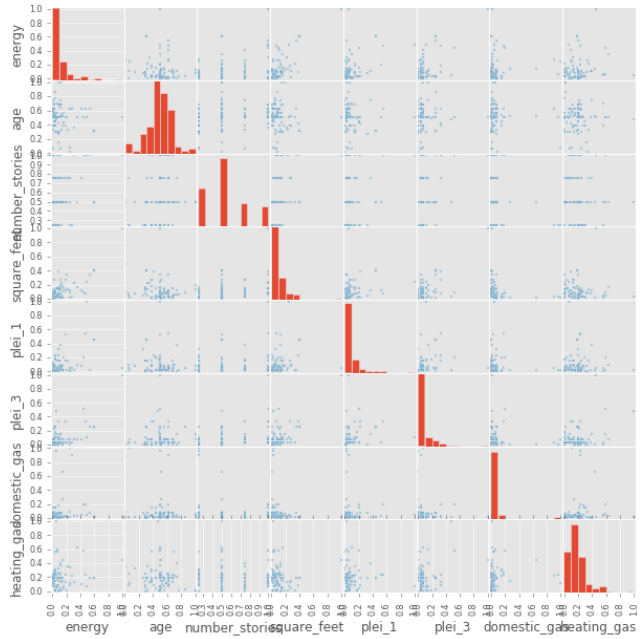
Notebooks > Spark Summit West - BlocPower Demo

File Edit View Insert Cell Kernel Help Python 2

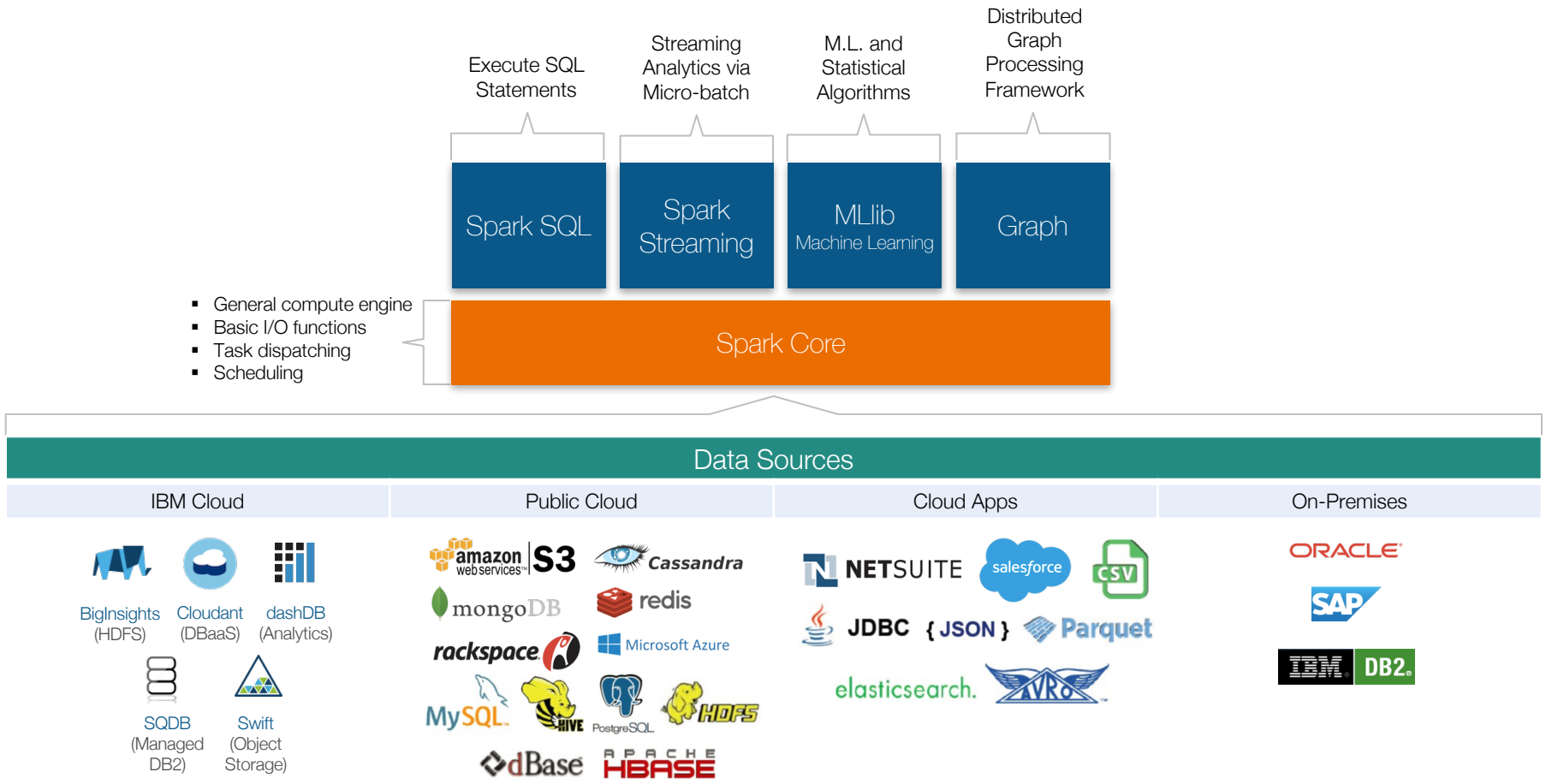
Format Markdown Cell Toolbar None

Explore the correlations

```
In [9]: import matplotlib.pyplot as plt
        %matplotlib inline
        plt.style.use('ggplot')
        ff = pd.tools.plotting.scatter_matrix(dfScaled, diagonal='hist',figsize=(10,10))
```



From a Notebook you can use IBM's managed Spark Service to blend multiple data types, sources, and workloads



The Spark Service uses Bluemix Object Storage as its preferred data store for building performant applications

- Object storage provides **inexpensive, scalable and self-healing** retention of massive amounts of unstructured data
- Every object exists at the same level in a **flat address space**
- Bluemix Object Storage has a **drag-and-drop** upload and **Swift API** for programmatic access

Object Storage

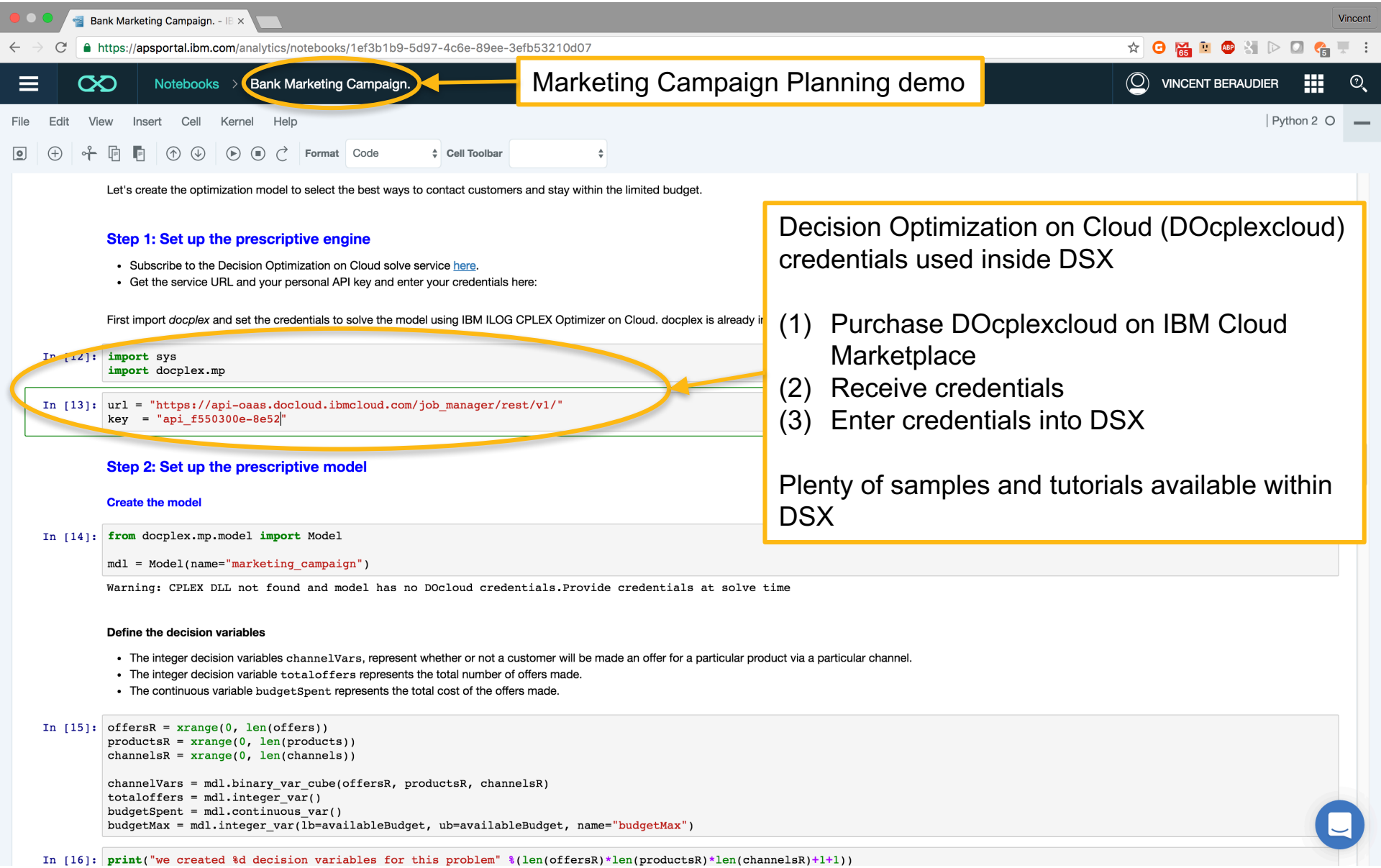
IBM

Supported Data Sources for DSX via on-premises and cloud Connections

Cloud Sources	On-Premises Sources	Cloud Targets	On-Premises Targets
Amazon Redshift	Apache Hive	Amazon S3	IBM DB2® LUW
Amazon S3	Cloudera Impala	Bluemix Object Storage	IBM Pure Data for Analytics®
Apache Hive	IBM DB2® LUW	IBM Cloudant™	Teradata
Bluemix Object Storage	IBM Informix®	IBM dashDB	
IBM BigInsights™ on Cloud	IBM Pure Data for Analytics®	IBM BigInsights™ on Cloud	
IBM Cloudant™	Microsoft SQL Server	IBM DB2® on Cloud	
IBM dashDB	MySQL Enterprise Edition	IBM SQL Database	
IBM DB2® on Cloud	Oracle	IBM Watson™ Analytics	
IBM SQL Database	Pivotal Greenplum	PostgreSQL on Compose	
Microsoft Azure	PostgreSQL	SoftLayer Object Storage	
PostgreSQL on Compose	Sybase		
Salesforce	Sybase IQ		
SoftLayer Object Storage	Teradata		

All of the supported targets are compatible with each source

IBM Decision Optimization for DSX via API calls to DOcplexcloud

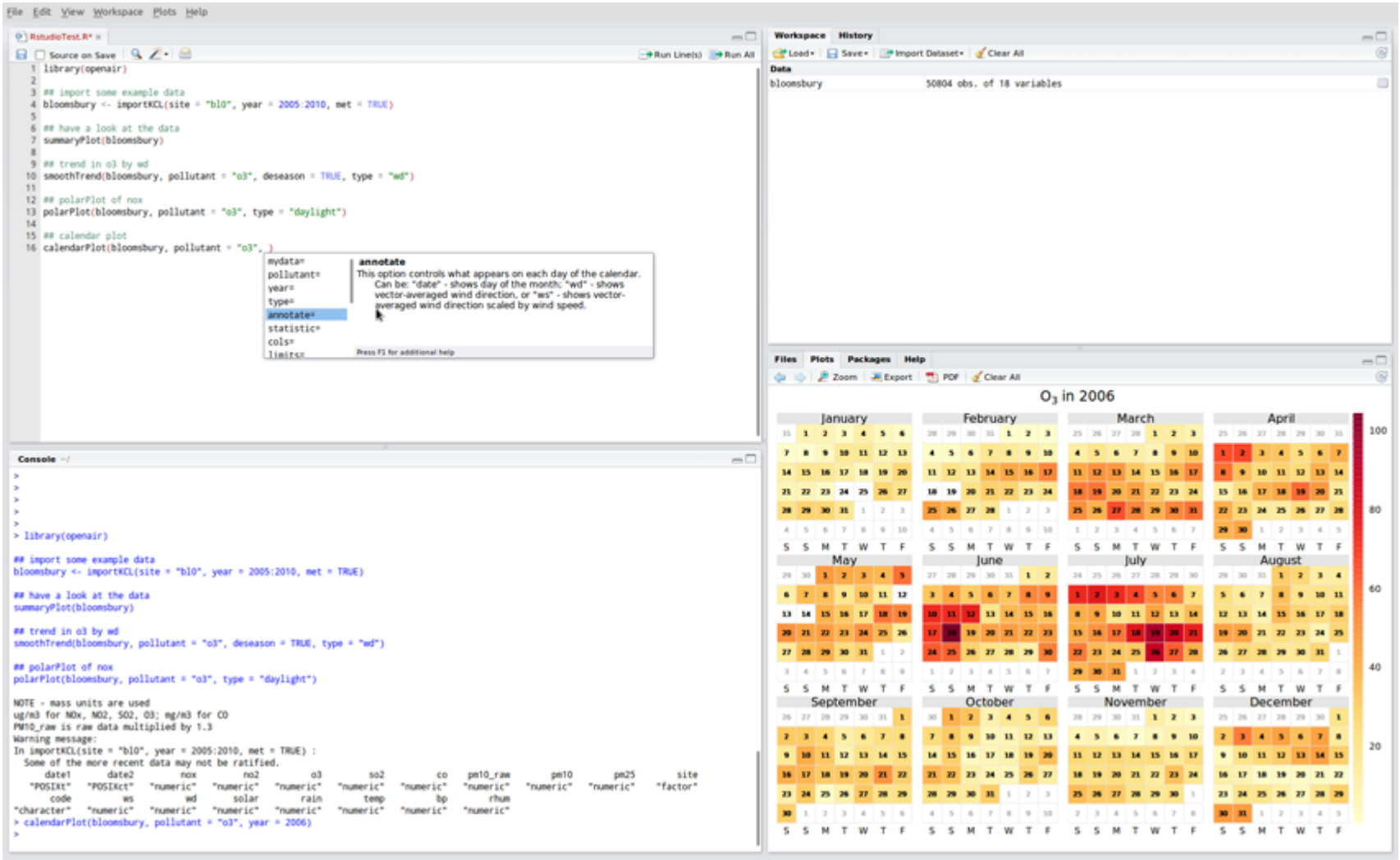


Decision Optimization on Cloud (DOcplexcloud) credentials used inside DSX

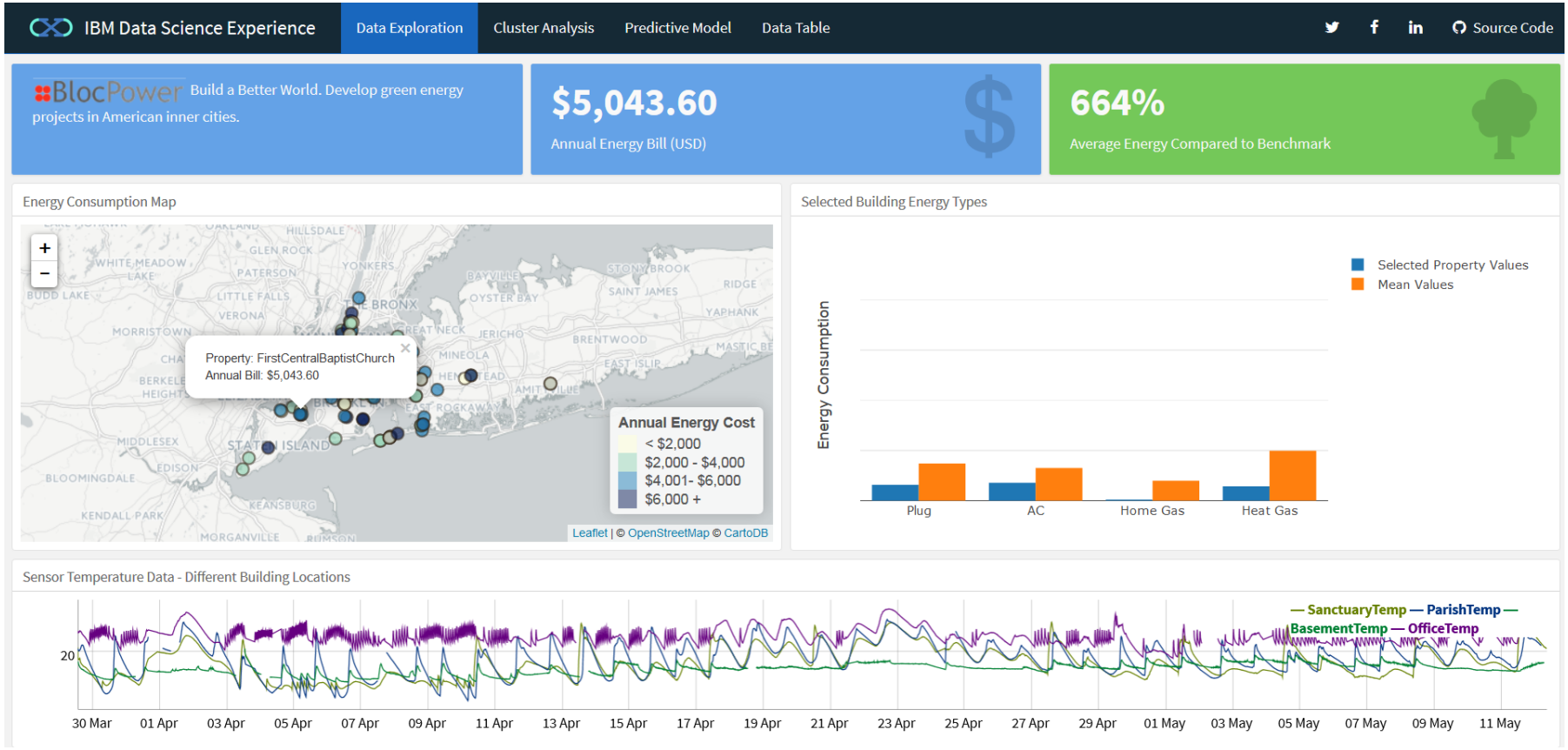
(1) Purchase DOcplexcloud on IBM Cloud Marketplace
(2) Receive credentials
(3) Enter credentials into DSX

Plenty of samples and tutorials available within DSX

DSX has RStudio built into the experience thanks to our strategic partnership



With RStudio you can create Shiny web applications to make your analysis accessible to the business



Modelling Energy Usage in NYC – BlocPower

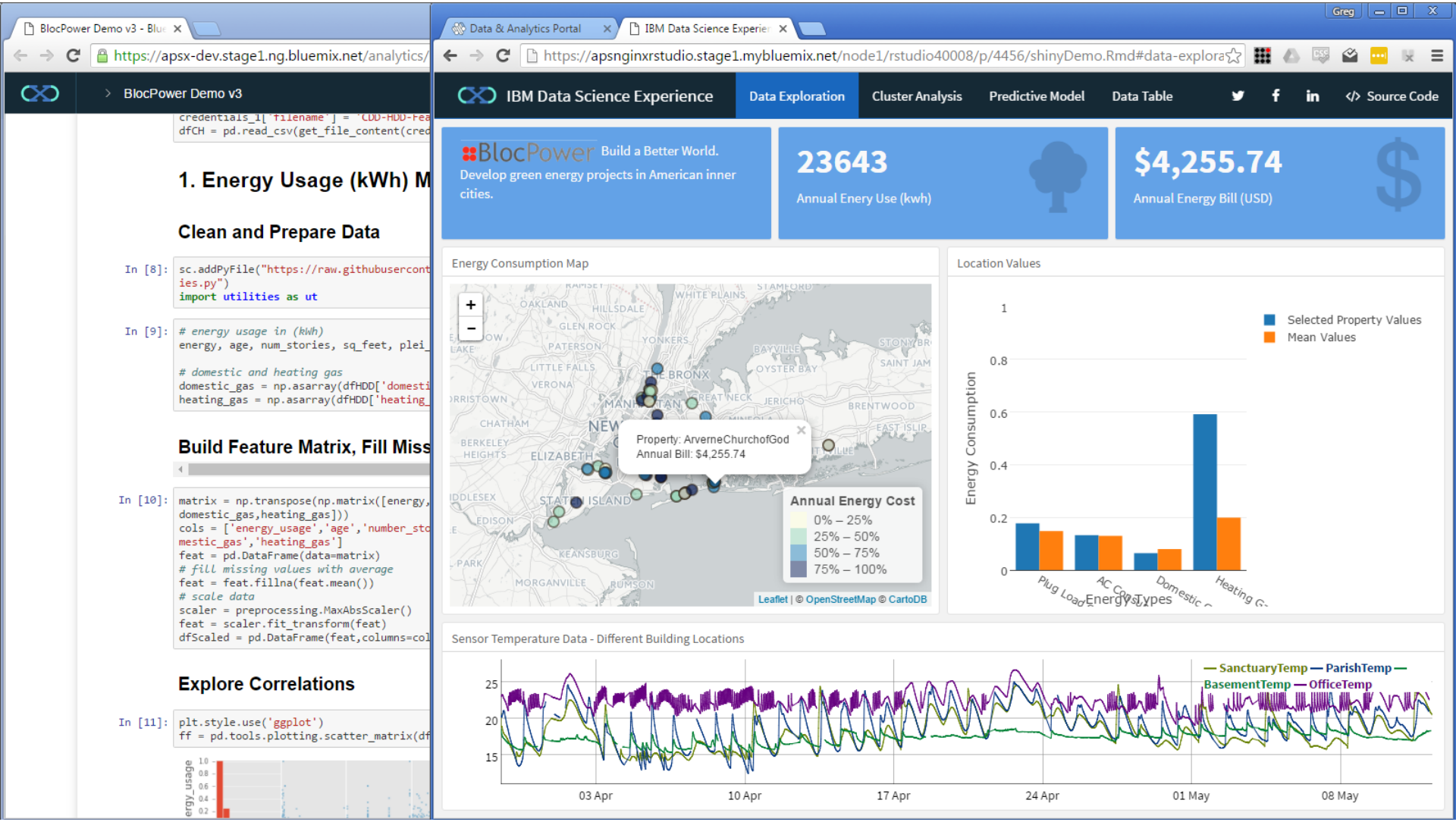
BlocPower

— Tooraji Arvajeh,
Chief Engineering Officer,
BlocPower

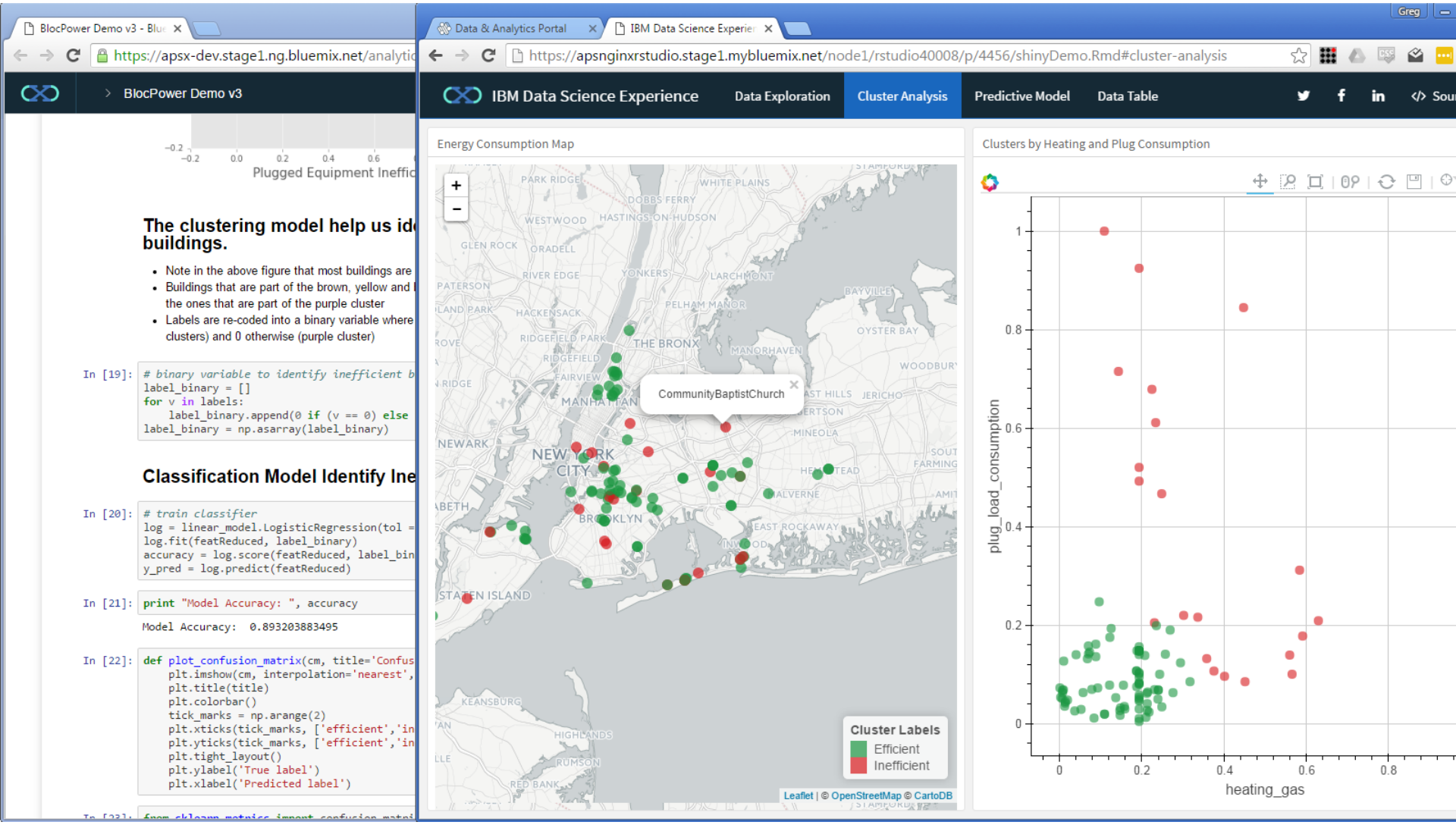
"BlocPower operation is diverse from outreach and targeting, origination of investment-grade clean energy projects to financing projects through our crowdfunding marketplace. Data is the underlying tool of our operation and IBM's Data Science Experience will facilitate a closer integration across it and help our business scale up faster. "

Blog Link: http://ibm.co/29KLbvu

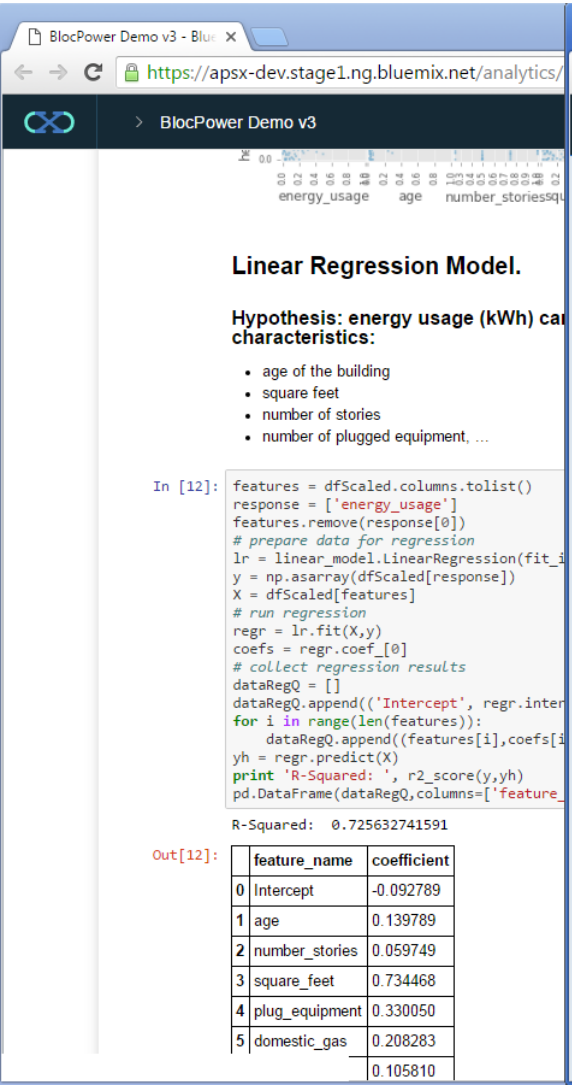
Use Shiny apps to share your analysis with business users

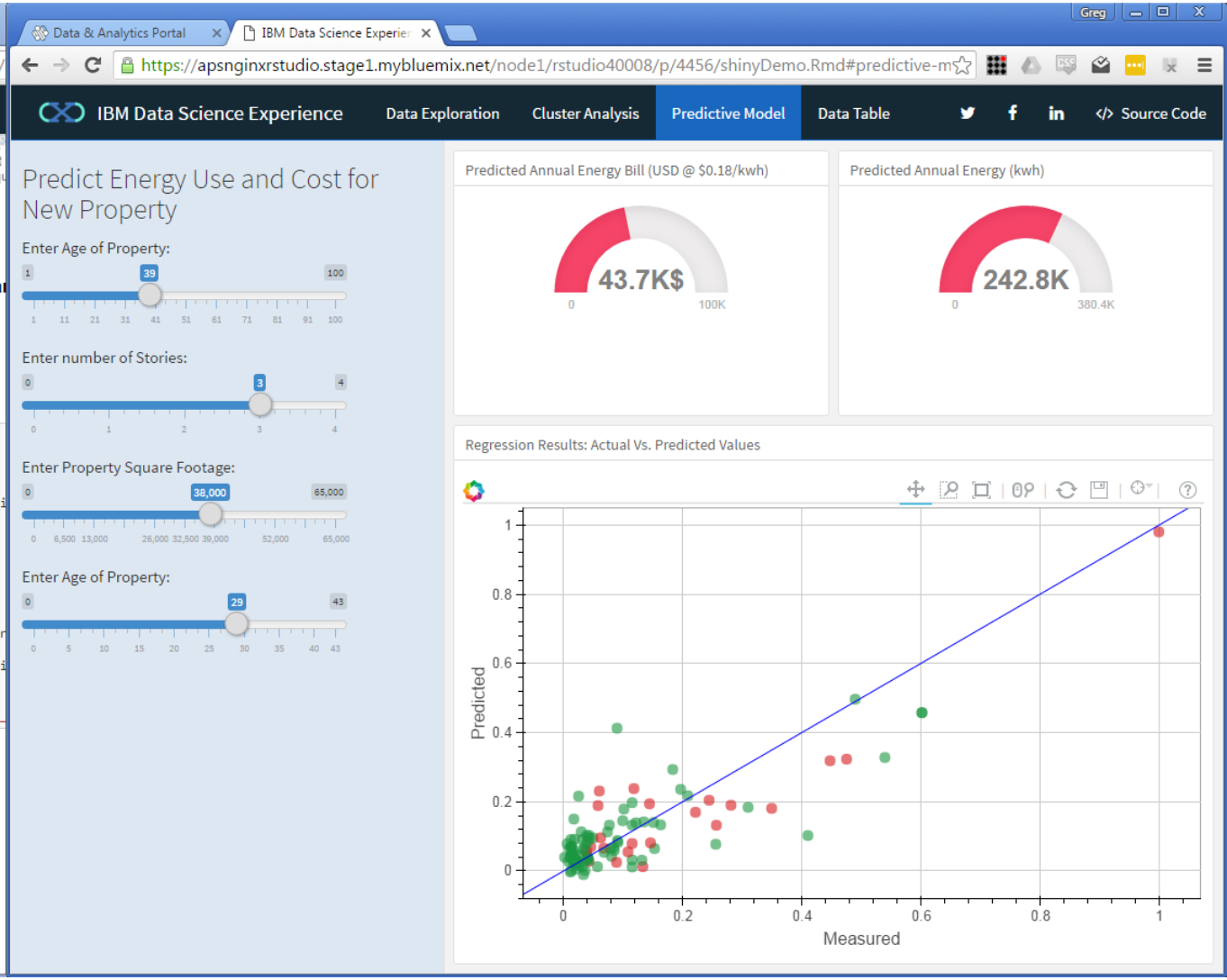


Interactively explore the analysis of your data science team



Adjust parameters on-the-fly and visualize model predictions





IBM MACHINE LEARNING

Operationalize insights with IBM Machine Learning

IBM Machine Learning

Data Access:

- Easily connect to Behind-the-Firewall and Public Cloud Data
- Catalogued and Governed Controls through Watson Data Platform

Creating Models:

- Single UI and API for creating ML Models on various Runtimes
- Auto-Modelling and Hyperparameter Optimization

Web Service:

- Real-time, Streaming, and Batch Deployment
- Continuous Monitoring and Feedback Loop

Intelligent Apps:

- Integrate ML models with apps, websites, etc.
- Continuously Improve and Adapt with Self-Learning

IBM Machine Learning – Functionality for All!

IBM Machine Learning (on Bluemix)

Data Science Experience with IBM ML

IBM Machine Learning for z/OS (with DSX)

App Developer

Data Scientist

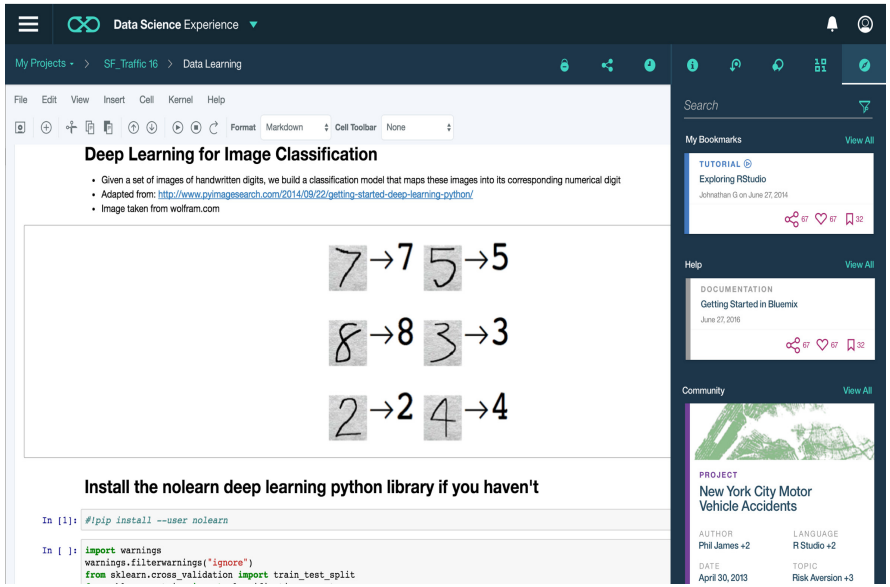
Data Scientist

IBM Machine Learning in Data Science Experience

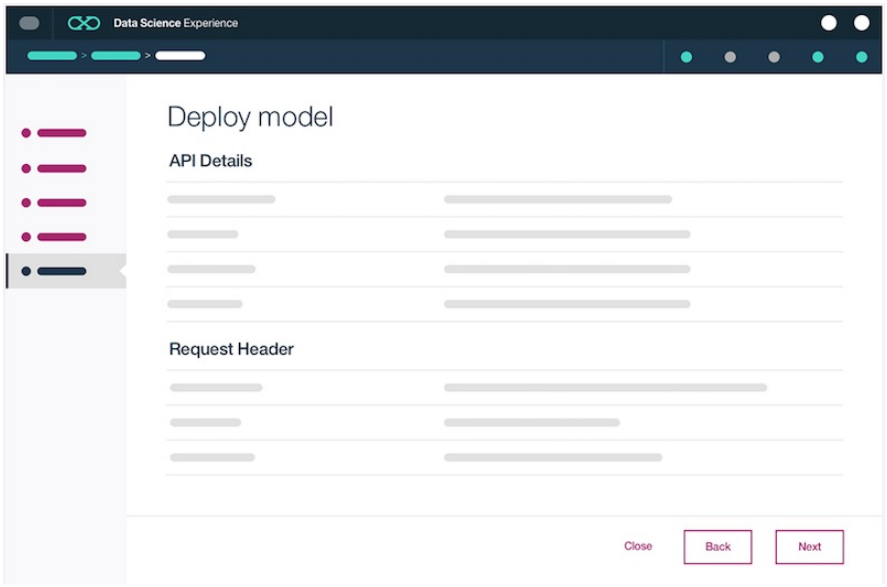
IBM Machine Learning is provisioned by default in Data Science Experience

- Enables Data Scientists to deploy machine learning models as web services
- Single UI for creating, collaborating, deploying, monitoring, and feedback
- Accessible via API, Wizard GUI, and Canvas

API for Jupyter Notebooks

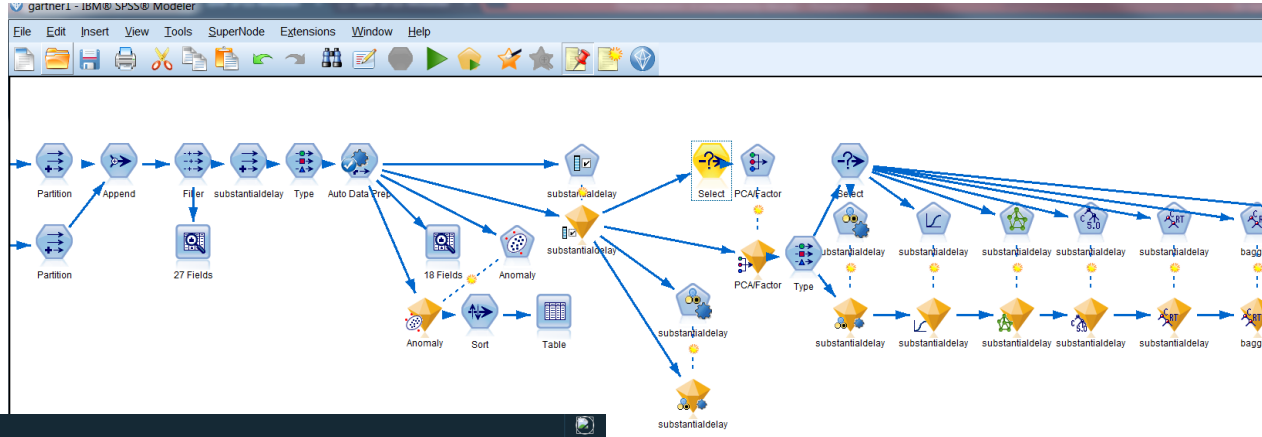


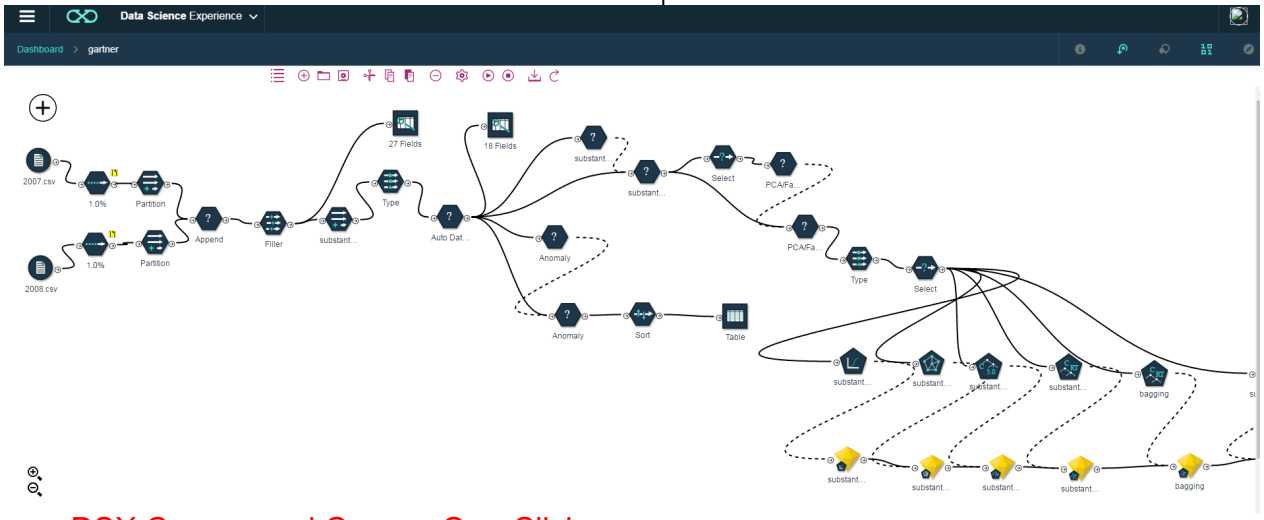
Wizard GUI



The DSX Canvas is compatible with existing SPSS Modeler Streams and can be deployed via IBM Machine Learning

- DSX Canvas has compatibility with legacy SPSS Modeler streams
- Multiple execution runtimes: SPSS Modeler, SparkML (coming soon)
- Support for R/Python/SQL code in the pipeline





- One-click pipeline deployment from DSX Canvas (left) via IBM Machine Learning

DSX Canvas and Canvas One-Click Deployment via IBM ML are Roadmap Items

Finding Data Science Experience Opportunities

1 Target the Right Buyer

- Data Scientists or Analytics Leaders who are tasked with building data-driven teams or intelligent applications leveraging data science or machine learning
- Decision makers such as Director of Analytics, Big Data Center of Excellence Leaders, VP of Data Science, LOB, CTO, Chief Data Officer and so on
- Existing analytics tools customers looking to grow their teams and expand their portfolio

2 Ask Qualifying Questions

- Do you have Data Science/Analytics teams in place?
- How do the various analytics team members collaborate?
- How do you manage open source tools for analytics?
- Do you now or in the future plan to leverage Apache Spark?
- How do you deal with data scientists needs for more tools in their portfolio?
- How do you create and deploy machine learning models today?

3 Listen for Key Words and Phrases

- Open Source Analytics, Collaborative Data Science
- RStudio, Jupyter Notebooks, R, Python, Scala, GitHub Integration, Microservices
- Single interface for predictive and prescriptive models
- Analyze large volumes of data, Apache Spark
- Scalable Pipelines and Machine Learning
- SPSS on Cloud, One-click Machine Learning
- Common project framework to manage the entire analytics lifecycle
- Shiny Applications, Decision Optimization

4 Align with other Analytics offerings

- IBM Machine Learning is available within DSX
- We will very soon have a Canvas that will support SPSS Modeler Streams and Machine Learning Pipelines
- We support R, Python and Scala so that data scientists can use their language of choice to leverage Apache Spark
- To address prescriptive analytics use cases we can leverage the DOcplexcloud API through notebooks in DSX
- As you can see DSX is not only very tightly integrated with our entire portfolio of analytics tools and services but also fits in very well into the broader Watson Data Platform

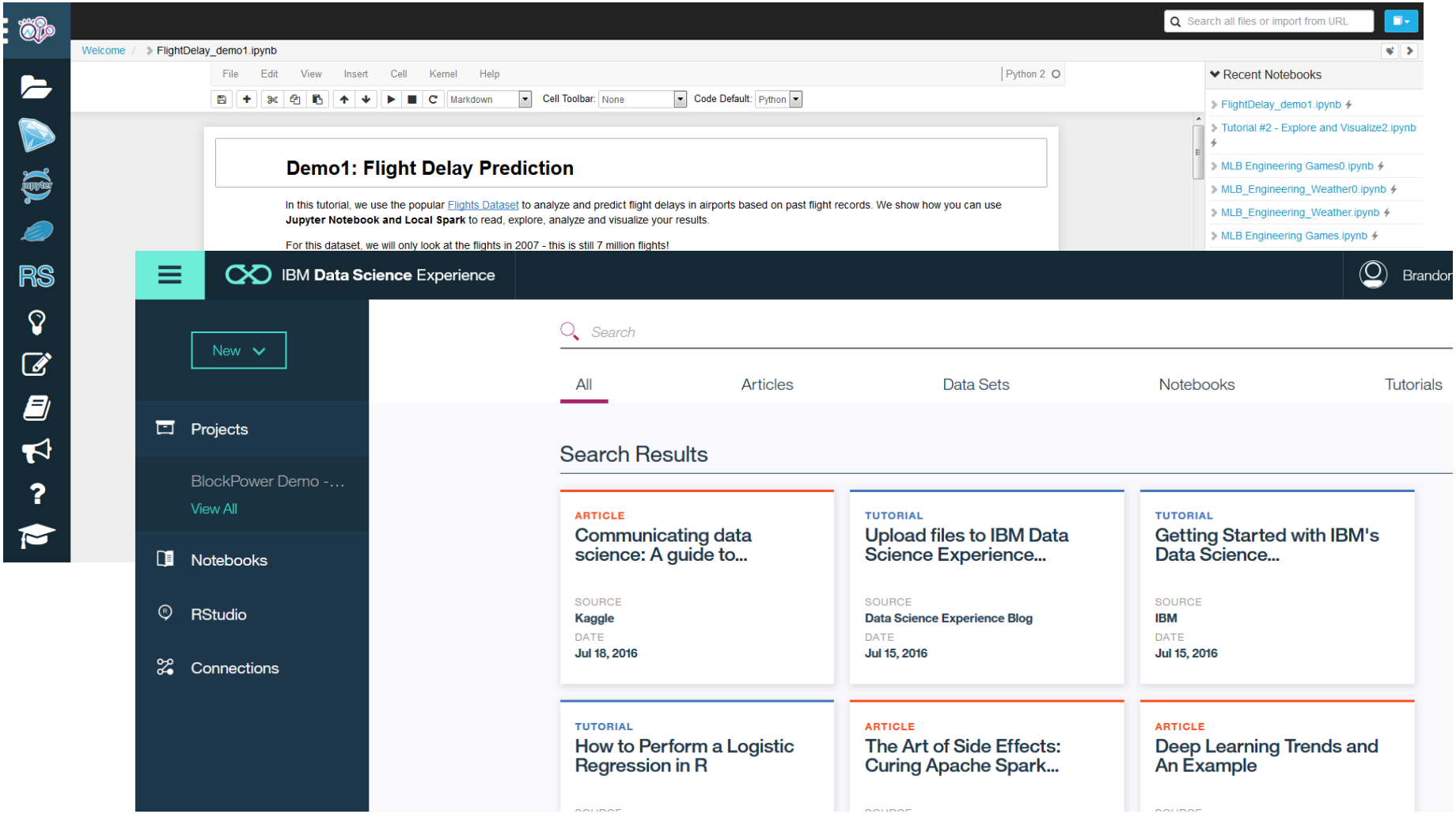
Get Started with Data Science Experience Today!

Calling all Data Science Professionals!

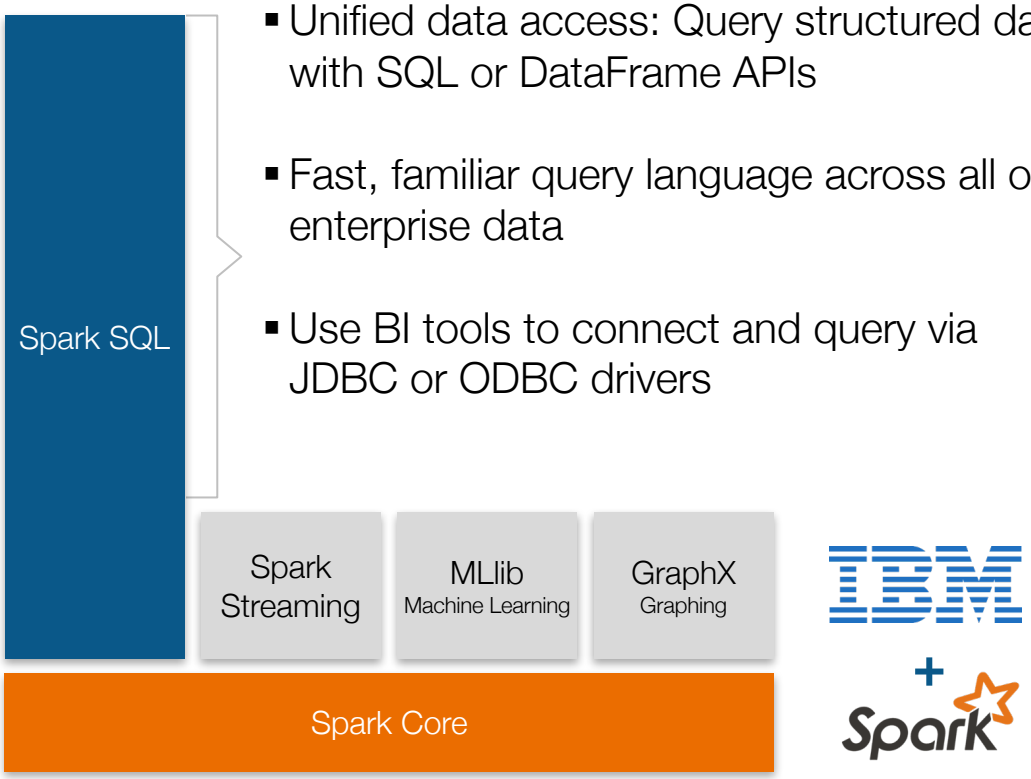
- Data Science Experience seamlessly integrates with the broader Watson Data Platform and is our primary experience for Data Science Professionals
- Our mission is to win the **hearts and minds** of Data Scientists
- DSX provides an integrated and collaborative environment that brings together, in a single environment, the tools and project framework needed to successfully make data science a team sport
- IBM Data Science Experience is a **freemium model** with Enterprise Plans available - **sign up** to try it out at **datascience.ibm.com**

APPENDIX

Data Scientist Workbench vs Data Science Experience



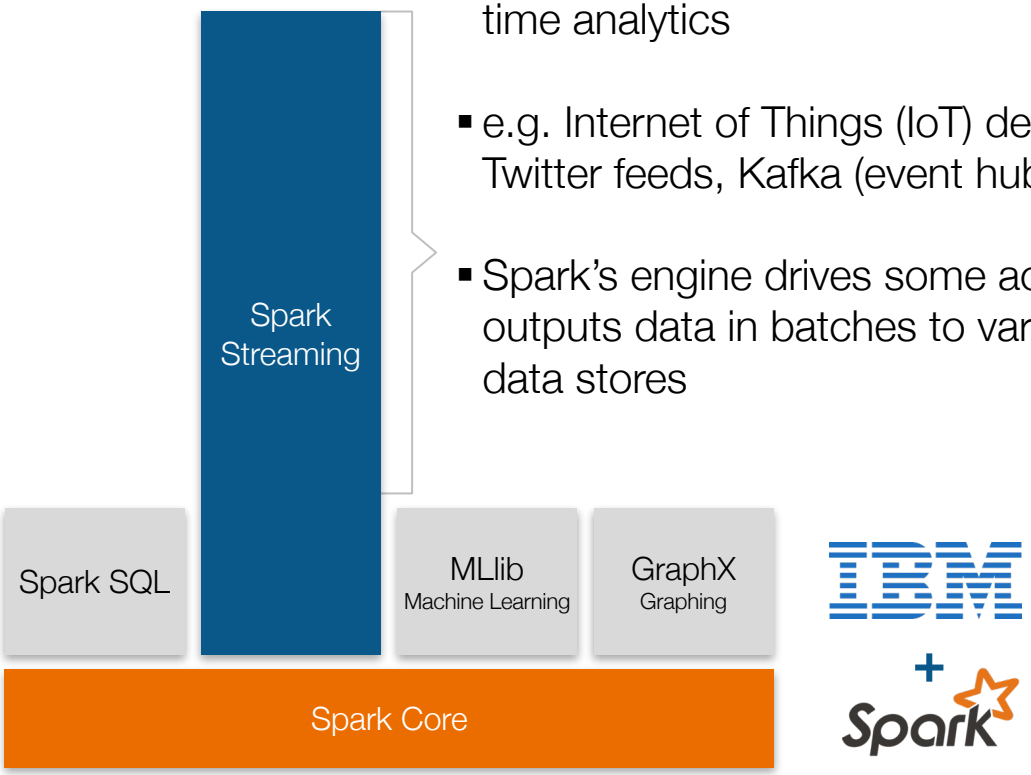
Select Libraries to Meet Use-Case Challenges



- Unified data access: Query structured data sets with SQL or DataFrame APIs
- Fast, familiar query language across all of your enterprise data
- Use BI tools to connect and query via JDBC or ODBC drivers

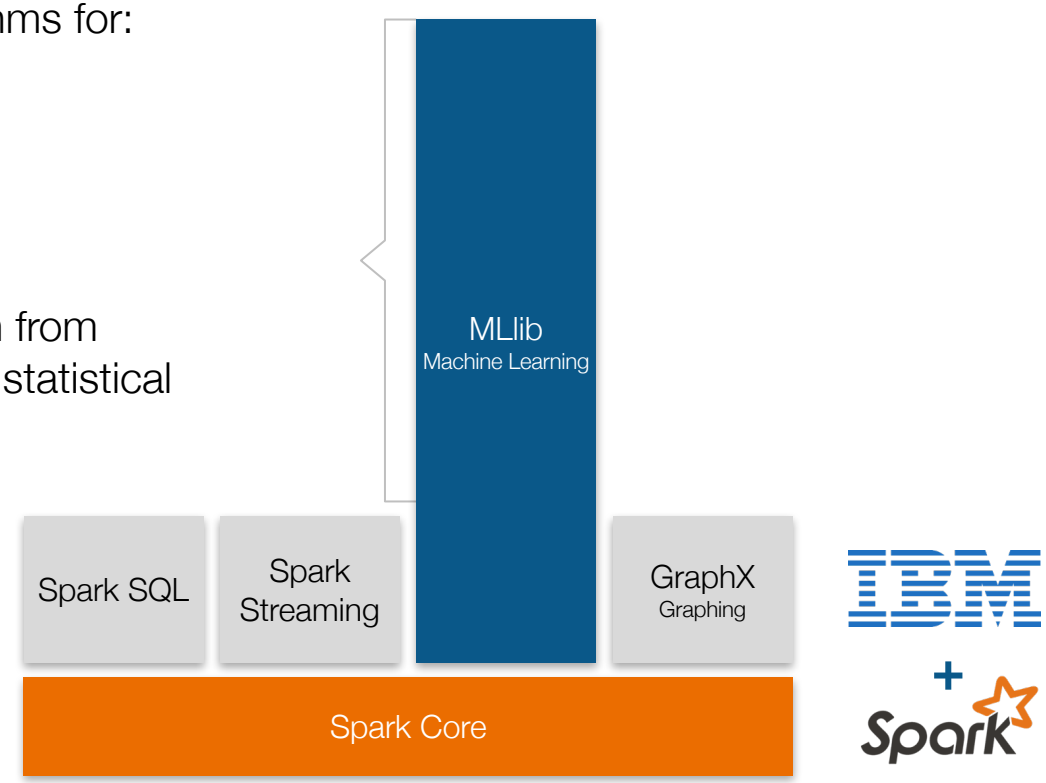
Select Libraries to Meet Use-Case Challenges

- Micro-batch event processing for near-real time analytics
- e.g. Internet of Things (IoT) devices, Twitter feeds, Kafka (event hub), etc.
- Spark's engine drives some action or outputs data in batches to various data stores



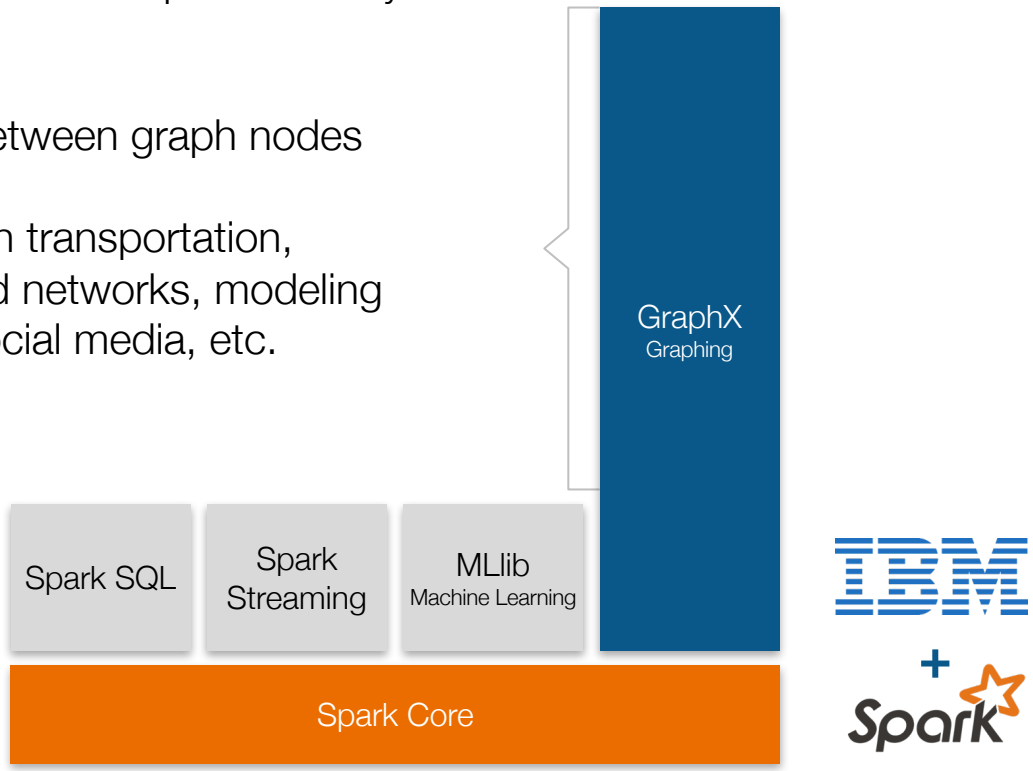
Select Libraries to Meet Use-Case Challenges

- Predictive and prescriptive analytics
- Machine learning algorithms for:
  - Clustering
  - Classification
  - Regression
  - etc.
- Smart application design from pre-built, out-of-the-box statistical and algorithmic models



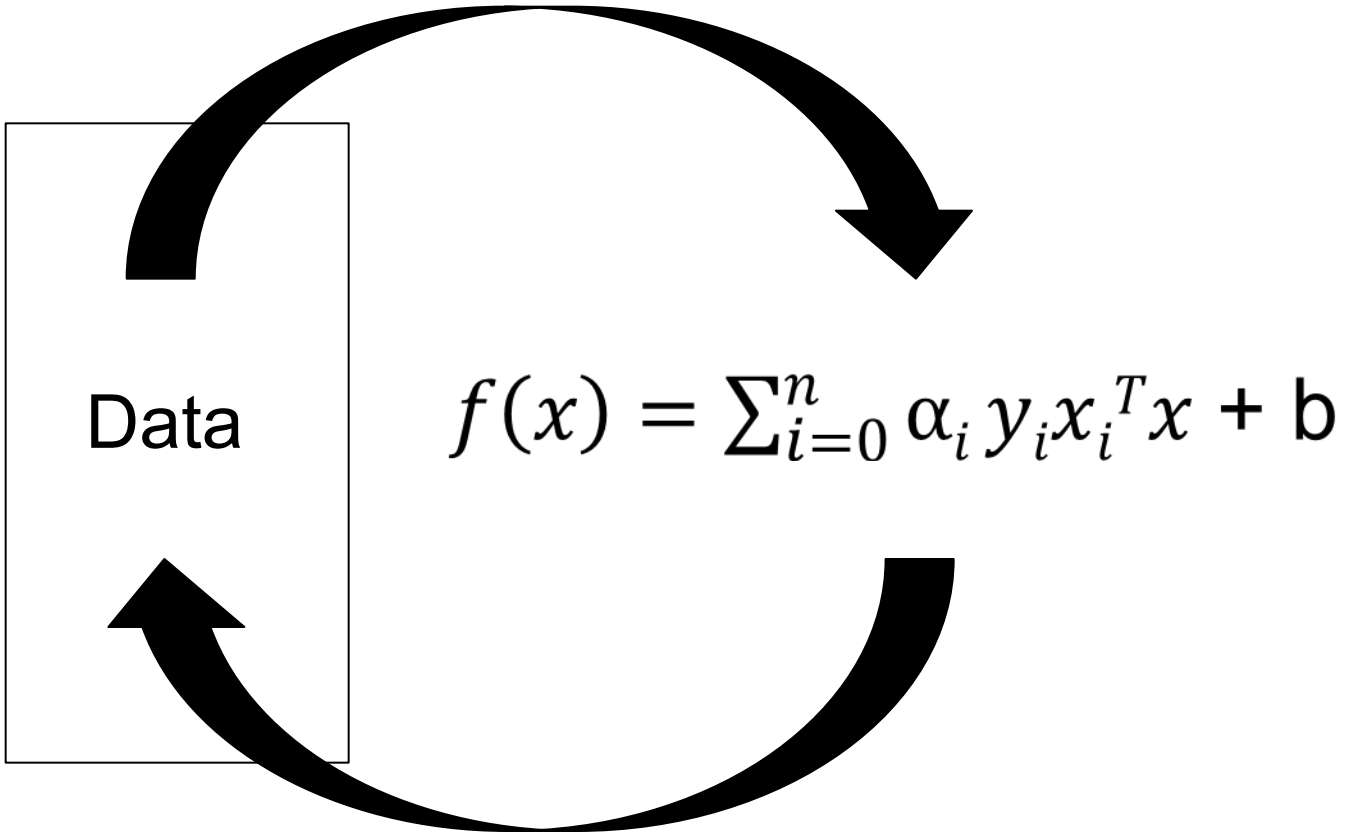
Select Libraries to Meet Use-Case Challenges

- Represent and analyze systems represented by graph nodes
- Trace interconnections between graph nodes
- Applicable to use cases in transportation, telecommunications, road networks, modeling personal relationships, social media, etc.

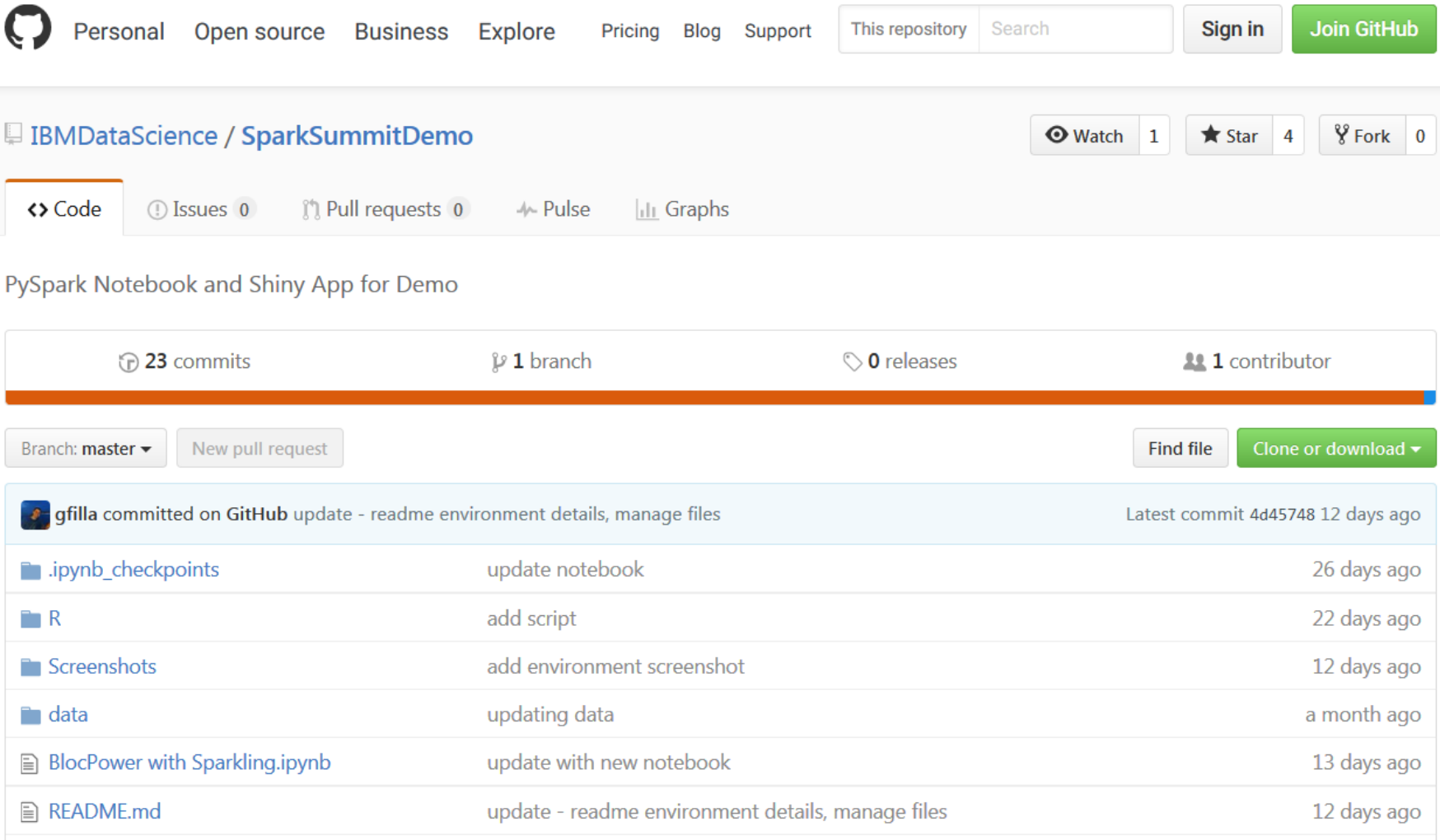


Machine Learning

- "The science of getting computers to act without being explicitly programmed"
- "Systems that can learn from data"

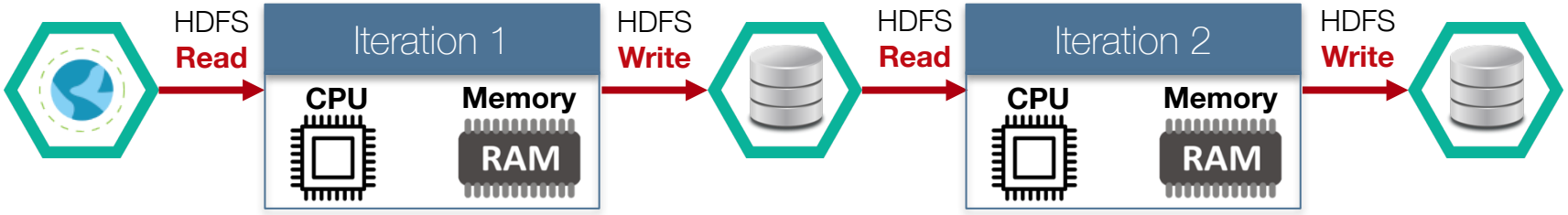


GitHub



Motivation for Apache Spark

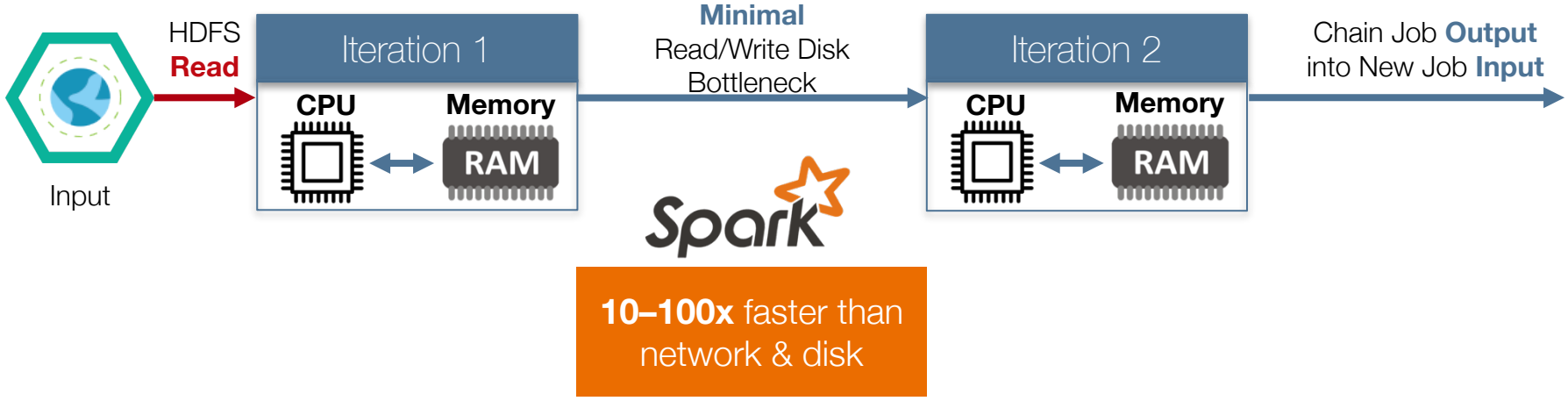
- **Traditional Approach: MapReduce jobs for complex jobs, interactive query, and online event-hub processing involves lots of (slow) disk I/O**



Motivation for Apache Spark

- **Traditional Approach: MapReduce jobs for complex jobs, interactive query, and online event-hub processing involves lots of (slow) disk I/O**

- **Solution: Keep data in-memory with a new distributed execution engine**



Object Storage

- Object storage, also called object-based storage, is a generic term that describes an approach to addressing and manipulating discrete units of storage called objects.

- Like files, objects contain data -- but unlike files, objects are not organized in a hierarchy. Every object exists at the same level in a flat address space called a storage pool and one object cannot be placed inside another object. Each object is assigned a unique identifier which allows a server or end user to retrieve the object without needing to know the physical location of the data.

- Object storage is often compared to valet parking at an upscale restaurant. When a customer uses valet parking, he exchanges his car keys for a receipt. The customer does not know where his car will be parked or how many times an attendant might move the car while the customer is dining. In this analogy, a storage object's unique identifier represents the customer's receipt.

[1]http://searchstorage.techtarget.com/definition/object-storage

Object Storage

- Object storage systems allow relatively inexpensive, scalable and self-healing retention of massive amounts of unstructured data. Object storage is used for diverse purposes such as storing photos on Facebook, songs on Spotify, or files in online collaboration services, such as Dropbox.

- Object Storage provides an unstructured cloud data store to build and deliver cloud applications and services with lowered cost, reliability, and speed to market. Bluemix developers and users can access and store unstructured data content and can interactively compose and connect to applications and services. The Object Storage service also provides programmatic access via API, SDKs and a consumable UI for object management.

Object Storage

IBM

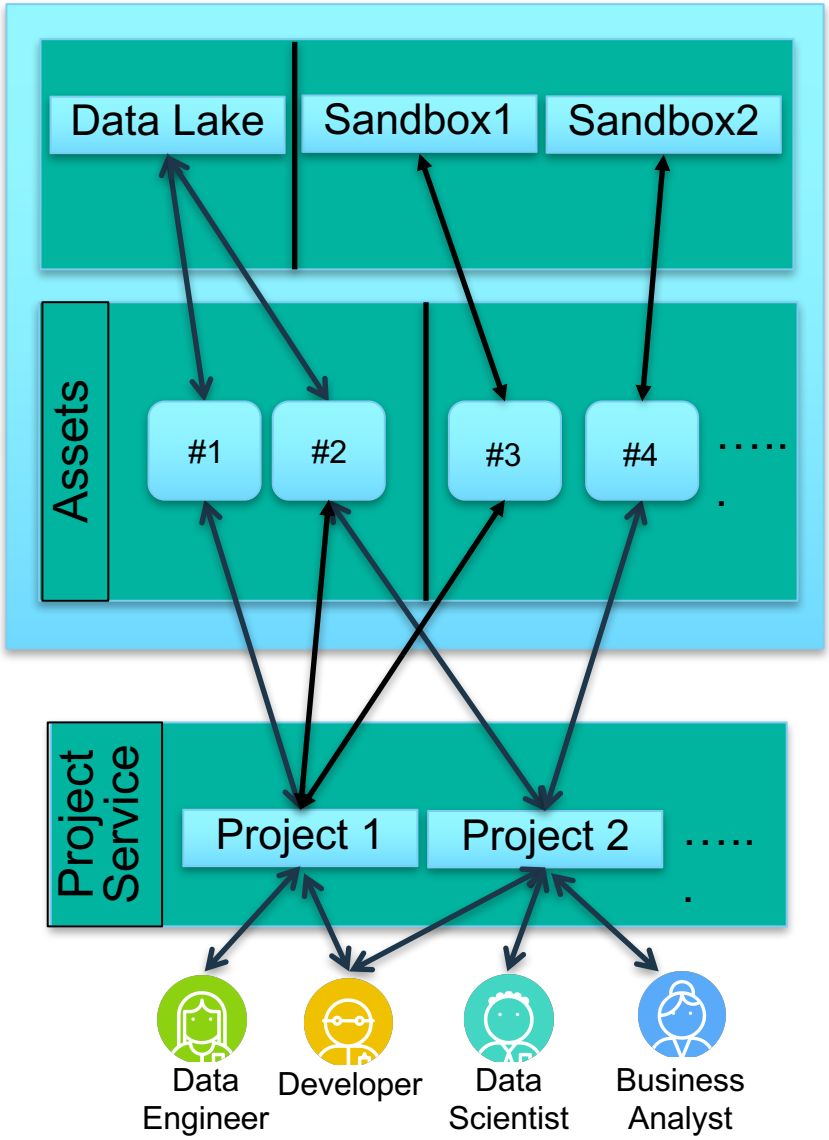
- Cloud Storage - store all your files (images, documents, and more) in the cloud. Use metadata to quickly tag and search your objects. Easily compose and bind to your object files from your Bluemix application.

- Easy Access - use drag and drop to quickly upload and manage your object store content or use industry adopted OpenStack Swift API and SDKs to access your object store programmatically.

DSX – Projects

Projects make collaboration easier

- Projects allow different users and personas to share a set of assets
- Projects enable you to collaborate and manage your notebooks, artifacts, etc.
- Projects have three levels of rights -- viewers, editors, and admin



IBM's Commitment to R

What is the R Consortium?

The R Consortium is a group organized under an open source governance and foundation model to provide support to the R community, the R Foundation and groups and individuals, using, maintaining and distributing R software. The R Consortium aims to expand outreach and assistance of developers who are currently interested or using the R language. The R Consortium, while an independent organization, is a Collaborative Project of the Linux Foundation with the Linux Foundation providing operational support and guidance.

What is R?

The R language is an open source environment for statistical computing and graphics, and runs on a wide variety of computing platforms. The R language has enjoyed significant growth, and a broad range of industries have adopted the R language, including biotech, finance, and advertising industries. The R language is often integrated into third party analysis, visualization and reporting applications.

Why are we joining the R Consortium?

IBM is announcing its full support for the R community of 2M+ dedicated users who have traditionally been underserved. R users will benefit from IBM Analytics products that provide native support for R and deployment environments that support R. Membership in the R Consortium, whose mission is to "advance the worldwide promotion of and support for the R open source language", demonstrates our commitment to R and the broader Data Science and Engineering community. It is important that IBM has a voice in the consortium to make sure our business interests are protected and also furthered as newer projects related to R are funded.

Overview of the membership

IBM will join Microsoft and RStudio as one of the three platinum members. A platinum membership gives IBM a seat on the board. Additionally, it also gives use a seat on the infrastructure steering committee that funds projects related to R. We will leverage the platform provided by the consortium to drive towards deeper integration of R into Spark. Also it helps to make sure IBM has a voice as changes to the R language and surrounding packages are made to for distributed computing, Spark, modern Big Data platforms, etc.

IBM and RStudio Strategic Partnership

Who is RStudio?
RStudio is a provider of open-source and enterprise-ready commercial tools for the R community. Founded in 2008, it is headquartered in Boston, MA. Inspired by the innovations of R users in science, education, and industry, RStudio develops free and open tools for R and enterprise-ready professional products for teams to scale and share work.

Why are we partnering with RStudio?
A partnership with Rstudio bring together IBM's Big Data & Analytics technology depth and services breadth with RStudio's platform and expertise on R. We are mutually aligned on the goal to make R a first-class citizen in Spark.

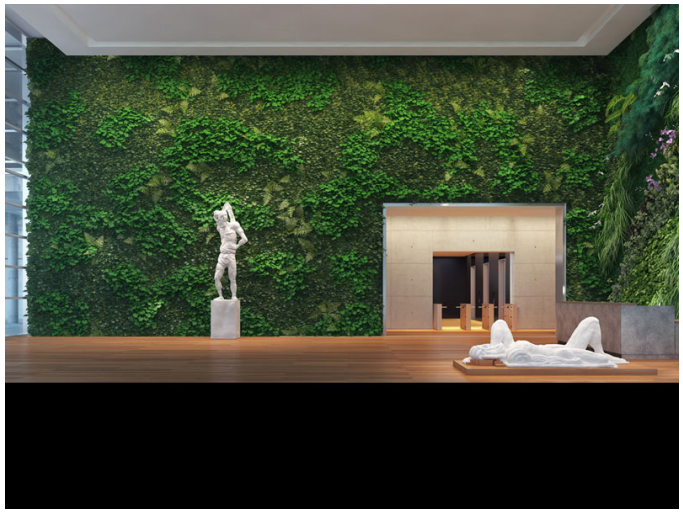
Overview of partnership
IBM and RStudio will collaborate to enable R packages to integrate with Apache Spark. R is a popular statistical programming language that offers a rich environment for statistical analysis and machine learning. The runtime for R is single-threaded, and by ensuring R code and packages work seamlessly with Spark, R users can leverage Spark's distributed computational engine to run large-scale data analysis from R.

IBM will integrate RStudio's open source offerings (RStudio Server and Shiny Server) in the Data Science Experience offering. RStudio Server is an Integrated Development Environment (IDE) for R. It includes a console, syntax-highlighting editor that supports direct code execution, as well as tools for plotting, history, debugging and workspace management. Shiny Server is an open source web application server that combines the power of R with the interactivity of the modern web providing the deployment needed for Shiny applications. Additionally, In the Data Science Experience offering, IBM will expose tutorials and news from RStudio blogs.

Spark Technology Center

IBM established Spark Technology Center to contribute to the Apache® Spark™ ecosystem – June 2015

505 Howard Street, San Francisco



IBM Spark Technology Center (STC)
San Francisco, USA

Growing pool of contributors
~50 world wide, and 3 committers

Apache SystemML now an official Apache Incubator project

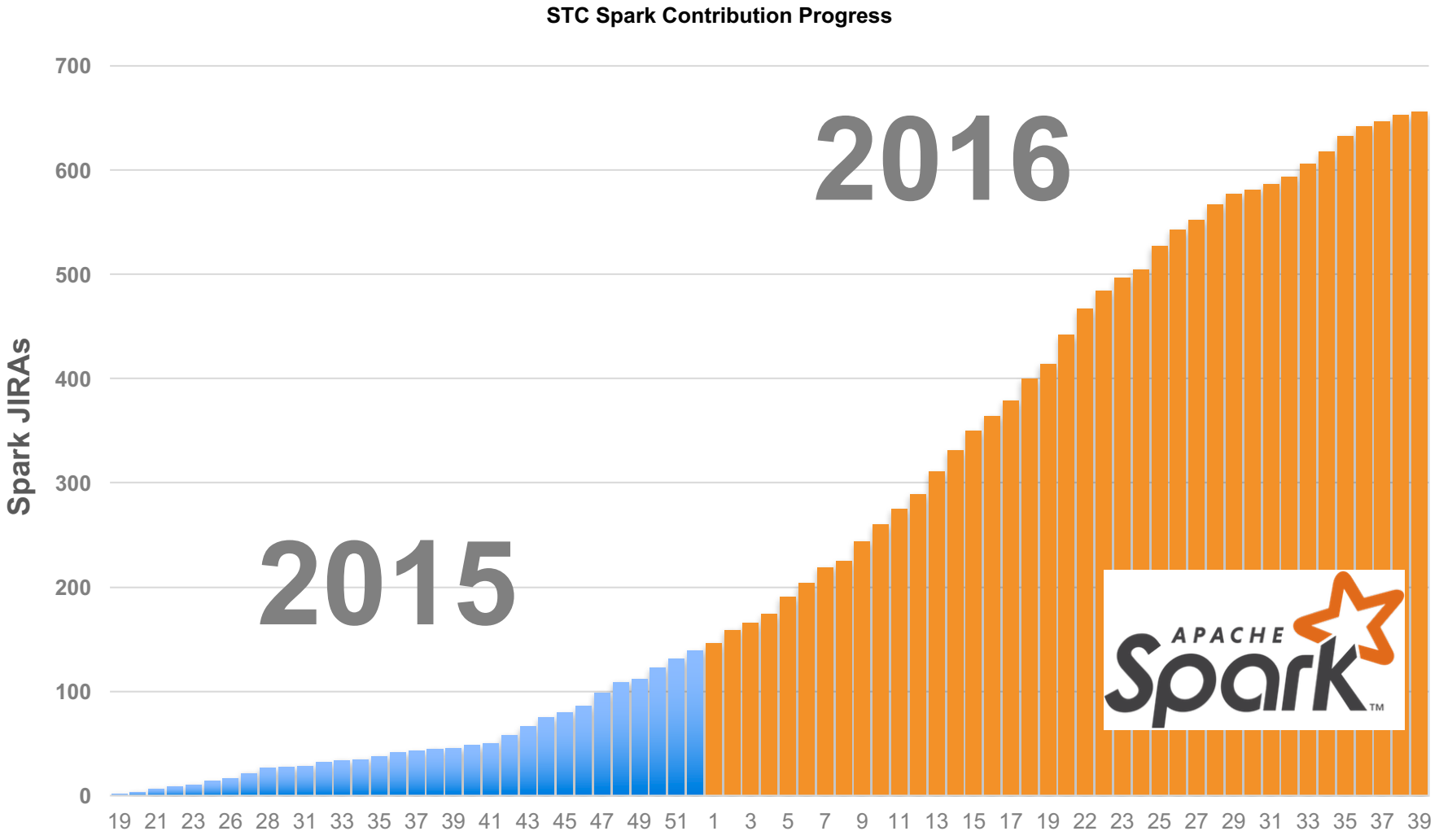
Founding member of AMPLab (and upcoming RISE Lab)

Member of R Consortium

Founding member of Scala Center

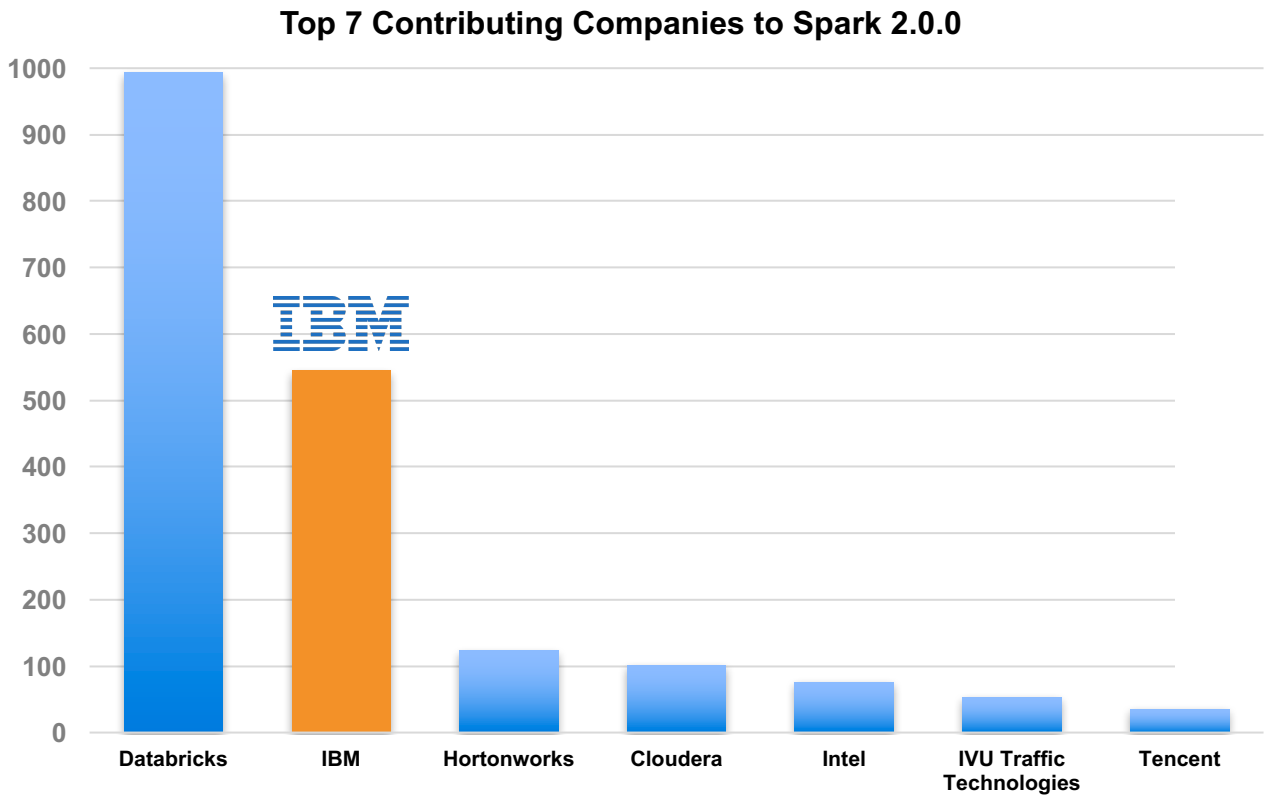
Partnerships in the ecosystem

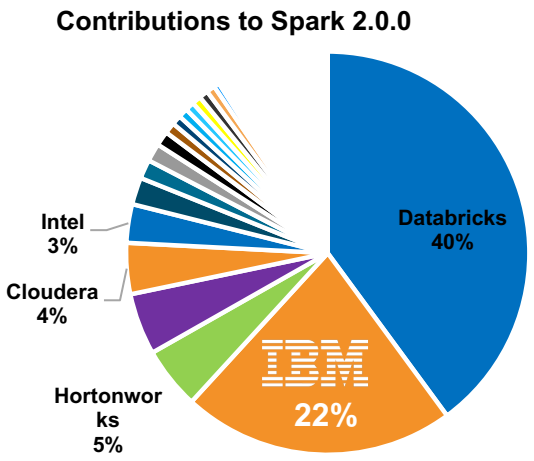
Spark Technology Center contributions have grown over 400% since start in June 2015



IBM had a significant impact on Spark 2.0

- IBM is #2 contributor to Apache Spark
- IBM was the leading contributor in Spark 2.0 to SparkML, PySpark, and SparkR

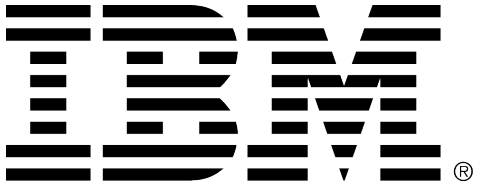




Spark Infused Across IBM Analytics Portfolio

Free and Open Data	▪ Analytics Exchange
Data Storage	▪ **On-Premises:** IBM Open Platform with Apache Hadoop (IOP), BigInsights, Neteeza, Cloudant, DB2, dashDB local and Informix ▪ **On-Cloud:** Cloudant, dashDB, Object Storage, SQL DB, BigInsights
Data Feeds, Load & Refinement	▪ Watson Data Platform ▪ IBM Streams ▪ IBM Insights for Twitter ▪ IBM Insights for Weather
Analytics and Solutions	▪ IBM Analytics for Apache spark ▪ SPSS Modeler and Analytics Server ▪ Watson Analytics ▪ Watson Health ▪ IBM Commerce ▪ Data Science Experience
Learning Tools	▪ Big Data University

IBM Apache Spark References



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