SANSA
in the Palm of your Browser

Carsten Felix Draschner - SDA Research

Overview

- get Databricks
- setup Databricks
    - get SANSA Jar
    - get sample files
    - create cluster
    - set spark enviroment
    - use SANSA jar
    - create notebook
    - use sansa modules

Databricks

- Similar concepts
    - jupyter notebooks
    - google colab
    - Scala
    - Apache Spark
    - AWS
- Advantages
    - No istallation required
    - available over browser
    - native scala spark notebooks
    - no local performance needed

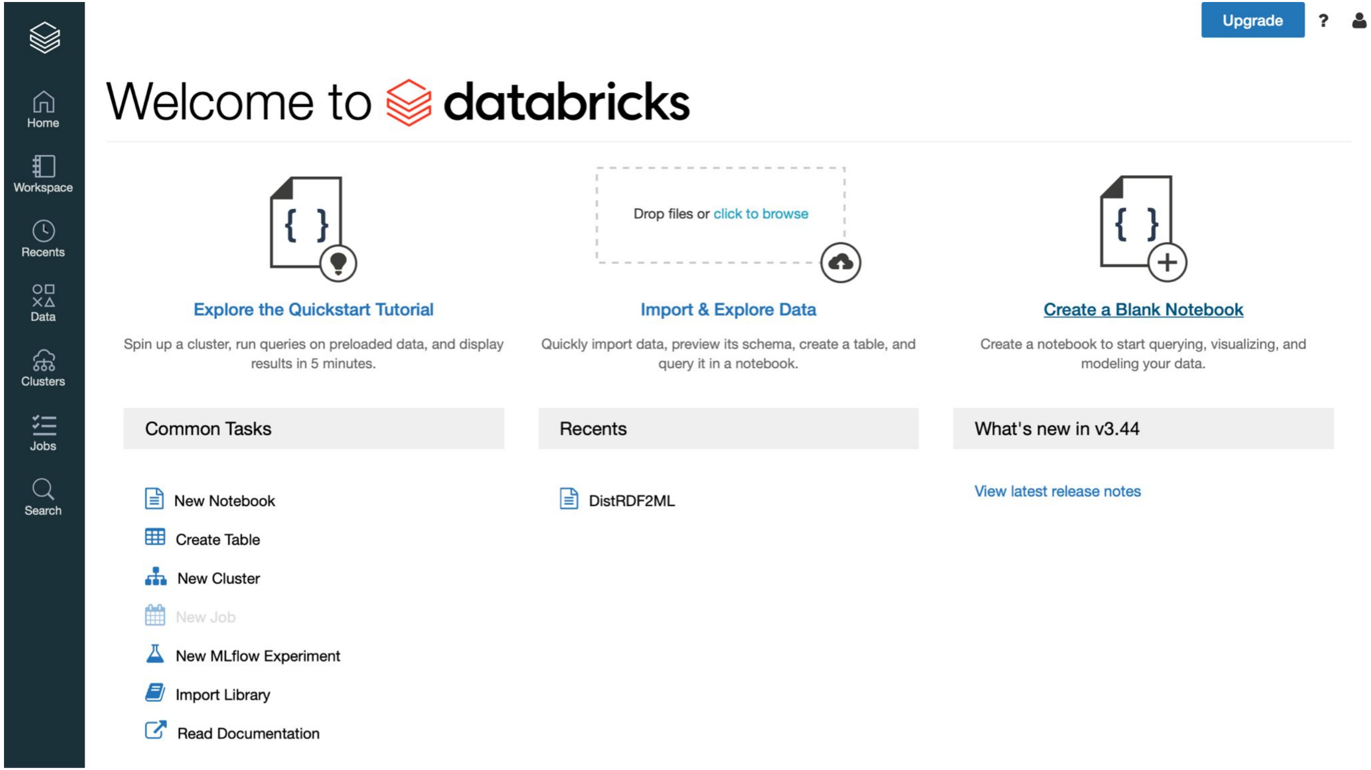
Databricks Registration

- Databricks FAQ
  - https://databricks.com/de/product/faq/community-edition
- Login
  - https://community.cloud.databricks.com/login.html
- Or create and use for free
  - https://databricks.com/try-databricks
  - 15GB Ram, 2 Core Cluster SAmple Cluster

Setup Databricks - Upload needed Data - jar

- Most recent SANSA Release Jar Available on Github Page:
  - https://github.com/SANSA-Stack/SANSA-Stack/releases
- Or through this link directly: 234mb fat jar
  - sansa-stack-spark_2.12-0.8.0-RC1-jar-with-dependencies.jar

Setup Databricks - Upload needed Data - jar



Welcome to databricks

Explore the Quickstart Tutorial

Spin up a cluster, run queries on preloaded data, and display results in 5 minutes.

Drop files or click to browse

Import & Explore Data

Quickly import data, preview its schema, create a table, and query it in a notebook.

Create a Blank Notebook

Create a notebook to start querying, visualizing, and modeling your data.

Common Tasks

- New Notebook
- Create Table
- New Cluster
- New Job
- New MLflow Experiment
- Import Library
- Read Documentation

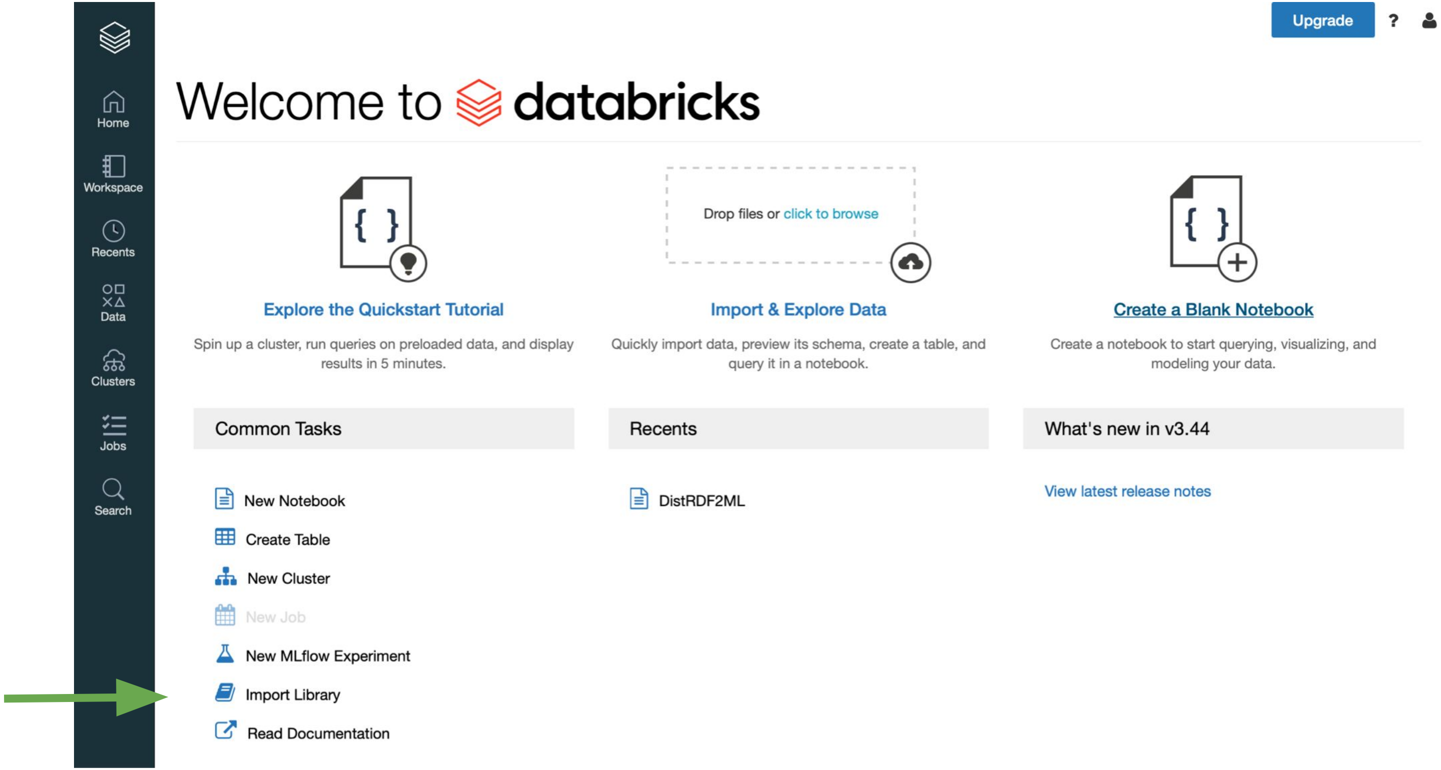
Recents

- DistRDF2ML

What's new in v3.44

View latest release notes

Setup Databricks - Upload needed Data - jar



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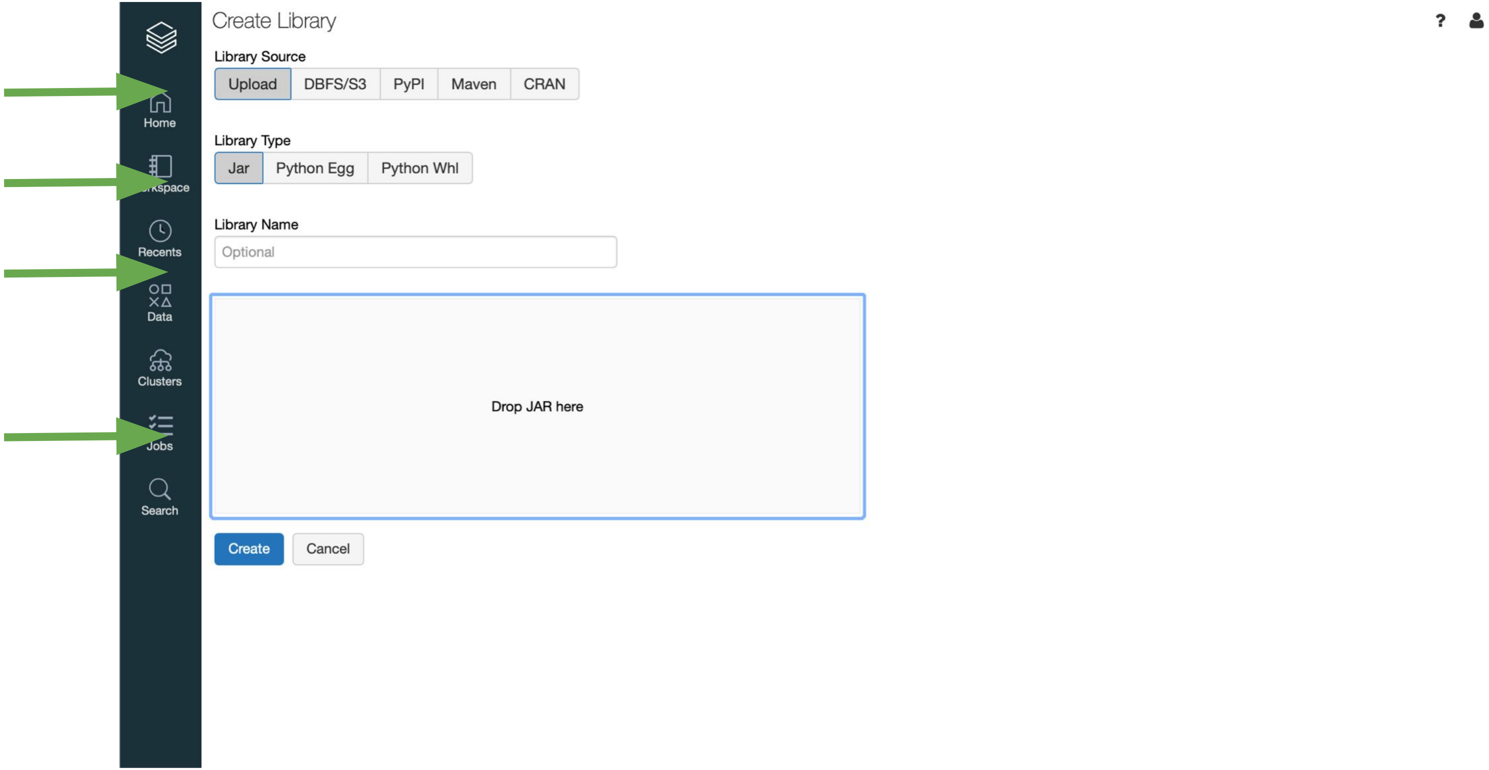


Create Library

Library Source

Upload | DBFS/S3 | PyPI | Maven | CRAN

Library Type

Jar | Python Egg | Python Whl

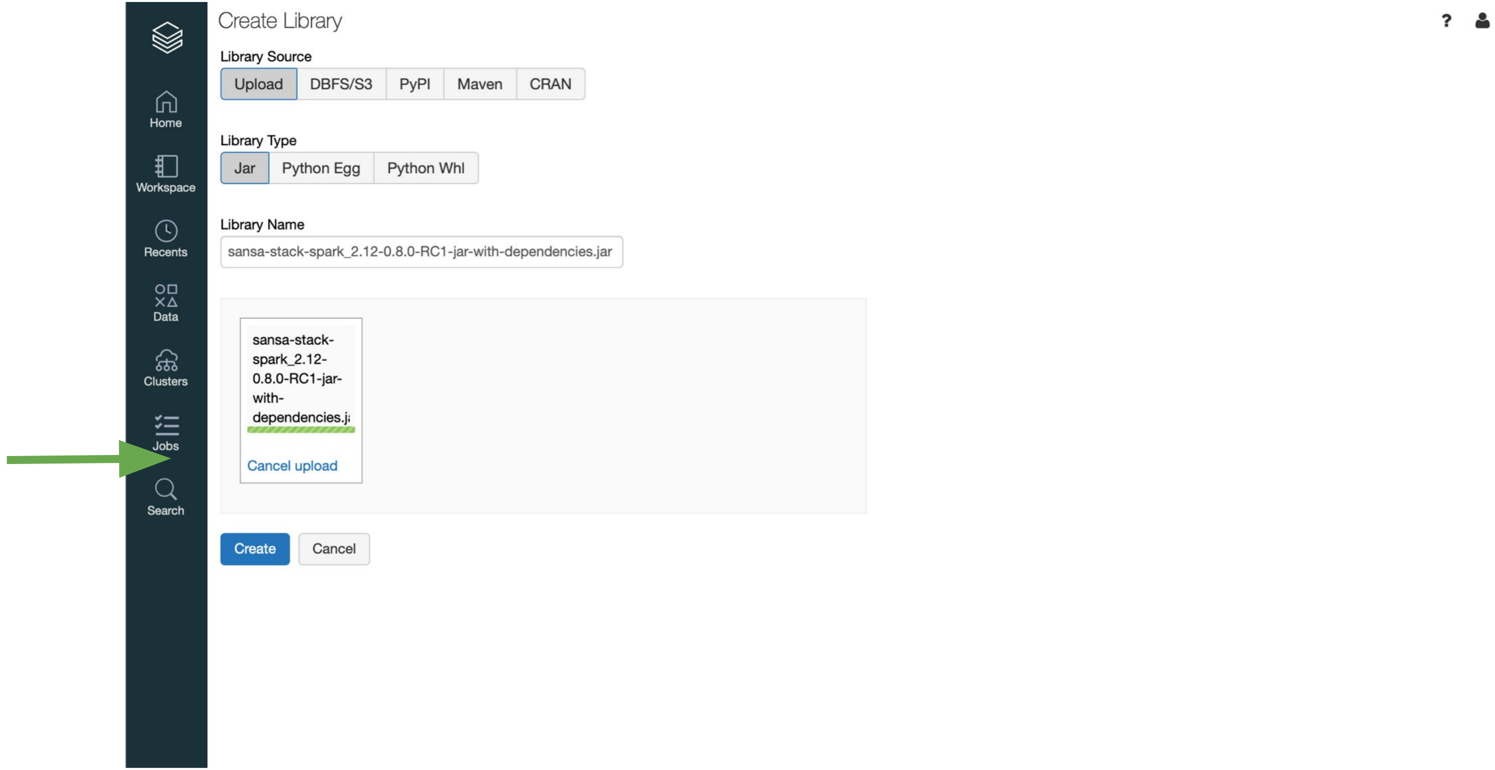
Library Name

Optional

Drop JAR here

Create | Cancel

Setup Databricks - Upload needed Data - jar



Create Library

Library Source: Upload | DBFS/S3 | PyPI | Maven | CRAN

Library Type: Jar | Python Egg | Python Whl

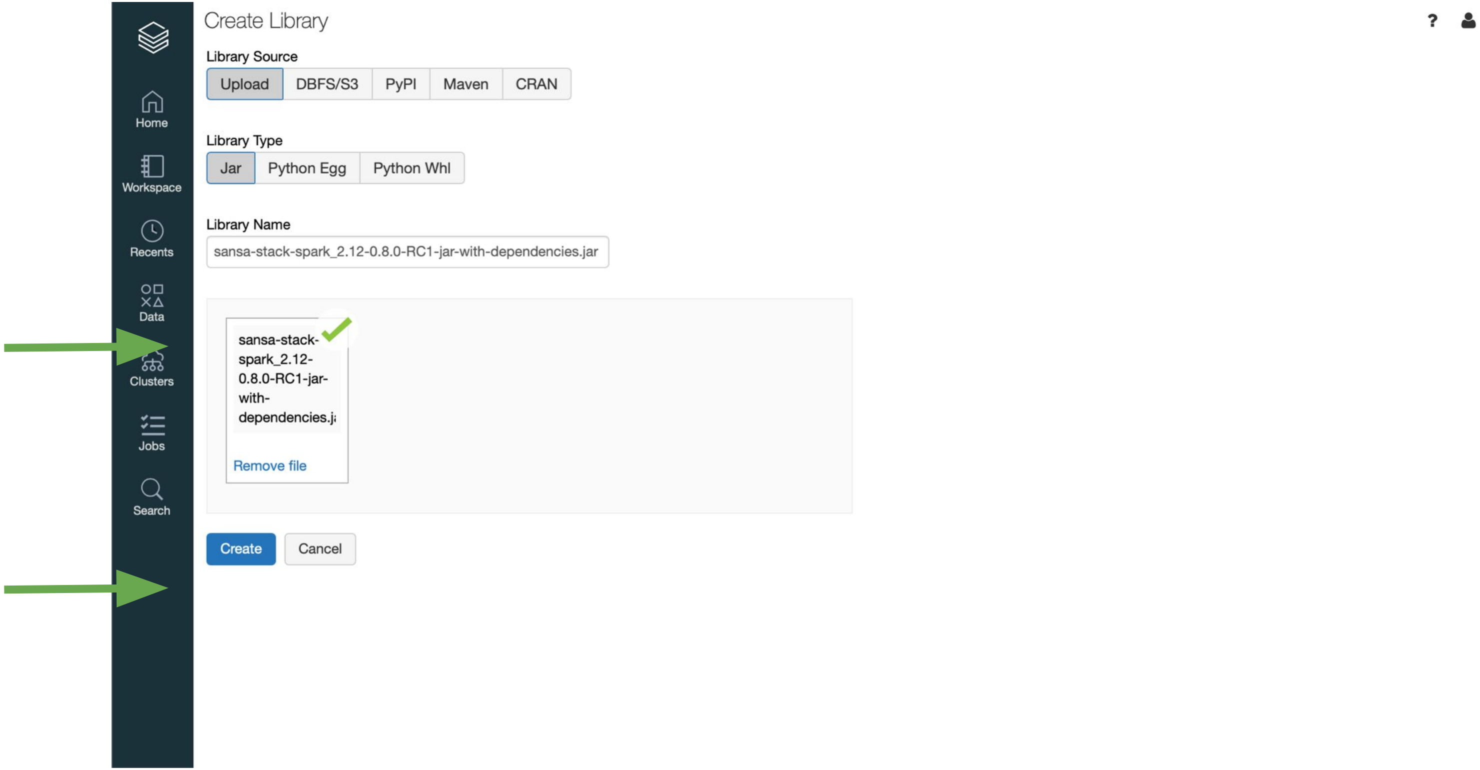
Library Name: sansa-stack-spark_2.12-0.8.0-RC1-jar-with-dependencies.jar

sansa-stack-spark_2.12-0.8.0-RC1-jar-with-dependencies.j

Cancel upload

Create | Cancel

Setup Databricks - Upload needed Data - jar



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Library Source

Upload | DBFS/S3 | PyPI | Maven | CRAN

Library Type

Jar | Python Egg | Python Whl

Library Name

sansa-stack-spark_2.12-0.8.0-RC1-jar-with-dependencies.jar

sansa-stack-spark_2.12-0.8.0-RC1-jar-with-dependencies.j

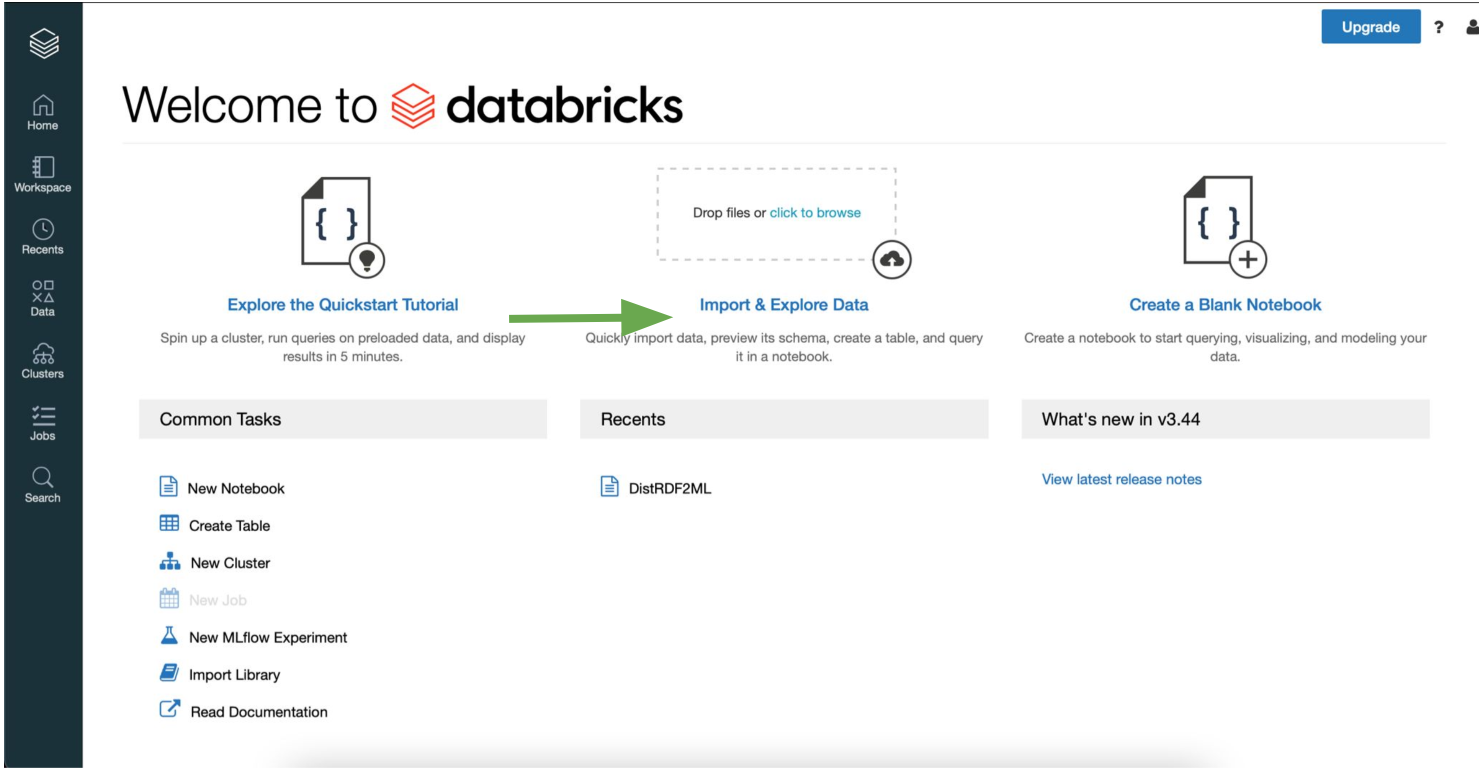
Remove file

Create | Cancel

Setup Databricks - Upload needed Data - data

- Sample data
  - LMDB
    - http://www.cs.toronto.edu/~oktie/linkedmdb/linkedmdb-18-05-2009-dump.nt
  - Sample Data
    - E4toE5.zip

Setup Databricks - Upload needed Data - data



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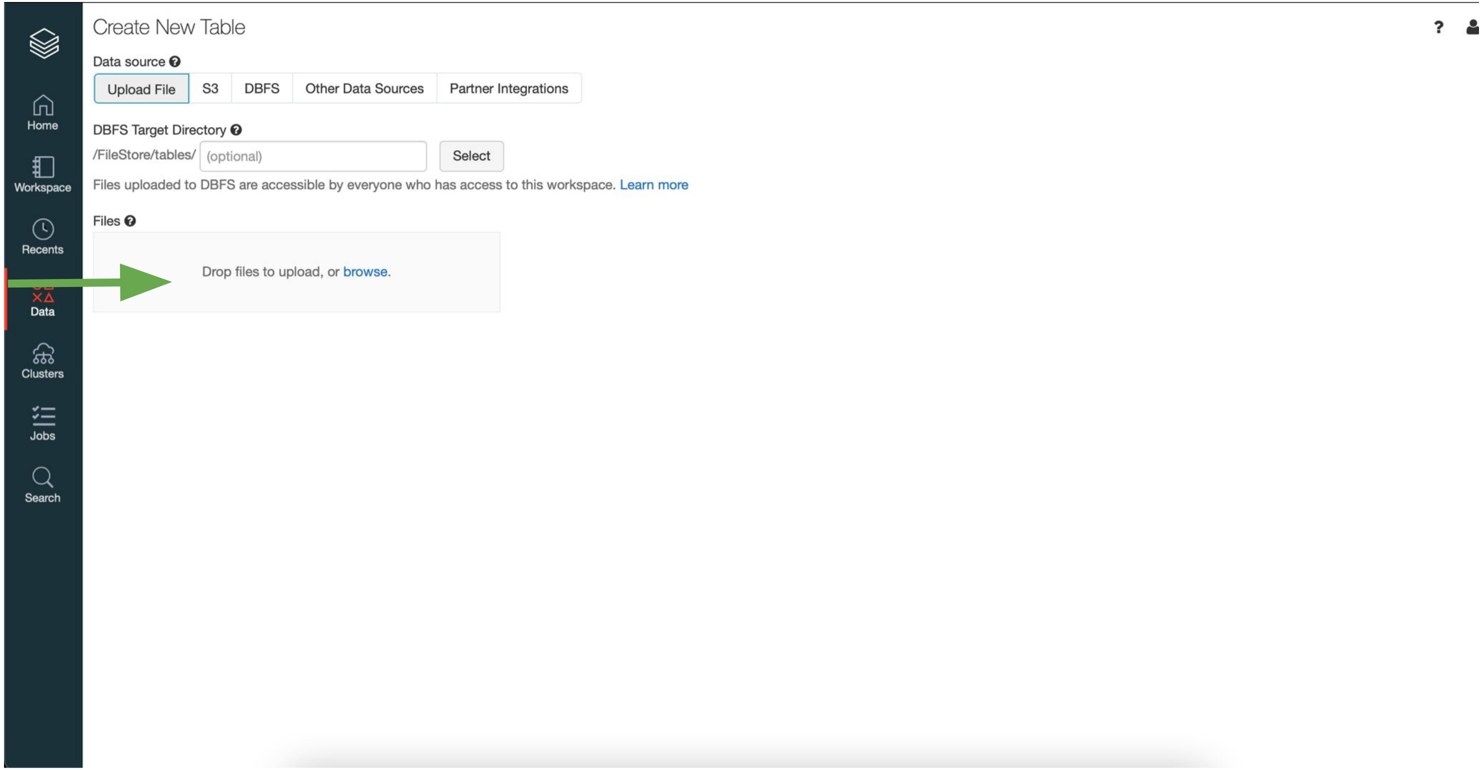


Create New Table

Data source

Upload File | S3 | DBFS | Other Data Sources | Partner Integrations

DBFS Target Directory

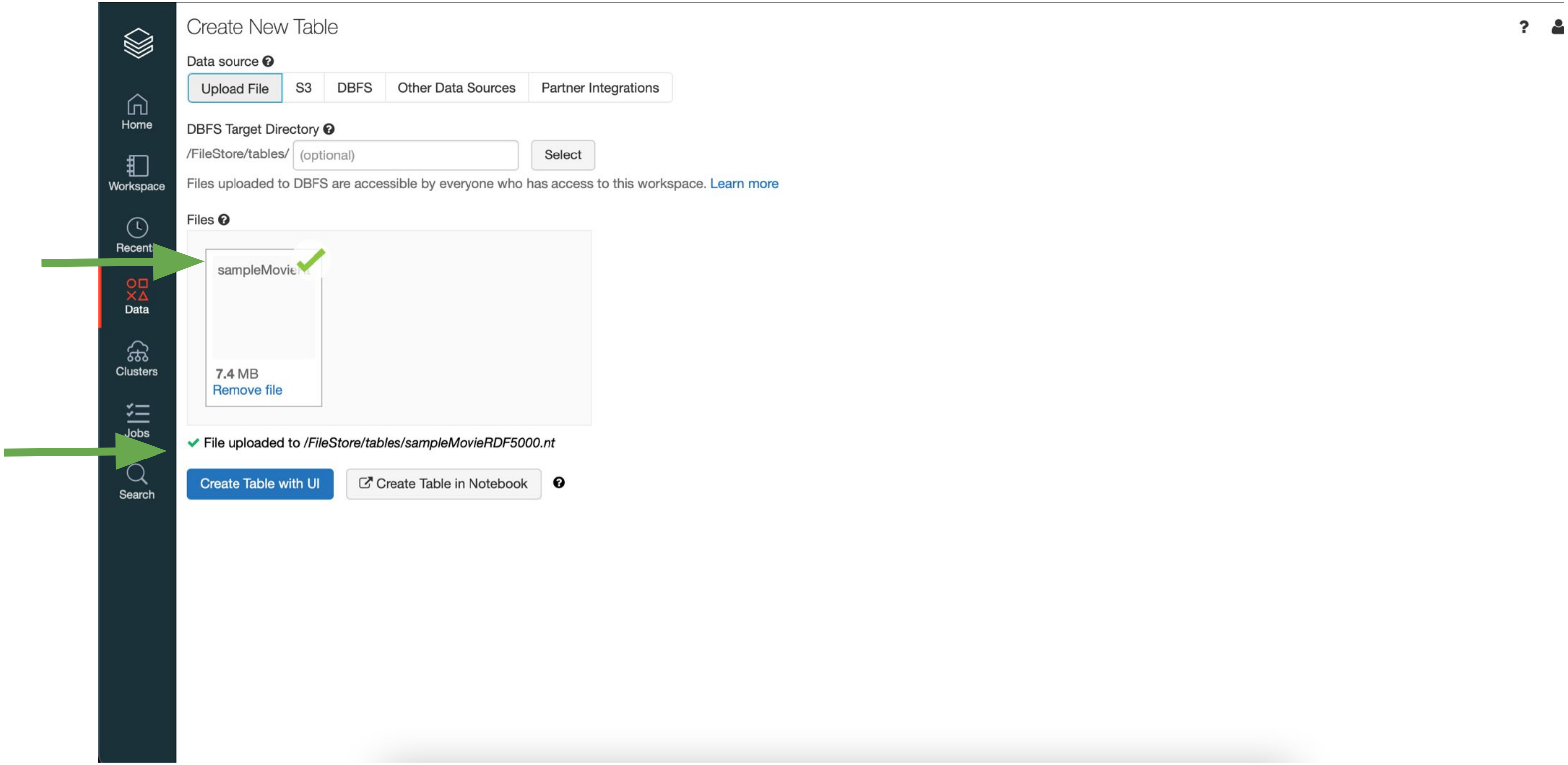
/FileStore/tables/ (optional) Select

Files uploaded to DBFS are accessible by everyone who has access to this workspace. Learn more

Files

Drop files to upload, or browse.

Setup Databricks - Upload needed Data - data



Create New Table

Data source

DBFS Target Directory

/FileStore/tables/ (optional)

Files uploaded to DBFS are accessible by everyone who has access to this workspace. Learn more

Files

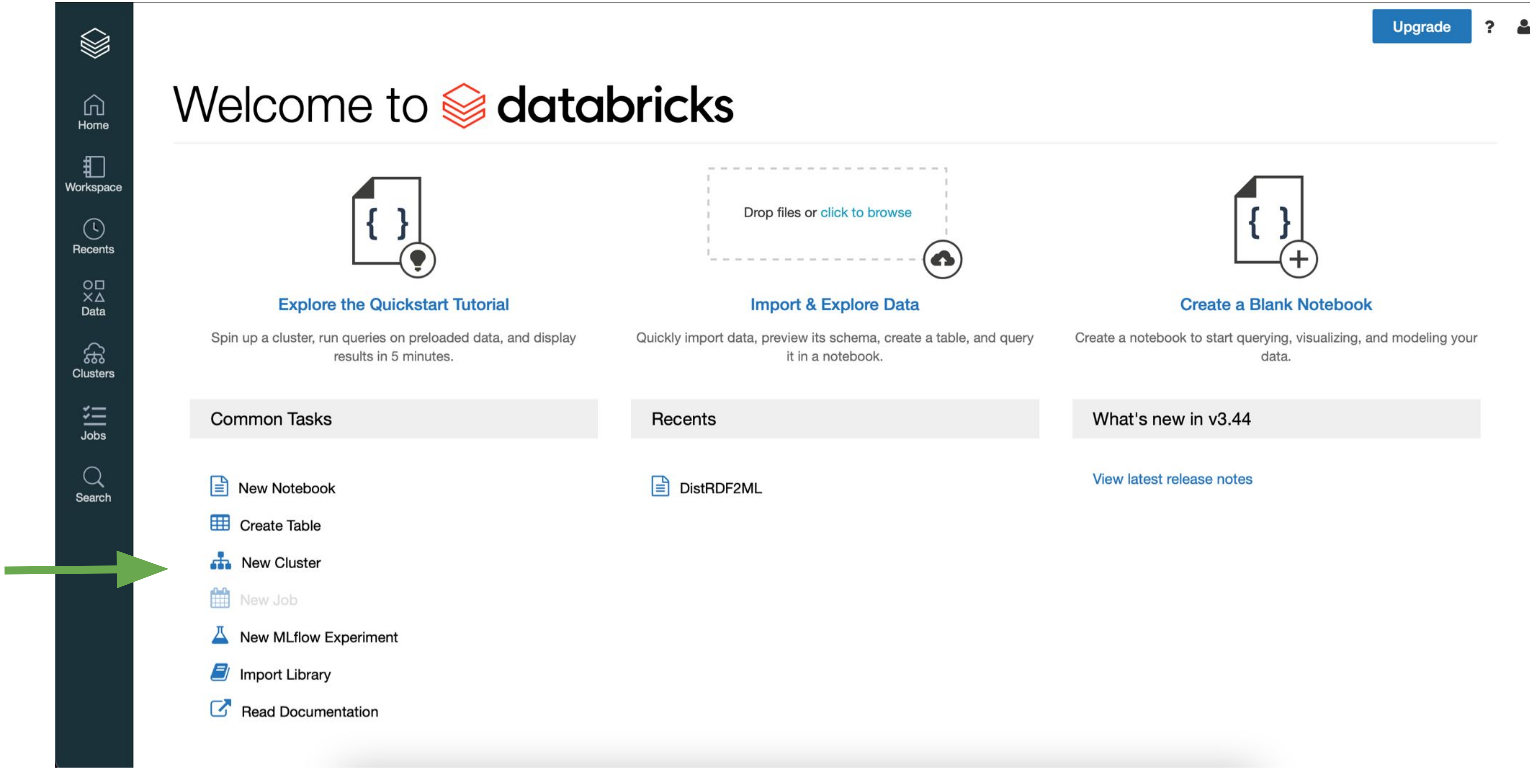
7.4 MB

✓ File uploaded to */FileStore/tables/sampleMovieRDF5000.nt*

Setup Cluster

- set spark (each one line)
  - `spark.databricks.delta.preview.enabled true`
  - `spark.serializer org.apache.spark.serializer.KryoSerializer`
  - `spark.kryo.registrator net.sansa_stack.rdf.spark.io.JenaKryoRegistrator, net.sansa_stack.query.spark.sparqlify.KryoRegistratorSparqlify`
- set jar

Setup Cluster



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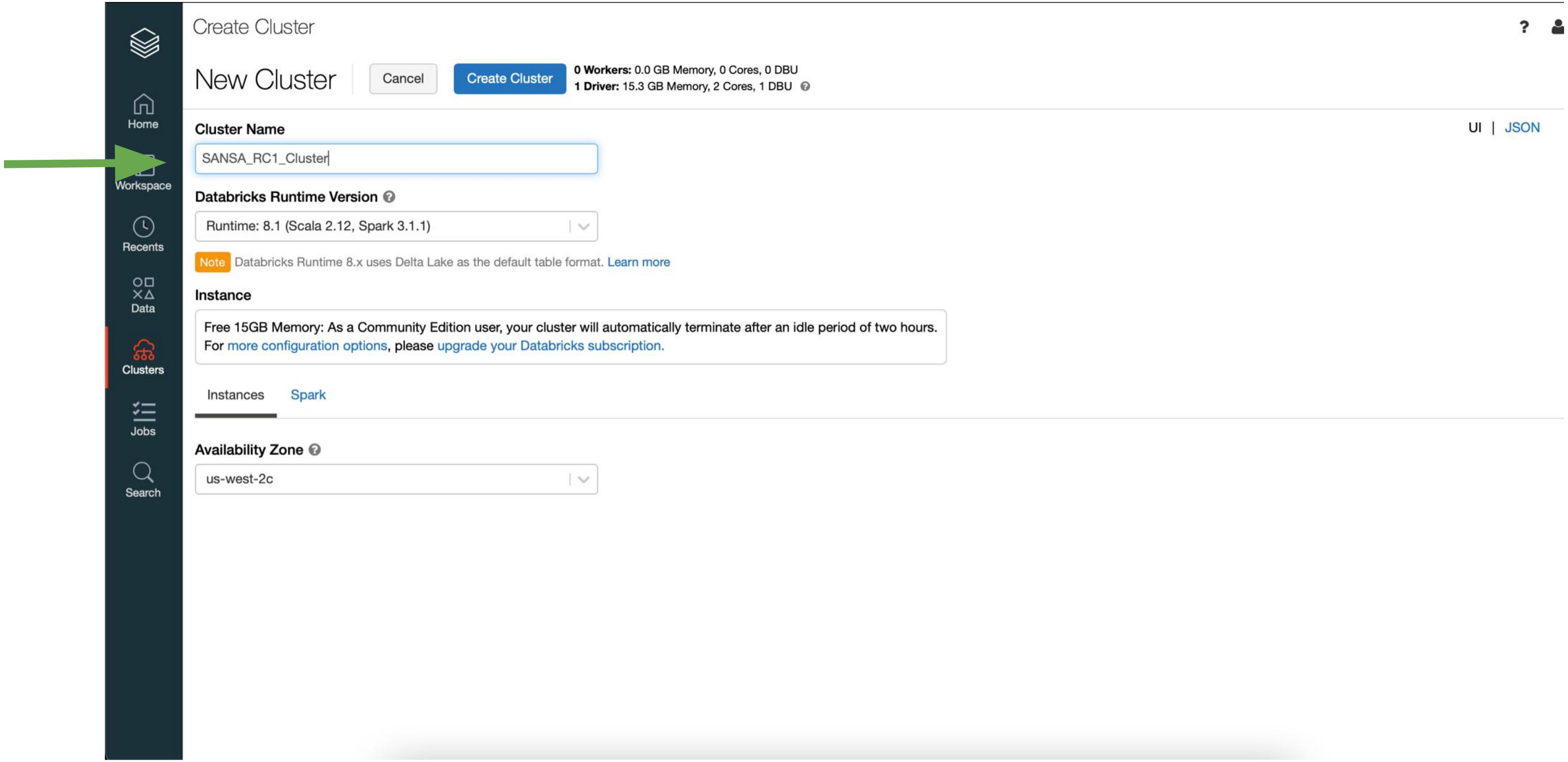
Setup Cluster - Give it a Name



0 Workers: 0.0 GB Memory, 0 Cores, 0 DBU
1 Driver: 15.3 GB Memory, 2 Cores, 1 DBU

Cluster Name

SANSA_RC1_Cluster

Databricks Runtime Version

Runtime: 8.1 (Scala 2.12, Spark 3.1.1)

Note Databricks Runtime 8.x uses Delta Lake as the default table format. Learn more

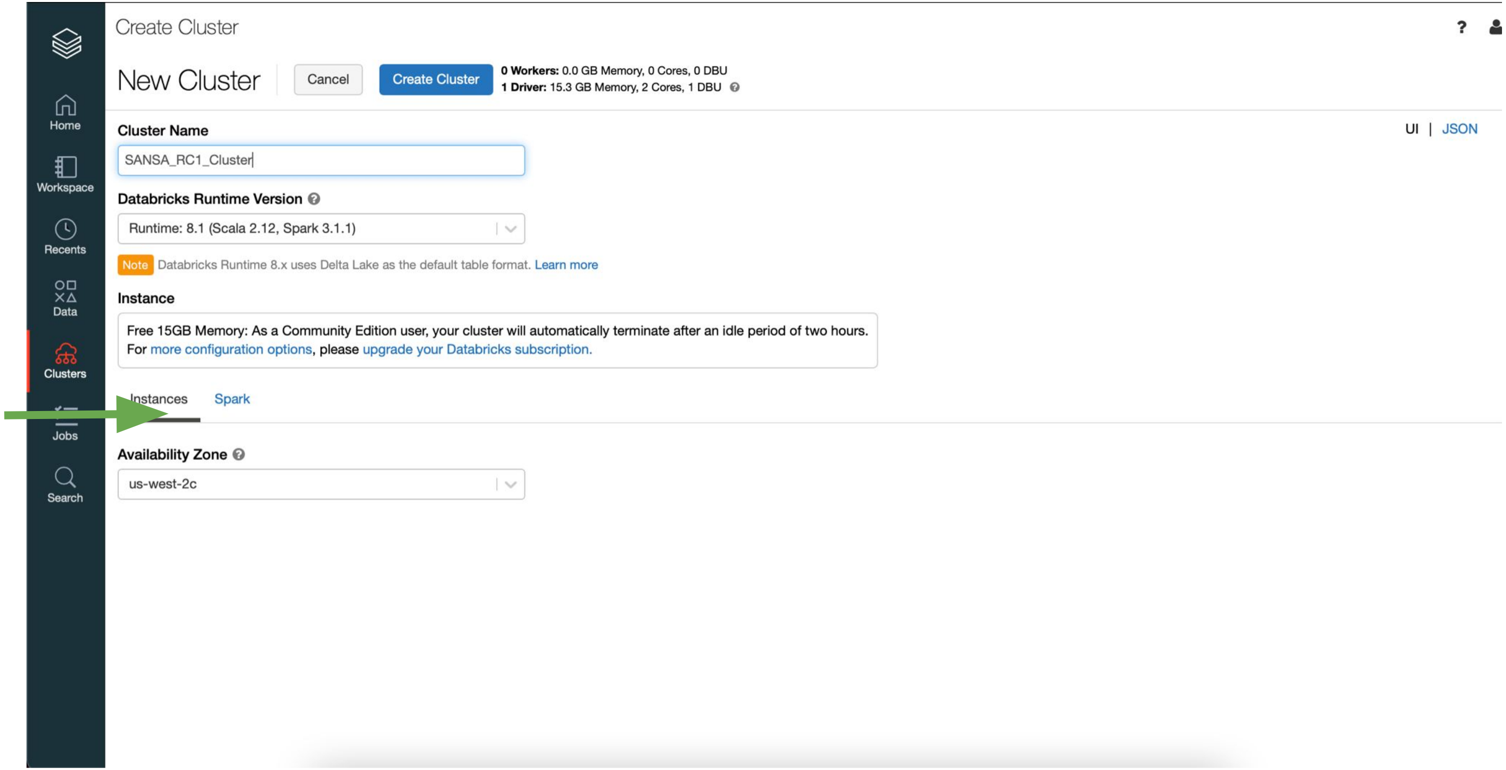
Instance

Free 15GB Memory: As a Community Edition user, your cluster will automatically terminate after an idle period of two hours. For more configuration options, please upgrade your Databricks subscription.

Availability Zone

us-west-2c

Setup Cluster - Set Spark



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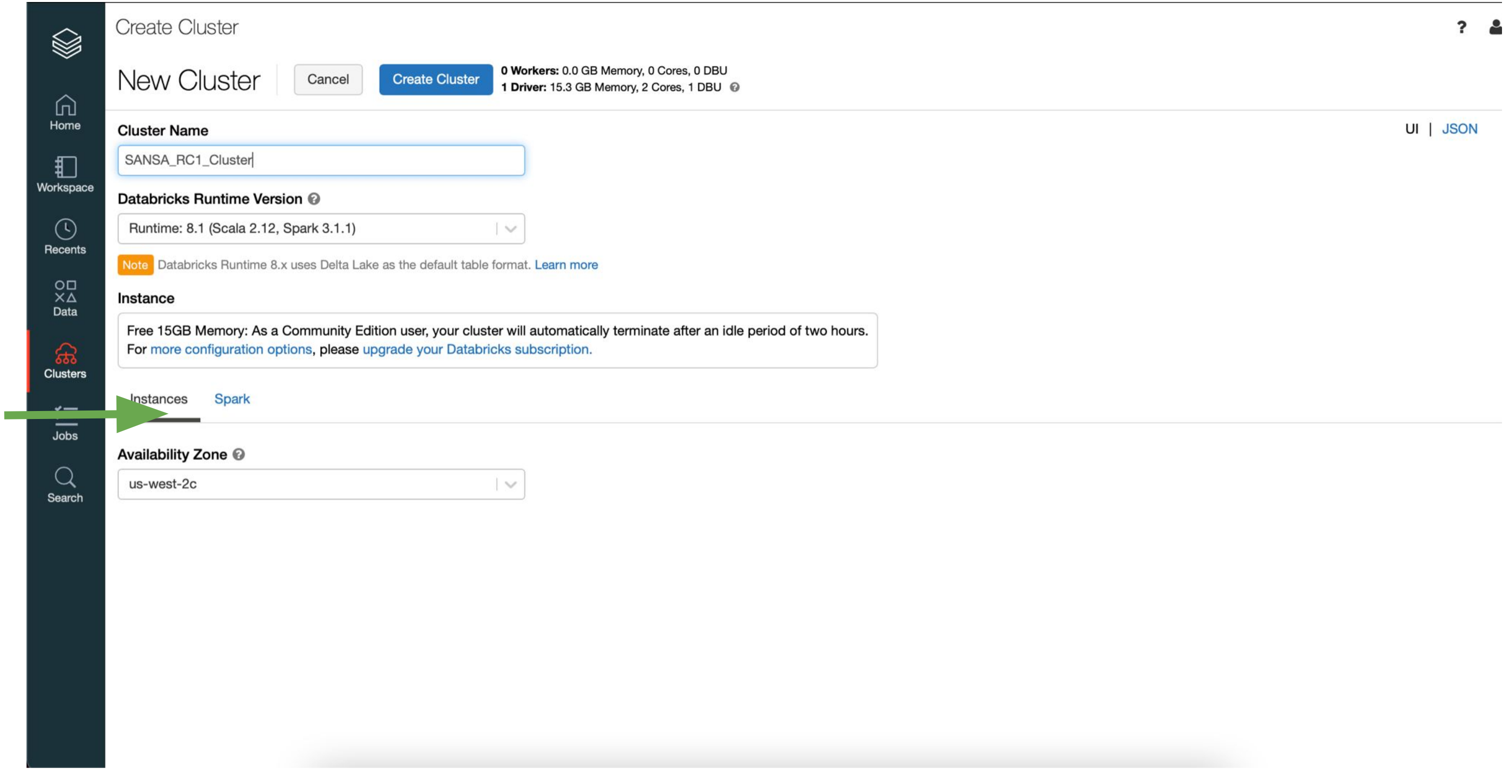

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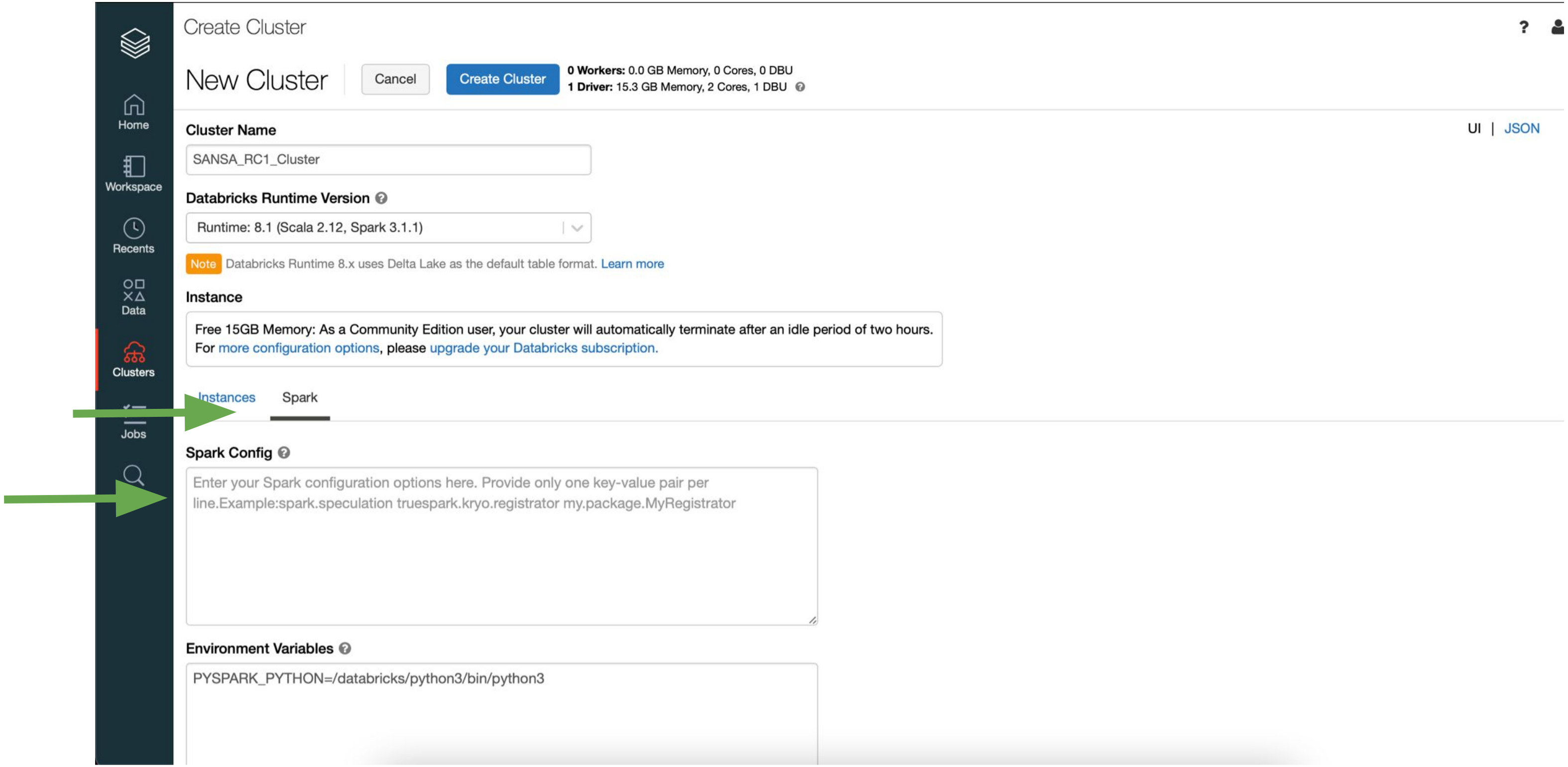

Create Cluster

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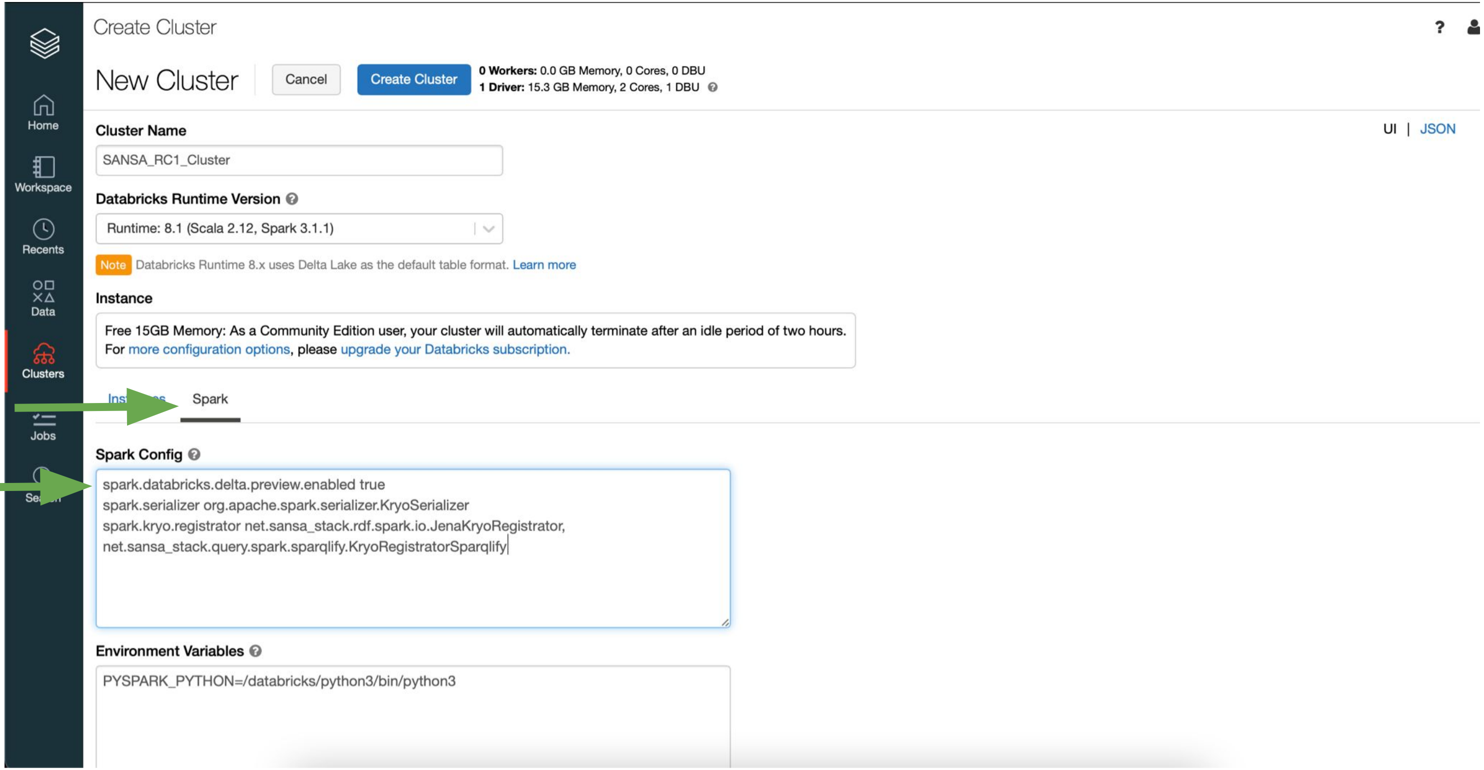
Spark Config

Enter your Spark configuration options here. Provide only one key-value pair per line.Example:spark.speculation truespark.kryo.registrator my.package.MyRegistrator

Environment Variables

PYSPARK_PYTHON=/databricks/python3/bin/python3

Setup Cluster - Set Spark



Create Cluster

New Cluster

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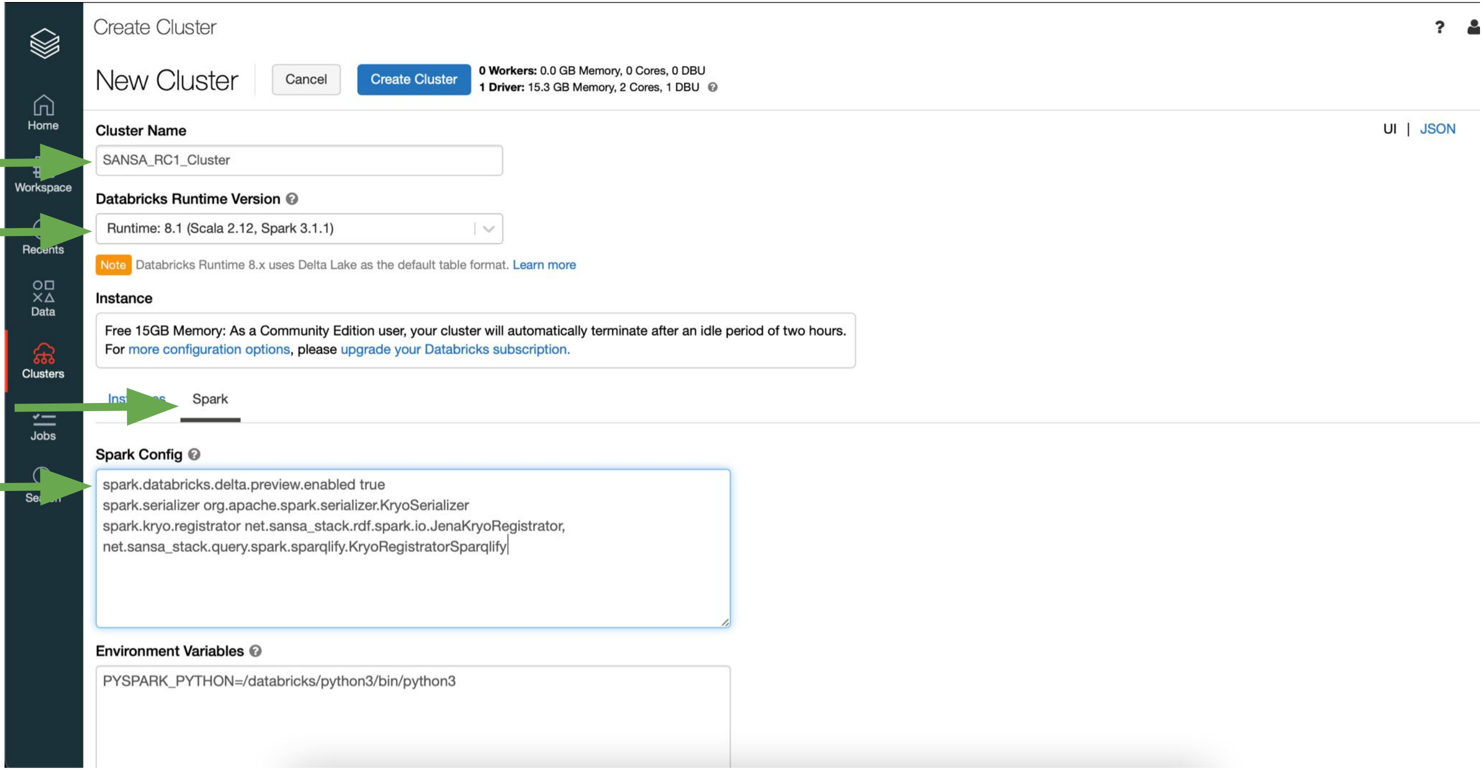
Spark Config

```
spark.databricks.delta.preview.enabled true
spark.serializer org.apache.spark.serializer.KryoSerializer
spark.kryo.registrator net.sansa_stack.rdf.spark.io.JenaKryoRegistrator,
net.sansa_stack.query.spark.sparqlify.KryoRegistratorSparqlify
```

Environment Variables

```
PYSPARK_PYTHON=/databricks/python3/bin/python3
```

Setup Cluster - Set Spark



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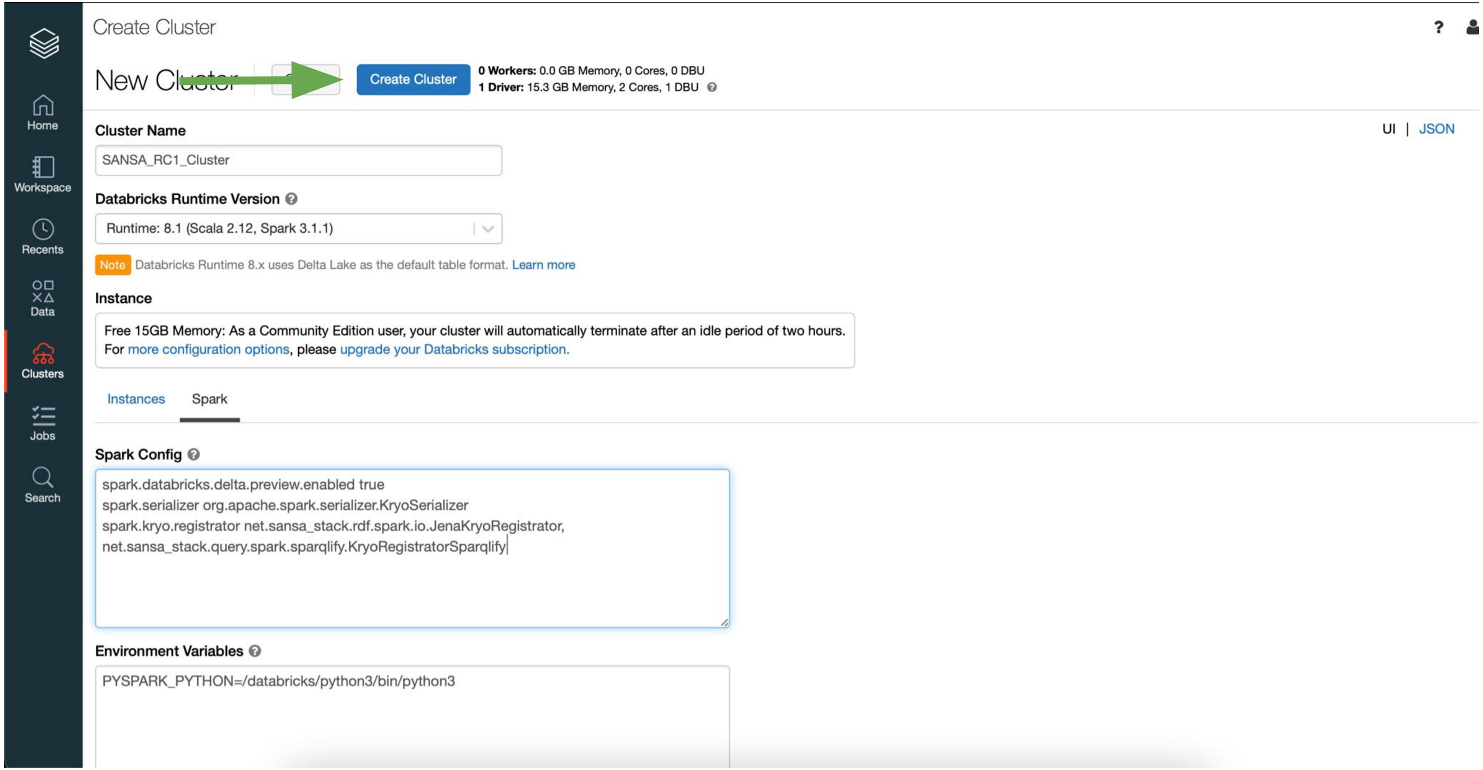
spark.kryo.registrator net.sansa_stack.rdf.spark.io.JenaKryoRegistrator,
net.sansa_stack.query.spark.sparqlify.KryoRegistratorSparqlify
```

Environment Variables

```
PYSPARK_PYTHON=/databricks/python3/bin/python3
```

Setup Cluster - Create Cluster



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net.sansa_stack.query.spark.sparqlify.KryoRegistratorSparqlify
```
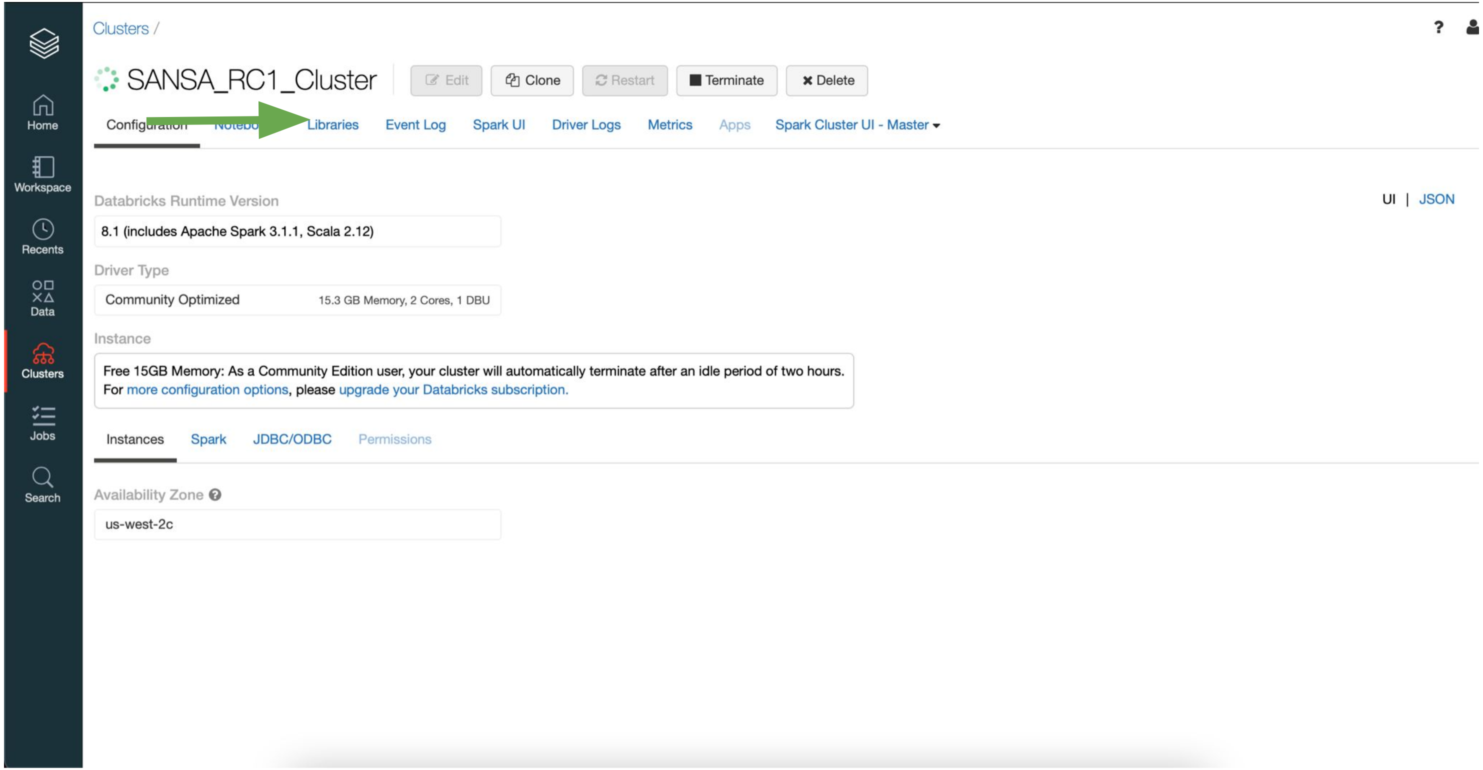

Environment Variables

```
PYSPARK_PYTHON=/databricks/python3/bin/python3
```

Setup Cluster - set SANSA JAR



Databricks Runtime Version

8.1 (includes Apache Spark 3.1.1, Scala 2.12)

Driver Type

Community Optimized 15.3 GB Memory, 2 Cores, 1 DBU

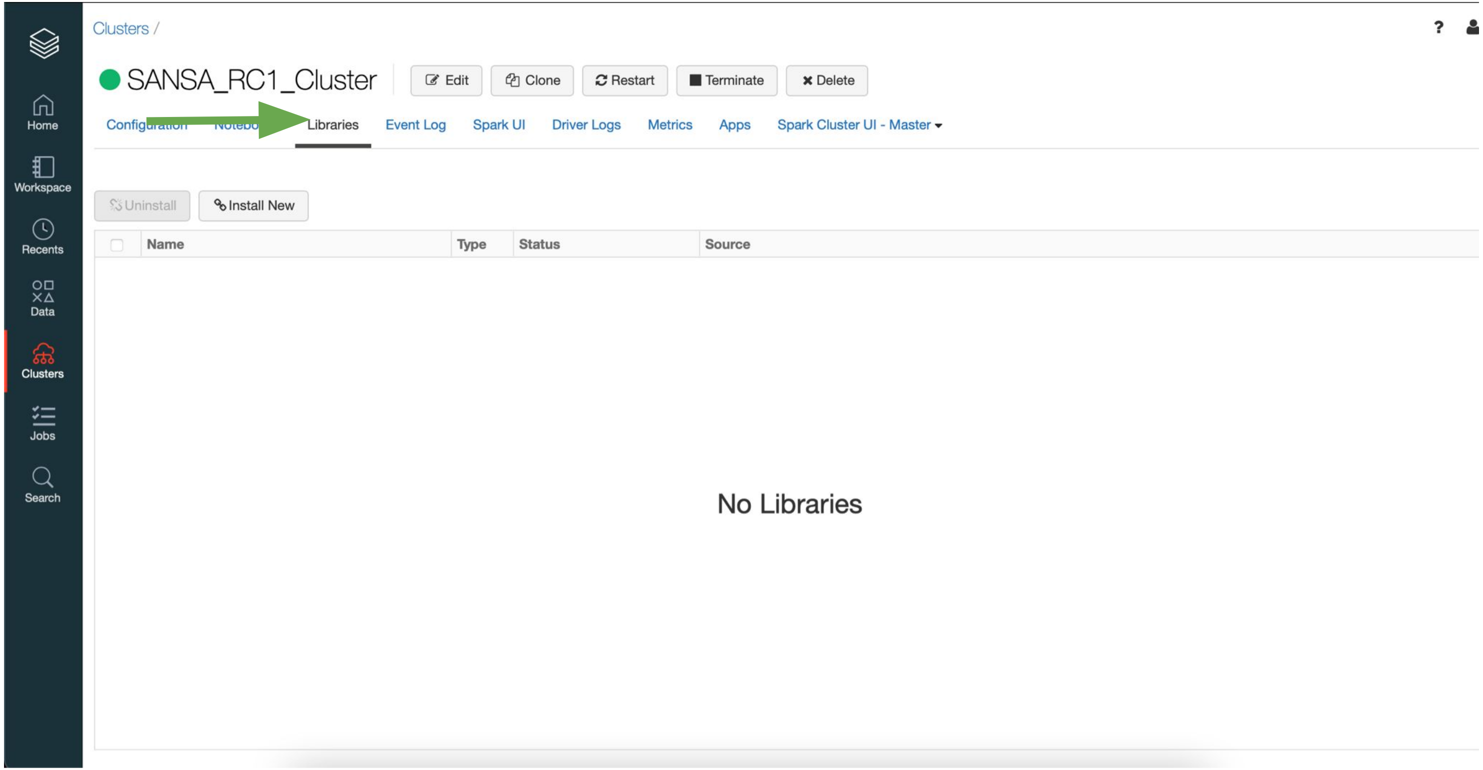
Instance

Free 15GB Memory: As a Community Edition user, your cluster will automatically terminate after an idle period of two hours. For more configuration options, please upgrade your Databricks subscription.

Availability Zone

us-west-2c

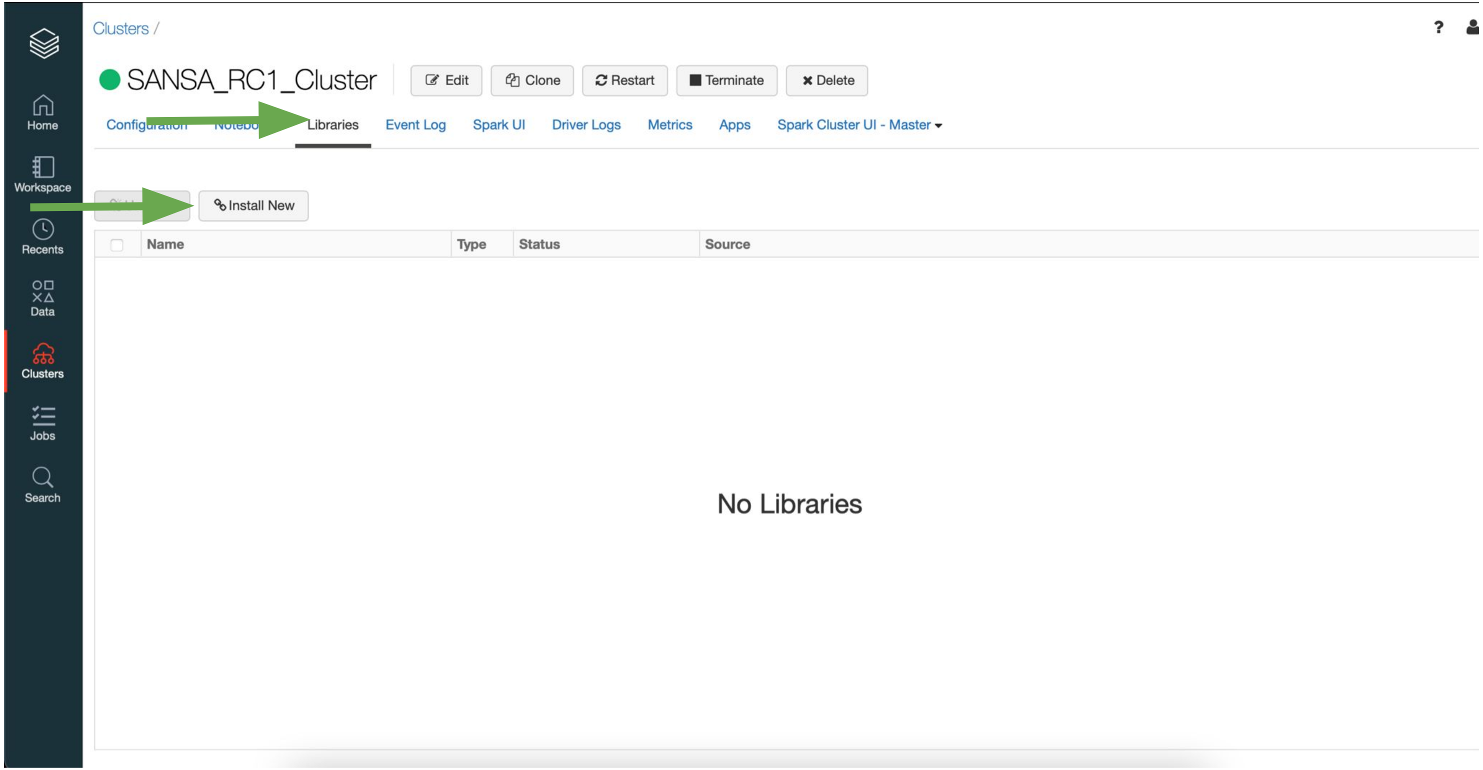
Setup Cluster - set SANSA JAR



□	Name	Type	Status	Source

No Libraries

Setup Cluster - set SANSA JAR



	Name	Type	Status	Source

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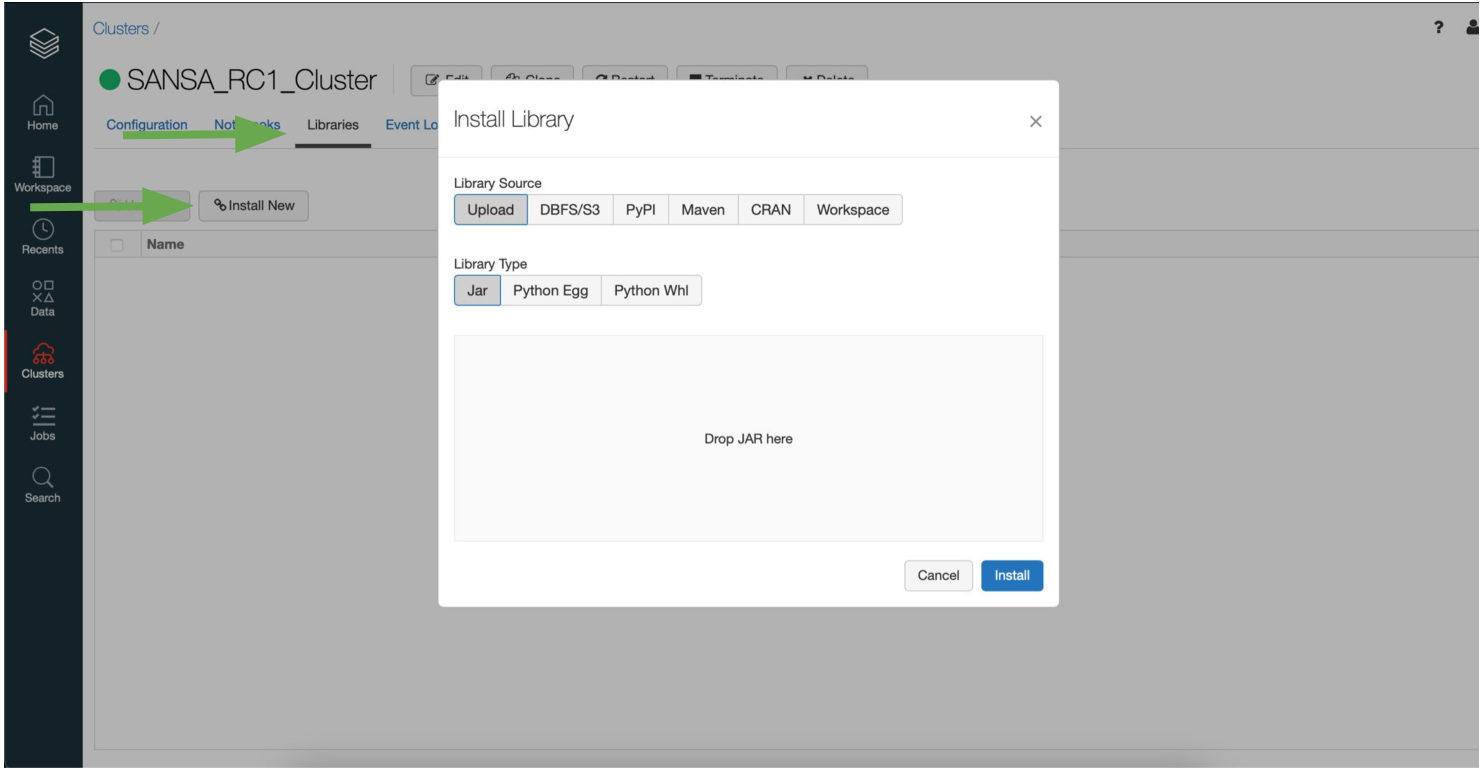


Install Library

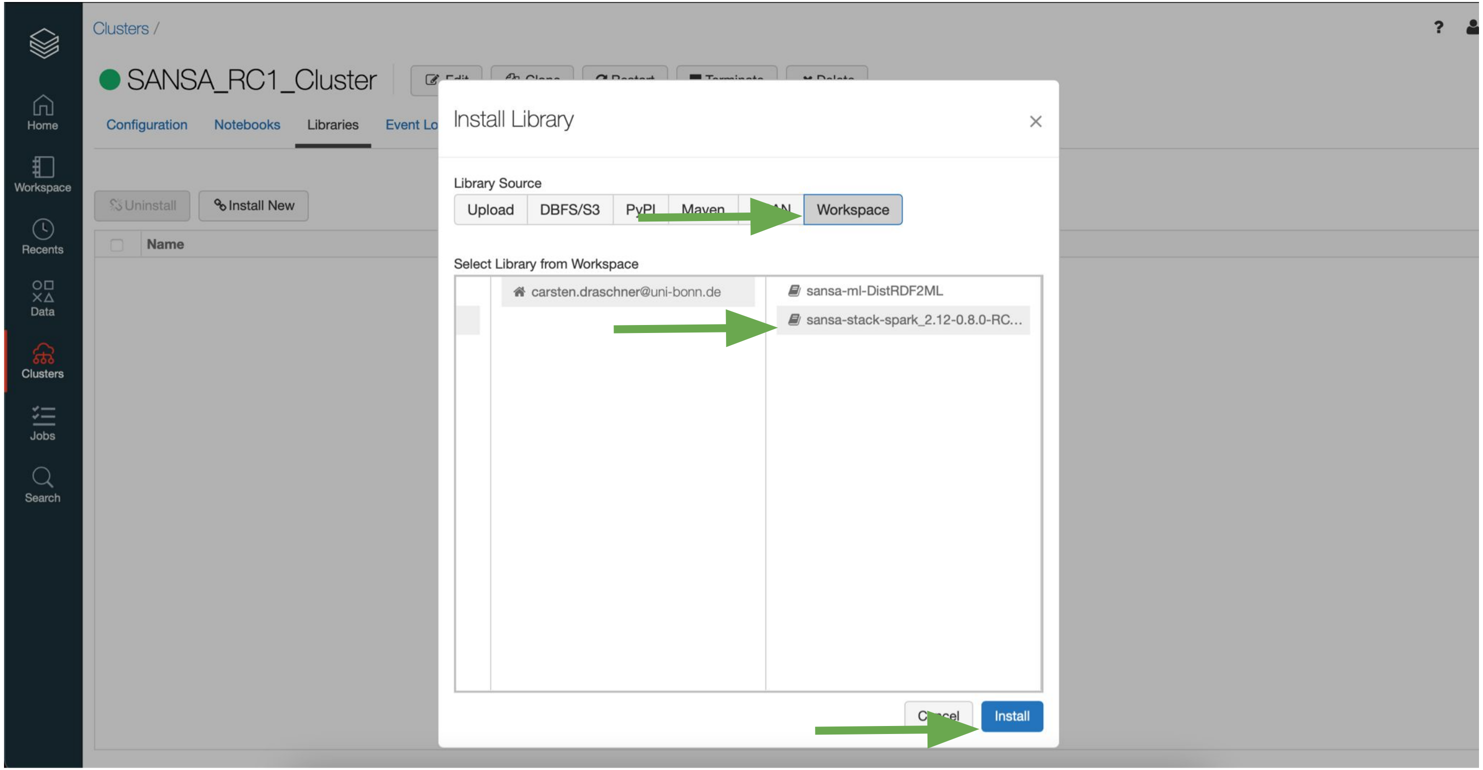
Library Source: Upload | DBFS/S3 | PyPI | Maven | CRAN | Workspace

Library Type: Jar | Python Egg | Python Whl

Drop JAR here

Cancel | Install

Setup Cluster - set SANSA JAR

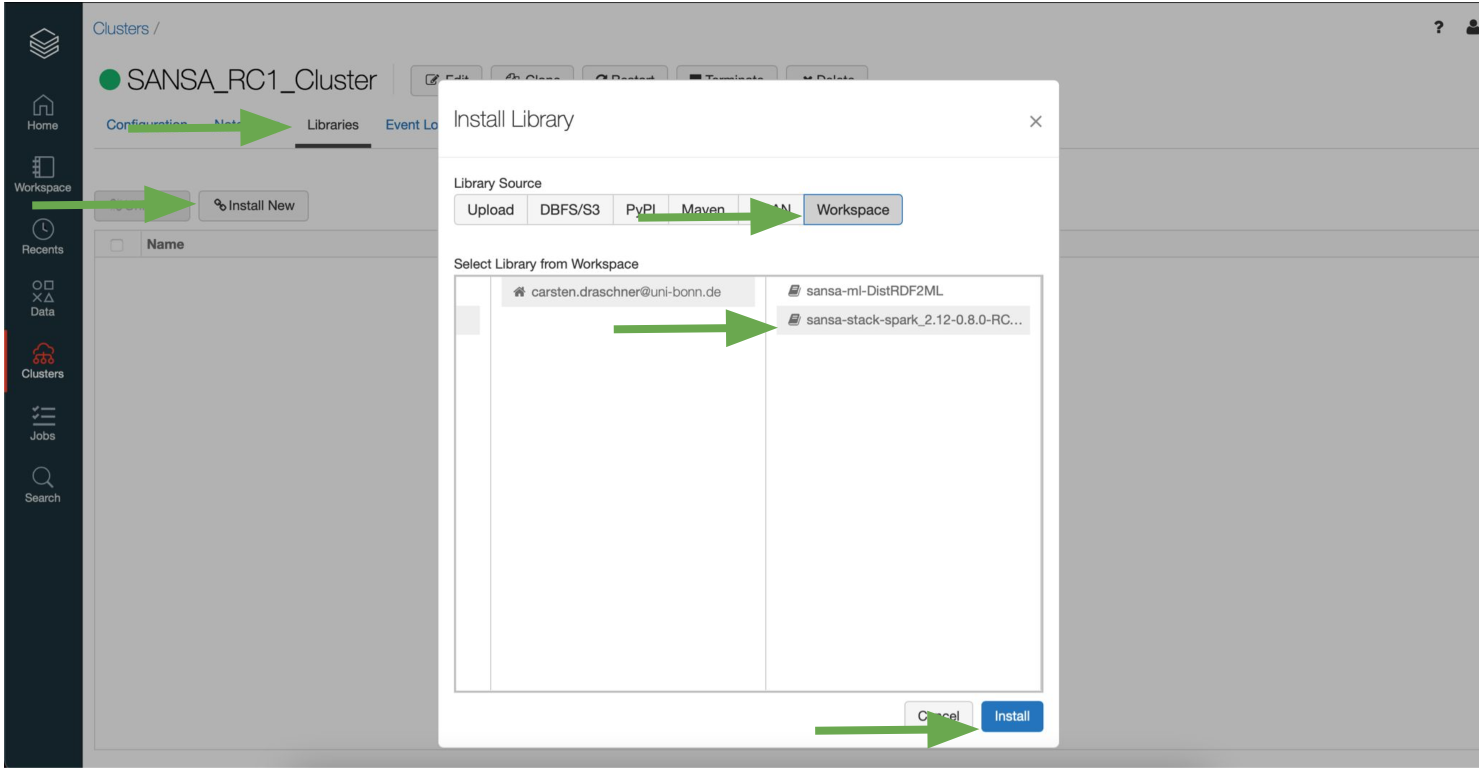


Library Source: Workspace

Select Library from Workspace

- carsten.draschner@uni-bonn.de
- sansa-ml-DistRDF2ML
- sansa-stack-spark_2.12-0.8.0-RC...

Setup Cluster - set SANSA JAR



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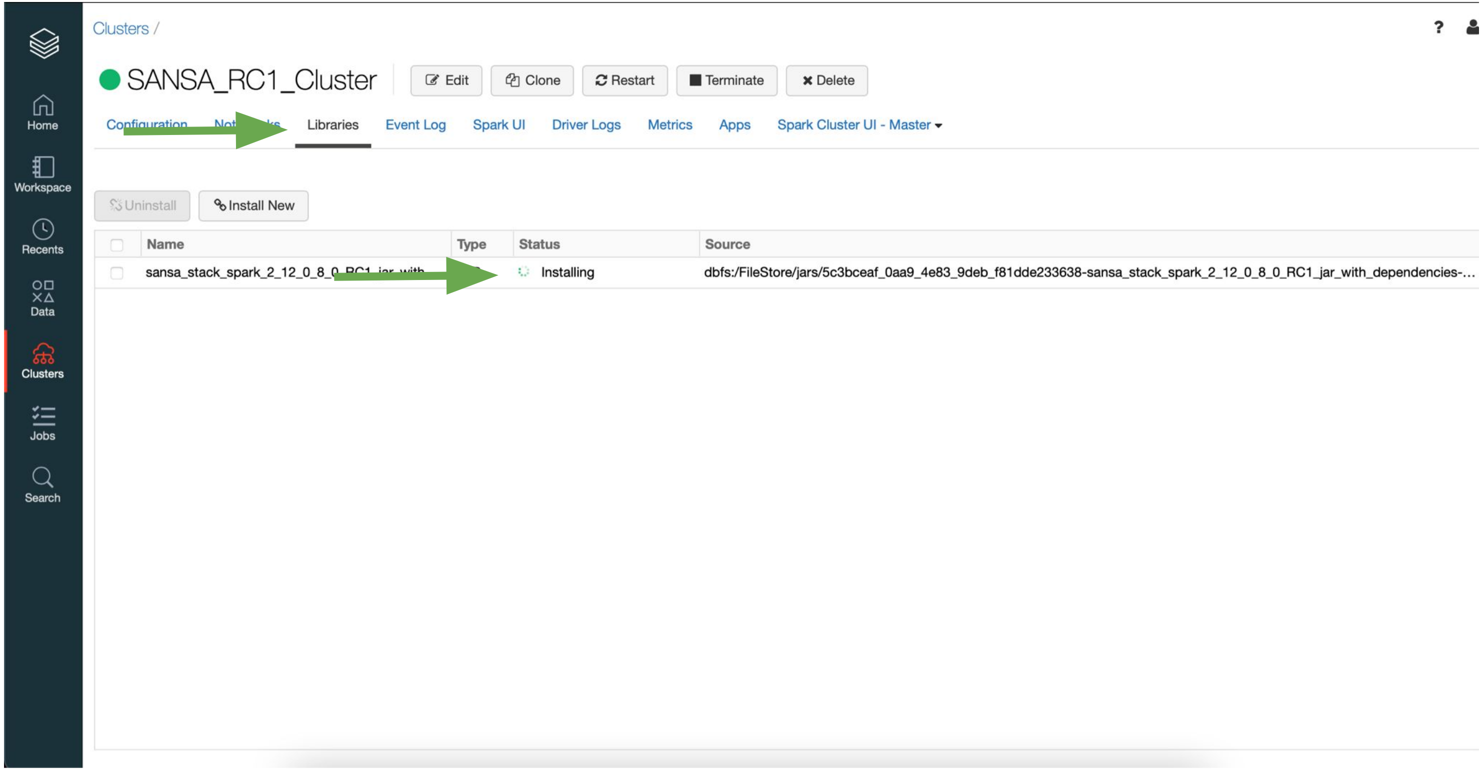

☐	Name	Type	Status	Source
☐	sansa_stack_spark_2_12_0_8_0_RC1_jar_with	[illegible]	Installing	dbfs:/FileStore/jars/5c3bceaf_0aa9_4e83_9deb_f81dde233638-sansa_stack_spark_2_12_0_8_0_RC1_jar_with_dependencies-…

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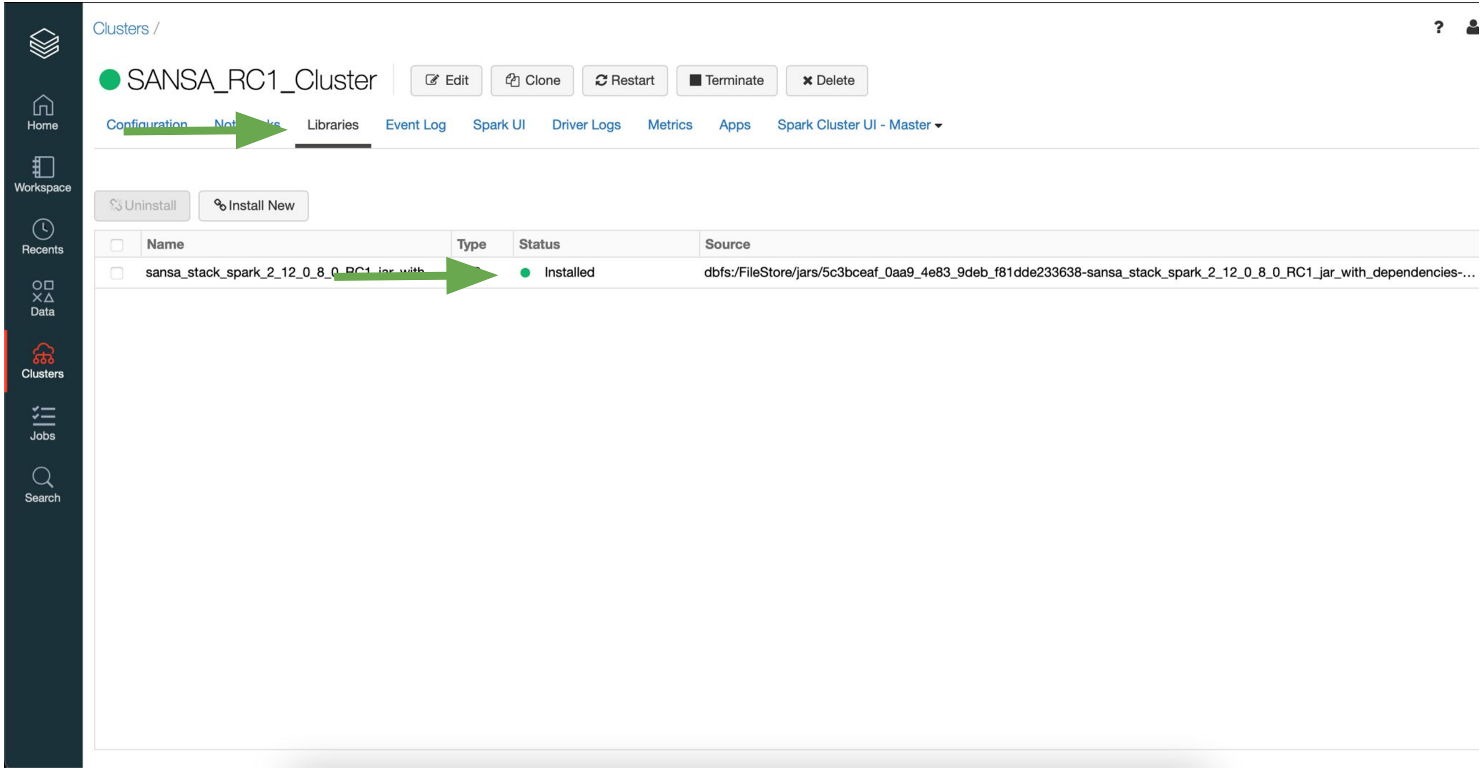
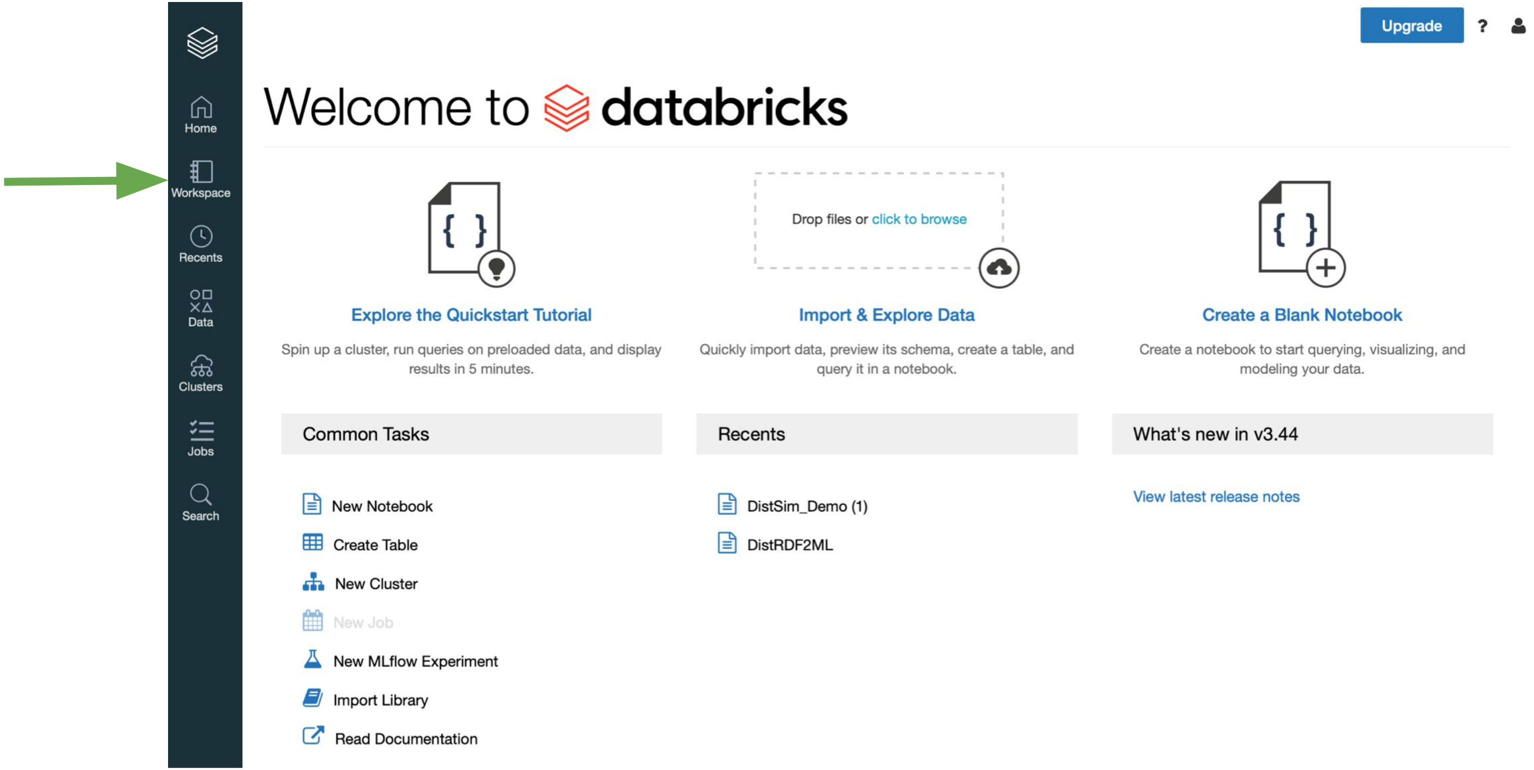


	Name	Type	Status	Source
□	sansa_stack_spark_2_12_0_8_0_RC1_jar_with		● Installed	dbfs:/FileStore/jars/5c3bceaf_0aa9_4e83_9deb_f81dde233638-sansa_stack_spark_2_12_0_8_0_RC1_jar_with_dependencies-…

Import Notebook

- Notebook
  - https://databricks-prod-cloudfront.cloud.databricks.com/public/4027ec902e239c93eaaa8714f173bcfc/6924783690087984/3044317244801485/8524188481975304/latest.html

Import Notebook



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- DistSim_Demo (1)
- DistRDF2ML

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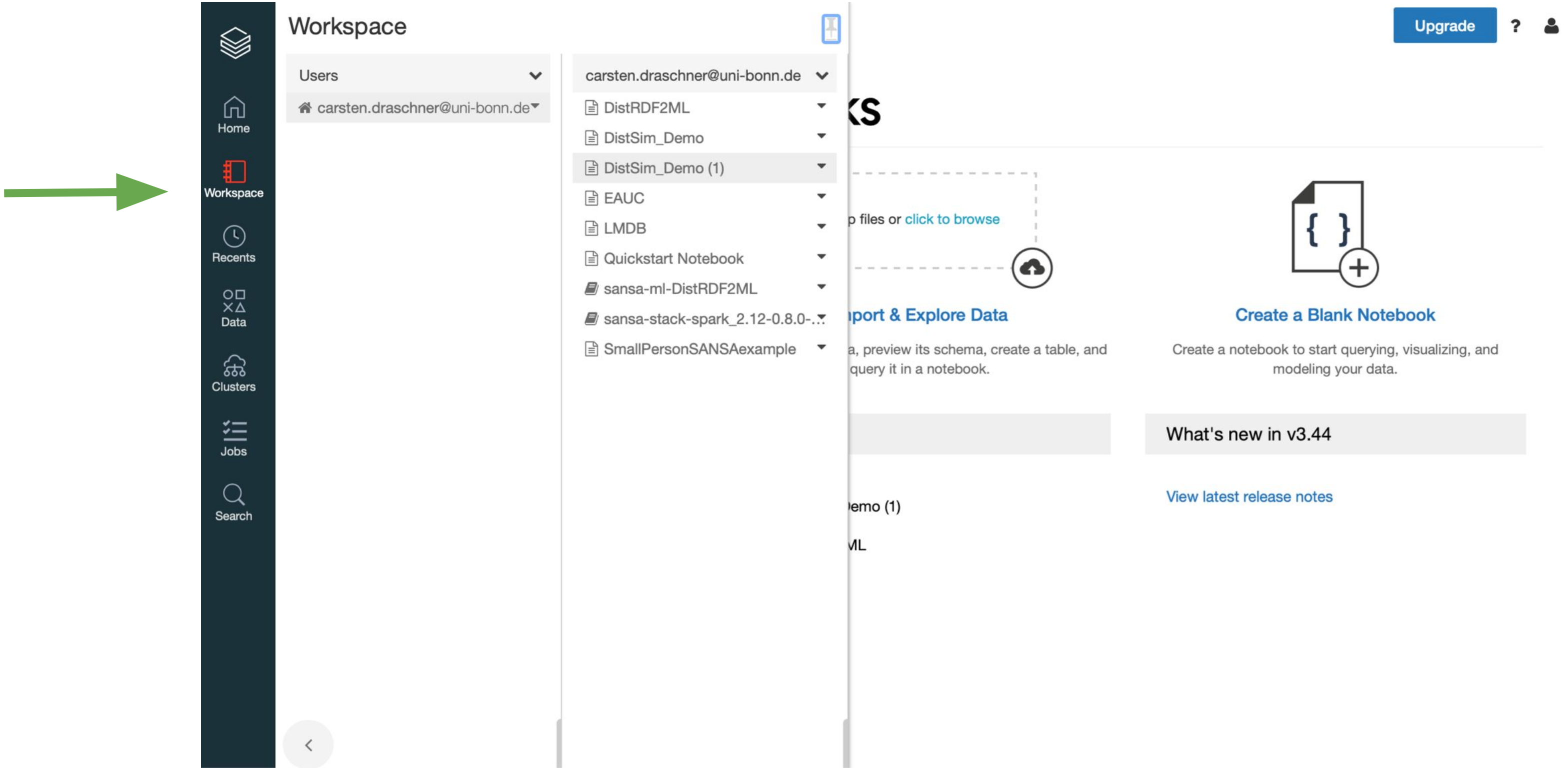
View latest release notes

Import Notebook


Workspace
Users
carsten.draschner@uni-bonn.de
carsten.draschner@uni-bonn.de
DistRDF2ML
DistSim_Demo
DistSim_Demo (1)
EAUC
LMDB
Quickstart Notebook
sansa-ml-DistRDF2ML
sansa-stack-spark_2.12-0.8.0-...
SmallPersonSANSAexample
Home
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Jobs
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p files or click to browse
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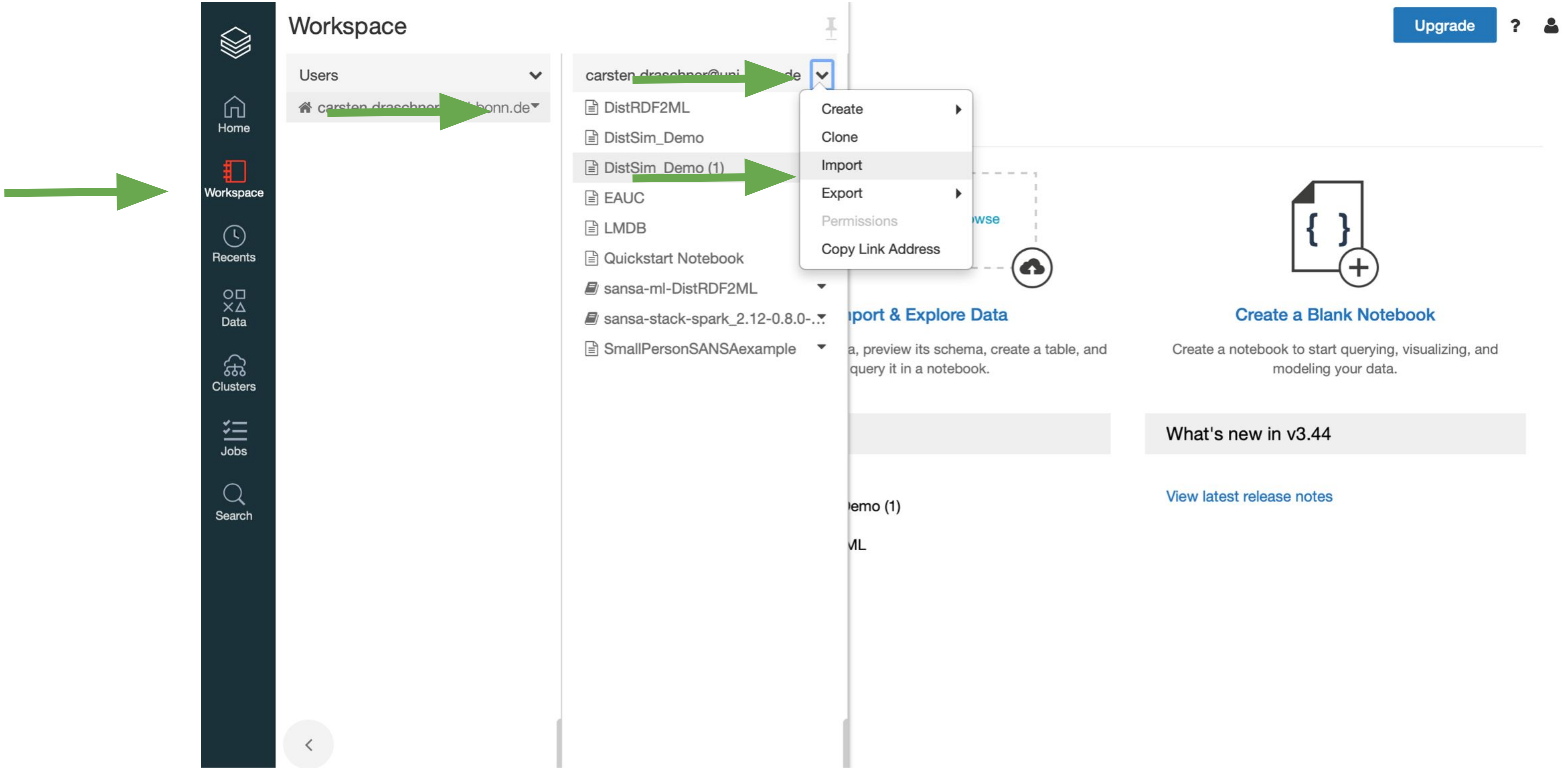
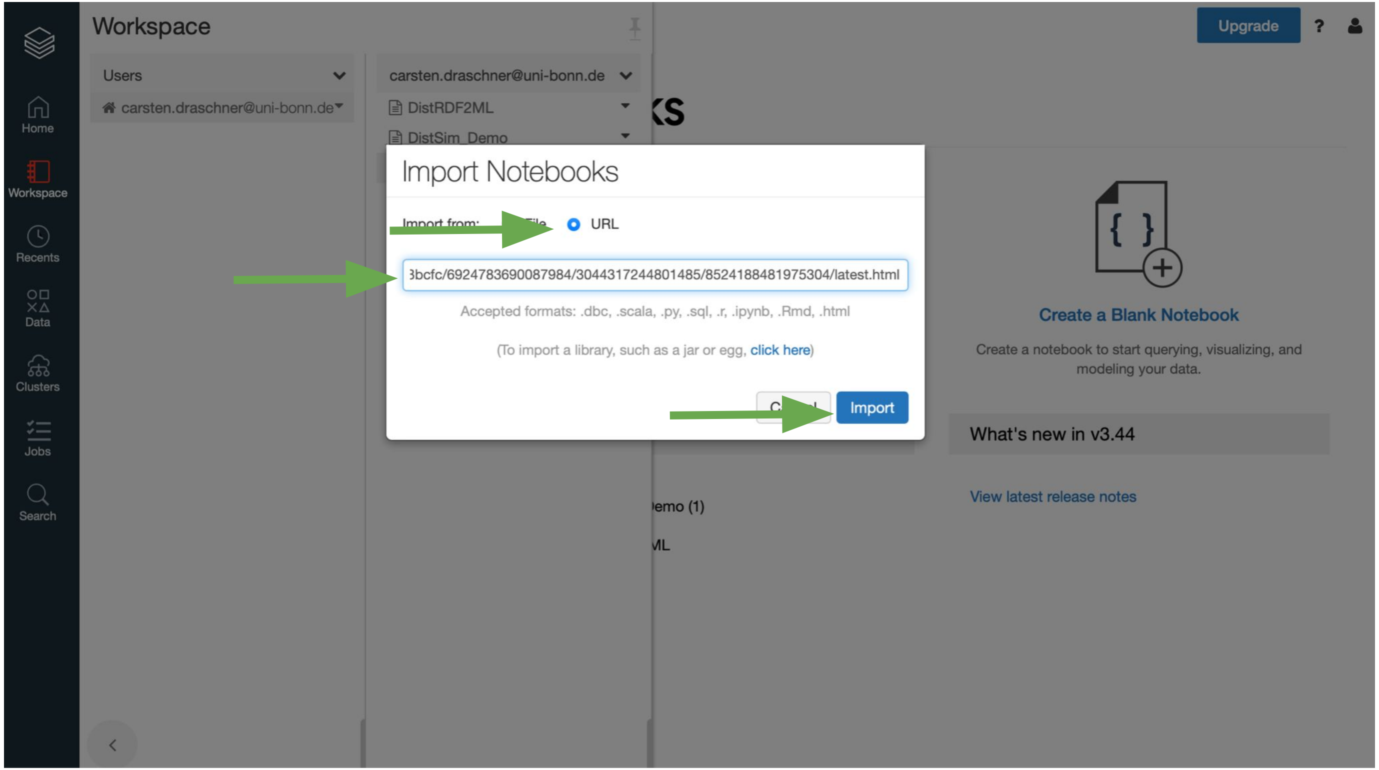
emo (1)
ML

Import Notebook



Import Notebook



Import Notebooks

Import from: File ● URL

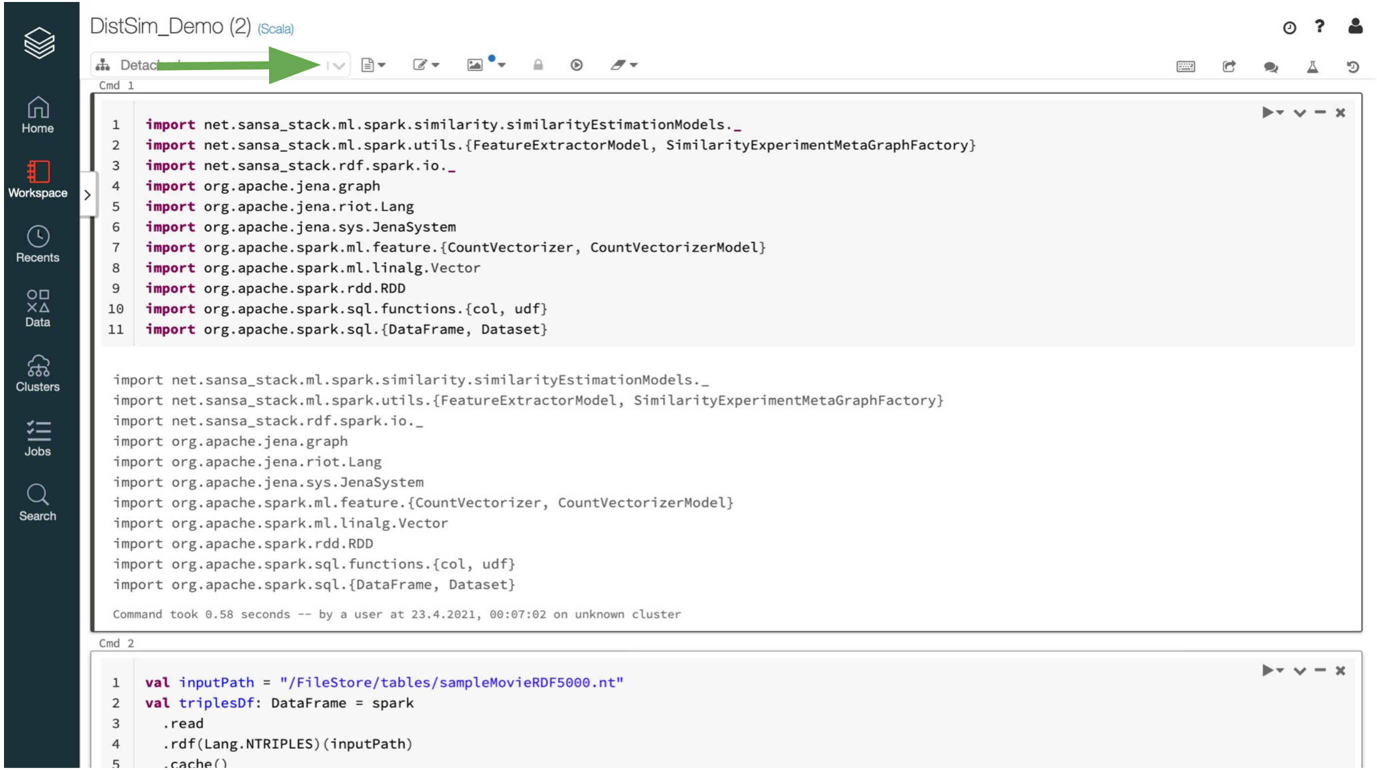
3bcfc/6924783690087984/3044317244801485/8524188481975304/latest.html

Accepted formats: .dbc, .scala, .py, .sql, .r, .ipynb, .Rmd, .html

(To import a library, such as a jar or egg, click here)

Workspace
Users
carsten.draschner@uni-bonn.de
carsten.draschner@uni-bonn.de
DistRDF2ML
DistSim_Demo
Upgrade
Home
Workspace
Recents
Data
Clusters
Jobs
Search
Create a Blank Notebook
Create a notebook to start querying, visualizing, and modeling your data.
What's new in v3.44
View latest release notes
Cancel
Import

Run Notebook - Select Cluster



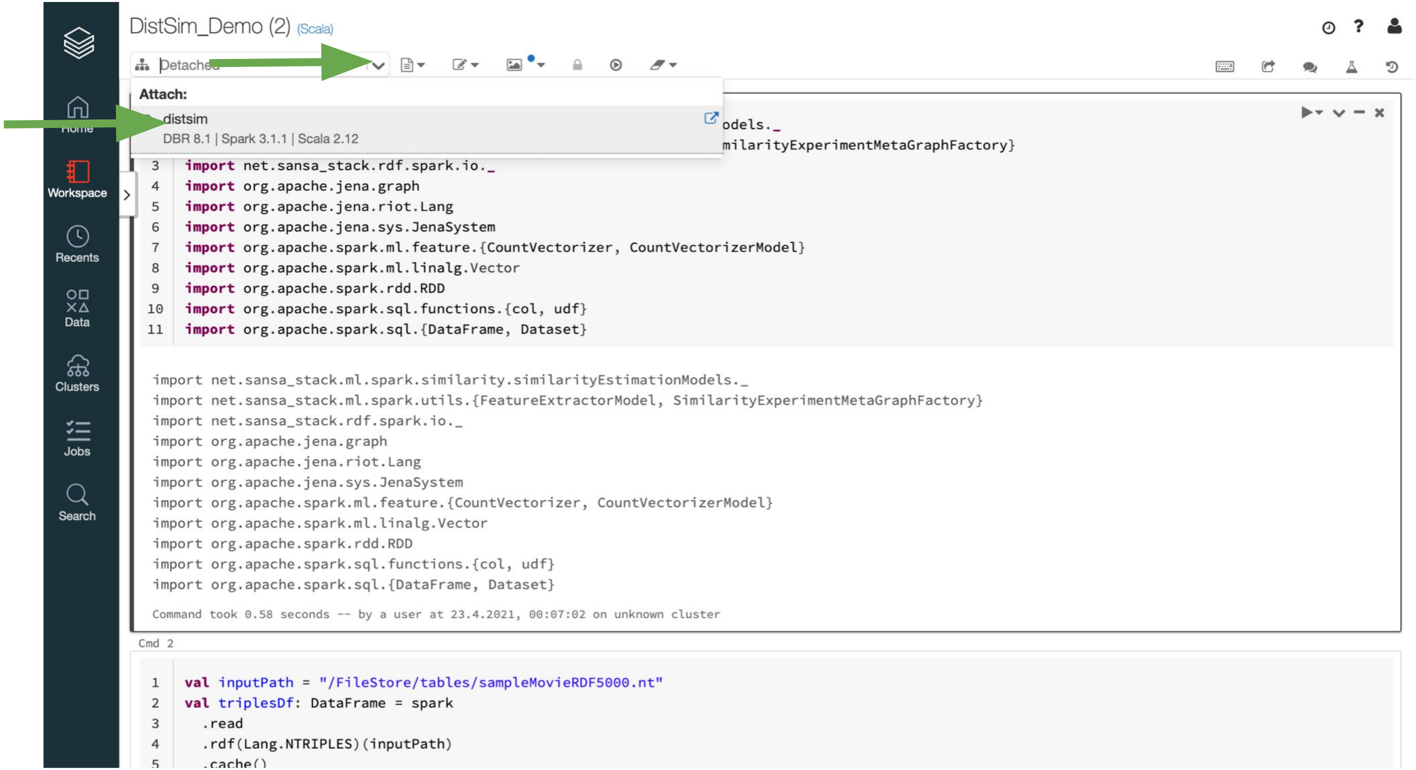
```
import net.sansa_stack.ml.spark.similarity.similarityEstimationModels._
import net.sansa_stack.ml.spark.utils.{FeatureExtractorModel, SimilarityExperimentMetaGraphFactory}
import net.sansa_stack.rdf.spark.io._
import org.apache.jena.graph
import org.apache.jena.riot.Lang
import org.apache.jena.sys.JenaSystem
import org.apache.spark.ml.feature.{CountVectorizer, CountVectorizerModel}
import org.apache.spark.ml.linalg.Vector
import org.apache.spark.rdd.RDD
import org.apache.spark.sql.functions.{col, udf}
import org.apache.spark.sql.{DataFrame, Dataset}
```

```
import net.sansa_stack.ml.spark.similarity.similarityEstimationModels._
import net.sansa_stack.ml.spark.utils.{FeatureExtractorModel, SimilarityExperimentMetaGraphFactory}
import net.sansa_stack.rdf.spark.io._
import org.apache.jena.graph
import org.apache.jena.riot.Lang
import org.apache.jena.sys.JenaSystem
import org.apache.spark.ml.feature.{CountVectorizer, CountVectorizerModel}
import org.apache.spark.ml.linalg.Vector
import org.apache.spark.rdd.RDD
import org.apache.spark.sql.functions.{col, udf}
import org.apache.spark.sql.{DataFrame, Dataset}

Command took 0.58 seconds -- by a user at 23.4.2021, 00:07:02 on unknown cluster
```

```
val inputPath = "/FileStore/tables/sampleMovieRDF5000.nt"
val triplesDf: DataFrame = spark
  .read
  .rdf(Lang.NTRIPLES)(inputPath)
  .cache()
```

Run Notebook - Select Cluster



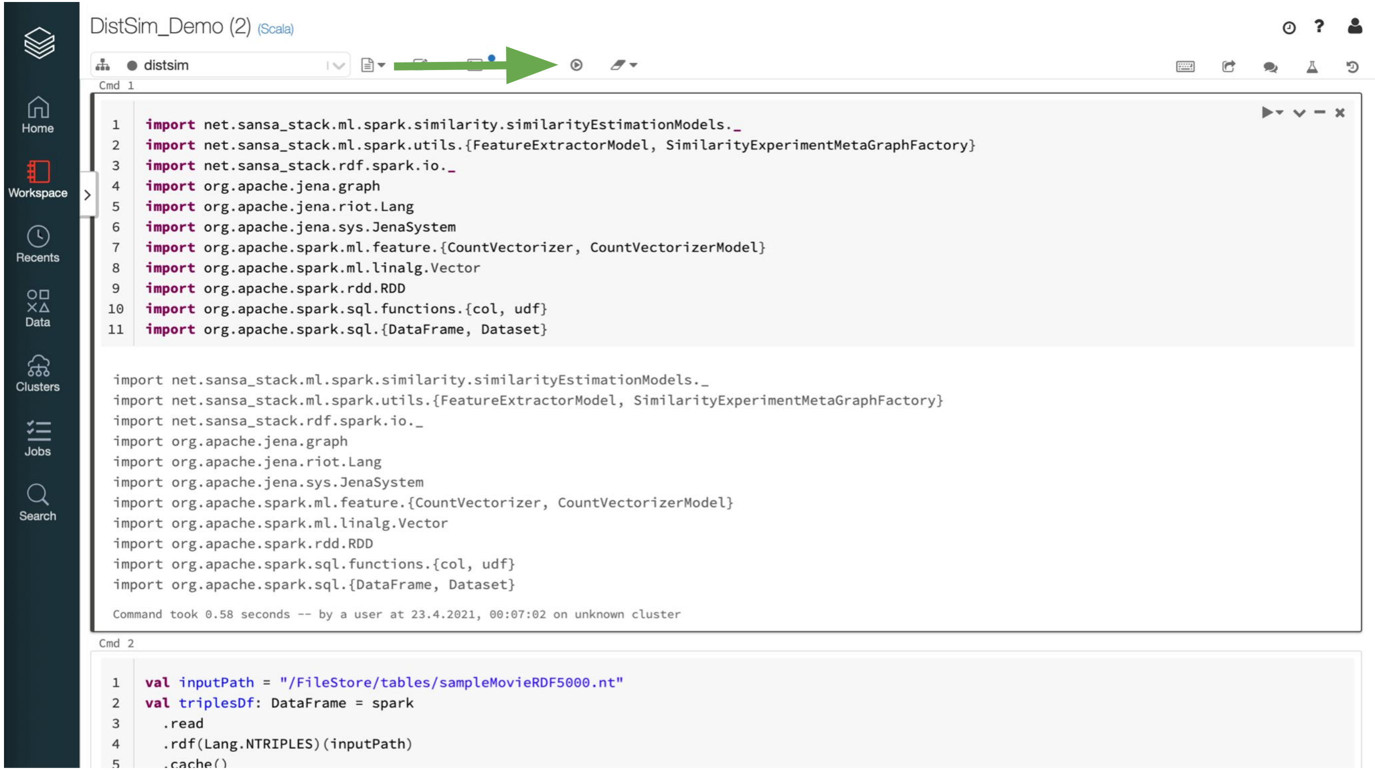
```
odels._
milarityExperimentMetaGraphFactory}
import net.sansa_stack.rdf.spark.io._
import org.apache.jena.graph
import org.apache.jena.riot.Lang
import org.apache.jena.sys.JenaSystem
import org.apache.spark.ml.feature.{CountVectorizer, CountVectorizerModel}
import org.apache.spark.ml.linalg.Vector
import org.apache.spark.rdd.RDD
import org.apache.spark.sql.functions.{col, udf}
import org.apache.spark.sql.{DataFrame, Dataset}
```

```
import net.sansa_stack.ml.spark.similarity.similarityEstimationModels._
import net.sansa_stack.ml.spark.utils.{FeatureExtractorModel, SimilarityExperimentMetaGraphFactory}
import net.sansa_stack.rdf.spark.io._
import org.apache.jena.graph
import org.apache.jena.riot.Lang
import org.apache.jena.sys.JenaSystem
import org.apache.spark.ml.feature.{CountVectorizer, CountVectorizerModel}
import org.apache.spark.ml.linalg.Vector
import org.apache.spark.rdd.RDD
import org.apache.spark.sql.functions.{col, udf}
import org.apache.spark.sql.{DataFrame, Dataset}
```

```
Command took 0.58 seconds -- by a user at 23.4.2021, 00:07:02 on unknown cluster
```

```
val inputPath = "/FileStore/tables/sampleMovieRDF5000.nt"
val triplesDf: DataFrame = spark
  .read
  .rdf(Lang.NTRIPLES)(inputPath)
  .cache()
```

Run Notebook - Run all cells



```
import net.sansa_stack.ml.spark.similarity.similarityEstimationModels._
import net.sansa_stack.ml.spark.utils.{FeatureExtractorModel, SimilarityExperimentMetaGraphFactory}
import net.sansa_stack.rdf.spark.io._
import org.apache.jena.graph
import org.apache.jena.riot.Lang
import org.apache.jena.sys.JenaSystem
import org.apache.spark.ml.feature.{CountVectorizer, CountVectorizerModel}
import org.apache.spark.ml.linalg.Vector
import org.apache.spark.rdd.RDD
import org.apache.spark.sql.functions.{col, udf}
import org.apache.spark.sql.{DataFrame, Dataset}
```

```
import net.sansa_stack.ml.spark.similarity.similarityEstimationModels._
import net.sansa_stack.ml.spark.utils.{FeatureExtractorModel, SimilarityExperimentMetaGraphFactory}
import net.sansa_stack.rdf.spark.io._
import org.apache.jena.graph
import org.apache.jena.riot.Lang
import org.apache.jena.sys.JenaSystem
import org.apache.spark.ml.feature.{CountVectorizer, CountVectorizerModel}
import org.apache.spark.ml.linalg.Vector
import org.apache.spark.rdd.RDD
import org.apache.spark.sql.functions.{col, udf}
import org.apache.spark.sql.{DataFrame, Dataset}
```

Command took 0.58 seconds -- by a user at 23.4.2021, 00:07:02 on unknown cluster

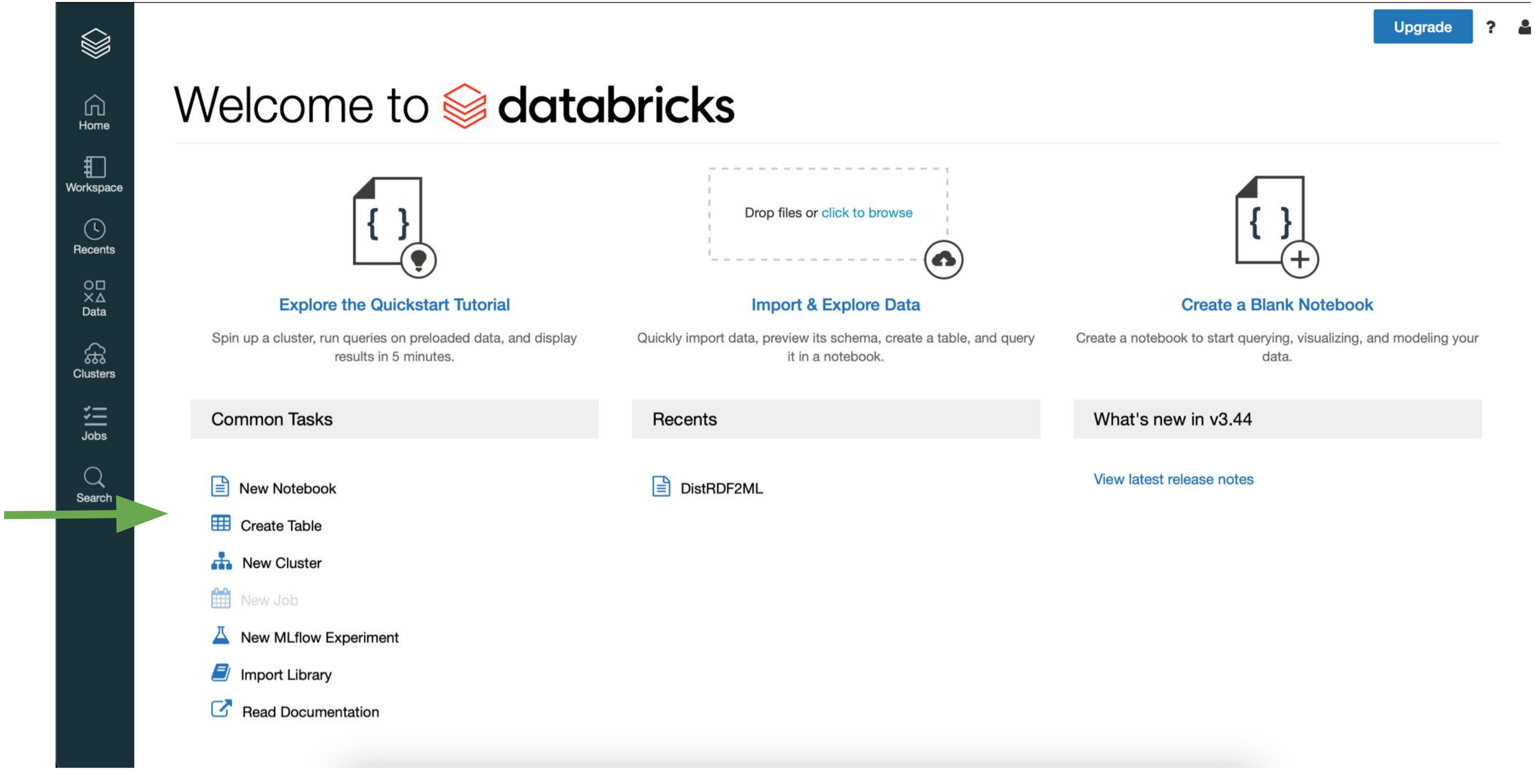
```
val inputPath = "/FileStore/tables/sampleMovieRDF5000.nt"
val triplesDf: DataFrame = spark
  .read
  .rdf(Lang.NTRIPLES)(inputPath)
  .cache()
```

You Made It!!!

Create Notebook

- Create Notebook
- Attach Cluster
- Read In Data
- Perform DistSim Modules

Create Notebook - Create Notebook



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Explore the Quickstart Tutorial

Spin up a cluster, run queries on preloaded data, and display results in 5 minutes.

Drop files or click to browse

Import & Explore Data

Quickly import data, preview its schema, create a table, and query it in a notebook.

Create a Blank Notebook

Create a notebook to start querying, visualizing, and modeling your data.

Common Tasks

- New Notebook
- Create Table
- New Cluster
- New Job
- New MLflow Experiment
- Import Library
- Read Documentation

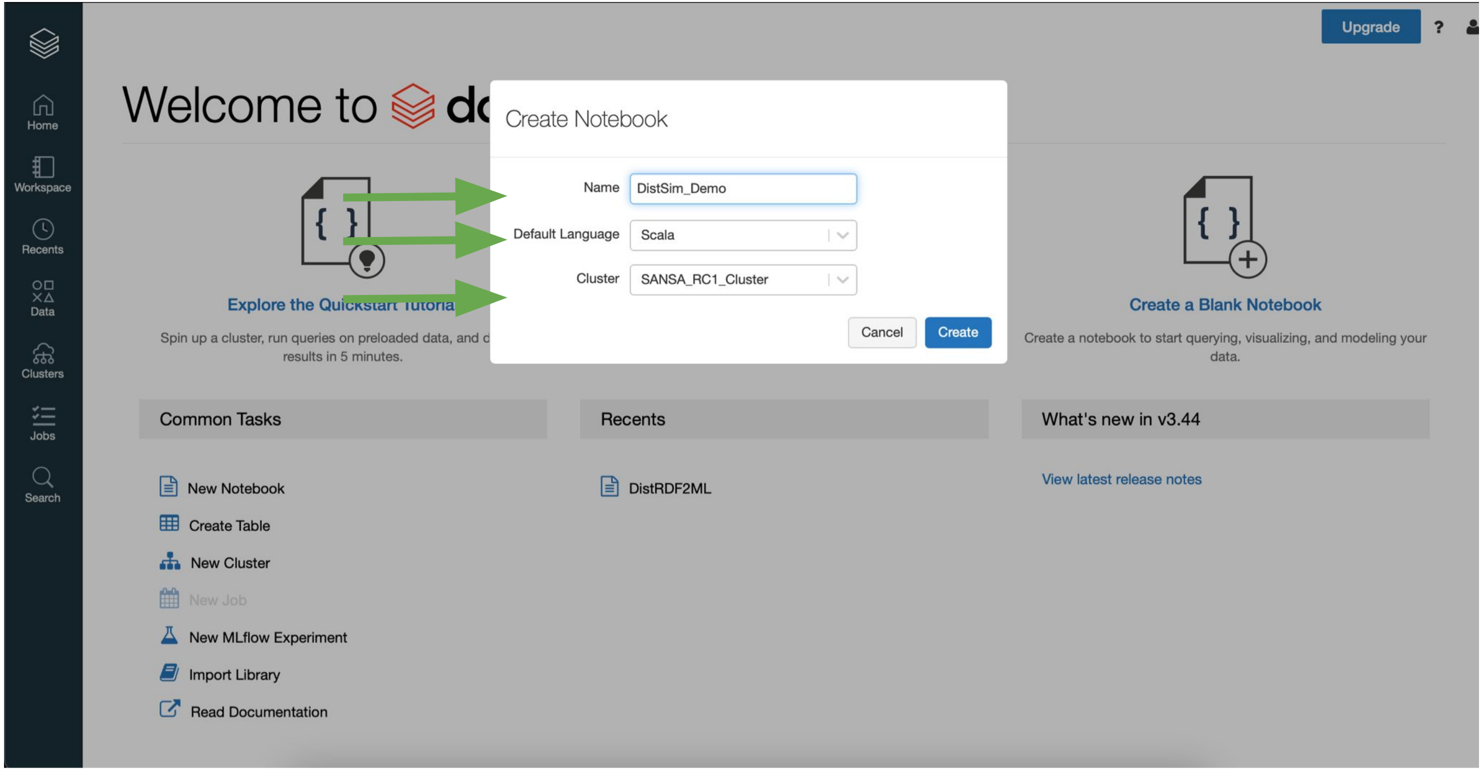
Recents

- DistRDF2ML

What's new in v3.44

View latest release notes

Create Notebook - Create Notebook



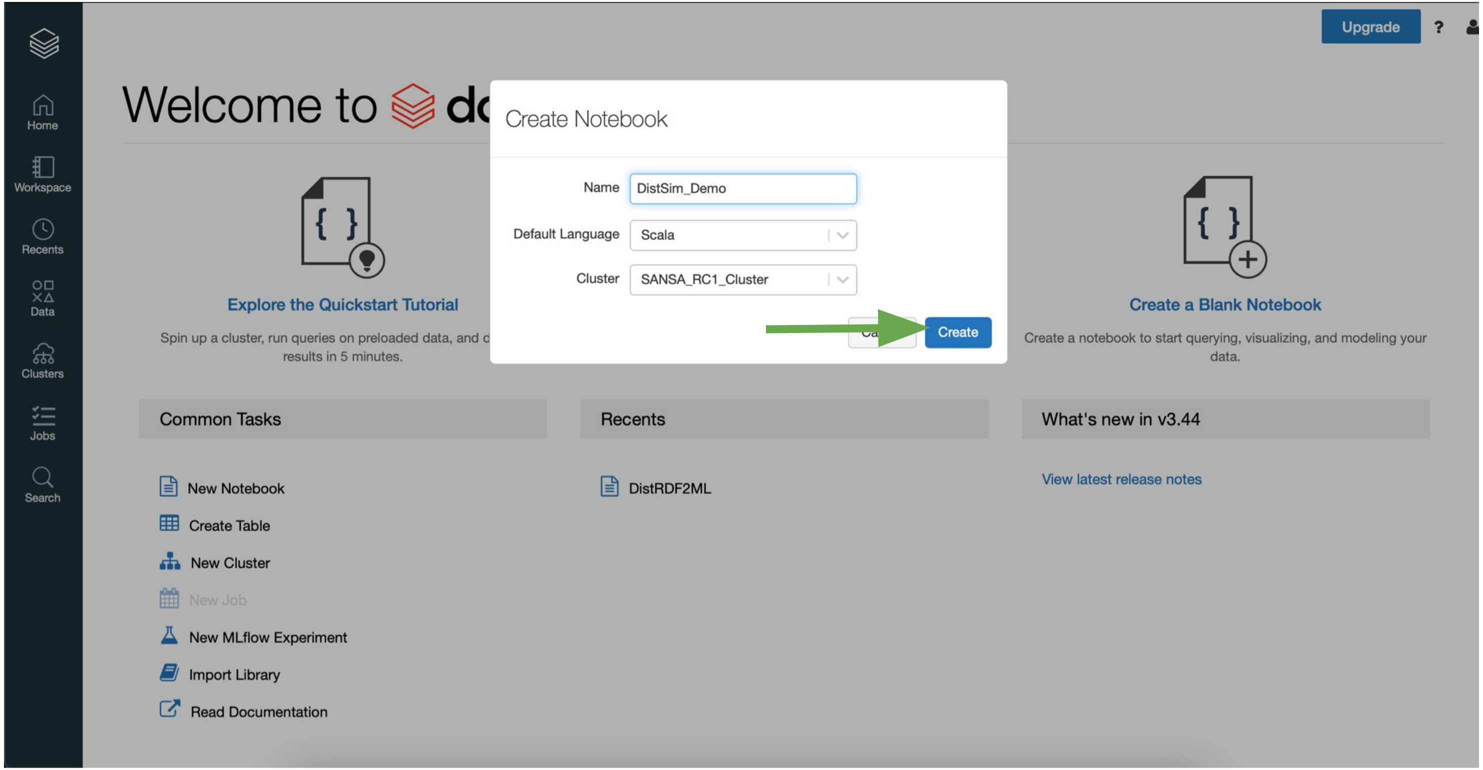
Create Notebook

Name: DistSim_Demo

Default Language: Scala

Cluster: SANSA_RC1_Cluster

Create Notebook - Create Notebook



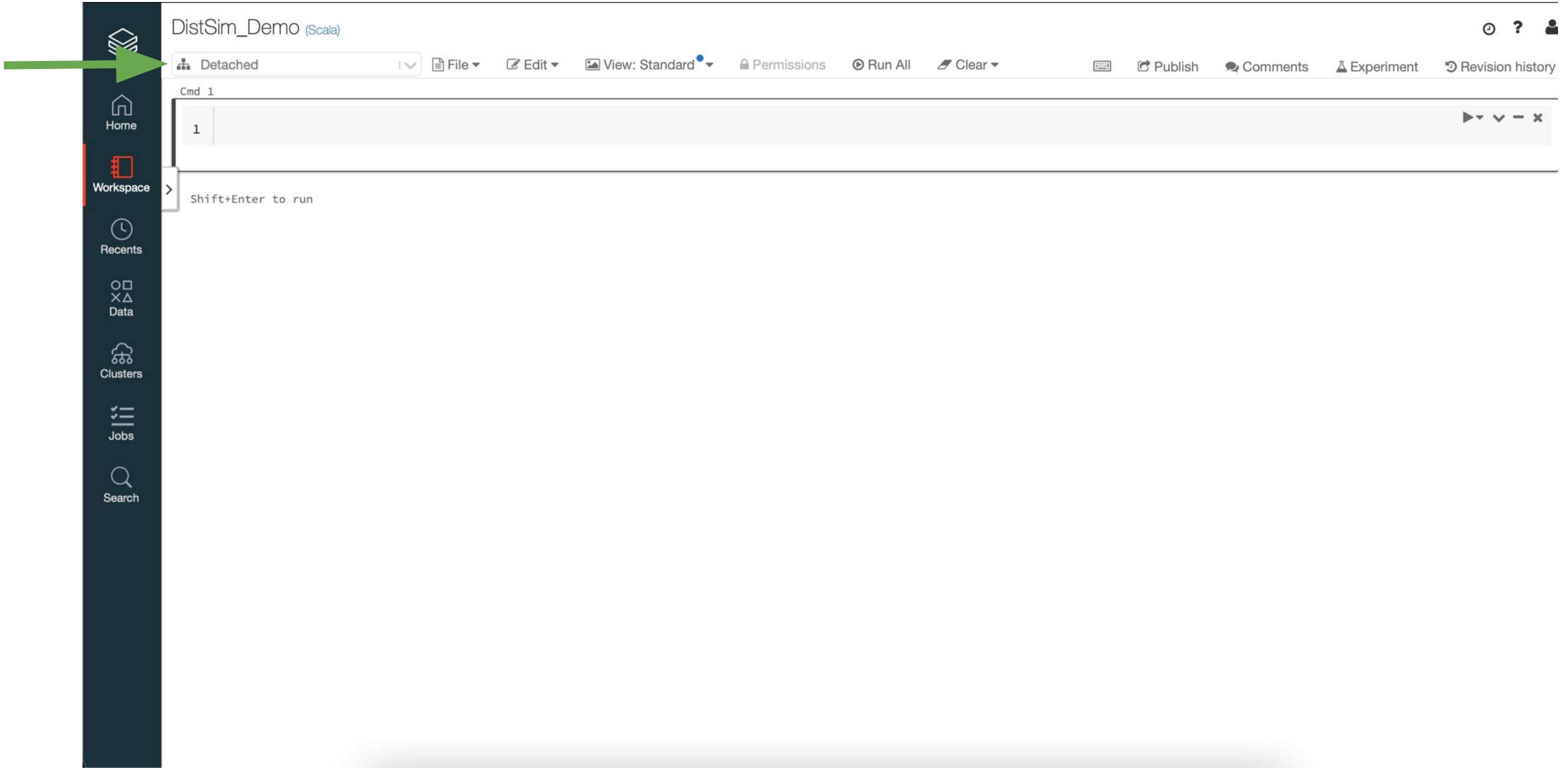
Create Notebook

Name: DistSim_Demo

Default Language: Scala

Cluster: SANSA_RC1_Cluster

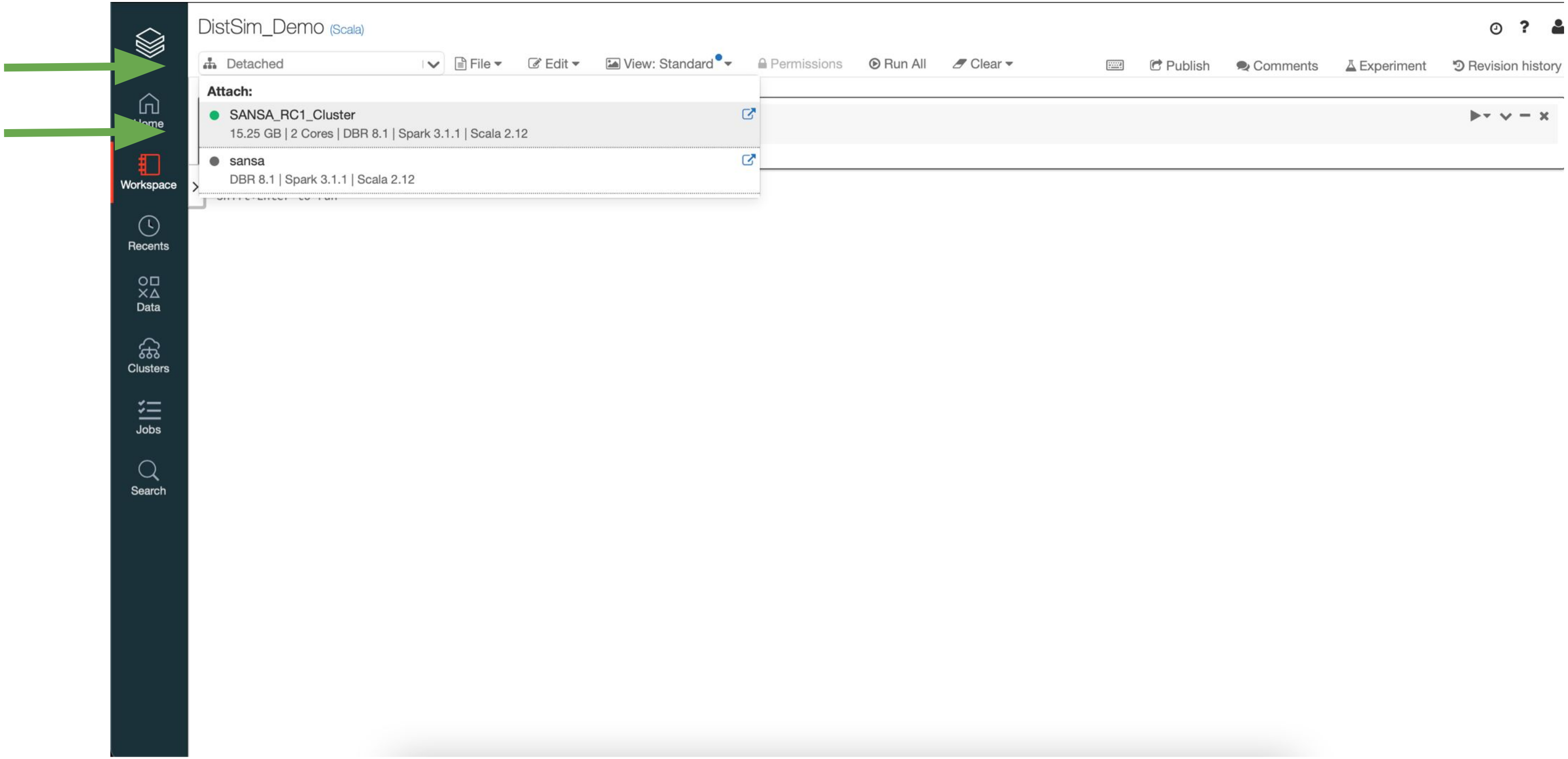
Create Notebook - Specify Cluster



```
Cmd 1
```

Shift+Enter to run

Create Notebook - Specify Cluster



Attach:

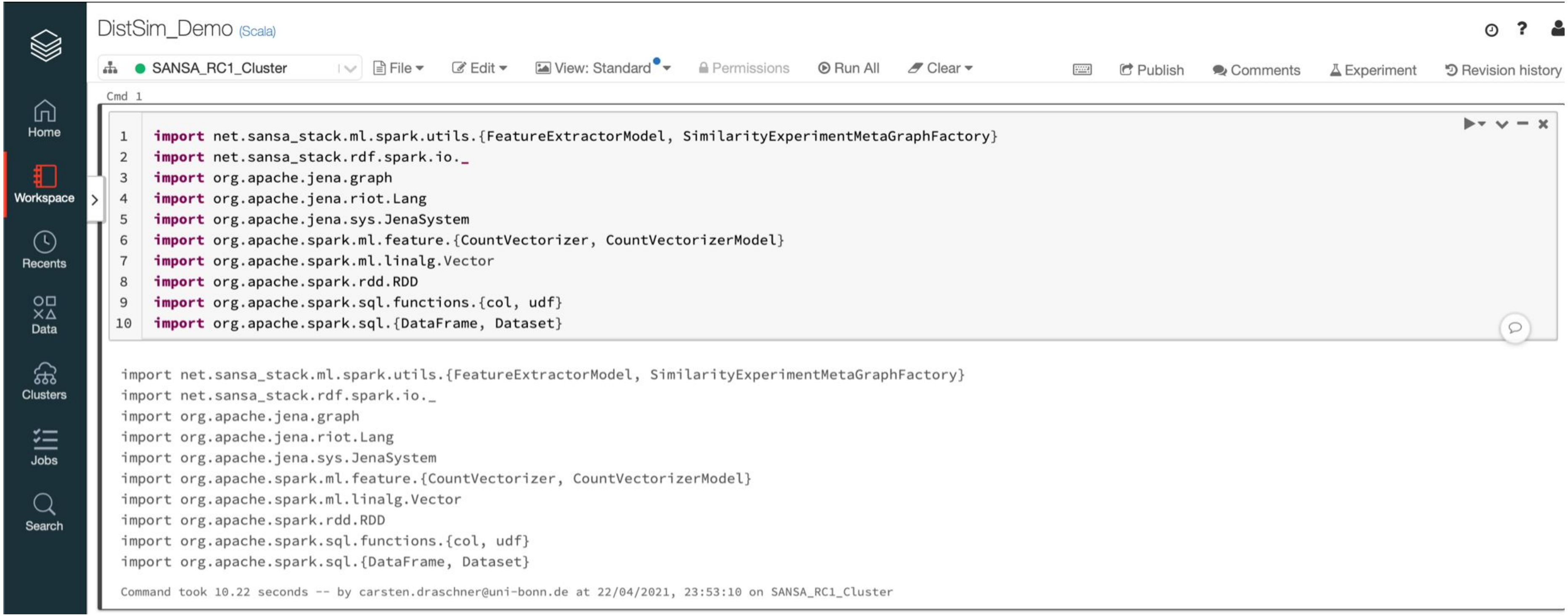
SANSA_RC1_Cluster
15.25 GB | 2 Cores | DBR 8.1 | Spark 3.1.1 | Scala 2.12

sansa
DBR 8.1 | Spark 3.1.1 | Scala 2.12

Code in Notebook - Imports

```
import net.sansa_stack.ml.spark.utils.{FeatureExtractorModel, SimilarityExperimentMetaGraphFactory}
import net.sansa_stack.rdf.spark.io._
import org.apache.jena.graph
import org.apache.jena.riot.Lang
import org.apache.jena.sys.JenaSystem
import org.apache.spark.ml.feature.{CountVectorizer, CountVectorizerModel}
import org.apache.spark.ml.linalg.Vector
import org.apache.spark.rdd.RDD
import org.apache.spark.sql.functions.{col, udf}
import org.apache.spark.sql.{DataFrame, Dataset}
```

Code in Notebook - Imports

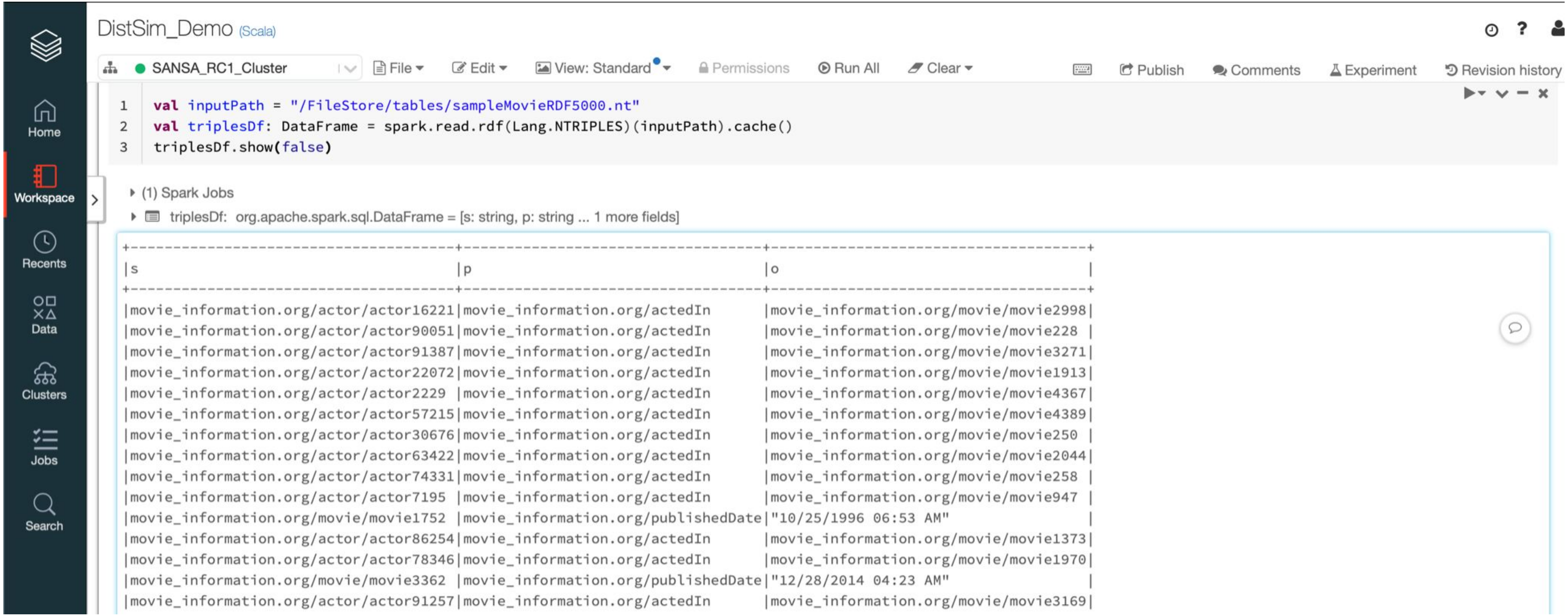


```scala
import net.sansa_stack.ml.spark.utils.{FeatureExtractorModel, SimilarityExperimentMetaGraphFactory}
import net.sansa_stack.rdf.spark.io._
import org.apache.jena.graph
import org.apache.jena.riot.Lang
import org.apache.jena.sys.JenaSystem
import org.apache.spark.ml.feature.{CountVectorizer, CountVectorizerModel}
import org.apache.spark.ml.linalg.Vector
import org.apache.spark.rdd.RDD
import org.apache.spark.sql.functions.{col, udf}
import org.apache.spark.sql.{DataFrame, Dataset}
```

```
import net.sansa_stack.ml.spark.utils.{FeatureExtractorModel, SimilarityExperimentMetaGraphFactory}
import net.sansa_stack.rdf.spark.io._
import org.apache.jena.graph
import org.apache.jena.riot.Lang
import org.apache.jena.sys.JenaSystem
import org.apache.spark.ml.feature.{CountVectorizer, CountVectorizerModel}
import org.apache.spark.ml.linalg.Vector
import org.apache.spark.rdd.RDD
import org.apache.spark.sql.functions.{col, udf}
import org.apache.spark.sql.{DataFrame, Dataset}

Command took 10.22 seconds -- by carsten.draschner@uni-bonn.de at 22/04/2021, 23:53:10 on SANSA_RC1_Cluster
```

Code in Notebook - Imports



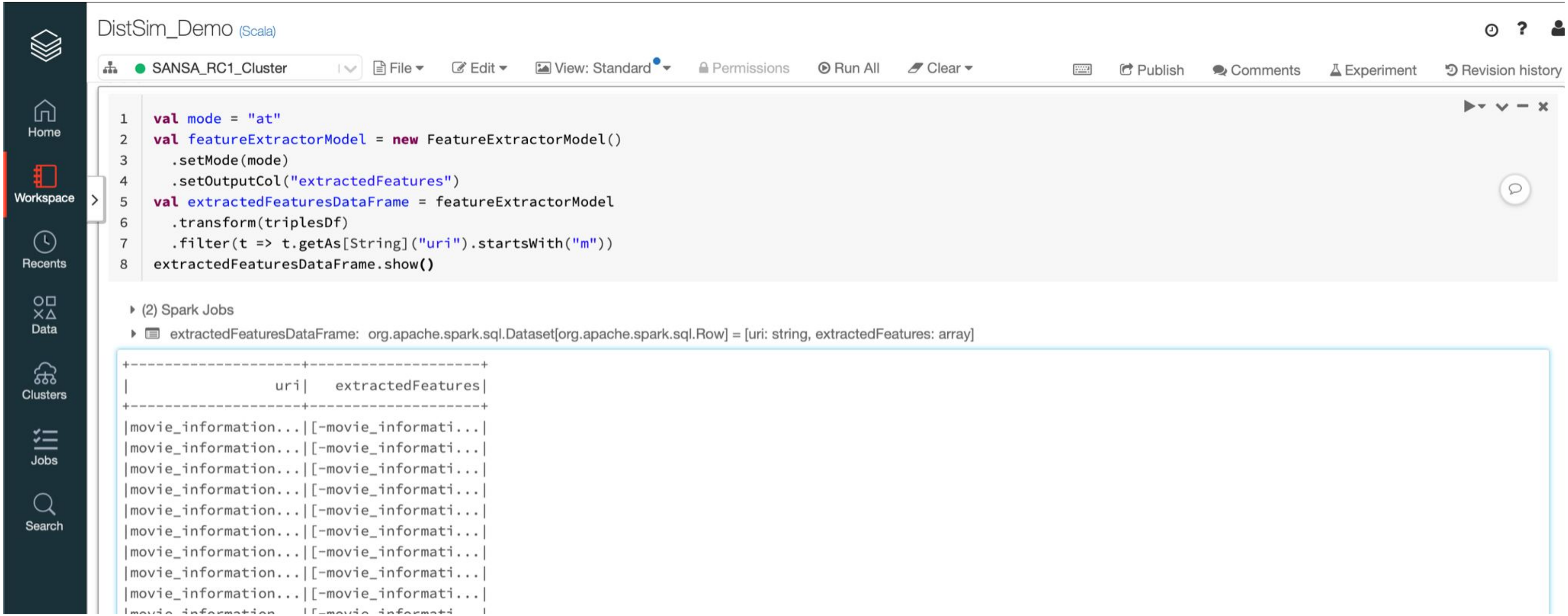
```scala
val inputPath = "/FileStore/tables/sampleMovieRDF5000.nt"
val triplesDf: DataFrame = spark.read.rdf(Lang.NTRIPLES)(inputPath).cache()
triplesDf.show(false)
```

(1) Spark Jobs

triplesDf: org.apache.spark.sql.DataFrame = [s: string, p: string ... 1 more fields]

```
+--------------------------------------+-----------------------------------+-------------------------------------+
|s                                     |p                                  |o                                    |
+--------------------------------------+-----------------------------------+-------------------------------------+
|movie_information.org/actor/actor16221|movie_information.org/actedIn      |movie_information.org/movie/movie2998|
|movie_information.org/actor/actor90051|movie_information.org/actedIn      |movie_information.org/movie/movie228 |
|movie_information.org/actor/actor91387|movie_information.org/actedIn      |movie_information.org/movie/movie3271|
|movie_information.org/actor/actor22072|movie_information.org/actedIn      |movie_information.org/movie/movie1913|
|movie_information.org/actor/actor2229 |movie_information.org/actedIn      |movie_information.org/movie/movie4367|
|movie_information.org/actor/actor57215|movie_information.org/actedIn      |movie_information.org/movie/movie4389|
|movie_information.org/actor/actor30676|movie_information.org/actedIn      |movie_information.org/movie/movie250 |
|movie_information.org/actor/actor63422|movie_information.org/actedIn      |movie_information.org/movie/movie2044|
|movie_information.org/actor/actor74331|movie_information.org/actedIn      |movie_information.org/movie/movie258 |
|movie_information.org/actor/actor7195 |movie_information.org/actedIn      |movie_information.org/movie/movie947 |
|movie_information.org/movie/movie1752 |movie_information.org/publishedDate|"10/25/1996 06:53 AM"                |
|movie_information.org/actor/actor86254|movie_information.org/actedIn      |movie_information.org/movie/movie1373|
|movie_information.org/actor/actor78346|movie_information.org/actedIn      |movie_information.org/movie/movie1970|
|movie_information.org/movie/movie3362 |movie_information.org/publishedDate|"12/28/2014 04:23 AM"                |
|movie_information.org/actor/actor91257|movie_information.org/actedIn      |movie_information.org/movie/movie3169|
```

Code in Notebook - Imports



```
val mode = "at"
val featureExtractorModel = new FeatureExtractorModel()
  .setMode(mode)
  .setOutputCol("extractedFeatures")
val extractedFeaturesDataFrame = featureExtractorModel
  .transform(triplesDf)
  .filter(t => t.getAs[String]("uri").startsWith("m"))
extractedFeaturesDataFrame.show()
```

(2) Spark Jobs

extractedFeaturesDataFrame: org.apache.spark.sql.Dataset[org.apache.spark.sql.Row] = [uri: string, extractedFeatures: array]

```
+--------------------+--------------------+
|                 uri|   extractedFeatures|
+--------------------+--------------------+
|movie_information...|[-movie_informati...|
|movie_information...|[-movie_informati...|
|movie_information...|[-movie_informati...|
|movie_information...|[-movie_informati...|
|movie_information...|[-movie_informati...|
|movie_information...|[-movie_informati...|
|movie_information...|[-movie_informati...|
|movie_information...|[-movie_informati...|
|movie_information...|[-movie_informati...|
|movie_information...|[-movie_informati...|
```