datarun Documentation

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CONTENTS

Datarun goal is to train and test machine learning models. It is a REST API written in Django.

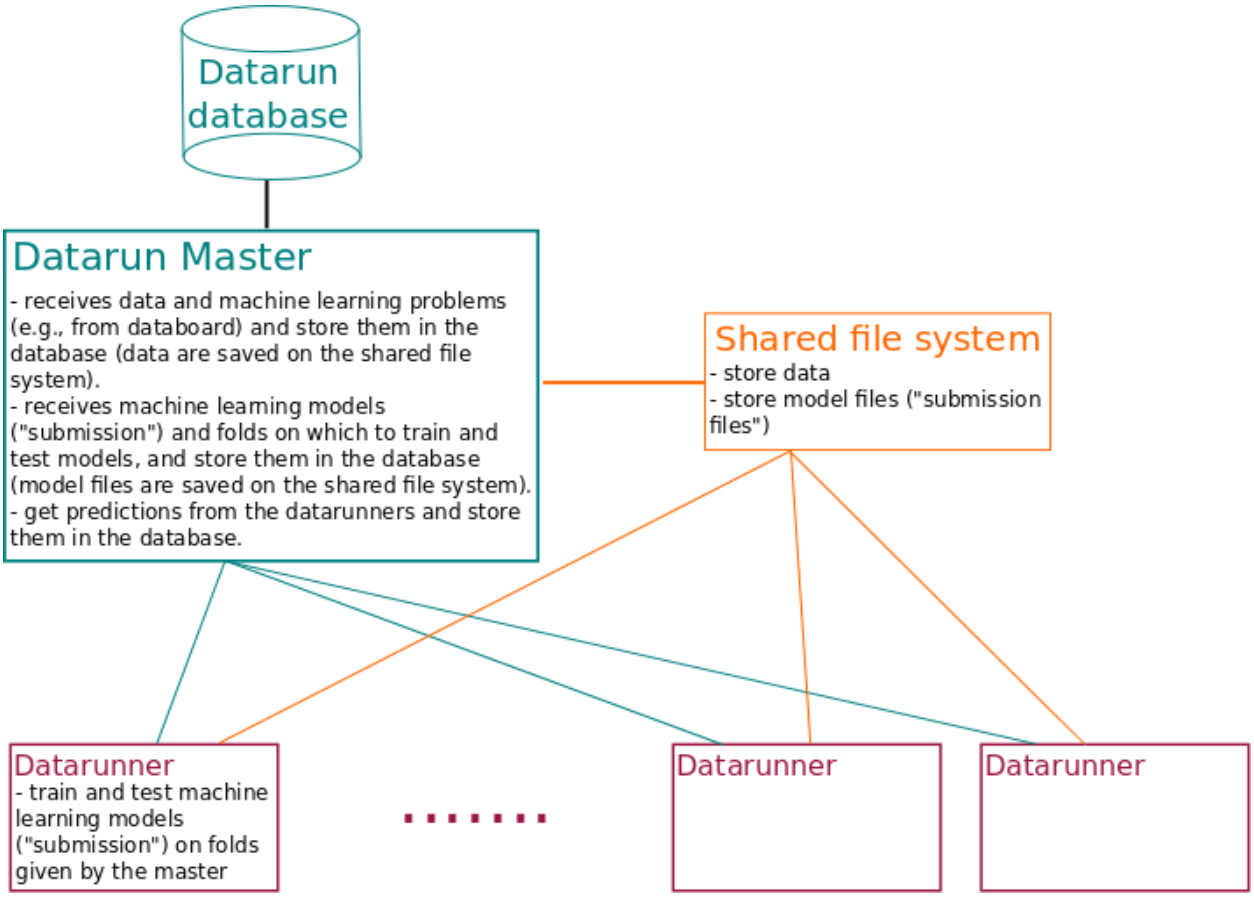
The basic workflow is the following (more details can be found in *How to use datarun?*):

1. Data (on which machine learning models are trained and tested) are sent to datarun.
2. Models and train and test indices of CV fold are send to datarun, which train and test these models on these indices.
3. The resulting predictions can then be requested.

In this documentation, we use the following terminology (which corresponds to the database tables, cf *Models*):

- `RawData` refers to the data on which machine learning models are trained and tested
- `Submission` refers to a machine learning model
- `Submission on cv fold` / `SubmissionFold` refers to a submission and the indices of train and test of a cv fold.

Datarun is made of a master and datarunners, as represented below:



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CHAPTER

ONE

HOW TO USE DATARUN?

The workflow to use datarun is the following:

1.1 1- Send data to datarun

The standard format of a data file excepted by datarun is a csv file whose first row contains the feature and target names, each line corresponds to a data sample.

Here is an example of a standard data file:

```
sepal length,sepal width,petal length,petal width,species
5.1,3.5,1.4,0.2,setosa
4.9,3.0,1.4,0.2,setosa
4.7,3.2,1.3,0.2,setosa
4.6,3.1,1.5,0.2,setosa
```

If your data match the standard data file, you need to send:

- the dataset name (for instance if you use databoard, you can use the problem name)
- your data file
- the name of the target column
- the workflow elements of the problem related to the dataset (for instance feature_extractor, classifier, ...)

If your data do not match the standard data file, you need to send in addition to above:

- a python file with 5 specific functions (an example of such file is `test_files/variable_stars/variable_stars_datarun.py`):
  - `prepare_data(raw_data_path)`
  - `get_train_data(raw_data_path)`
  - `get_test_data(raw_data_path)`
  - `train_submission(module_path, X, y, train_indices)`
  - `test_submission(trained_model, X, test_indices)`
- possibly other data files (if your data are split in different files).

In both cases, to send your data to datarun, you can use:

- a post request to `<master-host>/runapp/rawdata/` (cf *direct requests*, class runapp.views.RawDataList)
- the `post_data` function in the module test_files.post_api (cf *post_api module*)

Note for databoard users:

1. To prepare data for datarun:

- If they match the standard data file, there is nothing to do.
- If they do not match the standard data file,

    1. **create a file `problems/<problem_name>_datarun.py` which corresponds to the above mentionned python file.** Functions `prepare_data(raw_data_path)`, `get_train_data(raw_data_path)`, and `get_test_data(raw_data_path)` are almost exact copies of the same functions defined in `databoard/specific/problems/<problem_name>.py`, except the dependence on `raw_data_path` (which allows datarun to find the data file where it saves it). Be careful to remove all dependencies with `databoard` module. Functions `train_submission(module_path, X, y, train_indices)` and `test_submission(trained_model, X, test_indices)` are exact copies of the same functions defined in the problem workflow (`databoard/specific/workflows/<workflow_name>.py`).
    2. Add in `databoard/specific/problems/<problem_name>.py` a line specifying the above mentionned python file and possible other data files. E.g, `extra_files = extra_files = [vf_raw_filename, os.path.join(problems_path, problem_name, 'variable_star_datarun.py')]` (for the variable stars problem).

2. **To send data to datarun and to split data into train and test dataset, you can use the function `send_data_datarun` of d** This function can be called with fab: `fab send_data_datarun:<problem_name>,<datarun_master_url>,`

1.2 2- Split data into train and test dataset

If your data match the standard format, you can use:

- a post request to `<master-host>/runapp/rawdata/split/` (cf *direct requests*, class runapp.views.SplitTrainTest)
- the `post_split` function in the module test_files.post_api (cf *post_api module*)

If your data do not match the standard format, you can use:

- a post request to `<master-host>/runapp/rawdata/customsplit/` (cf *direct requests*, class runapp.views.CustomSplitTrainTest)
- the `custom_post_split` function in the module test_files.post_api (cf *post_api module*)

Note for databoard users: To send data to datarun and to split data into train and test dataset, you can use the function `send_data_datarun` of `databoard/db_tools.py`, which uses the functions `post_data` and `post_split` (or `custom_post_split`) of the module test_files.post_api of datarun (cf previous section).

This function can be called with fab: `fab send_data_datarun:<problem_name>,<datarun_master_url>,<dat`

1.3 3- Send submission on cv fold to be trained on datarun

To send a submission on cv fold, you can use:

- a post request to `<master-host>/runapp/submissionfold/` (cf *direct requests*, class runapp.views.SubmissionFoldList)
- the `post_submission_fold` function in the module test_files.post_api (cf *post_api module*)

If the associted submission files have already been sent, you'll need to send:

- the id of the associated submission
- the id of the submission on cv fold
- the train and test indices of the cv fold. * after compression (with zlib) and base64-encoding if you use a post request * the raw indices if you use the `post_submission_fold` function
- the priority level (`L` for low or `H` for high) of training this submission on cv fold.
- an indication that you want to force retraining the submission on cv fold even if it already exists (`force="submission_fold"` instead of `force=None`).

If the associated submission files have not been sent, you need to add:

- the id of the associated data. This id can be retrieved using:
- a post request to `<master-host>/runapp/rawdata/` (cf *direct requests*, class runapp.views.RawDataList)
- the `get_raw_data` function in the module test_files.post_api (cf *post_api module*)
- the list of submission files
- an indication that you want to force resending the submission even if its id already exists (`force="submission"` instead of `force=None`).

Note for databoard users: To send a submission on cv fold, you can use the function `train_test_submissions_datarun` of `databoard/db_tools.py` (which uses functions from the module test_files.post_api of datarun).

This function can be called with fab: `fab train_test_datarun:<data_id_datarun>,<datarun_master_url>,`

The <data_id_datarun> is printed when sending data to datarun, or it can be retrieved as mentionned above.

1.4 4- Get back your predictions

If you want to get all predictions that have not been requested, you can use:

- a post request to `<master-host>/runapp/testpredictions/new/` (cf *direct requests*, class runapp.views.GetTestPredictionNew)
- the `get_prediction_new` function in the module test_files.post_api (cf *post_api module*)

If you want to get predictions given a list of submission on cv fold ids, you can use:

- a post request to `<master-host>/runapp/testpredictions/list/` (cf *direct requests*, class runapp.views.GetTestPredictionList)
- the `get_prediction_list` function in the module test_files.post_api (cf *post_api module*)

Note for databoard users: To get back predictions, you can use the function `get_trained_tested_submissions_datarun` of `databoard/db_tools.py` (which uses functions from the module test_files.post_api of datarun).

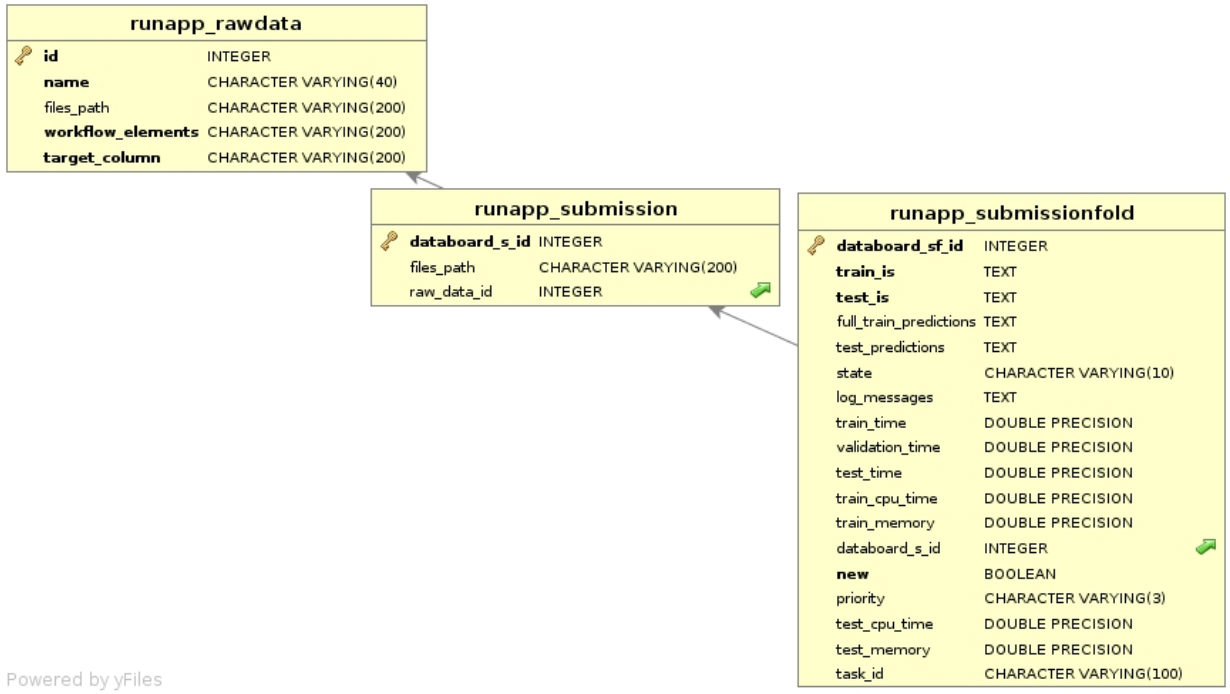
This function can be called with fab: `fab get_trained_tested_datarun:<datarun_master_url>,<datarun_u`

CHAPTER

TWO

MODELS

The database schema is the following:



class runapp.models.**RawData**(**args*, ***kwargs*)

Parameters

- **name** (*string*) – name of the data set
- **files_path** (*string*) – path of file where data are saved
- **workflow_elements** (*string*) – list of workflow elements used to solve the RAMP
- **column** (*target*) – name of the target column

class runapp.models.**Submission**(**args*, ***kwargs*)

Parameters

- **databoard_s_id** (*IntegerField(primary_key=True)*) – id of the submission in the db of databoard

- **files_path** (*CharField(max_length=200, null=True)*) – path of submitted files
- **raw_data** (*ForeignKey(RawData, null=True, blank=True)*) – associated raw data

class runapp.models.**SubmissionFold**(**args*, ***kwargs*)

Parameters

- **databoard_sf_id** (*IntegerField(primary_key=True)*) – id of the submission on cv fold in databoard db
- **databoard_s** (*ForeignKey(Submission, null=True, blank=True)*) – associated submission
- **train_is** (*TextField*) – train indices
- **test_is** (*TextField*) – test indices
- **priority** (*CharField, choices.*) – priority to train-test the fold ('L' for low priority, 'H' for high priority)
- **full_train_predictions** (*TextField*) – predictions of the entire train dataset
- **test_predictions** (*TextField*) – predictions of the test dataset
- **state** (*CharField, choices.*) – TODO, TRAINED, VALIDATED, TESTED, ERROR
- **log_messages** (*TextField*) – logs recorded during train and test
- **train_time** (*FloatField, default=0.*) – real clock training time
- **validation_time** (*FloatField, default=0.*) – real clock validation time
- **test_time** (*FloatField, default=0.*) – real clock testing time
- **train_cpu_time** (*FloatField, default=0.*) – training cpu time
- **train_memory** – peak memory usage during train and test (in kb)
- **test_cpu_time** – test cpu time
- **test_memory** (*FloatField, default=0.*) – peak memory usage durnig train and test (in kb)
- **new** (*BooleanField, default=True.*) – True when it has not already been sent by the API

CHAPTER

THREE

REQUESTS

You can either make direct requests to the datarun API, or use the post_api function.

3.1 direct requests

class runapp.views.**CustomSplitTrainTest**(***kwargs*)

Split data set into train and test datasets for custom dataset (when a specific.py was submitted along with raw data

post(*request*, *format=None*)

Split raw data into train and test datasets for custom dataset

•Example with curl (on localhost):

curl -u username:password -H "Content-Type: application/json" -X POST -d '{"raw_data_id": 1}' http://127.0.0.1:8000/runapp/rawdata/customsplit/

Don't forget double quotes for the json, simple quotes do not work

•Example with the python package requests (on localhost):

requests.post('http://127.0.0.1:8000/runapp/raw_data/customsplit/', auth=('username', 'password'), json={'raw_data_id': 1})

— parameters:

•name: raw_data_id description: id of the raw dataset required: true type: integer paramType: form

class runapp.views.**GetTestPredictionList**(***kwargs*)

Get predictions of submissions on cv fold given their ids

post(*request*, *format=None*)

Retrieve predictions (on the test data set) of SubmissionFold instances among a list of id that have been trained and tested

•Example with curl (on localhost):

curl -u username:password -H "Content-Type: application/json" -X POST -d '{"list_submission_fold": [1, 2, 10]}' http://127.0.0.1:8000/runapp/testpredictions/list/

Don't forget double quotes for the json, simple quotes do not work

•Example with the python package requests (on localhost):

requests.post('http://127.0.0.1:8000/runapp/testpredictions/list/', auth=('username', 'password'), json={'list_submission_fold': [1, 2, 10]})

— parameters:

•name: list_submission_fold description: list of submission on cv fold ids required: true type: list paramType: form

response_serializer: TestPredSubmissionFoldSerializer

class runapp.views.**GetTestPredictionNew**(***kwargs*)

Get predictions of submissions on cv fold that have not been requested

post(*request*, *format=None*)

Retrieve predictions (on the test data set) of SubmissionFold instances that have been trained and tested and not yet requested. You can specify a given data challenge by posting the raw_data id.

•Example with curl (on localhost):

curl -u username:password -H "Content-Type: application/json" -X POST -d '{"raw_data_id": 1}' http://127.0.0.1:8000/runapp/testpredictions/new/

Don't forget double quotes for the json, simple quotes do not work

•Example with the python package requests (on localhost):

requests.post('http://127.0.0.1:8000/runapp/testpredictions/new/', auth=('username', 'password'), json={'raw_data_id': 1})

— parameters:

•name: raw_data_id description: id of the raw dataset from which to get predictions required: false type: integer paramType: form

response_serializer: TestPredSubmissionFoldSerializer

class runapp.views.**RawDataList**(***kwargs*)

List all data set or submit a new one

get(*request*, *format=None*)

List all raw dataset

•Example with curl (on localhost):

curl -u username:password GET http://127.0.0.1:8000/runapp/rawdata/

•Example with the python package requests (on localhost):

requests.get('http://127.0.0.1:8000/runapp/rawdata/', auth=('username', 'password'))

— response_serializer: RawDataSerializer

post(*request*, *format=None*)

Create a new dataset

You have to post the name of the dataset, the target column, the workflow elements, and the raw data file. If your data file does not match the format expected by datarun (a csv with a first row containing the feature and target column name, and then a row for each sample), you can submit a python file containing three functions: prepare_data(data_path), get_train_data(data_path), and get_test_data(data_path)

•Example with curl (on localhost):

curl -u username:password -H "Content-Type: application/json" -X POST -d '{"name": "iris", "target_column": "species", "workflow_elements": "classifier", "files": {"iris.csv": 'blablabla', 'specific.py': 'bli'}}' http://127.0.0.1:8000/runapp/rawdata/

Don't forget double quotes for the json, simple quotes don't work.

•Example with the python package requests (on localhost):

requests.post('http://127.0.0.1:8000/runapp/rawdata/', auth=('username', 'password'), json={'name': 'iris', 'target_column': 'species', 'workflow_elements': 'classifier', 'files': {'iris.csv': 'bla', 'specific.py': 'bli'}})

— request_serializer: RawDataSerializer response_serializer: RawDataSerializer

class runapp.views.**SplitTrainTest**(***kwargs*)

Split data set into train and test datasets for normal dataset

post(*request*, *format=None*)

Split raw data into train and test datasets for normal dataset

•Example with curl (on localhost):

curl -u username:password -H "Content-Type: application/json" -X POST -d '{"random_state": 42, "held_out_test": 0.7, "raw_data_id": 1}' http://127.0.0.1:8000/runapp/rawdata/split/

Don't forget double quotes for the json, simple quotes do not work

•Example with the python package requests (on localhost):

requests.post('http://127.0.0.1:8000/runapp/raw_data/split/', auth=('username', 'password'), json={'random_state': 42, 'held_out_test': 0.7, 'raw_data_id': 1})

— parameters:

•name: random_state description: random state used to split data required: false type: integer paramType: form

•name: held_out_test description: percentage of the dataset kept as test dataset required: true type: float paramType: form

•name: raw_data_id description: id of the raw dataset required: true type: integer paramType: form

class runapp.views.**SubmissionFoldDetail**(***kwargs*)

Get a submission on CV fold given its id

get(*request*, *pk*, *format=None*)

Retrieve a SubmissionFold instance to check its state

•Example with curl (on localhost):

curl -u username:password GET http://127.0.0.1:8000/runapp/submissionfold/10/

•Example with the python package requests (on localhost):

requests.get('http://127.0.0.1:8000/runapp/submissionfold/10/', auth=('username', 'password'))

— parameters:

•name : pk description: id of the submission on cv fold in the databoard db required: true type: interger paramType: path

response_serializer: SubmissionFoldSerializer

class runapp.views.**SubmissionFoldLightList**(***kwargs*)

To get main info about all submissions on CV fold

get(*request*, *format=None*)

List main info (id, submission id, state, new) about all submissions on CV fold

•Example with curl (on localhost):

curl -u username:password GET http://127.0.0.1:8000/runapp/submissionfold-light/

•Example with the python package requests (on localhost):

requests.get('http://127.0.0.1:8000/runapp/submissionfold-light/', auth=('username', 'password'))

— response_serializer: SubmissionFoldLightSerializer

class runapp.views.**SubmissionFoldList**(***kwargs*)

To get all submissions on CV fold

get(*request*, *format=None*)

List all submission on CV fold

•Example with curl (on localhost):

curl -u username:password GET http://127.0.0.1:8000/runapp/submissionfold/

•Example with the python package requests (on localhost):

requests.get('http://127.0.0.1:8000/runapp/submissionfold/', auth=('username', 'password'))

— response_serializer: SubmissionFoldSerializer

post(*request*, *format=None*)

Create a submission on CV fold (and if necessary the associated submission)

•Example with curl (on localhost):

curl -u username:password -H "Content-Type: application/json" -X POST -d '{"databoard_s_id": 1, "files": {"classifier.py": "import sklearn.."}, "train_is": "hgjhg", "raw_data":1, "databoard_sf_id": 11, "test_is": "kdjhLGf2", "priority": "L"}' http://127.0.0.1:8000/runapp/submissionfold/

Don't forget double quotes for the json, simple quotes do not work

•Example with the python package requests (on localhost):

requests.post('http://127.0.0.1:8000/runapp/submissionfold/', auth=('username', 'password'), json={'databoard_sf_id': 10, 'databoard_s_id': 24, 'raw_data': 8, 'train_is': 'GDHRFdfgfd', 'test_is': 'kdjhLGf2', 'priority': 'L' 'files': {'classifier.py': 'import skle...'}})

Possible to force the submission and submission on CV fold (even if the ids already exist) by adding to the data dictionary "force": 'submission, submission_fold' to resubmit both, or "force": 'submission_fold' to resubmit only the submission on CV fold

— request_serializer: SubmissionFoldSerializer response_serializer: SubmissionFoldSerializer

runapp.views.**save_files**(*dir_data*, *data*)

save files from data['files'] in directory dir_data

3.2 post_api module

test_files.post_api.**custom_post_split**(*host_url*, *username*, *password*, *raw_data_id*)

To split data between train and test on datarun using a specific prepare_data function sent by databoard

Parameters

- **host_url** (*string*) – api host url, such as http://127.0.0.1:8000/ (localhost)
- **username** (*string*) – username to be used for authentication

- **password** (*string*) – password to be used for authentication
- **raw_data_id** (*integer*) – id of the raw dataset on datarun

test_files.post_api.**get_prediction_list**(*host_url*, *username*, *password*, *list_submission_fold_id*)

Get predictions given a list of submission on cv fold ids

Parameters

- **host_url** (*string*) – api host url, such as http://127.0.0.1:8000/ (localhost)
- **username** (*string*) – username to be used for authentication
- **password** (*string*) – password to be used for authentication
- **list_submission_fold_id** (*list*) – list of submission on cv fold ids from which we want the predictions

test_files.post_api.**get_prediction_new**(*host_url*, *username*, *password*, *raw_data_id*)

Get all new predictions given a raw data id

Parameters

- **host_url** (*string*) – api host url, such as http://127.0.0.1:8000/ (localhost)
- **username** (*string*) – username to be used for authentication
- **password** (*string*) – password to be used for authentication
- **raw_data_id** (*integer*) – id of a data set from which we want new predictions

test_files.post_api.**get_raw_data**(*host_url*, *username*, *password*)

Get all raw data sets

Parameters

- **host_url** (*string*) – api host url, such as http://127.0.0.1:8000/ (localhost)
- **username** (*string*) – username to be used for authentication
- **password** (*string*) – password to be used for authentication

test_files.post_api.**get_submission_fold**(*host_url*, *username*, *password*)

Get all submission on cv fold (all attributes)

Parameters

- **host_url** (*string*) – api host url, such as http://127.0.0.1:8000/ (localhost)
- **username** (*string*) – username to be used for authentication
- **password** (*string*) – password to be used for authentication

test_files.post_api.**get_submission_fold_detail**(*host_url*, *username*, *password*, *submission_fold_id*)

Get details about a submission on cv fold given its id

Parameters

- **host_url** (*string*) – api host url, such as http://127.0.0.1:8000/ (localhost)
- **username** (*string*) – username to be used for authentication
- **password** (*string*) – password to be used for authentication
- **submission_fold_id** – id of the submission on cv fold
- **submission_fold_id** – integer

test_files.post_api.**get_submission_fold_light**(*host_url*, *username*, *password*)
Get all submissions on cv fold only main info: id, associated submission id, state, and new

Parameters

- **host_url** (*string*) – api host url, such as http://127.0.0.1:8000/ (localhost)
- **username** (*string*) – username to be used for authentication
- **password** (*string*) – password to be used for authentication

test_files.post_api.**post_data**(*host_url*, *username*, *password*, *data_name*, *target_column*, *workflow_elements*, *data_file*, *extra_files=None*)
To post data to the datarun api. Data are compressed (with zlib) and base64-encoded before being posted.

Parameters

- **host_url** (*string*) – api host url, such as http://127.0.0.1:8000/ (localhost)
- **username** (*string*) – username to be used for authentication
- **password** (*string*) – password to be used for authentication
- **data_name** (*string*) – name of the raw dataset
- **target_column** (*string*) – name of the target column
- **workflow_elements** (*string*) – workflow elements associated with this dataset, e.g., feature_extractor, classifier
- **data_file** (*string*) – name with absolute path of the dataset file
- **extra_files** (*list of string*) – list of names with absolute path of extra files (such as a specific.py)

test_files.post_api.**post_split**(*host_url*, *username*, *password*, *held_out_test*, *raw_data_id*, *random_state=42*)
To split data between train and test on datarun

Parameters

- **host_url** (*string*) – api host url, such as http://127.0.0.1:8000/ (localhost)
- **username** (*string*) – username to be used for authentication
- **password** (*string*) – password to be used for authentication
- **held_out_test** (*float (between 0 and 1)*) – ratio of data for the test set
- **raw_data_id** (*integer*) – id of the raw dataset on datarun
- **random_state** (*integer*) – random state to be used in the shuffle split

test_files.post_api.**post_submission_fold**(*host_url*, *username*, *password*, *sub_id*, *sub_fold_id*, *train_is*, *test_is*, *priority='L'*, *raw_data_id=None*, *list_submission_files=None*, *force=None*)
To post submission on cv fold and submission (if not already posted). Submission files are compressed (with zlib) and base64-encoded before being posted.

Parameters

- **host_url** (*string*) – api host url, such as http://127.0.0.1:8000/ (localhost)
- **username** (*string*) – username to be used for authentication
- **password** (*string*) – password to be used for authentication

- **sub_id** (*integer*) – id of the submission on databoard
- **sub_fold_id** (*integer*) – id of the submission on cv fold on databoard
- **train_is** (*numpy array*) – train indices for the cv fold
- **test_is** (*numpy array*) – test indices for the cv fold
- **priority** (*string*) – priority level to train test the model: L for low and H for high
- **raw_data_id** (*integer*) – id of the associated data, when submitting a submission
- **list_submission_files** (*list*) – list of files of the submission, when submitting a submission
- **force** (*string*) – to force the submission even if ids already exist force can be 'submission, submission_fold' to resubmit both or 'submission, submission_fold' to resubmit only the submission on cv fold. None by default.

CHAPTER

FOUR

INDICES AND TABLES

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