`galactic` experiment guide

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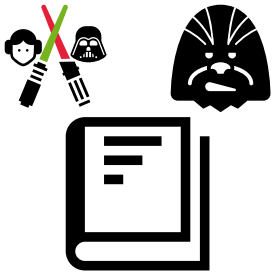

0.2.0

Contents

1 Introduction

This experiment guide is a collection of all the jupyter notebooks present in the data projects.

All lines

```
print("test")
```

are python input.

And all lines

```
test
```

are python output.

By default the following colors are used for drawing concept lattices:

- for generators;
- for pseudo-generators;
- for prototypes.

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2 Sample data

2.1 Iris data set

2.1.1 Iris data set, limiting the cardinality of concepts

The lattice construction from the Iris data set could lead to very big lattice (several hundred thousand concepts).

We can use the Population.from_file function to load a population in memory and the Explorer.from_file function to load a set of strategies described in a yaml file.

We can construct a concept lattice from a population and a list of strategies using the Lattice class.

The Hasse diagram of a lattice can be visualized using the HasseDiagram class, the reduced context can be displayed using the ReducedContext class and the summary table can be displayed using the Table class.

```
from galactic.population import Population
from galactic.strategies import Lattice, Explorer, Table
from galactic.concepts import ConceptRenderer
from galactic.algebras.poset.collections import HasseDiagram
from galactic.algebras.lattice import ReducedContext
```

```
import sys
import os
import pkg_resources

version = pkg_resources.get_distribution(
    "py-galactic-data-sample"
).version

data_path = os.path.join(
    sys.prefix,
    "share",
    "data",
    "py-galactic",
    "sample",
    version,
    "iris",
    "iris.csv"
```

```
)
```

```
with open(data_path, "r") as data_file:
    population = Population.from_file(data_file)
population
```

```
<galactic.population.main.Population at 0x7f5240055ac8>
```

```
len(population)
```

```
150
```

2.1.1.1 Limiting the cardinality of concepts to 110

```
explorer_path = os.path.join(
    sys.prefix,
    "share",
    "data",
    "py-galactic",
    "sample",
    version,
    "iris",
    "explorer-110.yaml"
)
```

```
with open(explorer_path, "r") as explorer_file:
    print(explorer_file.read())
    explorer_file.seek(0)
    explorer = Explorer.from_file(explorer_file)
```

```
- !strategy.core.LimitFilter
  arguments:
    - !strategy.numerical.hull.basic.Normal
      arguments:
        - !characteristic.numerical.Number
          characteristic: !characteristic.core.Key
            name: "sepal length"
    - !strategy.numerical.hull.basic.Normal
```

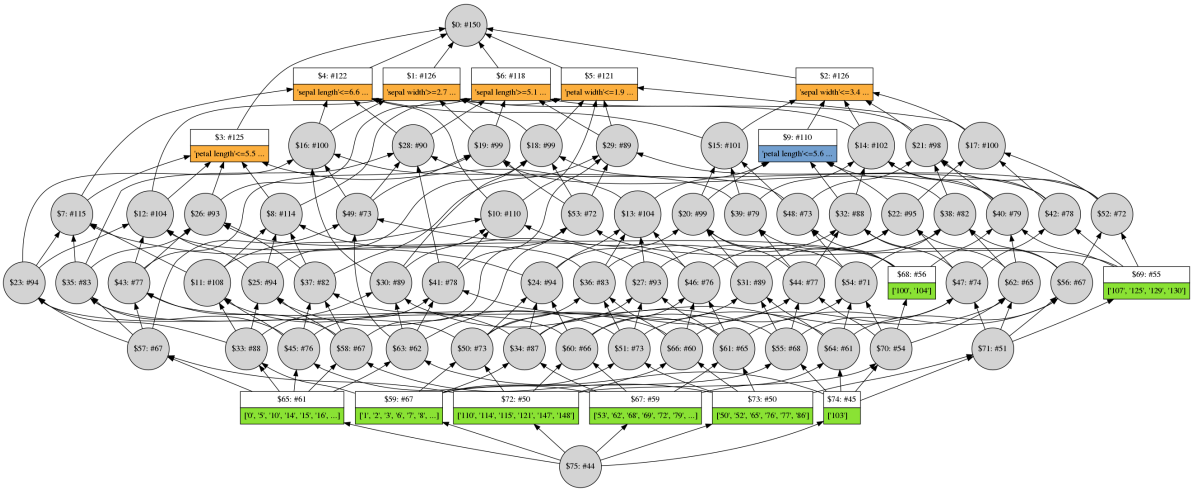
```
      arguments:
        - !characteristic.numerical.Number
          characteristic: !characteristic.core.Key
            name: "sepal width"
    - !strategy.numerical.hull.basic.Normal
      arguments:
        - !characteristic.numerical.Number
          characteristic: !characteristic.core.Key
            name: "petal length"
    - !strategy.numerical.hull.basic.Normal
      arguments:
        - !characteristic.numerical.Number
          characteristic: !characteristic.core.Key
            name: "petal width"
  params:
    measure: !measure.core.Cardinality
    limit: 110
```

```
explorer
```

```
[<galactic.strategies.filters.LimitFilter at 0x7f51f2ad3808>]
```

```
lattice = Lattice(population=population, explorer=explorer)
```

```
HasseDiagram(lattice, renderer=ConceptRenderer())
```




```
ReducedContext(lattice, renderer=ConceptRenderer())
```

	$1	$2	$3	$4	$5	$6	$9
[‘1’, ‘2’, ‘3’, ‘6’, ‘7’, ‘8’, …]	✓	✓	✓	✓	✓		✓
[‘0’, ‘5’, ‘10’, ‘14’, ‘15’, ‘16’, …]	✓		✓	✓	✓	✓	
[‘20’, ‘23’, ‘28’, ‘31’, ‘39’, ‘51’, …]		✓	✓	✓	✓	✓	✓
[‘20’, ‘23’, ‘28’, ‘31’, ‘39’, ‘51’, …]	✓	✓		✓		✓	
[‘20’, ‘23’, ‘28’, ‘31’, ‘39’, ‘50’, …]	✓	✓			✓	✓	
[‘20’, ‘23’, ‘28’, ‘31’, ‘39’, ‘51’, …]	✓	✓	✓	✓		✓	✓
[‘20’, ‘23’, ‘28’, ‘31’, ‘39’, ‘50’, …]	✓	✓	✓		✓	✓	✓
[‘20’, ‘23’, ‘28’, ‘31’, ‘39’, ‘51’, …]	✓	✓		✓	✓	✓	✓

```
Table(lattice)
```

Concept	Individuals	Predicates
0		'sepal length'>=4.3 'sepal length'<=7.9 'sepal width'>=2 'sepal width'<=4.4 'petal length'>=1 'petal length'<=6.9 'petal width'>=0.1 'petal width'<=2.5
1		'sepal width'>=2.7 'petal length'<=6.7
2		'sepal length'<=7.7 'sepal width'<=3.4 'petal length'>=1.1
3		'sepal length'<=7 'petal length'<=5.5 'petal width'<=2.4
4		'sepal length'<=6.6 'petal length'<=6
5		'sepal length'<=7.4 'petal length'<=6.3 'petal width'<=1.9
6		'sepal length'>=5.1 'sepal width'>=2.2 'petal length'>=1.2
9		'sepal length'<=7 'petal length'<=5.6 'petal width'<=2.4
10		'petal length'<=5.6
19	['109', '117', '131']	
21	118	'petal length'>=1.4 'petal width'>=0.2
33	['4', '22', '40', '43']	

34	['41', '57', '60', '93', '106']
40	['102', '105', '120', '122', '124', '135', ...]
52	108
59	['1', '2', '3', '6', '7', '8', ...]
60	113
62	140
64	134
65	['0', '5', '10', '14', '15', '16', ...]
66	['112', '139', '141', '145']
67	['53', '62', '68', '69', '72', '79', ...]
68	['100', '104']
69	['107', '125', '129', '130']
70	['128', '132', '136']
72	['110', '114', '115', '121', '147', '148']
73	['50', '52', '65', '76', '77', '86']
74	103
75	['20', '23', '28', '31', '39', '51', ...]

2.1.1.2 Limiting the cardinality of concepts to 100 and mixing categorized characteristic and numerical characteristic

```
explorer_path = os.path.join(
    sys.prefix,
    "share",
    "data",
    "py-galactic",
    "sample",
    version,
    "iris",
    "explorer-class.yaml"
)
```

```
with open(explorer_path, "r") as explorer_file:
    print(explorer_file.read())
    explorer_file.seek(0)
    explorer = Explorer.from_file(explorer_file)
```

```
- !strategy.core.LimitFilter
  arguments:
    - !strategy.numerical.hull.basic.Normal
      arguments:
        - !characteristic.numerical.Number
          characteristic: !characteristic.core.Key
            name: "petal length"
      params:
        coefficient: 1
    - !strategy.numerical.hull.basic.Normal
        arguments:
          - !characteristic.numerical.Number
            characteristic: !characteristic.core.Key
              name: "petal width"
        params:
          coefficient: 1
  params:
    measure: !measure.core.Cardinality
    limit: 100
```

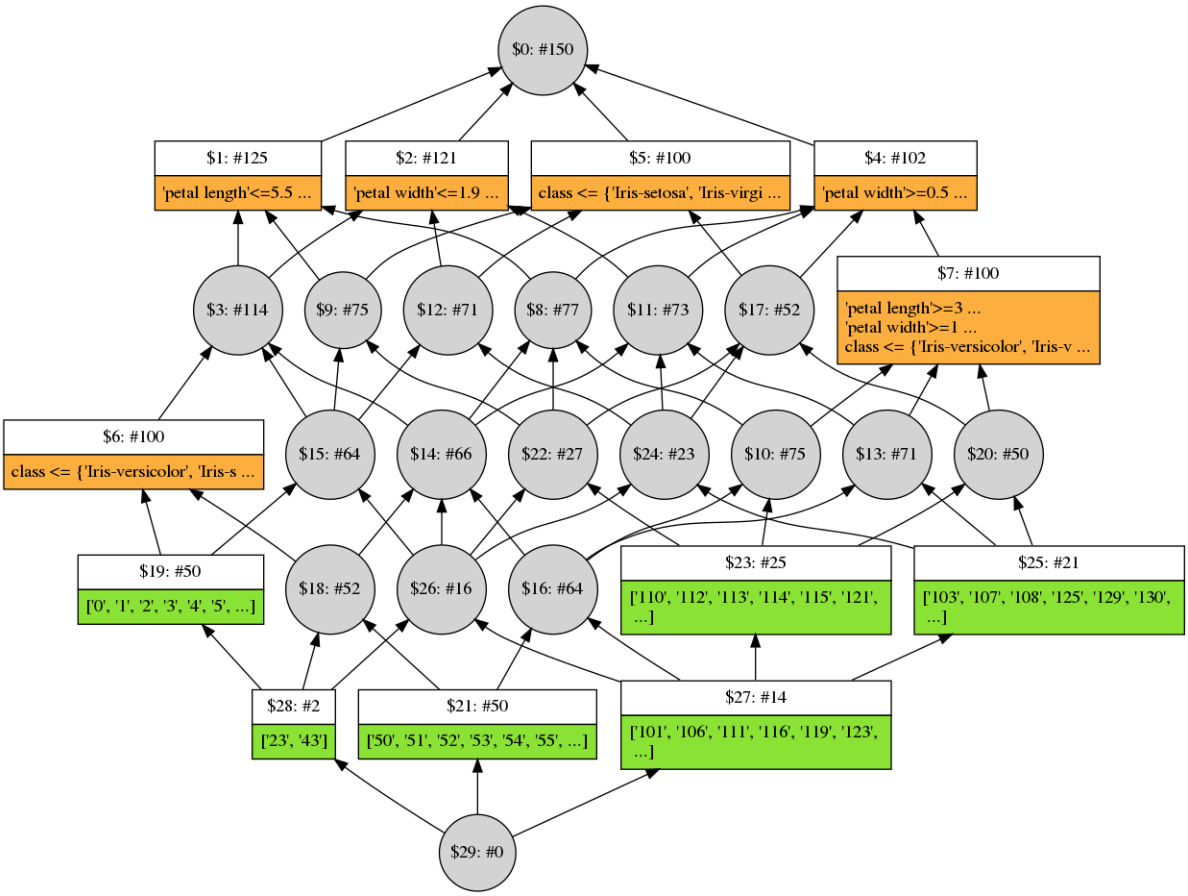
```
- !strategy.categorized.subset.basic.Category
  - !characteristic.categorized.Category
    - !characteristic.core.Key
      name: "class"
```

```
explorer
```

```
[<galactic.strategies.filters.LimitFilter at 0x7f5228a3a508>,
 <galactic_strategy_categorized_subset_basic.main.CategoryStrategy at 0x7f5228a
```

```
lattice = Lattice(population=population, explorer=explorer)
```

```
HasseDiagram(lattice, renderer=ConceptRenderer())
```




```
ReducedContext(lattice, renderer=ConceptRenderer())
```

	$1	$2	$4	$5	$6	$7
['0', '1', '2', '3', '4', '5', ...]	✓	✓		✓	✓	
['50', '51', '52', '53', '54', '55', ...]	✓	✓	✓		✓	✓
['101', '106', '110', '111', '112', '113', ...]	✓		✓	✓		✓
['101', '103', '106', '107', '108', '111', ...]		✓	✓	✓		✓
['101', '106', '111', '116', '119', '123', ...]	✓	✓	✓	✓		✓
['23', '43']	✓	✓	✓	✓	✓	

```
Table(lattice,concept_width=5,individual_width=20,predicate_width=40)
```

Concept	Individuals	Predicates
0		'petal length'>=1 'petal length'<=6.9 'petal width'>=0.1 'petal width'<=2.5 class <= {'Iris-setosa', 'Iris-versicolor', 'Iris-virginica'}
1		'petal length'<=5.5 'petal width'<=2.4
2		'petal length'<=6.3 'petal width'<=1.9

4		'petal length'>=1.6 'petal width'>=0.5
5		class <= {'Iris-setosa', 'Iris-virginica'}
6		'petal length'<=5.1 'petal width'<=1.8 class <= {'Iris-versicolor', 'Iris-setosa'}
7		'petal length'>=3 'petal width'>=1 class <= {'Iris-versicolor', 'Iris-virginica'}
19	['0', '1', '2', '3', '4', '5', ...]	'petal length'<=1.9 'petal width'<=0.6 class <= {'Iris-setosa'}
20	['100', '102', '104', '105', '109', '117', ...]	'petal length'>=4.5 'petal width'>=1.4 class <= {'Iris-virginica'}
21	['50', '51', '52', '53', '54', '55', ...]	class <= {'Iris-versicolor'}
23	['110', '112', '113', '114', '115', '121', ...]	'petal width'>=1.5
25	['103', '107', '108', '125', '129', '130', ...]	
27	['101', '106', '111', '116', '119', '123', ...]	
28	['23', '43']	'petal length'<=1.7

```
29                              'petal length'>=nan
                                'petal length'<=nan
                                'petal width'>=nan
                                'petal width'<=nan
                                class <= {}
```