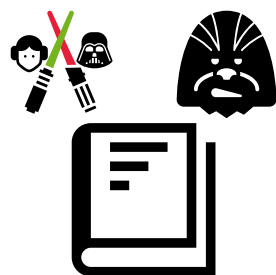


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# galactic experiment guide

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0.0.9

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## 1 Introduction



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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 `Strategies.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 Strategies
from galactic.concepts.lattice import Lattice
from galactic.concepts.lattice import Table
from galactic.algebras.poset.collections import HasseDiagram
from galactic.algebras.lattice.contexts 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.base_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.Population at 0x7f1bf27a1908>
```



```
len(population)
```



```
150
```

### 2.1.1.1 Limiting the cardinality of concepts to 110



```
explorer_path = os.path.join(  
    sys.base_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)  
    strategies = Strategies.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

```

```

strategies

```

```

[<galactic.strategies.LimitFilter at 0x7f1bd94872c8>]

```

```

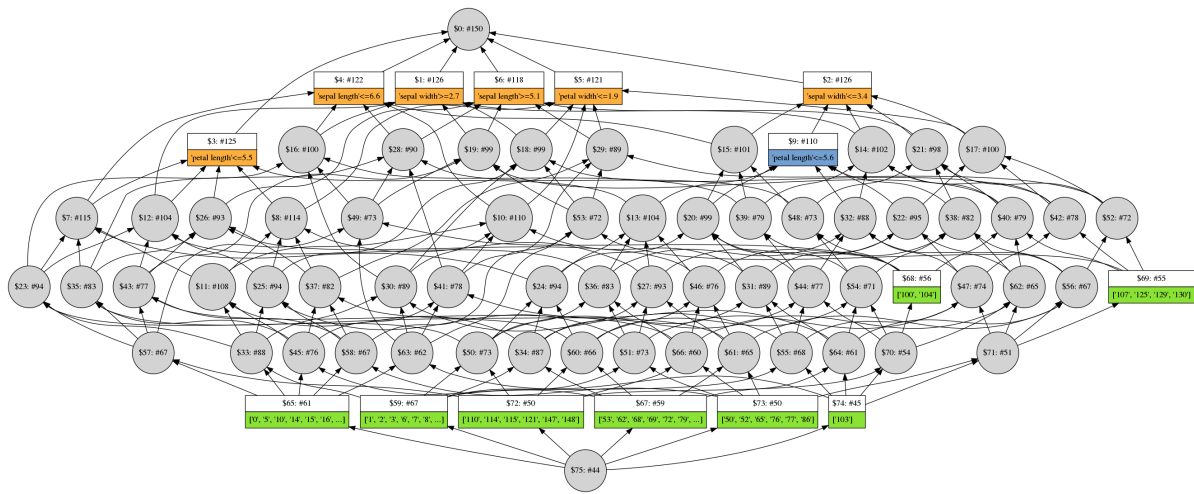
lattice = Lattice(population=population, strategies=strategies)

```

```

HasseDiagram(lattice)

```



ReducedContext(lattice)

	\$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_width=5,
    individual_width=20,
    predicate_width=40
)
```



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.base_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)
    strategies = Strategies.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"

```



| strategies



```

[<galactic.strategies.LimitFilter at 0x7f1bf2288788>,
 <galactic_strategy_categorized_subset_basic.CategoryStrategy at 0x7f1c002422c8>]

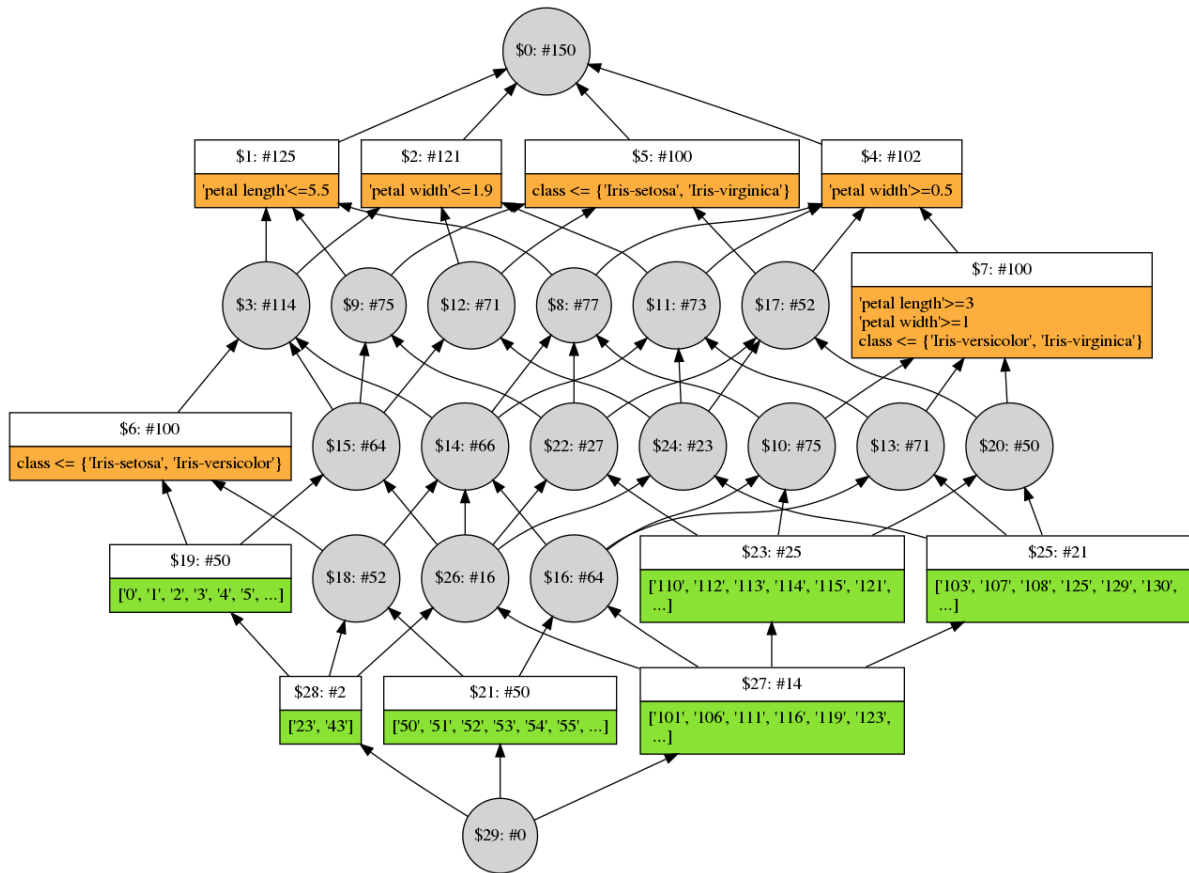
```



| lattice = Lattice(population=population, strategies=strategies)



### HasseDiagram(lattice)



### ReducedContext(lattice)

	\$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-setosa',
                   'Iris-versicolor'}
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 <= {}

```