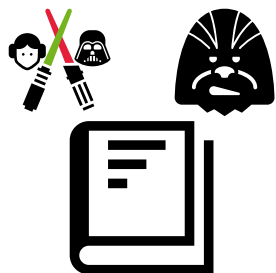

galactic experiment guide

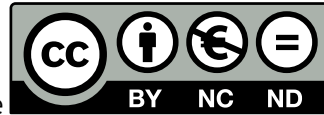
The Galactic Organization <contact@thegalactic.org>



0.1.0

Contents

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.

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.

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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 as LatticeTable
from galactic.algebras.poset.collections import HasseDiagram
from galactic.algebras.lattice.contexts import ReducedContext
from galactic.rules import \
    HasseDiagramOrderedBasis, \
    CanonicalDirectBasis
from galactic.rules import Table as BasisTable
```



```
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 0x7fbe04556d68>

```
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:

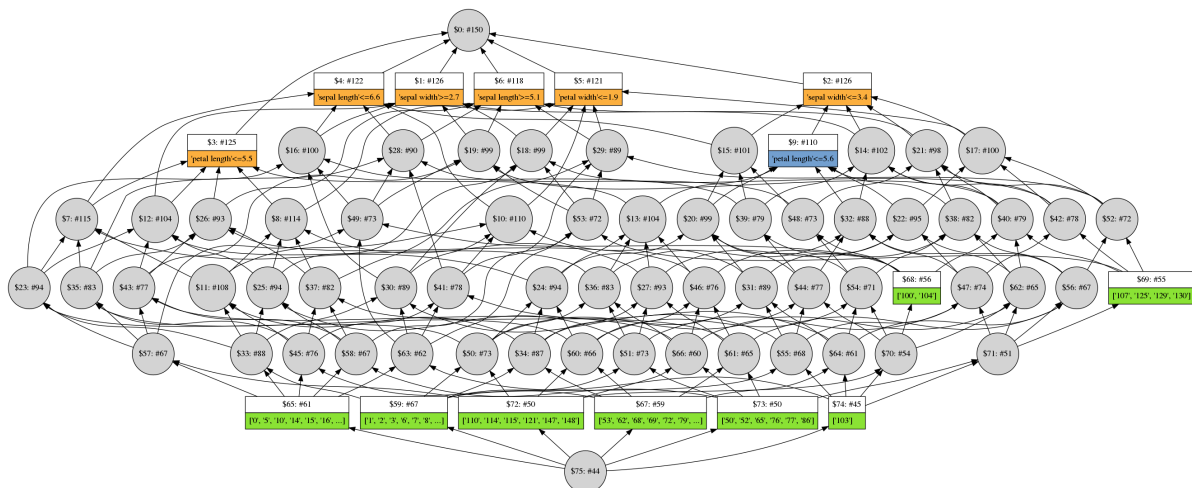
measure: !measure.core.Cardinality
limit: 110

strategies


[<galactic.strategies.LimitFilter at 0x7fbdad361e08>]

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', ...]	✓	✓		✓	✓	✓	✓



```
LatticeTable(
    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',
        ...]

```



```

basis = HasseDiagramOrderedBasis(lattice=lattice)
BasisTable(basis)

```

Premises	Conclusions	Support	Confidence
	\$0	1	1
\$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	1
'sepal width'>=2.7	\$1	0.84	1

\$1	'sepal length'>=4.3 'sepal length'<=7.9 'sepal width'>=2.7 'sepal width'<=4.4 'petal length'>=1 'petal length'<=6.7 'petal width'>=0.1 'petal width'<=2.5	0.84	1
'sepal width'<=3.4	\$2	0.84	1
\$2	'sepal length'>=4.3 'sepal length'<=7.7 'sepal width'>=2 'sepal width'<=3.4 'petal length'>=1.1 'petal length'<=6.9 'petal width'>=0.1 'petal width'<=2.5	0.84	1
'petal length'<=5.5	\$3	0.833333	1

\$3	'sepal length'>=4.3 'sepal length'<=7 'sepal width'>=2 'sepal width'<=4.4 'petal length'>=1 'petal length'<=5.5 'petal width'>=0.1 'petal width'<=2.4	0.833333	1
'sepal length'<=6.6	\$4	0.813333	1
\$4	'sepal length'>=4.3 'sepal length'<=6.6 'sepal width'>=2 'sepal width'<=4.4 'petal length'>=1 'petal length'<=6 'petal width'>=0.1 'petal width'<=2.5	0.813333	1
'petal width'<=1.9	\$5	0.806667	1

\$5	'sepal length'>=4.3 'sepal length'<=7.4 'sepal width'>=2 'sepal width'<=4.4 'petal length'>=1 'petal length'<=6.3 'petal width'>=0.1 'petal width'<=1.9	0.806667	1
'sepal length'>=5.1	\$6	0.786667	1
\$6	'sepal length'>=5.1 'sepal length'<=7.9 'sepal width'>=2.2 'sepal width'<=4.4 'petal length'>=1.2 'petal length'<=6.9 'petal width'>=0.1 'petal width'<=2.5	0.786667	1
\$3 \$4	\$7	0.766667	1

\$7	'sepal length'>=4.3 'sepal length'<=6.6 'sepal width'>=2 'sepal width'<=4.4 'petal length'>=1 'petal length'<=5.5 'petal width'>=0.1 'petal width'<=2.4	0.766667	1
\$3	\$8	0.76	1
\$5			
\$8	'sepal length'>=4.3 'sepal length'<=7 'sepal width'>=2 'sepal width'<=4.4 'petal length'>=1 'petal length'<=5.5 'petal width'>=0.1 'petal width'<=1.9	0.76	1

'sepal width'<=3.4	\$9	0.733333	1
'petal length'<=5.6	\$2		
\$9	'sepal length'>=4.3	0.733333	1
	'sepal length'<=7		
	'sepal width'>=2		
	'sepal width'<=3.4		
	'petal length'>=1.1		
	'petal length'<=5.6		
	'petal width'>=0.1		
	'petal width'<=2.4		
\$4	\$10	0.733333	1
\$5			

\$10	'sepal length'>=4.3 'sepal length'<=6.6 'sepal width'>=2 'sepal width'<=4.4 'petal length'>=1 'petal length'<=5.6 'petal width'>=0.1 'petal width'<=1.9	0.733333	1
\$7	\$11	0.72	1
\$8			
\$7	\$11	0.72	1
\$10			
\$8	\$11	0.72	1
\$10			

\$11	'sepal length'>=4.3 'sepal length'<=6.6 'sepal width'>=2 'sepal width'<=4.4 'petal length'>=1 'petal length'<=5.5 'petal width'>=0.1 'petal width'<=1.9	0.72	1
------	--	------	---

\$1 \$3	\$12	0.693333	1
------------	------	----------	---

\$12	'sepal length'>=4.3 'sepal length'<=7 'sepal width'>=2.7 'sepal width'<=4.4 'petal length'>=1 'petal length'<=5.5 'petal width'>=0.1 'petal width'<=2.4	0.693333	1
------	--	----------	---

\$3 \$9	\$13	0.693333	1
------------	------	----------	---

\$13	'sepal length'>=4.3 'sepal length'<=7 'sepal width'>=2 'sepal width'<=3.4 'petal length'>=1.1 'petal length'<=5.5 'petal width'>=0.1 'petal width'<=2.4	0.693333	1
------	--	----------	---

\$1 \$2	\$14	0.68	1
------------	------	------	---

\$14	'sepal length'>=4.3 'sepal length'<=7.7 'sepal width'>=2.7 'sepal width'<=3.4 'petal length'>=1.1 'petal length'<=6.7 'petal width'>=0.1 'petal width'<=2.5	0.68	1
------	--	------	---

\$2 \$4	\$15	0.673333	1
------------	------	----------	---

\$15	'sepal length'>=4.3 'sepal length'<=6.6 'sepal width'>=2 'sepal width'<=3.4 'petal length'>=1.1 'petal length'<=6 'petal width'>=0.1 'petal width'<=2.5	0.673333	1
------	--	----------	---

\$1 \$4	\$16	0.666667	1
------------	------	----------	---

\$16	'sepal length'>=4.3 'sepal length'<=6.6 'sepal width'>=2.7 'sepal width'<=4.4 'petal length'>=1 'petal length'<=6 'petal width'>=0.1 'petal width'<=2.5	0.666667	1
------	--	----------	---

\$2 \$5	\$17	0.666667	1
------------	------	----------	---

\$17	'sepal length'>=4.3 'sepal length'<=7.4 'sepal width'>=2 'sepal width'<=3.4 'petal length'>=1.1 'petal length'<=6.3 'petal width'>=0.1 'petal width'<=1.9	0.666667	1
------	--	----------	---

\$1 \$5	\$18	0.66	1
------------	------	------	---

\$18	'sepal length'>=4.3 'sepal length'<=7.4 'sepal width'>=2.7 'sepal width'<=4.4 'petal length'>=1 'petal length'<=6.3 'petal width'>=0.1 'petal width'<=1.9	0.66	1
------	--	------	---

\$1 \$6	\$19	0.66	1
------------	------	------	---

\$19	'sepal length'>=5.1 'sepal length'<=7.9 'sepal width'>=2.7 'sepal width'<=4.4 'petal length'>=1.2 'petal length'<=6.7 'petal width'>=0.1 'petal width'<=2.5	0.66	1
------	--	------	---

\$9	\$20	0.66	1
-----	------	------	---

\$15

\$20	'sepal length'>=4.3 'sepal length'<=6.6 'sepal width'>=2 'sepal width'<=3.4 'petal length'>=1.1 'petal length'<=5.6 'petal width'>=0.1 'petal width'<=2.4	0.66	1
------	--	------	---

\$2	\$21	0.653333	1
-----	------	----------	---

\$6

\$21	'sepal length'>=5.1 'sepal length'<=7.7 'sepal width'>=2.2 'sepal width'<=3.4 'petal length'>=1.4 'petal length'<=6.9 'petal width'>=0.2 'petal width'<=2.5	0.653333	1
------	--	----------	---

\$9	\$22	0.633333	1
-----	------	----------	---

\$17

\$22	'sepal length'>=4.3 'sepal length'<=7 'sepal width'>=2 'sepal width'<=3.4 'petal length'>=1.1 'petal length'<=5.6 'petal width'>=0.1 'petal width'<=1.9	0.633333	1
------	--	----------	---

\$7	\$23	0.626667	1
-----	------	----------	---

\$12

\$7	\$23	0.626667	1
\$16			
\$12	\$23	0.626667	1
\$16			
\$23	'sepal length'>=4.3 'sepal length'<=6.6 'sepal width'>=2.7 'sepal width'<=4.4 'petal length'>=1 'petal length'<=5.5 'petal width'>=0.1 'petal width'<=2.4	0.626667	1
\$7	\$24	0.626667	1
\$13			
\$7	\$24	0.626667	1
\$20			
\$13	\$24	0.626667	1
\$20			

\$24	'sepal length'>=4.3 'sepal length'<=6.6 'sepal width'>=2 'sepal width'<=3.4 'petal length'>=1.1 'petal length'<=5.5 'petal width'>=0.1 'petal width'<=2.4	0.626667	1
\$8 \$12	\$25	0.626667	1
\$8 \$18	\$25	0.626667	1
\$12 \$18	\$25	0.626667	1

\$25	'sepal length'>=4.3 'sepal length'<=7 'sepal width'>=2.7 'sepal width'<=4.4 'petal length'>=1 'petal length'<=5.5 'petal width'>=0.1 'petal width'<=1.9	0.626667	1
------	--	----------	---

\$3	\$26	0.62	1
-----	------	------	---

\$6

\$26	'sepal length'>=5.1 'sepal length'<=7 'sepal width'>=2.2 'sepal width'<=4.4 'petal length'>=1.2 'petal length'<=5.5 'petal width'>=0.1 'petal width'<=2.4	0.62	1
------	--	------	---

\$8	\$27	0.62	1
-----	------	------	---

\$13

\$8	\$27	0.62	1
\$22			
\$13	\$27	0.62	1
\$22			
\$27	'sepal length'>=4.3 'sepal length'<=7 'sepal width'>=2 'sepal width'<=3.4 'petal length'>=1.1 'petal length'<=5.5 'petal width'>=0.1 'petal width'<=1.9	0.62	1
\$4	\$28	0.6	1
\$6			

\$28	'sepal length'>=5.1 'sepal length'<=6.6 'sepal width'>=2.2 'sepal width'<=4.4 'petal length'>=1.2 'petal length'<=6 'petal width'>=0.1 'petal width'<=2.5	0.6	1
------	--	-----	---

\$5	\$29	0.593333	1
-----	------	----------	---

\$6

\$29	'sepal length'>=5.1 'sepal length'<=7.4 'sepal width'>=2.2 'sepal width'<=4.4 'petal length'>=1.2 'petal length'<=6.3 'petal width'>=0.1 'petal width'<=1.9	0.593333	1
------	--	----------	---

\$10	\$30	0.593333	1
------	------	----------	---

\$16

\$10	\$30	0.593333	1
\$18			
\$16	\$30	0.593333	1
\$18			
\$30	'sepal length'>=4.3 'sepal length'<=6.6 'sepal width'>=2.7 'sepal width'<=4.4 'petal length'>=1 'petal length'<=5.6 'petal width'>=0.1 'petal width'<=1.9	0.593333	1
\$10	\$31	0.593333	1
\$20			
\$10	\$31	0.593333	1
\$22			
\$20	\$31	0.593333	1
\$22			

\$31	'sepal length'>=4.3 'sepal length'<=6.6 'sepal width'>=2 'sepal width'<=3.4 'petal length'>=1.1 'petal length'<=5.6 'petal width'>=0.1 'petal width'<=1.9	0.593333	1
\$9 \$14	\$32	0.586667	1
\$32	'sepal length'>=4.3 'sepal length'<=7 'sepal width'>=2.7 'sepal width'<=3.4 'petal length'>=1.1 'petal length'<=5.6 'petal width'>=0.1 'petal width'<=2.4	0.586667	1
\$11 \$23	\$33	0.586667	1

\$11	\$33	0.586667	1
\$25			
\$11	\$33	0.586667	1
\$30			
\$23	\$33	0.586667	1
\$25			
\$23	\$33	0.586667	1
\$30			
\$25	\$33	0.586667	1
\$30			
\$33	'sepal length'>=4.3 'sepal length'<=6.6 'sepal width'>=2.7 'sepal width'<=4.4 'petal length'>=1 'petal length'<=5.5 'petal width'>=0.1 'petal width'<=1.9	0.586667	1
\$11	\$34	0.58	1
\$24			
\$11	\$34	0.58	1
\$27			
\$11	\$34	0.58	1
\$31			
\$24	\$34	0.58	1
\$27			
\$24	\$34	0.58	1
\$31			

\$27	\$34	0.58	1
\$31			
\$34	'sepal length'>=4.3 'sepal length'<=6.6 'sepal width'>=2 'sepal width'<=3.4 'petal length'>=1.1 'petal length'<=5.5 'petal width'>=0.1 'petal width'<=1.9	0.58	1
\$7	\$35	0.553333	1
\$26			
\$7	\$35	0.553333	1
\$28			
\$26	\$35	0.553333	1
\$28			

\$35	'sepal length'>=5.1 'sepal length'<=6.6 'sepal width'>=2.2 'sepal width'<=4.4 'petal length'>=1.2 'petal length'<=5.5 'petal width'>=0.1 'petal width'<=2.4	0.553333	1
\$12 \$13	\$36	0.553333	1
\$12 \$32	\$36	0.553333	1
\$13 \$32	\$36	0.553333	1

\$36	'sepal length'>=4.3 'sepal length'<=7 'sepal width'>=2.7 'sepal width'<=3.4 'petal length'>=1.1 'petal length'<=5.5 'petal width'>=0.1 'petal width'<=2.4	0.553333	1
\$8 \$26	\$37	0.546667	1
\$8 \$29	\$37	0.546667	1
\$26 \$29	\$37	0.546667	1

\$37	'sepal length'>=5.1 'sepal length'<=7 'sepal width'>=2.2 'sepal width'<=4.4 'petal length'>=1.2 'petal length'<=5.5 'petal width'>=0.1 'petal width'<=1.9	0.546667	1
------	--	----------	---

\$9	\$38	0.546667	1
-----	------	----------	---

\$21

\$38	'sepal length'>=5.1 'sepal length'<=7 'sepal width'>=2.2 'sepal width'<=3.4 'petal length'>=1.4 'petal length'<=5.6 'petal width'>=0.2 'petal width'<=2.4	0.546667	1
------	--	----------	---

\$14	\$39	0.526667	1
------	------	----------	---

\$15

\$14	\$39	0.526667	1
\$16			
\$15	\$39	0.526667	1
\$16			
\$39	'sepal length'>=4.3 'sepal length'<=6.6 'sepal width'>=2.7 'sepal width'<=3.4 'petal length'>=1.1 'petal length'<=6 'petal width'>=0.1 'petal width'<=2.5	0.526667	1
\$14	\$40	0.526667	1
\$19			
\$14	\$40	0.526667	1
\$21			
\$19	\$40	0.526667	1
\$21			

\$40	'sepal length'>=5.1 'sepal length'<=7.7 'sepal width'>=2.7 'sepal width'<=3.4 'petal length'>=1.4 'petal length'<=6.7 'petal width'>=0.2 'petal width'<=2.5	0.526667	1
\$10 \$28	\$41	0.52	1
\$10 \$29	\$41	0.52	1
\$28 \$29	\$41	0.52	1

```

$41      'sepal      0.52      1
         length'>=5.1
         'sepal
         length'<=6.6
         'sepal
         width'>=2.2
         'sepal
         width'<=4.4
         'petal
         length'>=1.2
         'petal
         length'<=5.6
         'petal
         width'>=0.1
         'petal
         width'<=1.9

```

```

$14      $42      0.52      1

```

```

$17

```

```

$14      $42      0.52      1

```

```

$18

```

```

$17      $42      0.52      1

```

```

$18

```

\$42	'sepal length'>=4.3 'sepal length'<=7.4 'sepal width'>=2.7 'sepal width'<=3.4 'petal length'>=1.1 'petal length'<=6.3 'petal width'>=0.1 'petal width'<=1.9	0.52	1
------	--	------	---

\$12	\$43	0.513333	1
------	------	----------	---

\$19

\$12	\$43	0.513333	1
------	------	----------	---

\$26

\$19	\$43	0.513333	1
------	------	----------	---

\$26

\$43	'sepal length'>=5.1 'sepal length'<=7 'sepal width'>=2.7 'sepal width'<=4.4 'petal length'>=1.2 'petal length'<=5.5 'petal width'>=0.1 'petal width'<=2.4	0.513333	1
------	--	----------	---

\$20	\$44	0.513333	1
------	------	----------	---

\$32

\$20	\$44	0.513333	1
------	------	----------	---

\$39

\$32	\$44	0.513333	1
------	------	----------	---

\$39

\$44	'sepal length'>=4.3 'sepal length'<=6.6 'sepal width'>=2.7 'sepal width'<=3.4 'petal length'>=1.1 'petal length'<=5.6 'petal width'>=0.1 'petal width'<=2.4	0.513333	1
\$11 \$35	\$45	0.506667	1
\$11 \$37	\$45	0.506667	1
\$11 \$41	\$45	0.506667	1
\$35 \$37	\$45	0.506667	1
\$35 \$41	\$45	0.506667	1
\$37 \$41	\$45	0.506667	1

\$45	'sepal length'>=5.1 'sepal length'<=6.6 'sepal width'>=2.2 'sepal width'<=4.4 'petal length'>=1.2 'petal length'<=5.5 'petal width'>=0.1 'petal width'<=1.9	0.506667	1
\$13	\$46	0.506667	1
\$26			
\$13	\$46	0.506667	1
\$38			
\$26	\$46	0.506667	1
\$38			

\$46	'sepal length'>=5.1 'sepal length'<=7 'sepal width'>=2.2 'sepal width'<=3.4 'petal length'>=1.4 'petal length'<=5.5 'petal width'>=0.2 'petal width'<=2.4	0.506667	1
\$22	\$47	0.493333	1
\$32			
\$22	\$47	0.493333	1
\$42			
\$32	\$47	0.493333	1
\$42			

\$47	'sepal length'>=4.3 'sepal length'<=7 'sepal width'>=2.7 'sepal width'<=3.4 'petal length'>=1.1 'petal length'<=5.6 'petal width'>=0.1 'petal width'<=1.9	0.493333	1
\$15 \$21	\$48	0.486667	1
\$15 \$28	\$48	0.486667	1
\$21 \$28	\$48	0.486667	1

\$48	'sepal length'>=5.1 'sepal length'<=6.6 'sepal width'>=2.2 'sepal width'<=3.4 'petal length'>=1.4 'petal length'<=6 'petal width'>=0.2 'petal width'<=2.5	0.486667	1
\$16	\$49	0.486667	1
\$19			
\$16	\$49	0.486667	1
\$28			
\$19	\$49	0.486667	1
\$28			

\$49	'sepal length'>=5.1 'sepal length'<=6.6 'sepal width'>=2.7 'sepal width'<=4.4 'petal length'>=1.2 'petal length'<=6 'petal width'>=0.1 'petal width'<=2.5	0.486667	1
\$23	\$50	0.486667	1
\$24			
\$23	\$50	0.486667	1
\$36			
\$23	\$50	0.486667	1
\$44			
\$24	\$50	0.486667	1
\$36			
\$24	\$50	0.486667	1
\$44			
\$36	\$50	0.486667	1
\$44			

\$50	'sepal length'>=4.3 'sepal length'<=6.6 'sepal width'>=2.7 'sepal width'<=3.4 'petal length'>=1.1 'petal length'<=5.5 'petal width'>=0.1 'petal width'<=2.4	0.486667	1
\$25	\$51	0.486667	1
\$27			
\$25	\$51	0.486667	1
\$36			
\$25	\$51	0.486667	1
\$47			
\$27	\$51	0.486667	1
\$36			
\$27	\$51	0.486667	1
\$47			
\$36	\$51	0.486667	1
\$47			

\$51	'sepal length'>=4.3 'sepal length'<=7 'sepal width'>=2.7 'sepal width'<=3.4 'petal length'>=1.1 'petal length'<=5.5 'petal width'>=0.1 'petal width'<=1.9	0.486667	1
\$17	\$52	0.48	1
\$21			
\$17	\$52	0.48	1
\$29			
\$21	\$52	0.48	1
\$29			

\$52	'sepal length'>=5.1 'sepal length'<=7.4 'sepal width'>=2.2 'sepal width'<=3.4 'petal length'>=1.4 'petal length'<=6.3 'petal width'>=0.2 'petal width'<=1.9	0.48	1
\$18	\$53	0.48	1
\$19			
\$18	\$53	0.48	1
\$29			
\$19	\$53	0.48	1
\$29			

\$53	'sepal length'>=5.1 'sepal length'<=7.4 'sepal width'>=2.7 'sepal width'<=4.4 'petal length'>=1.2 'petal length'<=6.3 'petal width'>=0.1 'petal width'<=1.9	0.48	1
\$20	\$54	0.473333	1
\$38			
\$20	\$54	0.473333	1
\$48			
\$38	\$54	0.473333	1
\$48			

\$54	'sepal length'>=5.1 'sepal length'<=6.6 'sepal width'>=2.2 'sepal width'<=3.4 'petal length'>=1.4 'petal length'<=5.6 'petal width'>=0.2 'petal width'<=2.4	0.473333	1
\$30	\$55	0.453333	1
\$31			
\$30	\$55	0.453333	1
\$44			
\$30	\$55	0.453333	1
\$47			
\$31	\$55	0.453333	1
\$44			
\$31	\$55	0.453333	1
\$47			
\$44	\$55	0.453333	1
\$47			

\$55	'sepal length'>=4.3 'sepal length'<=6.6 'sepal width'>=2.7 'sepal width'<=3.4 'petal length'>=1.1 'petal length'<=5.6 'petal width'>=0.1 'petal width'<=1.9	0.453333	1
\$22 \$38	\$56	0.446667	1
\$22 \$52	\$56	0.446667	1
\$38 \$52	\$56	0.446667	1

\$56	'sepal length'>=5.1 'sepal length'<=7 'sepal width'>=2.2 'sepal width'<=3.4 'petal length'>=1.4 'petal length'<=5.6 'petal width'>=0.2 'petal width'<=1.9	0.446667	1
\$23	\$57	0.446667	1
\$35			
\$23	\$57	0.446667	1
\$43			
\$23	\$57	0.446667	1
\$49			
\$35	\$57	0.446667	1
\$43			
\$35	\$57	0.446667	1
\$49			
\$43	\$57	0.446667	1
\$49			

\$57	'sepal length'>=5.1 'sepal length'<=6.6 'sepal width'>=2.7 'sepal width'<=4.4 'petal length'>=1.2 'petal length'<=5.5 'petal width'>=0.1 'petal width'<=2.4	0.446667	1
\$25	\$58	0.446667	1
\$37			
\$25	\$58	0.446667	1
\$43			
\$25	\$58	0.446667	1
\$53			
\$37	\$58	0.446667	1
\$43			
\$37	\$58	0.446667	1
\$53			
\$43	\$58	0.446667	1
\$53			

\$58	'sepal length'>=5.1 'sepal length'<=7 'sepal width'>=2.7 'sepal width'<=4.4 'petal length'>=1.2 'petal length'<=5.5 'petal width'>=0.1 'petal width'<=1.9	0.446667	1
\$33	\$59	0.446667	1
\$34			
\$33	\$59	0.446667	1
\$50			
\$33	\$59	0.446667	1
\$51			
\$33	\$59	0.446667	1
\$55			
\$34	\$59	0.446667	1
\$50			
\$34	\$59	0.446667	1
\$51			
\$34	\$59	0.446667	1
\$55			
\$50	\$59	0.446667	1
\$51			
\$50	\$59	0.446667	1
\$55			
\$51	\$59	0.446667	1
\$55			

\$59	'sepal length'>=4.3 'sepal length'<=6.6 'sepal width'>=2.7 'sepal width'<=3.4 'petal length'>=1.1 'petal length'<=5.5 'petal width'>=0.1 'petal width'<=1.9	0.446667	1
\$24	\$60	0.44	1
\$35			
\$24	\$60	0.44	1
\$46			
\$24	\$60	0.44	1
\$54			
\$35	\$60	0.44	1
\$46			
\$35	\$60	0.44	1
\$54			
\$46	\$60	0.44	1
\$54			

\$60	'sepal length'>=5.1 'sepal length'<=6.6 'sepal width'>=2.2 'sepal width'<=3.4 'petal length'>=1.4 'petal length'<=5.5 'petal width'>=0.2 'petal width'<=2.4	0.44	1
\$27	\$61	0.433333	1
\$37			
\$27	\$61	0.433333	1
\$46			
\$27	\$61	0.433333	1
\$56			
\$37	\$61	0.433333	1
\$46			
\$37	\$61	0.433333	1
\$56			
\$46	\$61	0.433333	1
\$56			

\$61	'sepal length'>=5.1 'sepal length'<=7 'sepal width'>=2.2 'sepal width'<=3.4 'petal length'>=1.4 'petal length'<=5.5 'petal width'>=0.2 'petal width'<=1.9	0.433333	1
\$32	\$62	0.433333	1
\$38			
\$32	\$62	0.433333	1
\$40			
\$38	\$62	0.433333	1
\$40			

\$62	'sepal length'>=5.1 'sepal length'<=7 'sepal width'>=2.7 'sepal width'<=3.4 'petal length'>=1.4 'petal length'<=5.6 'petal width'>=0.2 'petal width'<=2.4	0.433333	1
\$30 \$41	\$63	0.413333	1
\$30 \$49	\$63	0.413333	1
\$30 \$53	\$63	0.413333	1
\$41 \$49	\$63	0.413333	1
\$41 \$53	\$63	0.413333	1
\$49 \$53	\$63	0.413333	1

\$63	'sepal length'>=5.1 'sepal length'<=6.6 'sepal width'>=2.7 'sepal width'<=4.4 'petal length'>=1.2 'petal length'<=5.6 'petal width'>=0.1 'petal width'<=1.9	0.413333	1
\$31	\$64	0.406667	1
\$41			
\$31	\$64	0.406667	1
\$54			
\$31	\$64	0.406667	1
\$56			
\$41	\$64	0.406667	1
\$54			
\$41	\$64	0.406667	1
\$56			
\$54	\$64	0.406667	1
\$56			

\$64	'sepal length'>=5.1 'sepal length'<=6.6 'sepal width'>=2.2 'sepal width'<=3.4 'petal length'>=1.4 'petal length'<=5.6 'petal width'>=0.2 'petal width'<=1.9	0.406667	1
\$33	\$65	0.406667	1
\$45			
\$33	\$65	0.406667	1
\$57			
\$33	\$65	0.406667	1
\$58			
\$33	\$65	0.406667	1
\$63			
\$45	\$65	0.406667	1
\$57			
\$45	\$65	0.406667	1
\$58			
\$45	\$65	0.406667	1
\$63			
\$57	\$65	0.406667	1
\$58			
\$57	\$65	0.406667	1
\$63			
\$58	\$65	0.406667	1
\$63			

\$65	'sepal length'>=5.1 'sepal length'<=6.6 'sepal width'>=2.7 'sepal width'<=4.4 'petal length'>=1.2 'petal length'<=5.5 'petal width'>=0.1 'petal width'<=1.9	0.406667	1
\$36	\$66	0.4	1
\$43			
\$36	\$66	0.4	1
\$46			
\$36	\$66	0.4	1
\$62			
\$43	\$66	0.4	1
\$46			
\$43	\$66	0.4	1
\$62			
\$46	\$66	0.4	1
\$62			

\$66	'sepal length'>=5.1 'sepal length'<=7 'sepal width'>=2.7 'sepal width'<=3.4 'petal length'>=1.4 'petal length'<=5.5 'petal width'>=0.2 'petal width'<=2.4	0.4	1
\$34	\$67	0.393333	1
\$45			
\$34	\$67	0.393333	1
\$60			
\$34	\$67	0.393333	1
\$61			
\$34	\$67	0.393333	1
\$64			
\$45	\$67	0.393333	1
\$60			
\$45	\$67	0.393333	1
\$61			
\$45	\$67	0.393333	1
\$64			
\$60	\$67	0.393333	1
\$61			
\$60	\$67	0.393333	1
\$64			
\$61	\$67	0.393333	1
\$64			

\$67	'sepal length'>=5.1 'sepal length'<=6.6 'sepal width'>=2.2 'sepal width'<=3.4 'petal length'>=1.4 'petal length'<=5.5 'petal width'>=0.2 'petal width'<=1.9	0.393333	1
\$39 \$40	\$68	0.373333	1
\$39 \$48	\$68	0.373333	1
\$39 \$49	\$68	0.373333	1
\$40 \$48	\$68	0.373333	1
\$40 \$49	\$68	0.373333	1
\$48 \$49	\$68	0.373333	1

\$68	'sepal length'>=5.1 'sepal length'<=6.6 'sepal width'>=2.7 'sepal width'<=3.4 'petal length'>=1.4 'petal length'<=6 'petal width'>=0.2 'petal width'<=2.5	0.373333	1
\$40	\$69	0.366667	1
\$42			
\$40	\$69	0.366667	1
\$52			
\$40	\$69	0.366667	1
\$53			
\$42	\$69	0.366667	1
\$52			
\$42	\$69	0.366667	1
\$53			
\$52	\$69	0.366667	1
\$53			

\$69	'sepal length'>=5.1 'sepal length'<=7.4 'sepal width'>=2.7 'sepal width'<=3.4 'petal length'>=1.4 'petal length'<=6.3 'petal width'>=0.2 'petal width'<=1.9	0.366667	1
\$44	\$70	0.36	1
\$54			
\$44	\$70	0.36	1
\$62			
\$44	\$70	0.36	1
\$68			
\$54	\$70	0.36	1
\$62			
\$54	\$70	0.36	1
\$68			
\$62	\$70	0.36	1
\$68			

\$70	'sepal length'>=5.1 'sepal length'<=6.6 'sepal width'>=2.7 'sepal width'<=3.4 'petal length'>=1.4 'petal length'<=5.6 'petal width'>=0.2 'petal width'<=2.4	0.36	1
\$47 \$56	\$71	0.34	1
\$47 \$62	\$71	0.34	1
\$47 \$69	\$71	0.34	1
\$56 \$62	\$71	0.34	1
\$56 \$69	\$71	0.34	1
\$62 \$69	\$71	0.34	1

\$71	'sepal length'>=5.1 'sepal length'<=7 'sepal width'>=2.7 'sepal width'<=3.4 'petal length'>=1.4 'petal length'<=5.6 'petal width'>=0.2 'petal width'<=1.9	0.34	1
\$50	\$72	0.333333	1
\$57			
\$50	\$72	0.333333	1
\$60			
\$50	\$72	0.333333	1
\$66			
\$50	\$72	0.333333	1
\$70			
\$57	\$72	0.333333	1
\$60			
\$57	\$72	0.333333	1
\$66			
\$57	\$72	0.333333	1
\$70			
\$60	\$72	0.333333	1
\$66			
\$60	\$72	0.333333	1
\$70			
\$66	\$72	0.333333	1
\$70			

\$72	'sepal length'>=5.1 'sepal length'<=6.6 'sepal width'>=2.7 'sepal width'<=3.4 'petal length'>=1.4 'petal length'<=5.5 'petal width'>=0.2 'petal width'<=2.4	0.333333	1
\$51	\$73	0.333333	1
\$58			
\$51	\$73	0.333333	1
\$61			
\$51	\$73	0.333333	1
\$66			
\$51	\$73	0.333333	1
\$71			
\$58	\$73	0.333333	1
\$61			
\$58	\$73	0.333333	1
\$66			
\$58	\$73	0.333333	1
\$71			
\$61	\$73	0.333333	1
\$66			
\$61	\$73	0.333333	1
\$71			
\$66	\$73	0.333333	1
\$71			

\$73	'sepal length'>=5.1 'sepal length'<=7 'sepal width'>=2.7 'sepal width'<=3.4 'petal length'>=1.4 'petal length'<=5.5 'petal width'>=0.2 'petal width'<=1.9	0.333333	1
\$55	\$74	0.3	1
\$63			
\$55	\$74	0.3	1
\$64			
\$55	\$74	0.3	1
\$70			
\$55	\$74	0.3	1
\$71			
\$63	\$74	0.3	1
\$64			
\$63	\$74	0.3	1
\$70			
\$63	\$74	0.3	1
\$71			
\$64	\$74	0.3	1
\$70			
\$64	\$74	0.3	1
\$71			
\$70	\$74	0.3	1
\$71			

\$74	'sepal length'>=5.1 'sepal length'<=6.6 'sepal width'>=2.7 'sepal width'<=3.4 'petal length'>=1.4 'petal length'<=5.6 'petal width'>=0.2 'petal width'<=1.9	0.3	1
\$59	\$75	0.293333	1
\$65			
\$59	\$75	0.293333	1
\$67			
\$59	\$75	0.293333	1
\$72			
\$59	\$75	0.293333	1
\$73			
\$59	\$75	0.293333	1
\$74			
\$65	\$75	0.293333	1
\$67			
\$65	\$75	0.293333	1
\$72			
\$65	\$75	0.293333	1
\$73			
\$65	\$75	0.293333	1
\$74			
\$67	\$75	0.293333	1
\$72			

\$67	\$75	0.293333	1
\$73			
\$67	\$75	0.293333	1
\$74			
\$72	\$75	0.293333	1
\$73			
\$72	\$75	0.293333	1
\$74			
\$73	\$75	0.293333	1
\$74			
\$75	'sepal length'>=5.1 'sepal length'<=6.6 'sepal width'>=2.7 'sepal width'<=3.4 'petal length'>=1.4 'petal length'<=5.5 'petal width'>=0.2 'petal width'<=1.9	0.293333	1

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"
```

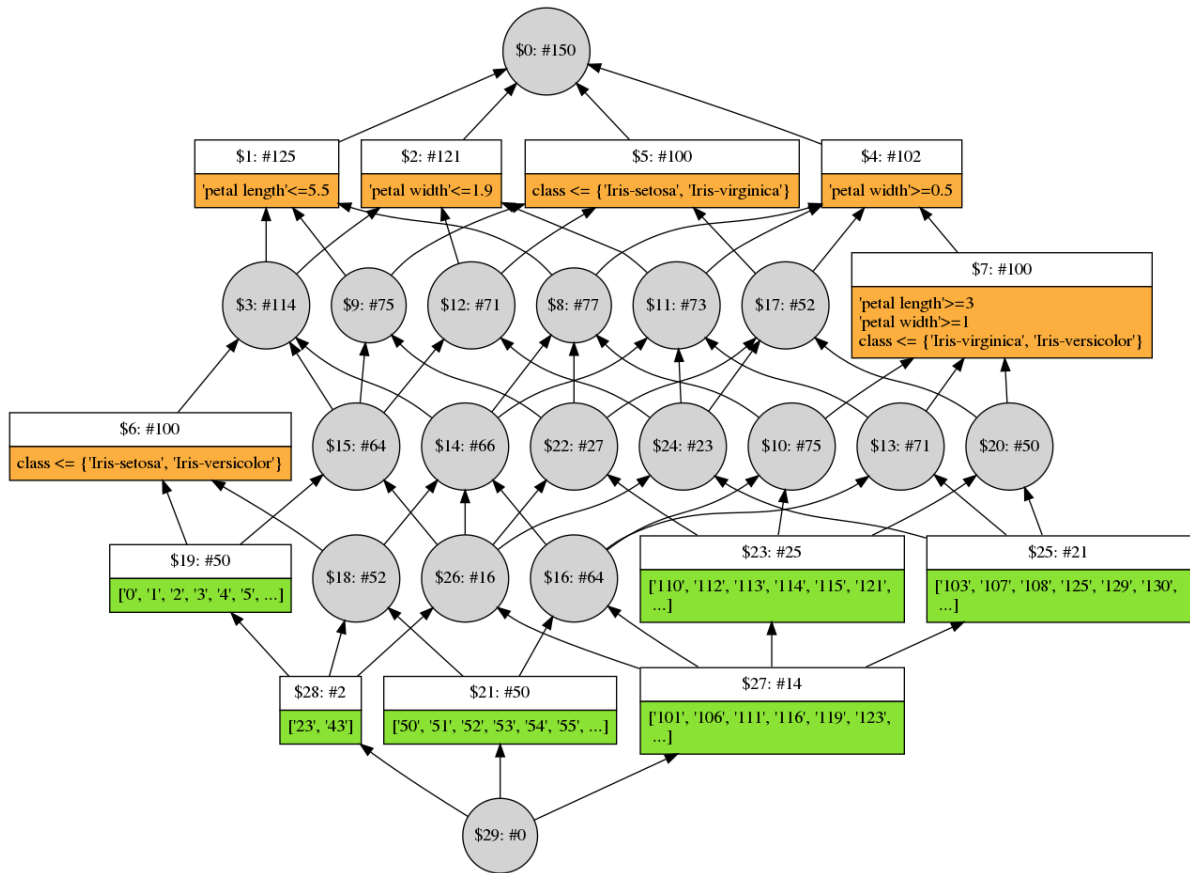
```
strategies
```

```
[<galactic.strategies.LimitFilter at 0x7fbdedb71a48>,
 <galactic_strategy_categorized_subset_basic.CategoryStrategy at 0x7fbdedb71b48>]
```

```
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']		✓		✓		✓		✓



```
LatticeTable(
    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-virginica', 'Iris-versicolor'}
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-virginica',
                    'Iris-versicolor'}
19         ['0', '1', '2',      'petal length'<=1.9
           '3', '4', '5', ...] 'petal width'<=0.6
          class <= {'Iris-setosa'}
20         ['100', '102',      'petal length'>=4.5
           '104', '105',      'petal width'>=1.4
           '109', '117', ...] class <= {'Iris-virginica'}
21         ['50', '51', '52',   class <= {'Iris-versicolor'}
           '53', '54', '55',
           ...]
23         ['110', '112',      'petal width'>=1.5
           '113', '114',
           '115', '121', ...]
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 <= {}

```



```

basis = HasseDiagramOrderedBasis(lattice=lattice)
BasisTable(
    basis,

```

```

support=0.0,
premise_width=4,
conclusion_width=4
)

```

Premises	Conclusions	Support	Confidence
	\$0	1	1
\$0	'petal length'>=1 'petal length'<=6.9 'petal width'>=0.1 'petal width'<=2.5 class <= {'Iris-setosa', 'Iris-virginica', 'Iris-versicolor'}	1	1
'petal length'<=5.5	\$1	0.833333	1
\$1	'petal length'>=1 'petal length'<=5.5 'petal width'>=0.1 'petal width'<=2.4 class <= {'Iris-setosa', 'Iris-virginica', 'Iris-versicolor'}	0.833333	1
'petal width'<=1.9	\$2	0.806667	1
\$2	'petal length'>=1 'petal length'<=6.3 'petal width'>=0.1 'petal width'<=1.9 class <= {'Iris-setosa', 'Iris-virginica', 'Iris-versicolor'}	0.806667	1
\$1 \$2	\$3	0.76	1

\$3	'petal length'>=1 'petal length'<=5.5 'petal width'>=0.1 'petal width'<=1.9 class <= {'Iris-setosa', 'Iris-virginica', 'Iris-versicolor'}	0.76	1
'petal width'>=0.5	\$4	0.68	1
\$4	'petal length'>=1.6 'petal length'<=6.9 'petal width'>=0.5 'petal width'<=2.5 class <= {'Iris-setosa', 'Iris-virginica', 'Iris-versicolor'}	0.68	1
class <= {'Iris-setosa', 'Iris-virginica'}	\$5	0.666667	1
\$5	'petal length'>=1 'petal length'<=6.9 'petal width'>=0.1 'petal width'<=2.5 class <= {'Iris-setosa', 'Iris-virginica'}	0.666667	1
class <= {'Iris-setosa', 'Iris-versicolor'}	\$6	0.666667	1

\$6	'petal length'>=1 'petal length'<=5.1 'petal width'>=0.1 'petal width'<=1.8 class <= {'Iris-setosa', 'Iris-versicolor'}	0.666667	1
'petal length'>=3	\$7	0.666667	1
'petal width'>=1	\$7	0.666667	1
class <= {'Iris-virginica', 'Iris-versicolor'}	\$7	0.666667	1
\$7	'petal length'>=3 'petal length'<=6.9 'petal width'>=1 'petal width'<=2.5 class <= {'Iris-virginica', 'Iris-versicolor'}	0.666667	1
\$1	\$8	0.513333	1
\$4			
\$8	'petal length'>=1.6 'petal length'<=5.5 'petal width'>=0.5 'petal width'<=2.4 class <= {'Iris-setosa', 'Iris-virginica', 'Iris-versicolor'}	0.513333	1
\$1	\$9	0.5	1
\$5			

\$9	'petal length'>=1 'petal length'<=5.5 'petal width'>=0.1 'petal width'<=2.4 class <= {'Iris-setosa', 'Iris-virginica'}	0.5	1
\$7 \$8	\$10	0.5	1
\$10	'petal length'>=3 'petal length'<=5.5 'petal width'>=1 'petal width'<=2.4 class <= {'Iris-virginica', 'Iris-versicolor'}	0.5	1
\$2 \$4	\$11	0.486667	1
\$11	'petal length'>=1.6 'petal length'<=6.3 'petal width'>=0.5 'petal width'<=1.9 class <= {'Iris-setosa', 'Iris-virginica', 'Iris-versicolor'}	0.486667	1
\$2 \$5	\$12	0.473333	1
\$12	'petal length'>=1 'petal length'<=6.3 'petal width'>=0.1 'petal width'<=1.9 class <= {'Iris-setosa', 'Iris-virginica'}	0.473333	1
\$7 \$11	\$13	0.473333	1

\$13	'petal length'>=3 'petal length'<=6.3 'petal width'>=1 'petal width'<=1.9 class <= {'Iris-virginica', 'Iris-versicolor'}	0.473333	1
\$3 \$8	\$14	0.44	1
\$3 \$11	\$14	0.44	1
\$8 \$11	\$14	0.44	1
\$14	'petal length'>=1.6 'petal length'<=5.5 'petal width'>=0.5 'petal width'<=1.9 class <= {'Iris-setosa', 'Iris-virginica', 'Iris-versicolor'}	0.44	1
\$3 \$9	\$15	0.426667	1
\$3 \$12	\$15	0.426667	1
\$9 \$12	\$15	0.426667	1
\$15	'petal length'>=1 'petal length'<=5.5 'petal width'>=0.1 'petal width'<=1.9 class <= {'Iris-setosa', 'Iris-virginica'}	0.426667	1
\$10 \$13	\$16	0.426667	1

\$10	\$16	0.426667	1
\$14			
\$13	\$16	0.426667	1
\$14			
\$16	'petal length'>=3 'petal length'<=5.5 'petal width'>=1 'petal width'<=1.9 class <= {'Iris-virginica', 'Iris-versicolor'}	0.426667	1
\$4	\$17	0.346667	1
\$5			
\$17	'petal length'>=1.6 'petal length'<=6.9 'petal width'>=0.5 'petal width'<=2.5 class <= {'Iris-setosa', 'Iris-virginica'}	0.346667	1
\$6	\$18	0.346667	1
\$14			
\$18	'petal length'>=1.6 'petal length'<=5.1 'petal width'>=0.5 'petal width'<=1.8 class <= {'Iris-setosa', 'Iris-versicolor'}	0.346667	1
\$6	\$19	0.333333	1
\$15			
\$19	'petal length'>=1 'petal length'<=1.9 'petal width'>=0.1 'petal width'<=0.6 class <= {'Iris-setosa'}	0.333333	1

\$7	\$20	0.333333	1
\$17			
\$20	'petal length'>=4.5 'petal length'<=6.9 'petal width'>=1.4 'petal width'<=2.5 class <= {'Iris-virginica'}	0.333333	1
\$16	\$21	0.333333	1
\$18			
\$21	'petal length'>=3 'petal length'<=5.1 'petal width'>=1 'petal width'<=1.8 class <= {'Iris-versicolor'}	0.333333	1
\$8	\$22	0.18	1
\$9			
\$8	\$22	0.18	1
\$17			
\$9	\$22	0.18	1
\$17			
\$22	'petal length'>=1.6 'petal length'<=5.5 'petal width'>=0.5 'petal width'<=2.4 class <= {'Iris-setosa', 'Iris-virginica'}	0.18	1
\$10	\$23	0.166667	1
\$20			
\$10	\$23	0.166667	1
\$22			
\$20	\$23	0.166667	1
\$22			

\$23	'petal length'>=4.5 'petal length'<=5.5 'petal width'>=1.5 'petal width'<=2.4 class <= {'Iris-virginica'}	0.166667	1
\$11	\$24	0.153333	1
\$12			
\$11	\$24	0.153333	1
\$17			
\$12	\$24	0.153333	1
\$17			
\$24	'petal length'>=1.6 'petal length'<=6.3 'petal width'>=0.5 'petal width'<=1.9 class <= {'Iris-setosa', 'Iris-virginica'}	0.153333	1
\$13	\$25	0.14	1
\$20			
\$13	\$25	0.14	1
\$24			
\$20	\$25	0.14	1
\$24			
\$25	'petal length'>=4.5 'petal length'<=6.3 'petal width'>=1.4 'petal width'<=1.9 class <= {'Iris-virginica'}	0.14	1
\$14	\$26	0.106667	1
\$15			
\$14	\$26	0.106667	1
\$22			
\$14	\$26	0.106667	1
\$24			

\$15	\$26	0.106667	1
\$22			
\$15	\$26	0.106667	1
\$24			
\$22	\$26	0.106667	1
\$24			
\$26	'petal length'>=1.6 'petal length'<=5.5 'petal width'>=0.5 'petal width'<=1.9 class <= {'Iris-setosa', 'Iris-virginica'}	0.106667	1
\$16	\$27	0.0933333	1
\$23			
\$16	\$27	0.0933333	1
\$25			
\$16	\$27	0.0933333	1
\$26			
\$23	\$27	0.0933333	1
\$25			
\$23	\$27	0.0933333	1
\$26			
\$25	\$27	0.0933333	1
\$26			
\$27	'petal length'>=4.5 'petal length'<=5.5 'petal width'>=1.5 'petal width'<=1.9 class <= {'Iris-virginica'}	0.0933333	1
\$18	\$28	0.0133333	1
\$19			
\$18	\$28	0.0133333	1
\$26			
\$19	\$28	0.0133333	1
\$26			

```
$28          'petal length'>=1.6      0.0133333  1
            'petal length'<=1.7
            'petal width'>=0.5
            'petal width'<=0.6
            class <=
            {'Iris-setosa'}
```



```
basis = CanonicalDirectBasis(lattice=lattice)
```



```
BasisTable(
    basis,
    support=0.5,
    premise_width=4,
    conclusion_width=4
)
```

Premises	Conclusions	Support	Confidence
	'petal length'>=1 'petal length'<=6.9 'petal width'>=0.1 'petal width'<=2.5 class <= {'Iris-setosa', 'Iris-virginica', 'Iris-versicolor'}	1	1
'petal length'<=5.5	'petal length'>=1 'petal width'>=0.1 'petal width'<=2.4 class <= {'Iris-setosa', 'Iris-virginica', 'Iris-versicolor'}	0.833333	1

'petal width'<=1.9	'petal length'>=1 'petal length'<=6.3 'petal width'>=0.1 class <= {'Iris-setosa', 'Iris-virginica', 'Iris-versicolor'}	0.806667	1
'petal width'>=0.5	'petal length'>=1.6 'petal length'<=6.9 'petal width'<=2.5 class <= {'Iris-setosa', 'Iris-virginica', 'Iris-versicolor'}	0.68	1
class <= {'Iris-setosa', 'Iris-virginica'}	'petal length'>=1 'petal length'<=6.9 'petal width'>=0.1 'petal width'<=2.5	0.666667	1
class <= {'Iris-setosa', 'Iris-versicolor'}	'petal length'>=1 'petal length'<=5.1 'petal width'>=0.1 'petal width'<=1.8	0.666667	1
'petal length'>=3	'petal length'<=6.9 'petal width'>=1 'petal width'<=2.5 class <= {'Iris-virginica', 'Iris-versicolor'}	0.666667	1
'petal width'>=1	'petal length'>=3 'petal length'<=6.9 'petal width'<=2.5 class <= {'Iris-virginica', 'Iris-versicolor'}	0.666667	1

```
class <=      'petal length'>=3      0.666667      1
{'Iris-virginica', 'petal length'<=6.9
'Iris-versicolor'} 'petal width'>=1
                  'petal width'<=2.5
```