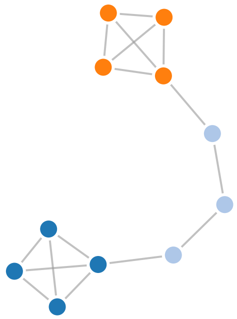
NetworkX

Network Analysis in Python

NetworkX is a Python package for the creation, manipulation, and study of the structure, dynamics, and functions of complex networks.



Software for complex networks

- Data structures for graphs, digraphs, and multigraphs
- Many standard graph algorithms
- Network structure and analysis measures
- Generators for classic graphs, random graphs, and synthetic networks
- Nodes can be "anything" (e.g., text, images, XML records)
- Edges can hold arbitrary data (e.g., weights, time-series)
- Open source 3-clause BSD license
- Well tested with over 90% code coverage
- Additional benefits from Python include fast prototyping, easy to teach, and multi-platform

Algorithms

A closer look at some of the algorithms and network analysis techniques provided by NetworkX.

Welcome to nx-guides!

Contents

launch binder

This site provides educational materials officially developed and curated by the NetworkX community. The goal of the repository is to provide high-quality educational resources for learning about network analysis and graph theory with NetworkX. Examples include:

- Long-form narrative documentation, such as tutorials
- In-depth examinations of common graph and network algorithms and their implementations in NetworkX
- Demonstrations or domain-specific applications of NetworkX highlighting best-practices for network analysis.

About

The educational materials are in the form of markdown-based Jupyter notebooks, so everything is interactive! You can follow along yourself:

1. *on binder*, by clicking on the launch button at the top of this page, or the rocket icon in the upper-right corner of any

of the pages, or

2. *locally*, by cloning the repository (see the octocat icon above) and running `jupyter notebook`.

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Graph Generators

A closer look at the functions provided by NetworkX to create interesting graphs.

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Reference

Release: 3.1

Date: Apr 04, 2023

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Vitality

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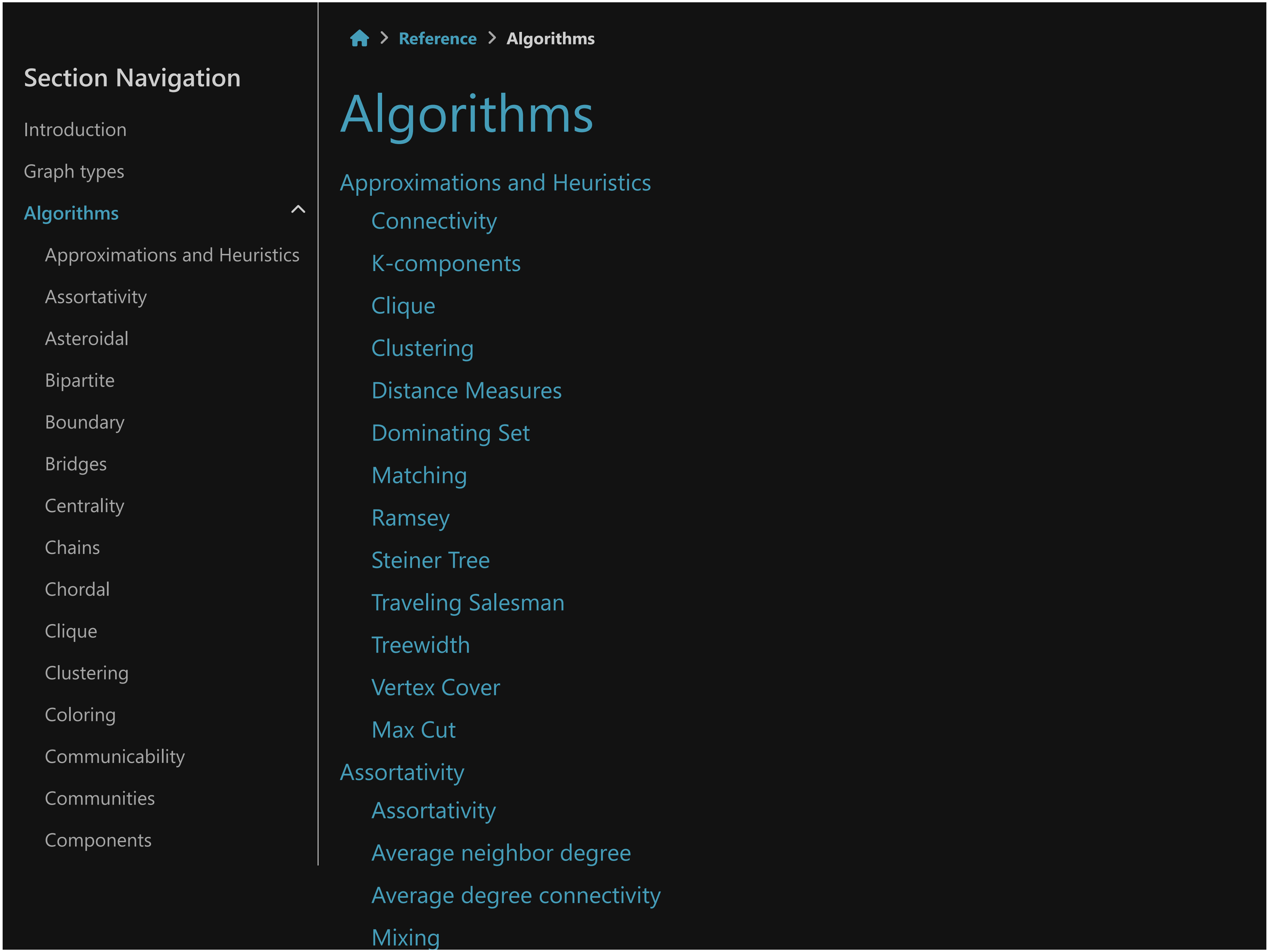
Specific List of Algorithms in Detail



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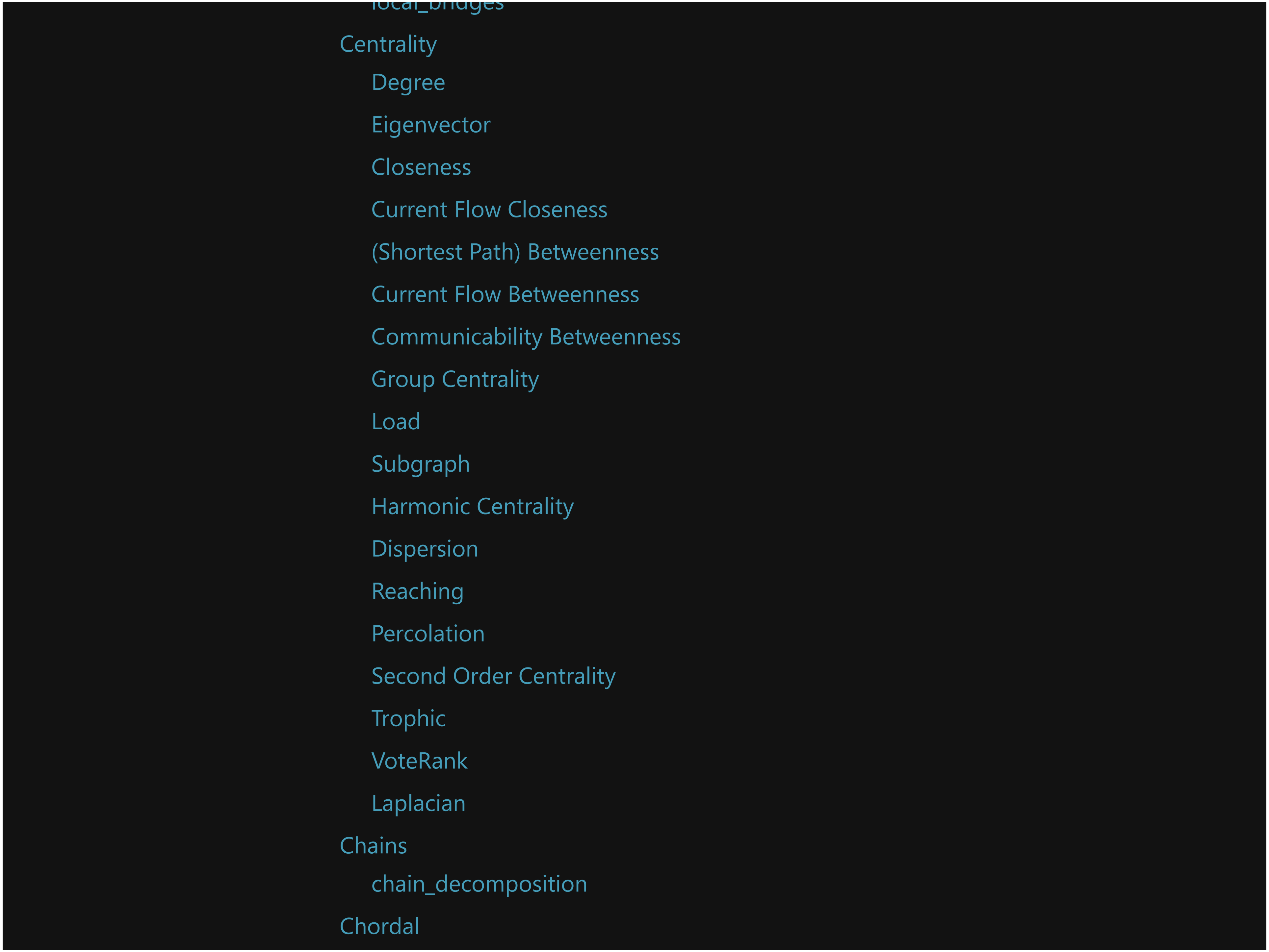

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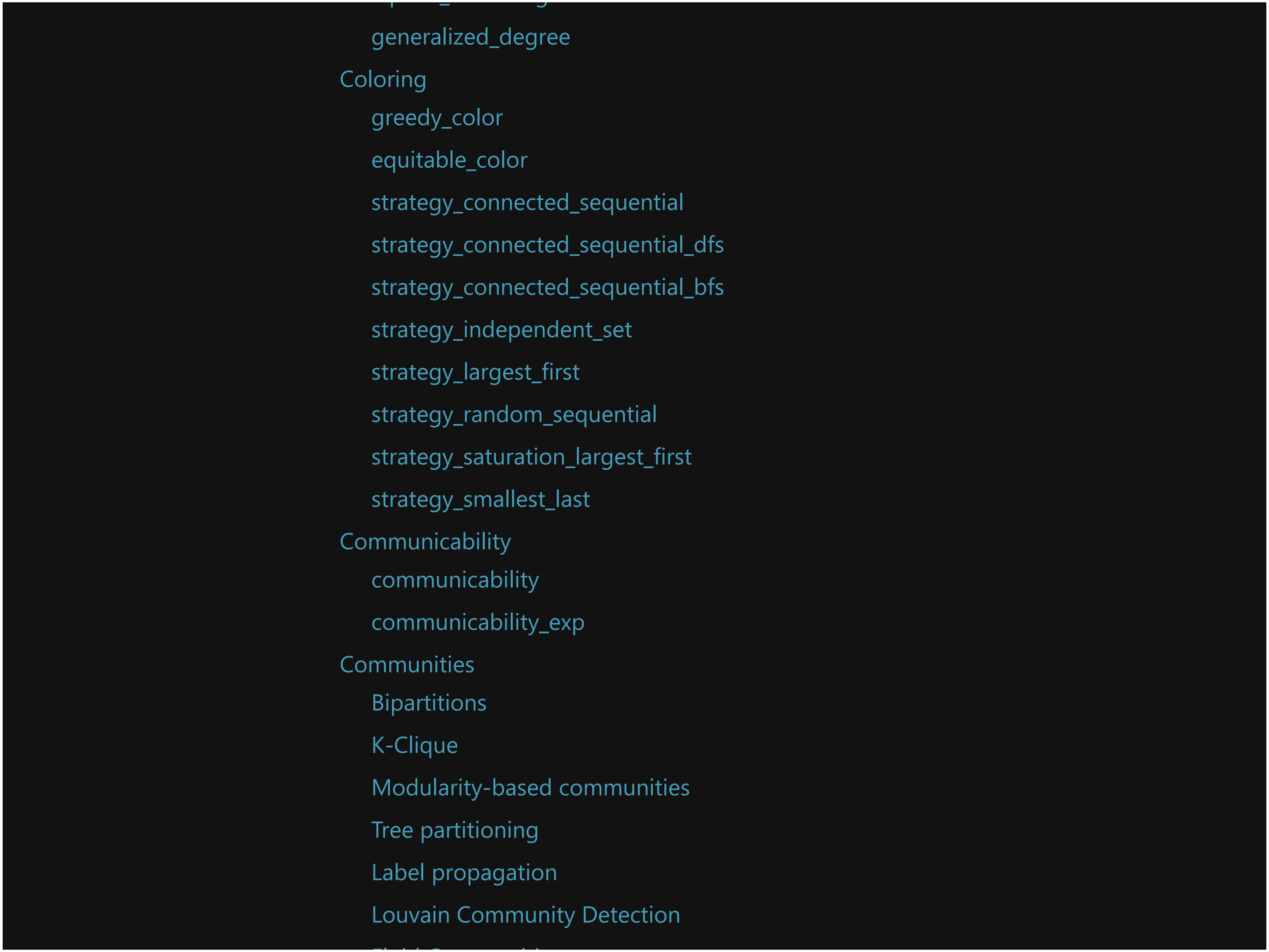

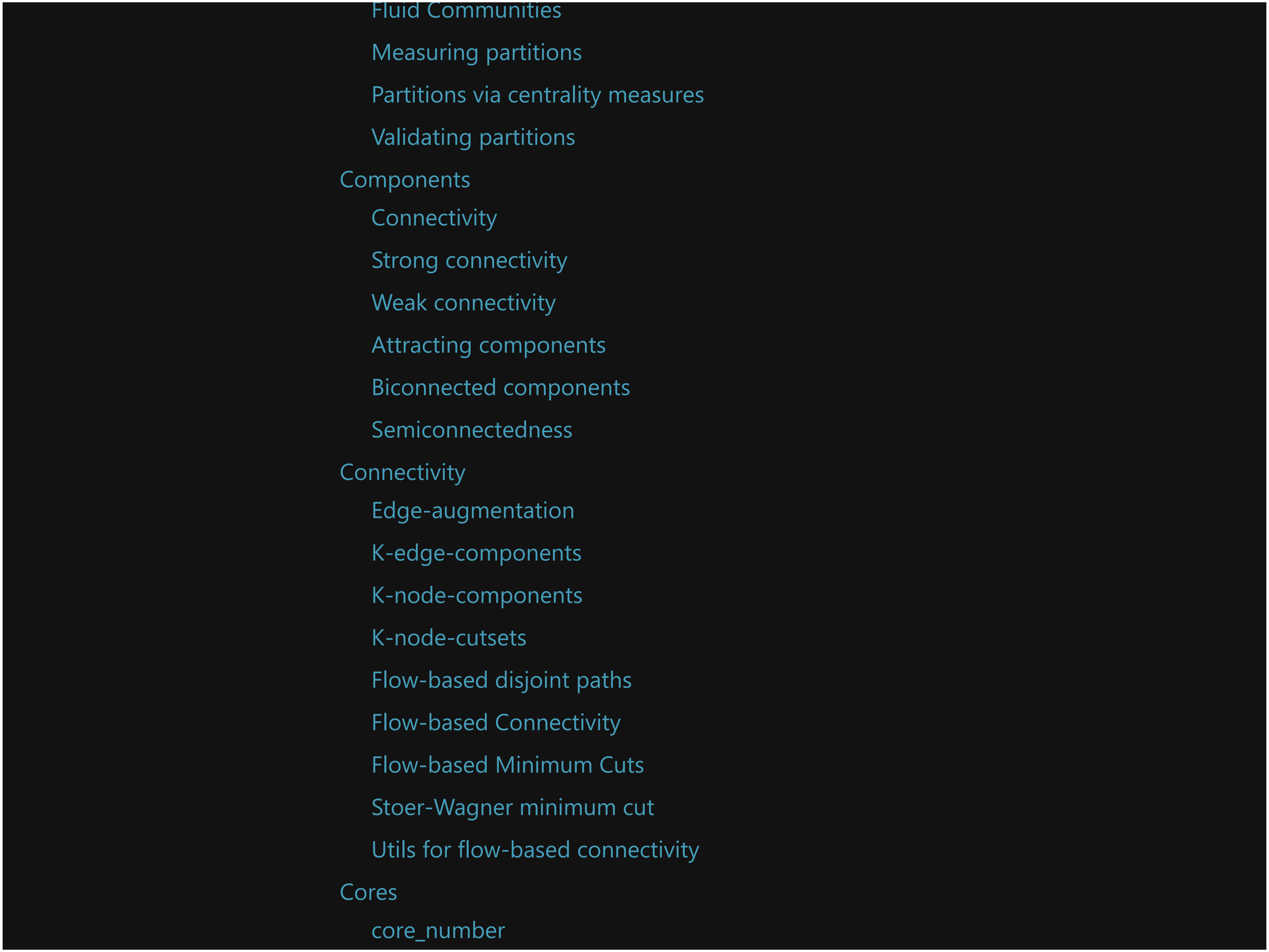

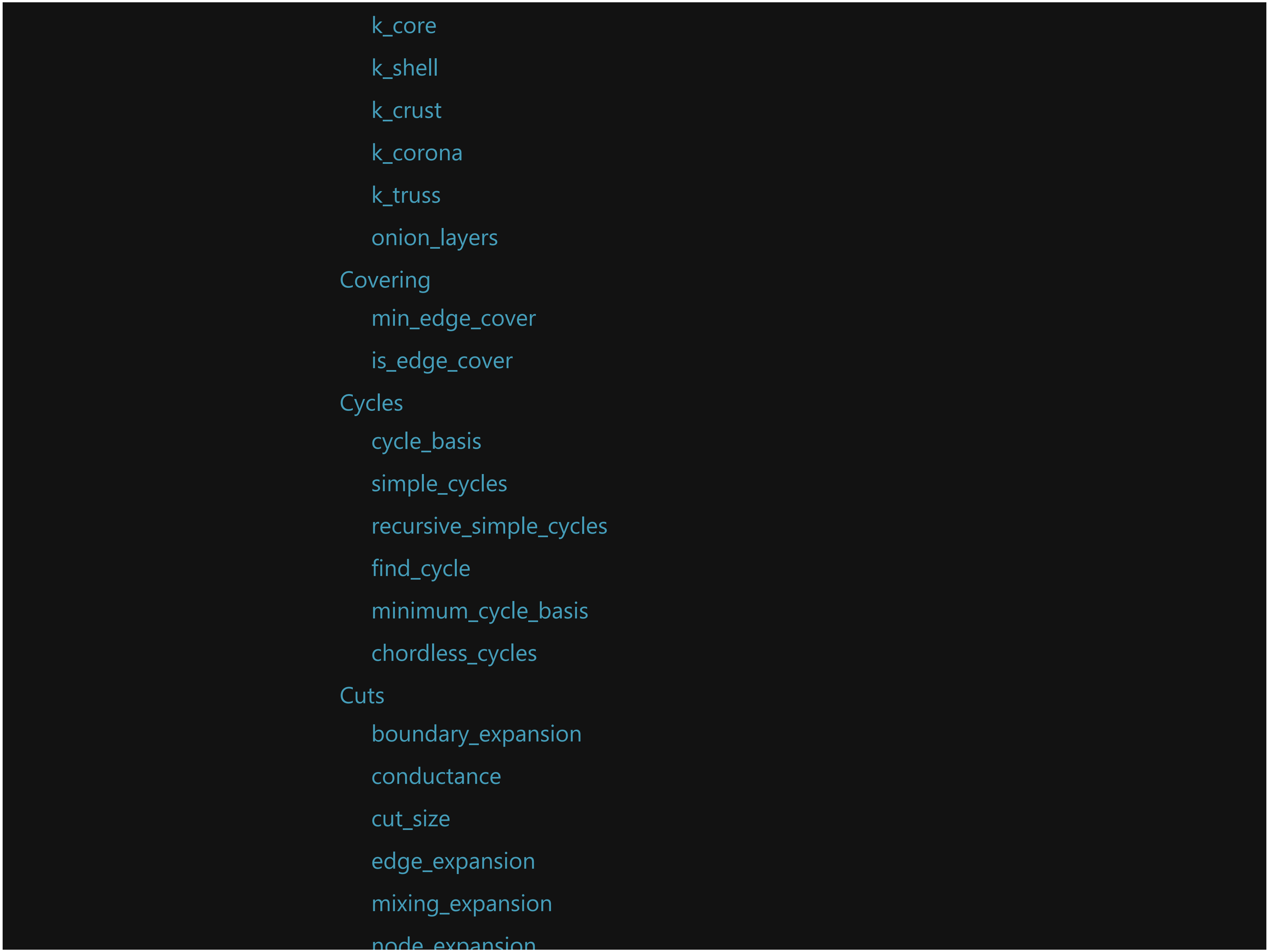

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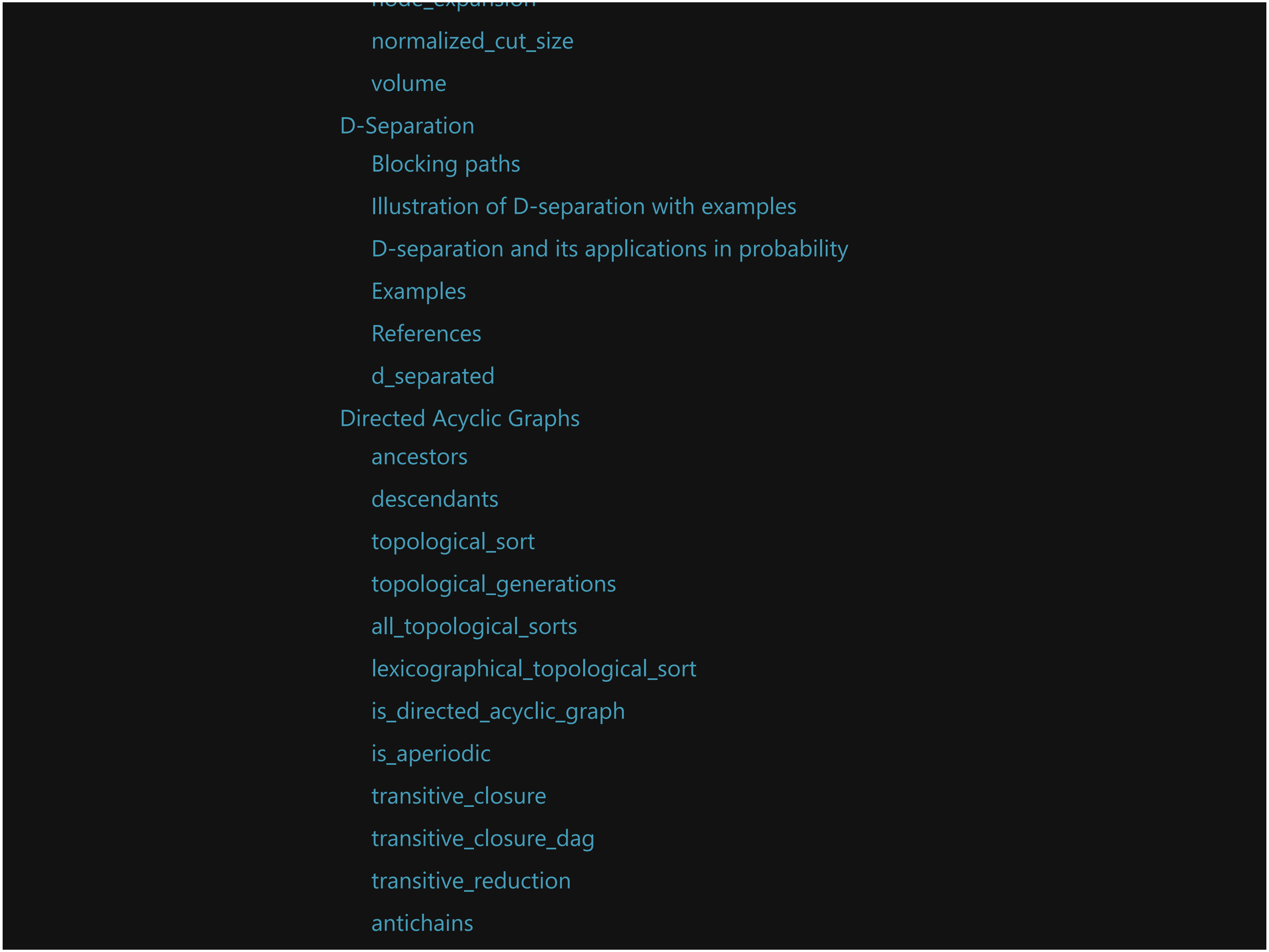

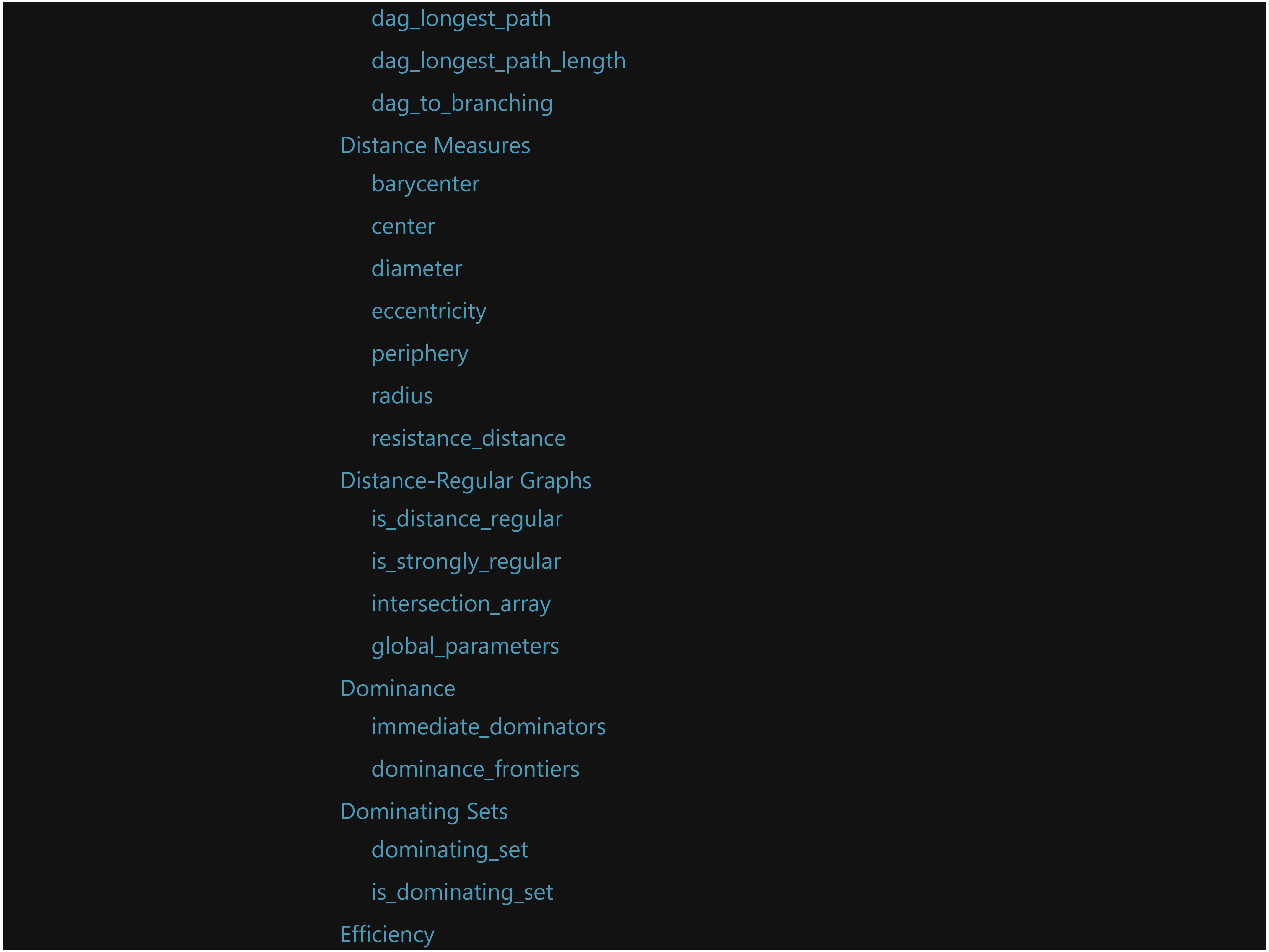

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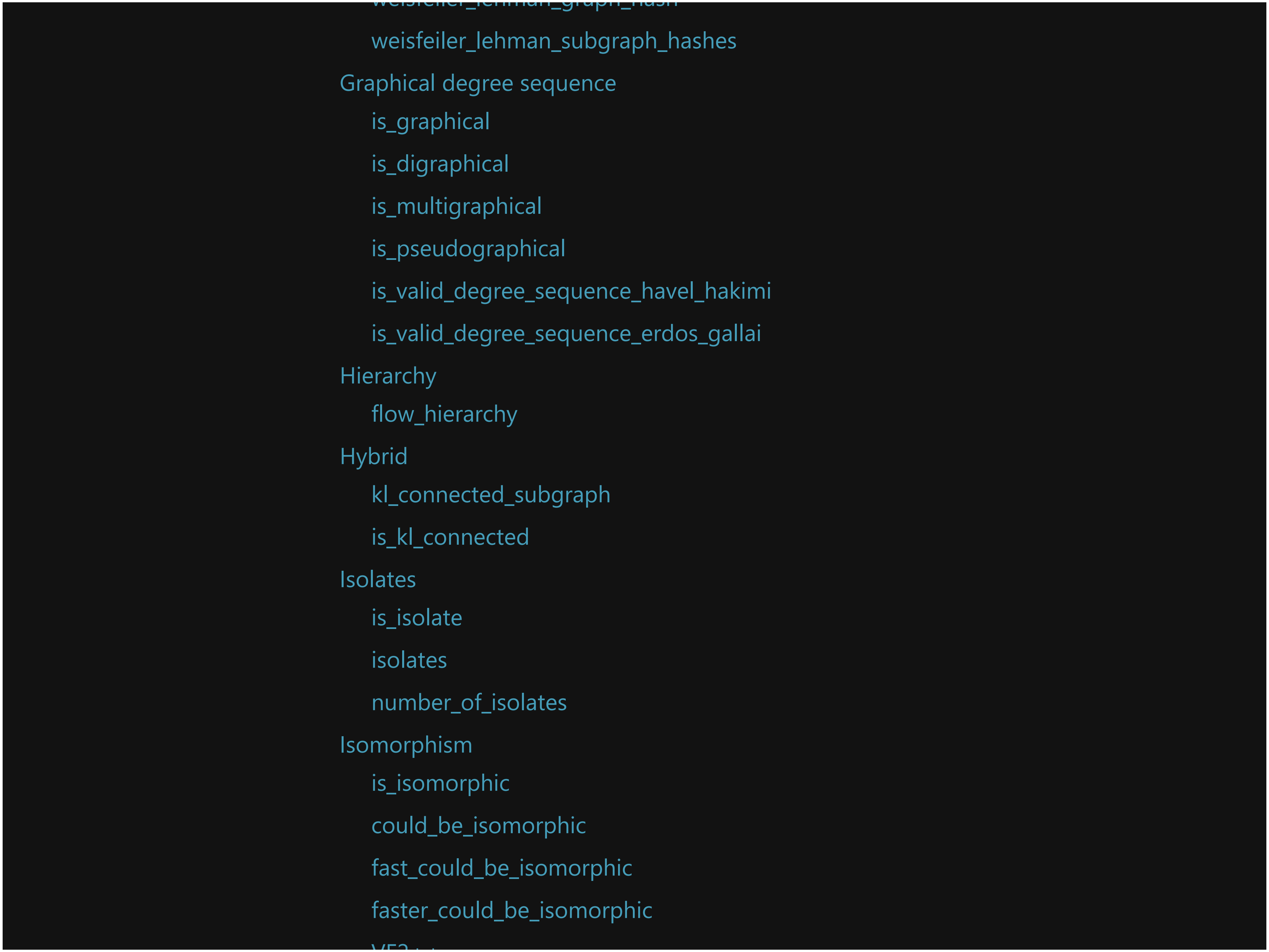

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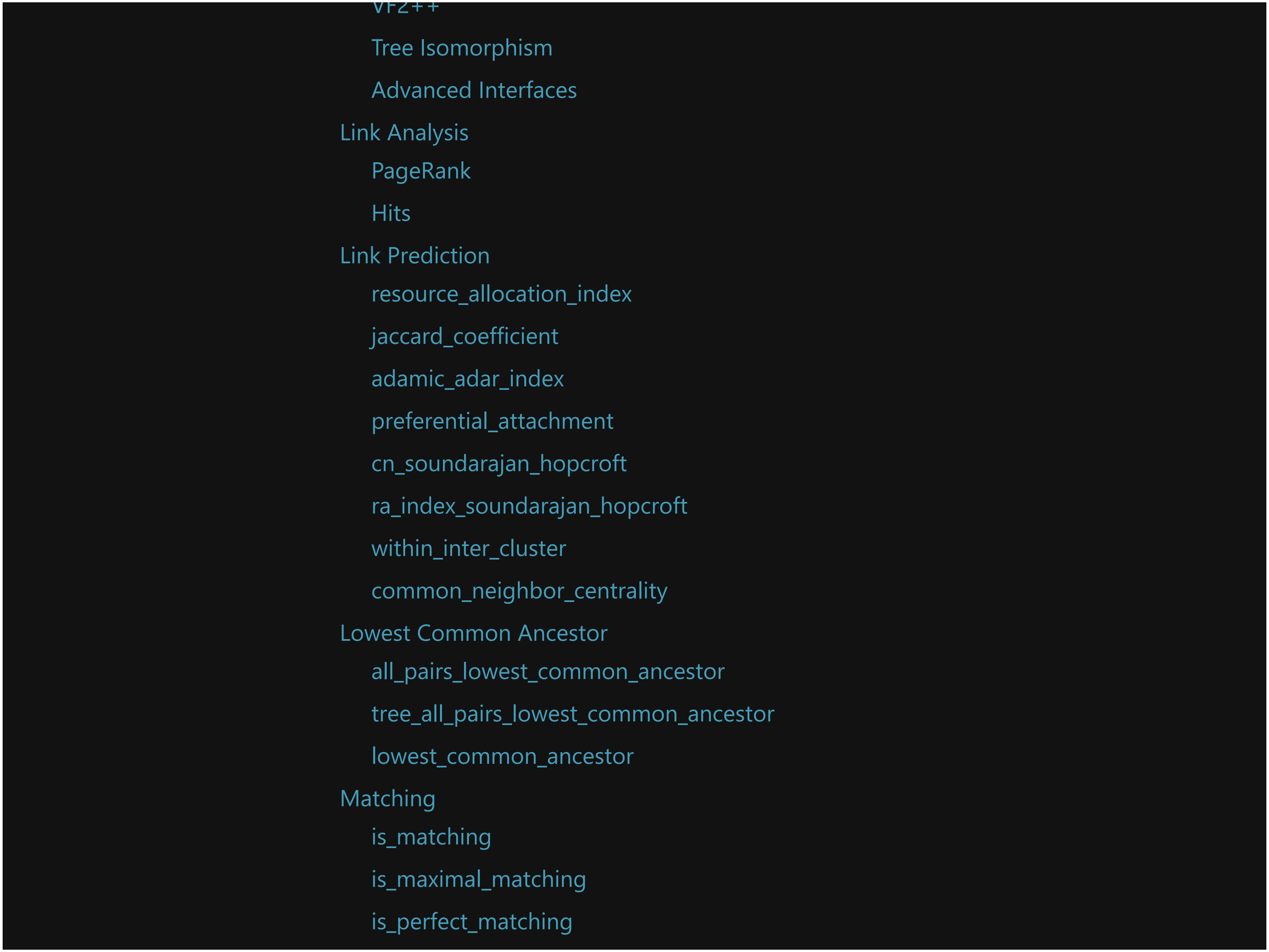

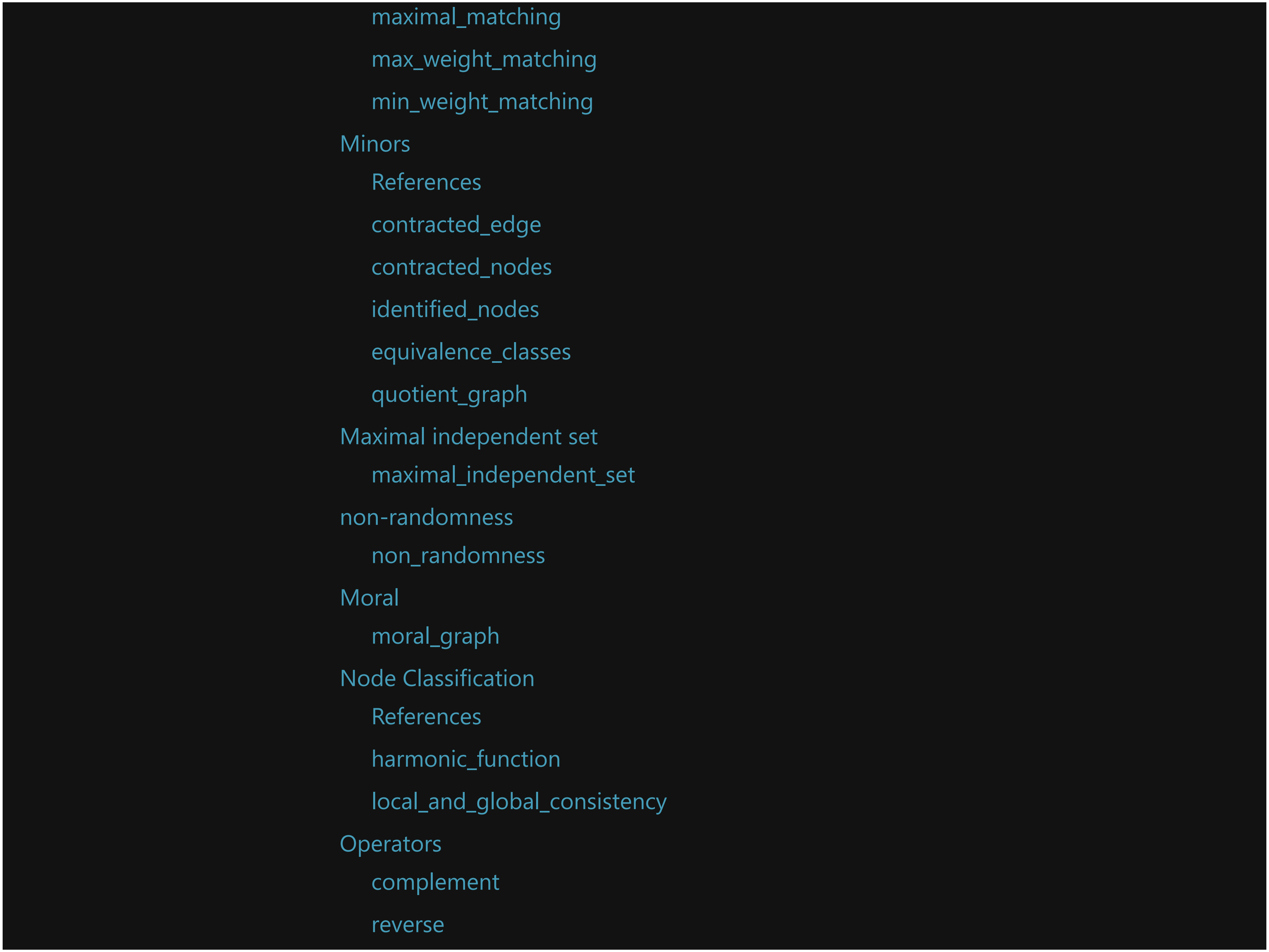

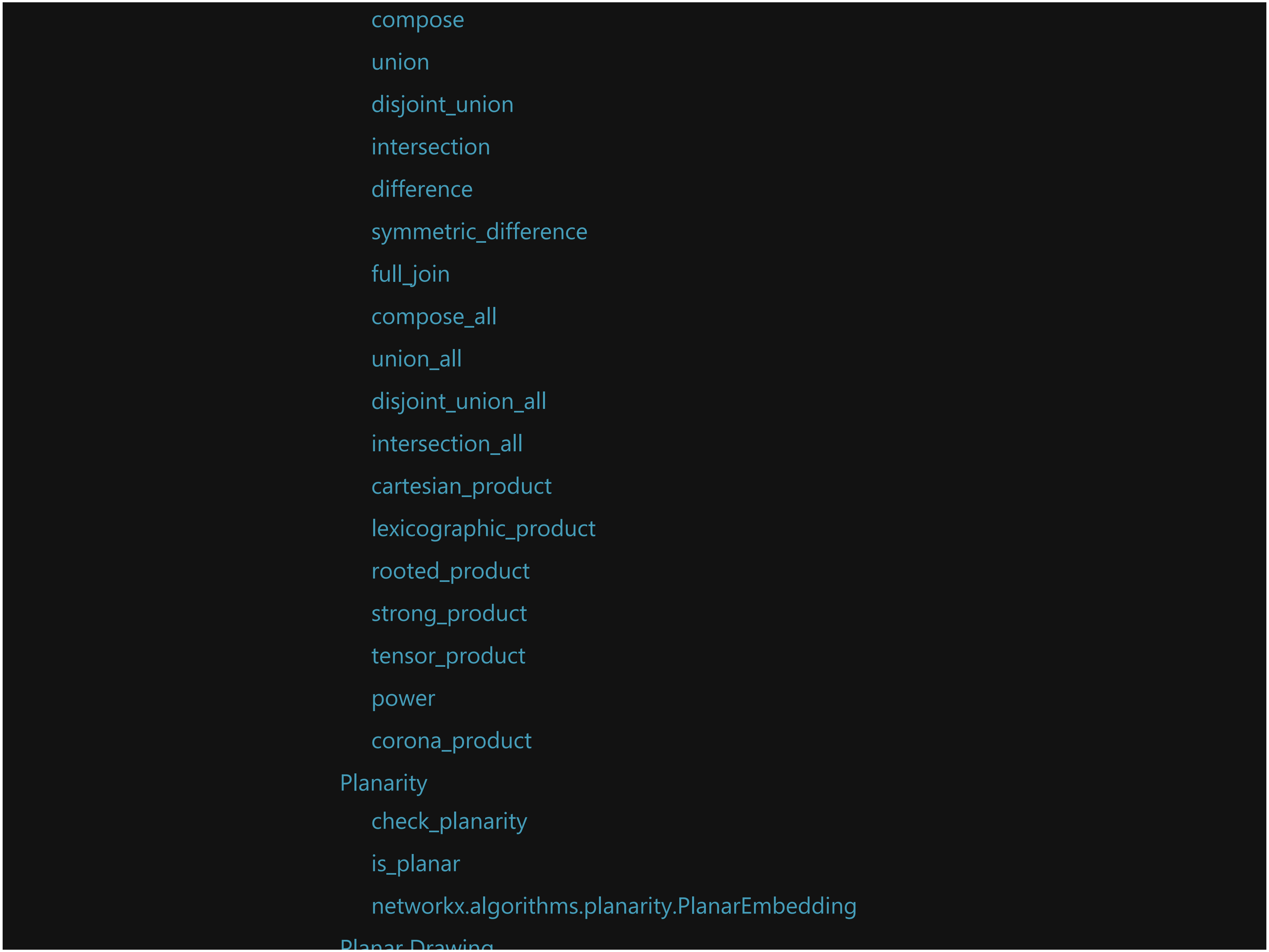

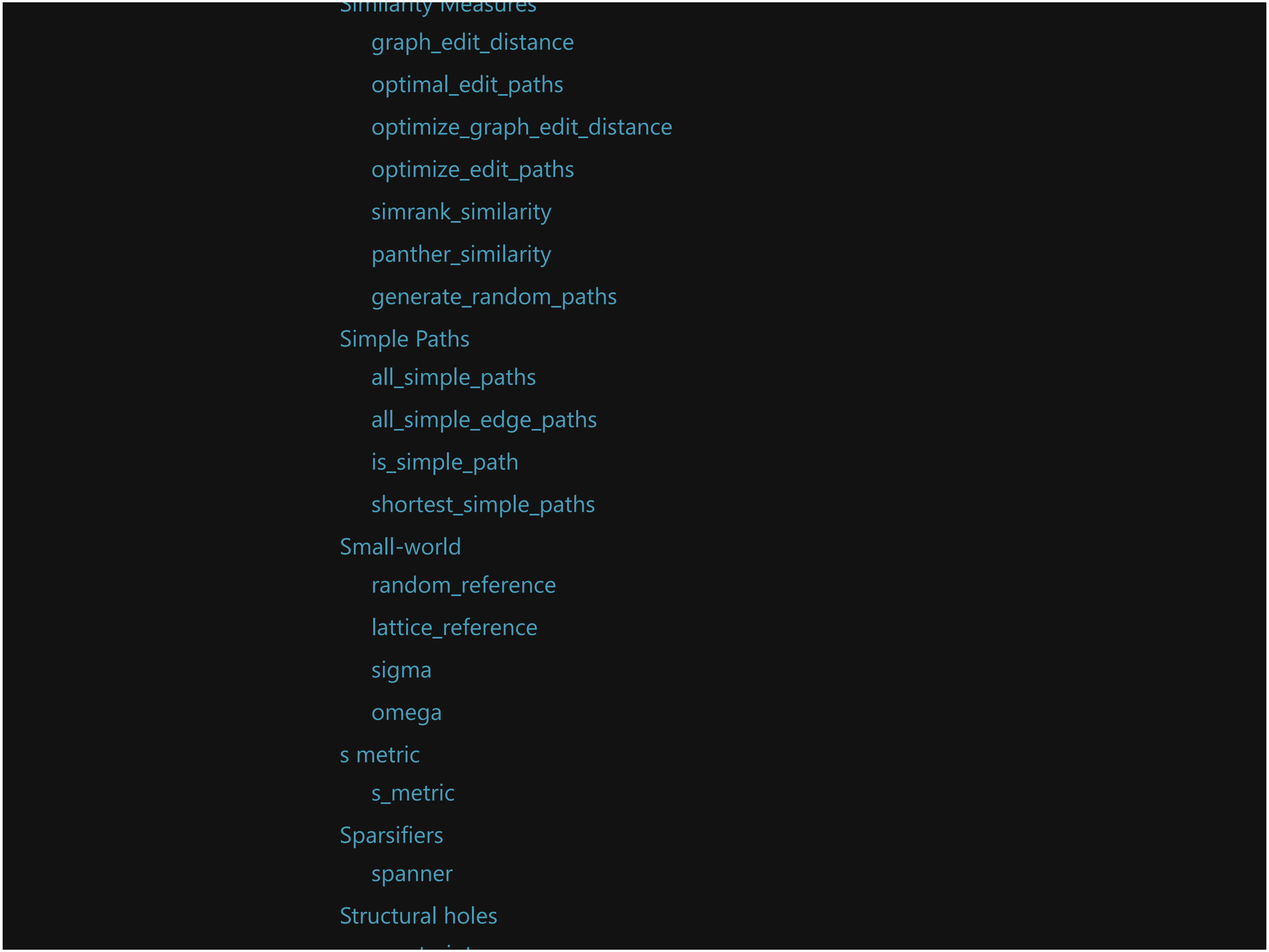

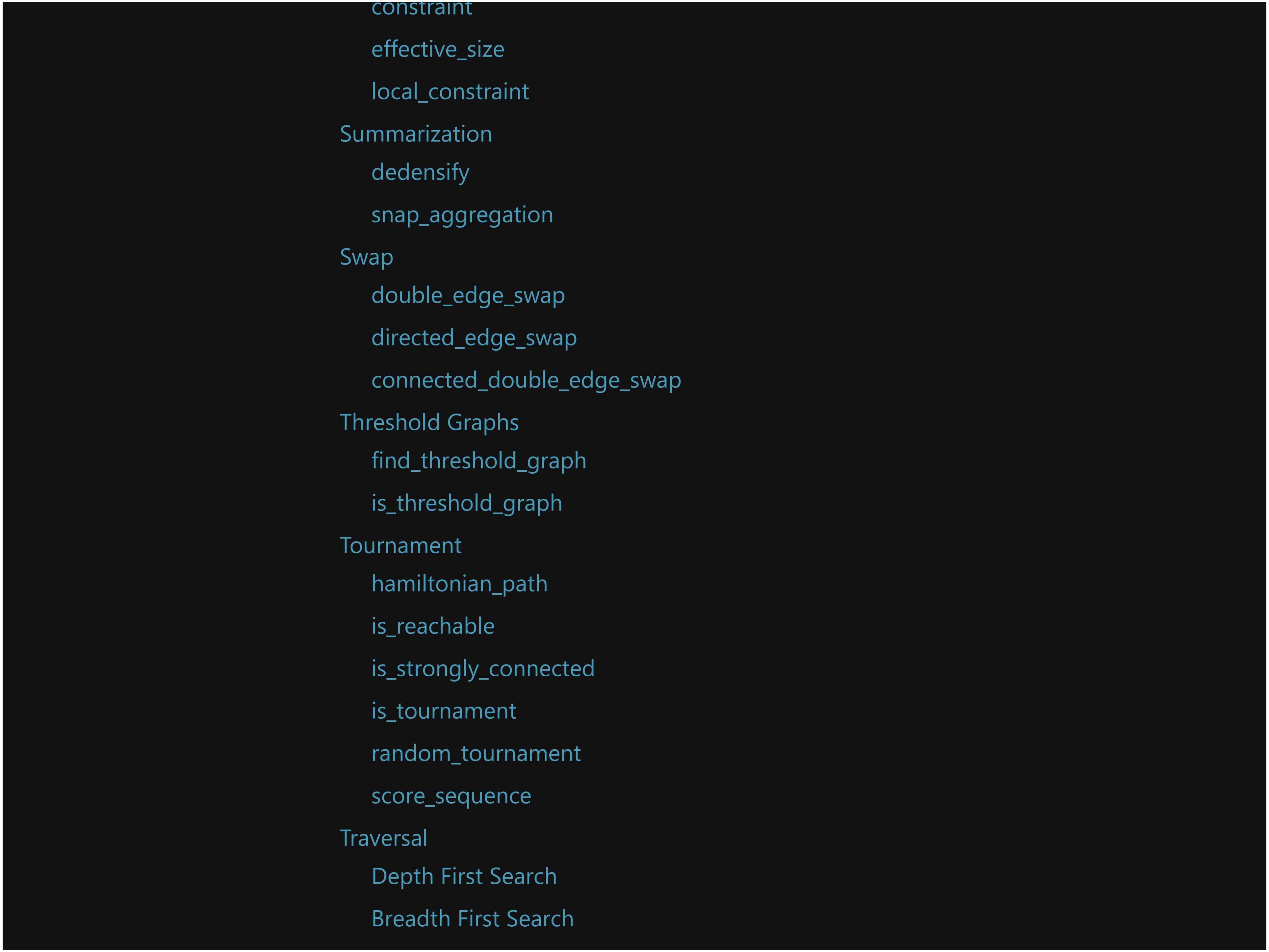

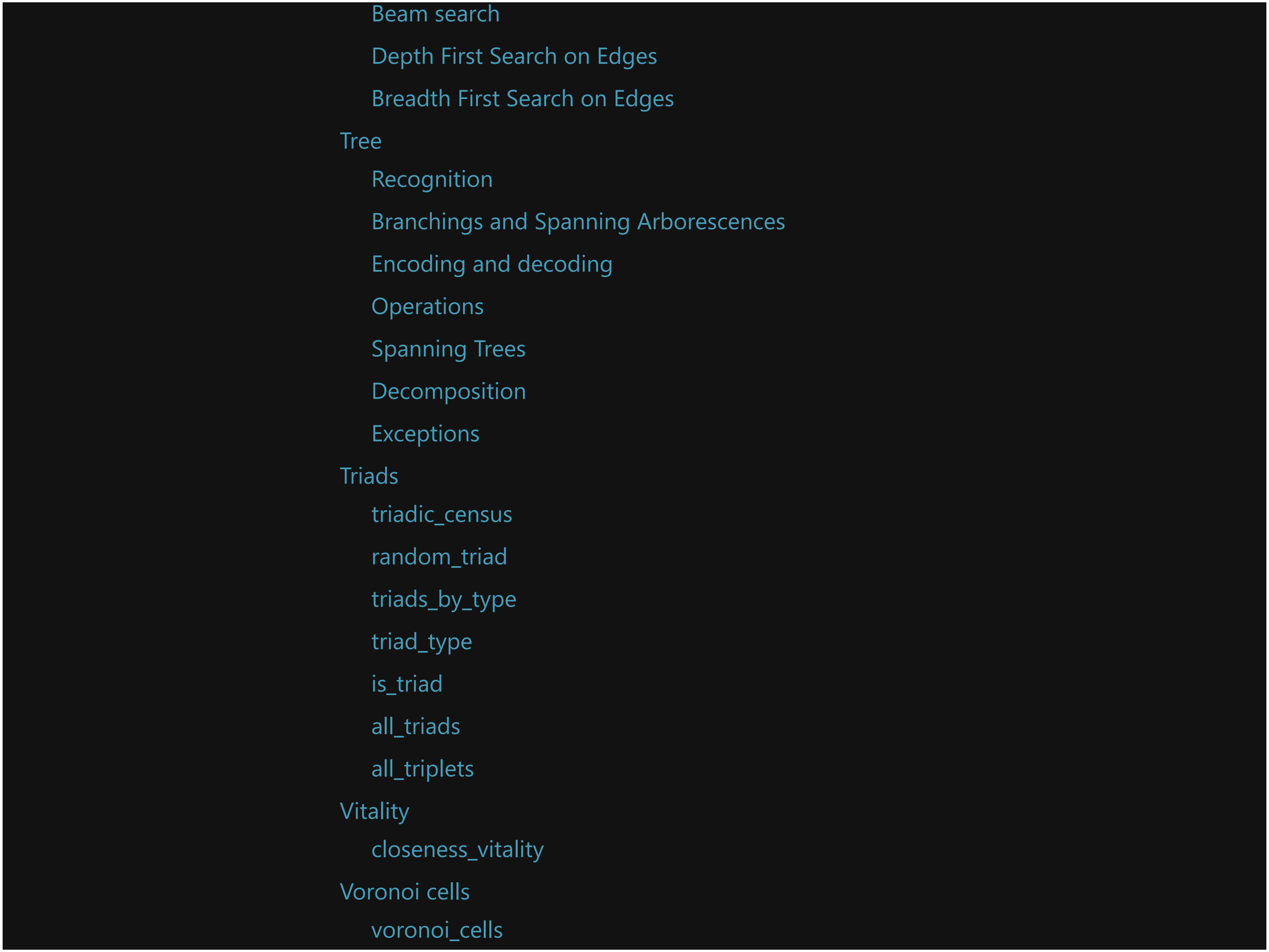

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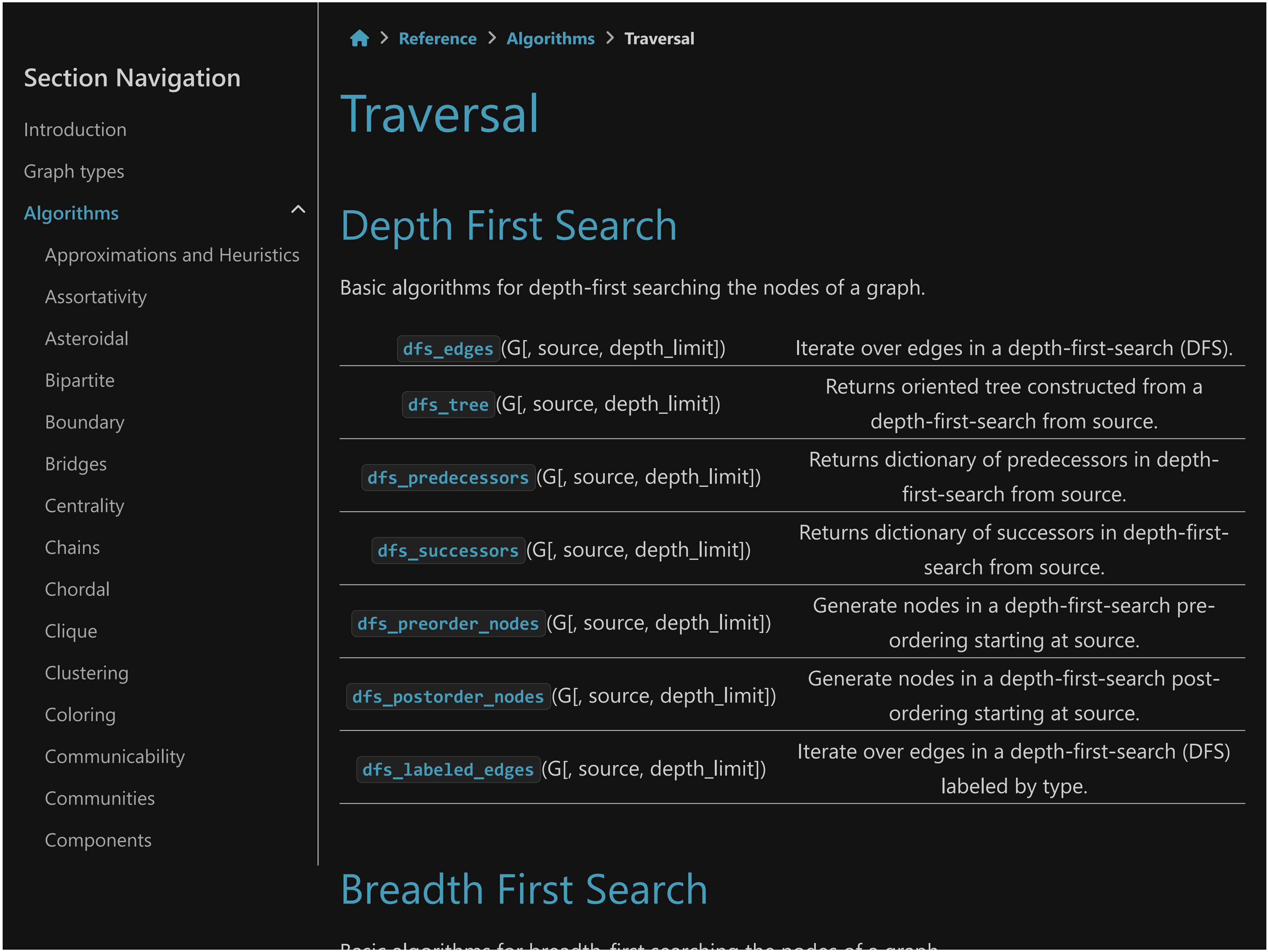

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Traversal

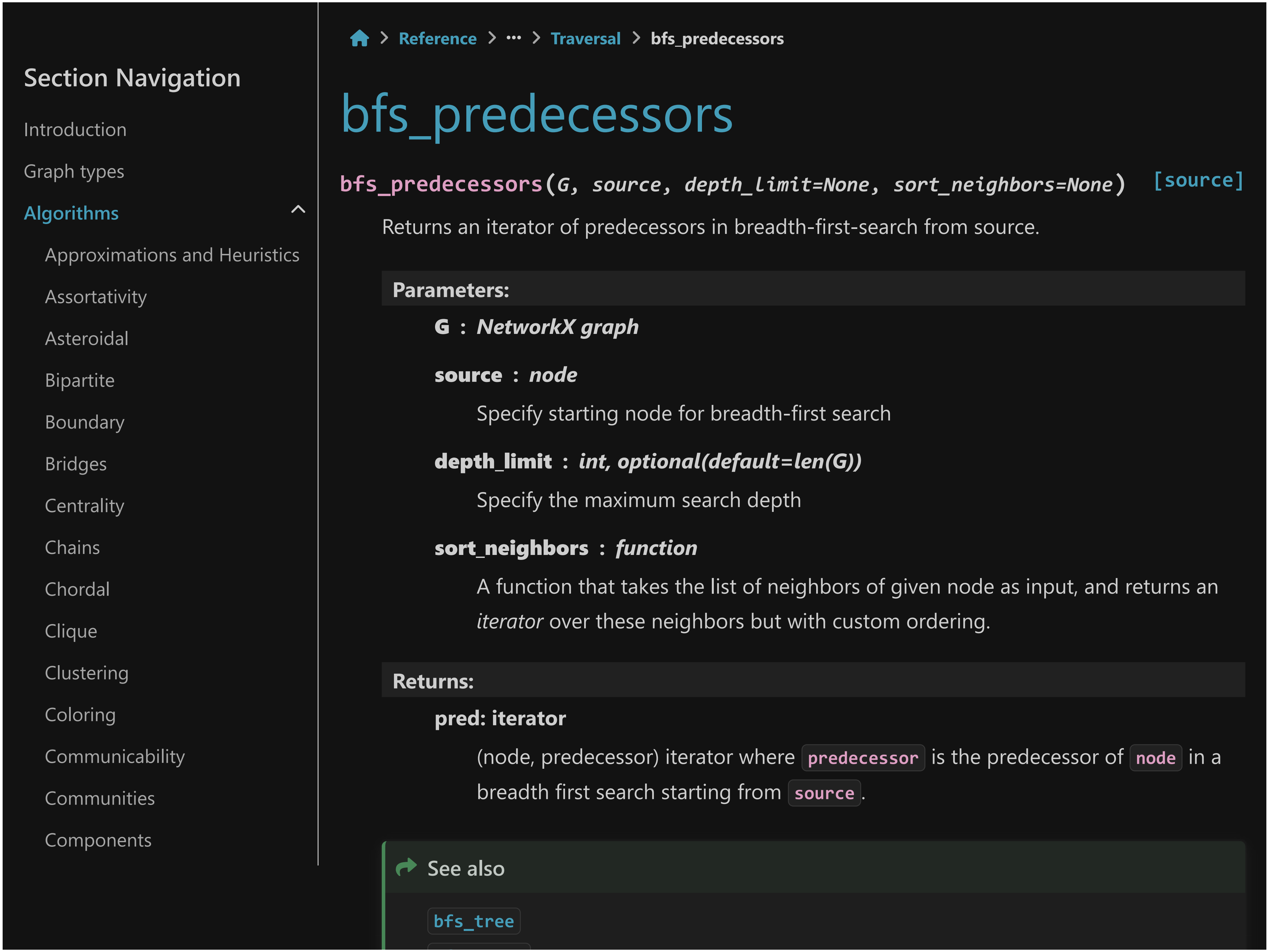
Depth First Search

Basic algorithms for depth-first searching the nodes of a graph.

`dfs_edges`(G[, source, depth_limit])	Iterate over edges in a depth-first-search (DFS).
`dfs_tree`(G[, source, depth_limit])	Returns oriented tree constructed from a depth-first-search from source.
`dfs_predecessors`(G[, source, depth_limit])	Returns dictionary of predecessors in depth-first-search from source.
`dfs_successors`(G[, source, depth_limit])	Returns dictionary of successors in depth-first-search from source.
`dfs_preorder_nodes`(G[, source, depth_limit])	Generate nodes in a depth-first-search pre-ordering starting at source.
`dfs_postorder_nodes`(G[, source, depth_limit])	Generate nodes in a depth-first-search post-ordering starting at source.
`dfs_labeled_edges`(G[, source, depth_limit])	Iterate over edges in a depth-first-search (DFS) labeled by type.

Breadth First Search

Basic algorithms for breadth-first searching the nodes of a graph.



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bfs_predecessors

`bfs_predecessors(G, source, depth_limit=None, sort_neighbors=None)` [source]

Returns an iterator of predecessors in breadth-first-search from source.

Parameters:

G : *NetworkX graph*

source : *node*

Specify starting node for breadth-first search

depth_limit : *int, optional(default=len(G))*

Specify the maximum search depth

sort_neighbors : *function*

A function that takes the list of neighbors of given node as input, and returns an *iterator* over these neighbors but with custom ordering.

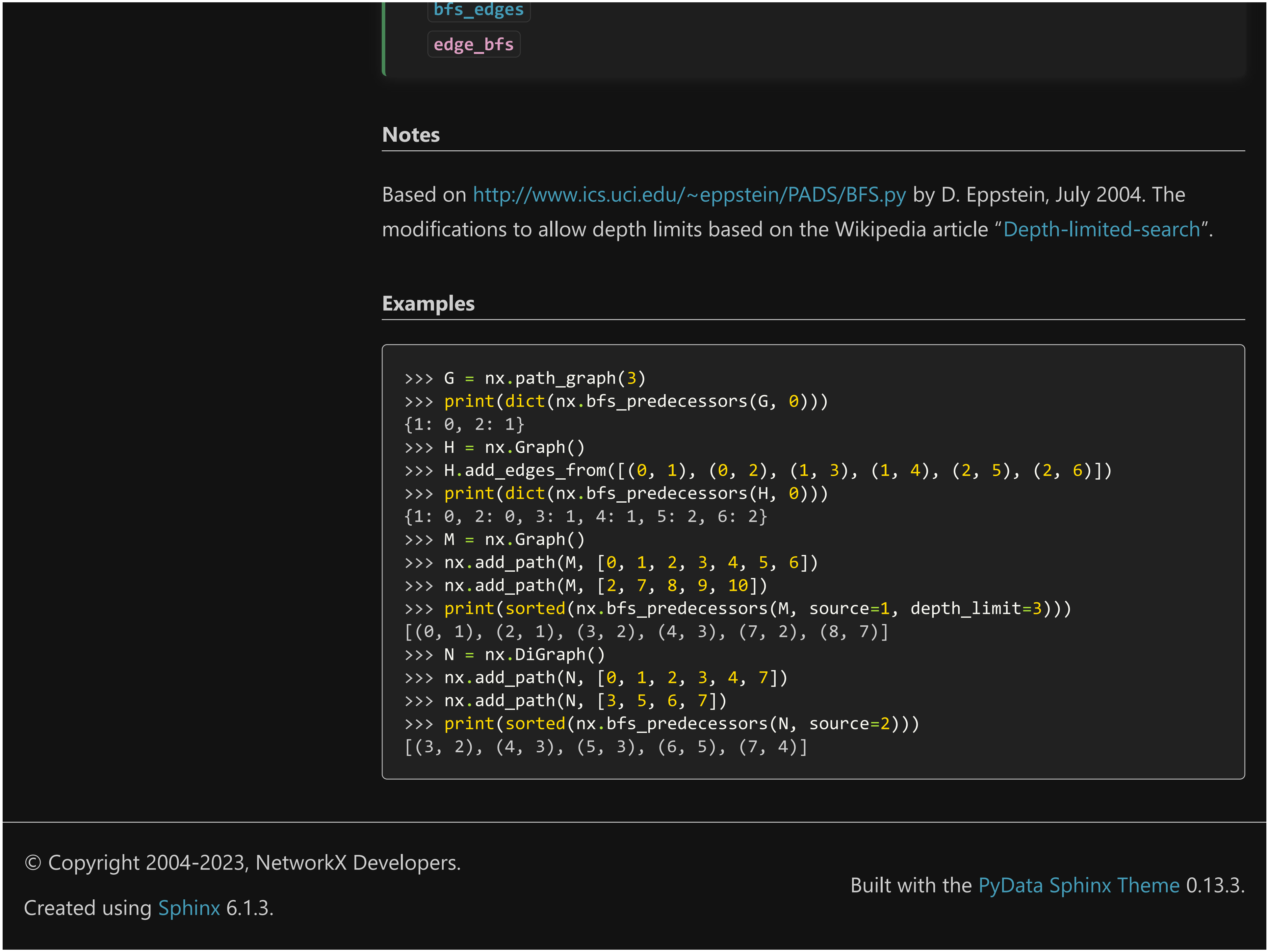
Returns:

pred: iterator

(node, predecessor) iterator where `predecessor` is the predecessor of `node` in a breadth first search starting from `source`.

See also

`bfs_tree`



`bfs_edges`

`edge_bfs`

Notes

Based on http://www.ics.uci.edu/~eppstein/PADS/BFS.py by D. Eppstein, July 2004. The modifications to allow depth limits based on the Wikipedia article “Depth-limited-search”.

Examples

```
>>> G = nx.path_graph(3)
>>> print(dict(nx.bfs_predecessors(G, 0)))
{1: 0, 2: 1}
>>> H = nx.Graph()
>>> H.add_edges_from([(0, 1), (0, 2), (1, 3), (1, 4), (2, 5), (2, 6)])
>>> print(dict(nx.bfs_predecessors(H, 0)))
{1: 0, 2: 0, 3: 1, 4: 1, 5: 2, 6: 2}
>>> M = nx.Graph()
>>> nx.add_path(M, [0, 1, 2, 3, 4, 5, 6])
>>> nx.add_path(M, [2, 7, 8, 9, 10])
>>> print(sorted(nx.bfs_predecessors(M, source=1, depth_limit=3)))
[(0, 1), (2, 1), (3, 2), (4, 3), (7, 2), (8, 7)]
>>> N = nx.DiGraph()
>>> nx.add_path(N, [0, 1, 2, 3, 4, 7])
>>> nx.add_path(N, [3, 5, 6, 7])
>>> print(sorted(nx.bfs_predecessors(N, source=2)))
[(3, 2), (4, 3), (5, 3), (6, 5), (7, 4)]
```

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