
PyGraphviz Documentation

Release 1.7.dev

PyGraphviz Developers

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DOWNLOAD

1.1 Software

Source and binary releases: <https://pypi.python.org/pypi/pygraphviz>

Github (latest development): <https://github.com/pygraphviz/pygraphviz>

1.2 Documentation

PDF

<http://pygraphviz.github.io/documentation/latest/pygraphviz.pdf>

INSTALLING

2.1 Quick Install

Get PyGraphviz from the Python Package Index at <http://pypi.python.org/pypi/pygraphviz> or install it with:

```
pip install pygraphviz
```

and an attempt will be made to find and install an appropriate version that matches your operating system and Python version.

You can install the development version (at github.com) with:

```
pip install git://github.com/pygraphviz/pygraphviz.git#egg=pygraphviz
```

2.1.1 Providing path to graphviz

We tried our best to discover graphviz location automatically, but if you would like specify specific location for graphviz you may provide additional parameters to specify graphviz location

include-path= path to graphviz include files library-path= path to graphviz library files

For example

```
python setup.py install --include-path=/usr/local/Cellar/graphviz/2.38.0/include/  
→graphviz --library-path=/usr/local/Cellar/graphviz/2.38.0/lib
```

2.2 Installing from Source

You can install from source by downloading a source archive file (tar.gz or zip) or by checking out the source files from the Subversion repository.

2.2.1 Source Archive File

1. Download the source (tar.gz or zip file).
2. Unpack and change directory to pygraphviz-“version”
3. Run “python setup.py install” to build and install
4. (optional) Run “pytest” to execute the tests

2.2.2 Github

1. Clone the pygraphviz repository

```
git clone https://github.com/pygraphviz/pygraphviz.git
```

(see <https://github.com/pygraphviz/pygraphviz/> for other options)

2. Change directory to “pygraphviz”
3. Run “python setup.py install” to build and install
4. (optional) Run “pytest” to execute the tests

If you don’t have permission to install software on your system, you can install into another directory using the `-user`, `-prefix`, or `-home` flags to `setup.py`.

For example

```
python setup.py install --prefix=/home/username/python
or
python setup.py install --home=~
or
python setup.py install --user
```

If you didn’t install in the standard Python site-packages directory you will need to set your PYTHONPATH variable to the alternate location. See <http://docs.python.org/2/install/index.html#search-path> for further details.

2.3 Requirements

2.3.1 Python

PyGraphviz is tested and works with Python 3.6, 3.7, and 3.8.

There are several other distributions that contain the key packages you need for scientific computing. See the following link for a list: <http://scipy.org/install.html>

For Red Hat Enterprise Linux 7, the requirements are:

```
sudo yum groups install -y "Development Tools"
sudo yum install -y python-devel graphviz-devel
sudo python -m pip install pytest
```


2.3.2 GraphViz

To use PyGraphviz you need GraphViz version 2.16 or later. Some versions have known bugs that have been fixed; get the latest release available for best results.

- Official site: <http://www.graphviz.org>

TUTORIAL

The API is very similar to that of NetworkX. Much of the NetworkX tutorial at <http://networkx.github.io/documentation/latest/tutorial/> is applicable to PyGraphviz. See http://pygraphviz.github.io/documentation/latest/reference/api_notes.html for major differences.

3.1 Start-up

Import PyGraphviz with

```
>>> import pygraphviz as pgv
```

or to bring into the current namespace without the “pgv” prefix

```
>>> from pygraphviz import *
```

3.2 Graphs

To make an empty pygraphviz graph use the AGraph class:

```
>>> G=pgv.AGraph()
```

You can use the strict and directed keywords to control what type of graph you want. The default is to create a strict graph (no parallel edges or self-loops). To create a digraph with possible parallel edges and self-loops use

```
>>> G=pgv.AGraph(strict=False,directed=True)
```

You may specify a dot format file to be read on initialization:

```
>>> G=pgv.AGraph("Petersen.dot")
```

Other options for initializing a graph are using a string,

```
>>> G=pgv.AGraph('graph {1 - 2}')
```

using a dict of dicts,

```
>>> d={'1': {'2': None}, '2': {'1': None, '3': None}, '3': {'2': None}}
>>> A=pgv.AGraph(d)
```

or using a SWIG pointer to the AGraph datastructure,

```
>>> h=A.handle
>>> C=pgv.AGraph(h)
```

3.3 Nodes, and edges

Nodes and edges can be added one at a time

```
>>> G.add_node('a') # adds node 'a'
>>> G.add_edge('b','c') # adds edge 'b'->'c' (and also nodes 'b', 'c')
```

or from lists or containers.

```
>>> nodelist=['f','g','h']
>>> G.add_nodes_from(nodelist)
```

If the node is not a string an attempt will be made to convert it to a string

```
>>> G.add_node(1) # adds node '1'
```

3.4 Attributes

To set the default attributes for graphs, nodes, and edges use the `graph_attr`, `node_attr`, and `edge_attr` dictionaries

```
>>> G.graph_attr['label']='Name of graph'
>>> G.node_attr['shape']='circle'
>>> G.edge_attr['color']='red'
```

Graph attributes can be set when initializing the graph

```
>>> G=pgv.AGraph(ranksep='0.1')
```

Attributes can be added when adding nodes or edges,

```
>>> G.add_node(1, color='red')
>>> G.add_edge('b','c',color='blue')
```

or through the node or edge attr dictionaries,

```
>>> n=G.get_node(1)
>>> n.attr['shape']='box'
```

```
>>> e=G.get_edge('b','c')
>>> e.attr['color']='green'
```

3.5 Layout and Drawing

Pygraphviz provides several methods for layout and drawing of graphs.

To store and print the graph in dot format as a Python string use

```
>>> s=G.string()
```

To write to a file use

```
>>> G.write("file.dot")
```

To add positions to the nodes with a Graphviz layout algorithm

```
>>> G.layout() # default to neato
>>> G.layout(prog='dot') # use dot
```

To render the graph to an image

```
>>> G.draw('file.png') # write previously positioned graph to PNG file
>>> G.draw('file.ps',prog='circo') # use circo to position, write PS file
```


REFERENCE

4.1 AGraph Class

class AGraph (*thing=None, filename=None, data=None, string=None, handle=None, name='', strict=True, directed=False, **attr*)
Class for Graphviz agraph type.

Example use

```
>>> from pygraphviz import *
>>> G=AGraph()
>>> G=AGraph(directed=True)
>>> G=AGraph("file.dot")
```

Graphviz graph keyword parameters are processed so you may add them like

```
>>> G=AGraph(landscape='true',ranksep='0.1')
```

or alternatively

```
>>> G=AGraph()
>>> G.graph_attr.update(landscape='true',ranksep='0.1')
```

and

```
>>> G.node_attr.update(color='red')
>>> G.edge_attr.update(len='2.0',color='blue')
```

See <http://www.graphviz.org/doc/info/attrs.html> for a list of attributes.

Keyword parameters:

thing is a generic input type (filename, string, handle to pointer, dictionary of dictionaries). An attempt is made to automatically detect the type so you may write for example:

```
>>> d={'1': {'2': None}, '2': {'1': None, '3': None}, '3': {'2': None}}
>>> A=AGraph(d)
>>> s=A.to_string()
>>> B=AGraph(s)
>>> h=B.handle
>>> C=AGraph(h)
```

Parameters:

```
name:      Name for the graph

strict: True|False (True for simple graphs)

directed: True|False

data: Dictionary of dictionaries or dictionary of lists
representing nodes or edges to load into initial graph

string:   String containing a dot format graph

handle:   Swig pointer to an agraph_t data structure
```

acyclic (*args='', copy=False*)

Reverse sufficient edges in digraph to make graph acyclic. Modifies existing graph.

To create a new graph use

```
>>> A=AGraph()
>>> B=A.acyclic(copy=True)
```

See the graphviz “acyclic” program for details of the algorithm.

add_cycle (*nlist*)

Add the cycle of nodes given in nlist.

add_edge (*u, v=None, key=None, **attr*)

Add a single edge between nodes u and v.

If the nodes u and v are not in the graph they will added.

If u and v are not strings, conversion to a string will be attempted. String conversion will work if u and v have valid string representation (try str(u) if you are unsure).

```
>>> G=AGraph()
>>> G.add_edge('a', 'b')
>>> G.edges()
[('a', 'b')]
```

The optional key argument allows assignment of a key to the edge. This is especially useful to distinguish between parallel edges in multi-edge graphs (strict=False).

```
>>> G=AGraph(strict=False)
>>> G.add_edge('a', 'b', 'first')
>>> G.add_edge('a', 'b', 'second')
>>> sorted(G.edges(keys=True))
[('a', 'b', 'first'), ('a', 'b', 'second')]
```

Attributes can be added when edges are created or updated after creation

```
>>> G.add_edge('a', 'b', color='green')
```

Attributes must be valid strings.

See <http://www.graphviz.org/doc/info/attrs.html> for a list of attributes.

add_edges_from (*ebunch, **attr*)

Add nodes to graph from a container ebunch.

ebunch is a container of edges such as a list or dictionary.


```
>>> G=AGraph()
>>> elist=[('a','b'),('b','c')]
>>> G.add_edges_from(elist)
```

Attributes can be added when edges are created or updated after creation

```
>>> G.add_edges_from(elist, color='green')
```

add_node (*n*, ***attr*)

Add a single node *n*.

If *n* is not a string, conversion to a string will be attempted. String conversion will work if *n* has valid string representation (try `str(n)` if you are unsure).

```
>>> G=AGraph()
>>> G.add_node('a')
>>> G.nodes()
['a']
>>> G.add_node(1) # will be converted to a string
>>> G.nodes()
['a', '1']
```

Attributes can be added to nodes on creation or updated after creation (attribute values must be strings)

```
>>> G.add_node(2, color='red')
```

See <http://www.graphviz.org/doc/info/attrs.html> for a list of attributes.

Anonymous Graphviz nodes are currently not implemented.

add_nodes_from (*nbunch*, ***attr*)

Add nodes from a container *nbunch*.

nbunch can be any iterable container such as a list or dictionary

```
>>> G=AGraph()
>>> nlist=['a','b',1,'spam']
>>> G.add_nodes_from(nlist)
>>> sorted(G.nodes())
['1', 'a', 'b', 'spam']
```

Attributes can be added to nodes on creation or updated after creation

```
>>> G.add_nodes_from(nlist, color='red') # set all nodes in nlist red
```

add_path (*nlist*)

Add the path of nodes given in *nlist*.

add_subgraph (*nbunch=None*, *name=None*, ***attr*)

Return subgraph induced by nodes in *nbunch*.

clear ()

Remove all nodes, edges, and attributes from the graph.

close ()

copy ()

Return a copy of the graph.

Versions <=1.6 made a copy by writing and the reading a dot string. This version loads a new graph with nodes, edges and attributes.

degree (*nbunch=None, with_labels=False*)

Return the degree of nodes given in nbunch container.

Using optional with_labels=True returns a dictionary keyed by node with value set to the degree.

degree_iter (*nbunch=None, indeg=True, outdeg=True*)

Return an iterator over the degree of the nodes given in nbunch container.

Returns paris of (node,degree).

delete_edge (*u, v=None, key=None*)

Remove edge between nodes u and v from the graph.

With optional key argument will only remove an edge matching (u,v,key).

delete_edges_from (*ebunch*)

Remove edges from ebunch (a container of edges).

delete_node (*n*)

Remove the single node n.

Attempting to remove a node that isn't in the graph will produce an error.

```
>>> G=AGraph()
>>> G.add_node('a')
>>> G.remove_node('a')
```

delete_nodes_from (*nbunch*)

Remove nodes from a container nbunch.

nbunch can be any iterable container such as a list or dictionary

```
>>> G=AGraph()
>>> nlist=['a','b',1,'spam']
>>> G.add_nodes_from(nlist)
>>> G.remove_nodes_from(nlist)
```

delete_subgraph (*name*)

Remove subgraph with given name.

property directed

Return True if graph is directed or False if not.

draw (*path=None, format=None, prog=None, args=''*)

Output graph to path in specified format.

An attempt will be made to guess the output format based on the file extension of *path*. If that fails, then the *format* parameter will be used.

Note, if *path* is a file object returned by a call to `os.fdopen()`, then the method for discovering the format will not work. In such cases, one should explicitly set the *format* parameter; otherwise, it will default to 'dot'.

Formats (not all may be available on every system depending on how Graphviz was built)

'canon', 'cmap', 'cmapx', 'cmapx_np', 'dia', 'dot', 'fig', 'gd', 'gd2', 'gif', 'hpgl', 'imap', 'imap_np', 'ismap', 'jpe', 'jpeg', 'jpg', 'mif', 'mp', 'pcl', 'pdf', 'pic', 'plain', 'plain-ext', 'png', 'ps', 'ps2', 'svg', 'svgz', 'vml', 'vmlz', 'vrml', 'vtx', 'wbmp', 'xdot', 'xlib'

If `prog` is not specified and the graph has positions (see `layout()`) then no additional graph positioning will be performed.

Optional `prog=['neato'|'dot'|'twopi'|'circo'|'fdp'|'nop']` will use specified graphviz layout method.

```
>>> G = AGraph()
>>> G.layout()
```

use current node positions, output ps in 'file.ps' >>> `G.draw('file.ps')`

use dot to position, output png in 'file' >>> `G.draw('file', format='png', prog='dot')`

use keyword 'args' to pass additional arguments to graphviz >>> `G.draw('test.ps', prog='twopi', args='-Gepsilon=1')`

The layout might take a long time on large graphs.

edges (*nbunch=None, keys=False*)

Return list of edges in the graph.

If the optional `nbunch` (container of nodes) only edges adjacent to nodes in `nbunch` will be returned.

```
>>> G=AGraph()
>>> G.add_edge('a', 'b')
>>> G.add_edge('c', 'd')
>>> print(sorted(G.edges()))
[('a', 'b'), ('c', 'd')]
>>> print(G.edges('a'))
[('a', 'b')]
```

edges_iter (*nbunch=None, keys=False*)

Return iterator over edges in the graph.

If the optional `nbunch` (container of nodes) only edges adjacent to nodes in `nbunch` will be returned.

Note: modifying the graph structure while iterating over edges may produce unpredictable results. Use `edges()` as an alternative.

from_string (*string*)

Load a graph from a string in dot format.

Overwrites any existing graph.

To make a new graph from a string use

```
>>> s='digraph {1 -> 2}'
>>> A=AGraph()
>>> t=A.from_string(s)
>>> A=AGraph(string=s) # specify s is a string
>>> A=AGraph(s) # s assumed to be a string during initialization
```

get_edge (*u, v, key=None*)

Return an edge object (Edge) corresponding to edge (u,v).

```
>>> G=AGraph()
>>> G.add_edge('a', 'b')
>>> edge=G.get_edge('a', 'b')
```

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```
>>> print(edge)
('a', 'b')
```

With optional key argument will only get edge matching (u,v,key).

get_name()

get_node(n)

Return a node object (Node) corresponding to node n.

```
>>> G=AGraph()
>>> G.add_node('a')
>>> node=G.get_node('a')
>>> print(node)
a
```

get_subgraph(name)

Return existing subgraph with specified name or None if it doesn't exist.

has_edge(u, v=None, key=None)

Return True an edge u-v is in the graph or False if not.

```
>>> G=AGraph()
>>> G.add_edge('a', 'b')
>>> G.has_edge('a', 'b')
True
```

Optional key argument will restrict match to edges (u,v,key).

has_neighbor(u, v, key=None)

Return True if u has an edge to v or False if not.

```
>>> G=AGraph()
>>> G.add_edge('a', 'b')
>>> G.has_neighbor('a', 'b')
True
```

Optional key argument will only find edges (u,v,key).

has_node(n)

Return True if n is in the graph or False if not.

```
>>> G=AGraph()
>>> G.add_node('a')
>>> G.has_node('a')
True
>>> 'a' in G # same as G.has_node('a')
True
```

in_degree(nbunch=None, with_labels=False)

Return the in-degree of nodes given in nbunch container.

Using optional with_labels=True returns a dictionary keyed by node with value set to the degree.

in_degree_iter(nbunch=None)

Return an iterator over the in-degree of the nodes given in nbunch container.

Returns paris of (node,degree).

in_edges (*nbunch=None, keys=False*)

Return list of in edges in the graph. If the optional nbunch (container of nodes) only in edges adjacent to nodes in nbunch will be returned.

in_edges_iter (*nbunch=None, keys=False*)

Return iterator over out edges in the graph.

If the optional nbunch (container of nodes) only out edges adjacent to nodes in nbunch will be returned.

Note: modifying the graph structure while iterating over edges may produce unpredictable results. Use `in_edges()` as an alternative.

in_neighbors (*n*)

Return list of predecessor nodes of n.

is_directed ()

Return True if graph is directed or False if not.

is_strict ()

Return True if graph is strict or False if not.

Strict graphs do not allow parallel edges or self loops.

is_undirected ()

Return True if graph is undirected or False if not.

iterdegree (*nbunch=None, indeg=True, outdeg=True*)

Return an iterator over the degree of the nodes given in nbunch container.

Returns paris of (node,degree).

iteredges (*nbunch=None, keys=False*)

Return iterator over edges in the graph.

If the optional nbunch (container of nodes) only edges adjacent to nodes in nbunch will be returned.

Note: modifying the graph structure while iterating over edges may produce unpredictable results. Use `edges()` as an alternative.

iterindegree (*nbunch=None*)

Return an iterator over the in-degree of the nodes given in nbunch container.

Returns paris of (node,degree).

iterinedges (*nbunch=None, keys=False*)

Return iterator over out edges in the graph.

If the optional nbunch (container of nodes) only out edges adjacent to nodes in nbunch will be returned.

Note: modifying the graph structure while iterating over edges may produce unpredictable results. Use `in_edges()` as an alternative.

iterneighbors (*n*)

Return iterator over the nodes attached to n.

Note: modifying the graph structure while iterating over node neighbors may produce unpredictable results. Use `neighbors()` as an alternative.

iternodes ()

Return an iterator over all the nodes in the graph.

Note: modifying the graph structure while iterating over the nodes may produce unpredictable results. Use `nodes()` as an alternative.

iteroutdegree (*nbunch=None*)

Return an iterator over the out-degree of the nodes given in `nbunch` container.

Returns paris of (node,degree).

iteroutedges (*nbunch=None, keys=False*)

Return iterator over out edges in the graph.

If the optional `nbunch` (container of nodes) only out edges adjacent to nodes in `nbunch` will be returned.

Note: modifying the graph structure while iterating over edges may produce unpredictable results. Use `out_edges()` as an alternative.

iterpred (*n*)

Return iterator over predecessor nodes of `n`.

Note: modifying the graph structure while iterating over node predecessors may produce unpredictable results. Use `predecessors()` as an alternative.

itersucc (*n*)

Return iterator over successor nodes of `n`.

Note: modifying the graph structure while iterating over node successors may produce unpredictable results. Use `successors()` as an alternative.

layout (*prog='neato', args=''*)

Assign positions to nodes in graph.

Optional `prog=['neato'|'dot'|'twopi'|'circo'|'fdp'|'nop']` will use specified graphviz layout method.

```
>>> A=AGraph()
>>> A.layout() # uses neato
>>> A.layout(prog='dot')
```

Use keyword args to add additional arguments to graphviz programs.

The layout might take a long time on large graphs.

property name

neighbors (*n*)

Return a list of the nodes attached to `n`.

neighbors_iter (*n*)

Return iterator over the nodes attached to `n`.

Note: modifying the graph structure while iterating over node neighbors may produce unpredictable results. Use `neighbors()` as an alternative.

nodes ()

Return a list of all nodes in the graph.

nodes_iter ()

Return an iterator over all the nodes in the graph.

Note: modifying the graph structure while iterating over the nodes may produce unpredictable results. Use `nodes()` as an alternative.

number_of_edges ()

Return the number of edges in the graph.

number_of_nodes ()

Return the number of nodes in the graph.

order ()

Return the number of nodes in the graph.

out_degree (*nbunch=None, with_labels=False*)

Return the out-degree of nodes given in nbunch container.

Using optional with_labels=True returns a dictionary keyed by node with value set to the degree.

out_degree_iter (*nbunch=None*)

Return an iterator over the out-degree of the nodes given in nbunch container.

Returns paris of (node,degree).

out_edges (*nbunch=None, keys=False*)

Return list of out edges in the graph.

If the optional nbunch (container of nodes) only out edges adjacent to nodes in nbunch will be returned.

out_edges_iter (*nbunch=None, keys=False*)

Return iterator over out edges in the graph.

If the optional nbunch (container of nodes) only out edges adjacent to nodes in nbunch will be returned.

Note: modifying the graph structure while iterating over edges may produce unpredictable results. Use out_edges() as an alternative.

out_neighbors (*n*)

Return list of successor nodes of n.

predecessors (*n*)

Return list of predecessor nodes of n.

predecessors_iter (*n*)

Return iterator over predecessor nodes of n.

Note: modifying the graph structure while iterating over node predecessors may produce unpredictable results. Use predecessors() as an alternative.

prepare_nbunch (*nbunch=None*)

read (*path*)

Read graph from dot format file on path.

path can be a file name or file handle

use:

```
G.read('file.dot')
```

remove_edge (*u, v=None, key=None*)

Remove edge between nodes u and v from the graph.

With optional key argument will only remove an edge matching (u,v,key).

remove_edges_from (*ebunch*)

Remove edges from ebunch (a container of edges).

remove_node (*n*)

Remove the single node *n*.

Attempting to remove a node that isn't in the graph will produce an error.

```
>>> G=AGraph()
>>> G.add_node('a')
>>> G.remove_node('a')
```

remove_nodes_from (*nbunch*)

Remove nodes from a container *nbunch*.

nbunch can be any iterable container such as a list or dictionary

```
>>> G=AGraph()
>>> nlist=['a', 'b', 1, 'spam']
>>> G.add_nodes_from(nlist)
>>> G.remove_nodes_from(nlist)
```

remove_subgraph (*name*)

Remove subgraph with given name.

reverse ()

Return copy of directed graph with edge directions reversed.

property strict

Return True if graph is strict or False if not.

Strict graphs do not allow parallel edges or self loops.

string ()

Return a string (unicode) representation of graph in dot format.

string_nop ()

Return a string (unicode) representation of graph in dot format.

subgraph (*nbunch=None, name=None, **attr*)

Return subgraph induced by nodes in *nbunch*.

subgraph_parent (*nbunch=None, name=None*)

Return parent graph of subgraph or None if graph is root graph.

subgraph_root (*nbunch=None, name=None*)

Return root graph of subgraph or None if graph is root graph.

subgraphs ()

Return a list of all subgraphs in the graph.

subgraphs_iter ()

Iterator over subgraphs.

successors (*n*)

Return list of successor nodes of *n*.

successors_iter (*n*)

Return iterator over successor nodes of *n*.

Note: modifying the graph structure while iterating over node successors may produce unpredictable results. Use `successors()` as an alternative.

to_directed (***kws*)

Return directed copy of graph.

Each undirected edge $u-v$ is represented as two directed edges $u \rightarrow v$ and $v \rightarrow u$.

to_string()

Return a string (unicode) representation of graph in dot format.

to_undirected()

Return undirected copy of graph.

tred(args='', copy=False)

Transitive reduction of graph. Modifies existing graph.

To create a new graph use

```
>>> A=AGraph()
>>> B=A.tred(copy=True)
```

See the graphviz “tred” program for details of the algorithm.

unflatten(args='')

Adjust directed graphs to improve layout aspect ratio.

```
>>> A = AGraph()
>>> A_unflattened = A.unflatten('-f -l 3')
>>> A.unflatten('-f -l 1').layout()
```

Use keyword args to add additional arguments to graphviz programs.

write(path=None)

Write graph in dot format to file on path.

path can be a file name or file handle

use:

```
G.write('file.dot')
```

4.2 FAQ

Q I followed the installation instructions but when I do

```
>>> import pygraphviz
```

I get an error like ImportError: libagraph.so.1: cannot open shared object file: No such file or directory

What is wrong?

A Some Unix systems don't include the Graphviz library in the default search path for the run-time linker. The path is often something like /usr/lib/graphviz or /sw/lib/graphviz etc. and it needs to be added to your search path. You can

1. set the LD_LIBRARY_PATH environment variable e.g. `export LD_LIBRARY_PATH=${LD_LIBRARY_PATH}:/usr/lib/graphviz`
2. configure your system with the additional path. e.g. for Linux add a line to /etc/ld.so.conf and run ldconfig

Q How do I compile pygraphviz under Windows? And why don't you distribute a pygraphviz Windows installer?

A We don't have Windows development machines but would like to have pygraphviz work on all platforms. If you have success with Windows or would be willing to help test and distribute a Windows installer please drop us a note.

See also issues at: <https://github.com/pygraphviz/pygraphviz/search?q=Windows&type=Issues>

4.3 API Notes

4.3.1 pygraphviz-1.2

No API changes

4.3.2 pygraphviz-1.1

Pygraphviz-1.1 adds unicode (graphviz charset) support. The default Node type is now unicode. See examples/utf8.py for an example of how to use non-ASCII characters.

The `__str__` and `__repr__` methods have been rewritten and a `__unicode__` method added.

If `G` is a `pygraphviz.AGraph` object then

- `str(G)` produces a dot-format string representation (some characters might not be represented correctly)
- `unicode(G)` produces a dot-format unicode representation
- `repr(G)` produces a string of the unicode representation.
- `print G` produces a formatted dot language output

4.3.3 pygraphviz-0.32

pygraphviz-0.32 is a rewrite of pygraphviz-0.2x with some significant changes in the API and Graphviz wrapper. It is not compatible with earlier versions.

The goal of pygraphviz is to provide a (mostly) Pythonic interface to the Graphviz Agraph data-structure, layout, and drawing algorithms.

The API is now similar to the NetworkX API. Studying the documentation and Tutorial for NetworkX will teach you most of what you need to know for pygraphviz. For a short introduction on pygraphviz see the pygraphviz Tutorial.

There are some important differences between the PyGraphviz and NetworkX API. With PyGraphviz

- All nodes must be of string or unicode type. An attempt will be made to convert other types to a string.
- Nodes and edges are custom Python objects. Nodes are like unicode/string objects and edges are like tuple objects. (In NetworkX nodes can be anything and edges are two- or three-tuples.)
- Graphs, edges, and nodes may have attributes such as color, size, shape, attached to them. If the attributes are known Graphviz attributes they will be used for drawing and layout.

- The `layout()` and `draw()` methods allow positioning of nodes and rendering in all of the supported Graphviz output formats.
- The `string()` method produces a string with the graph represented in Graphviz dot format. See also `from_string()`.
- The `subgraph()` method is the Graphviz representation of subgraphs: a tree of graphs under the original (root) graph. They are primarily used for clustering of nodes when drawing with dot.

Pygraphviz supports most of the Graphviz API.

4.4 News

4.4.1 pygraphviz-1.6

Release date: 05 September 2020

- Add Python 3.8 support
- Drop Python 2.7 support
- Update to SWIG 4.0.1

4.4.2 pygraphviz-1.5

Release date: 10 September 2018

- Python 3.7 support

4.4.3 pygraphviz-1.3.1

Release date: 6 September 2015

- Update manifest to include missing files

4.4.4 pygraphviz-1.3

Release date: 5 September 2015

- Python 3 support
- Encoding bugfixes

<https://github.com/pygraphviz/pygraphviz/issues?q=milestone%3Apygraphviz-1.3+is%3Aclosed>

4.4.5 pygraphviz-1.2

Release date: 3 August 2013

- Quote Graphviz program names to work with space (Windows fix)
- Keep name in reverse()

4.4.6 pygraphviz-1.1

Release date: 9 February 2011

- Added unicode support for handling non-ASCII characters
- Better handling of user data on initialization of AGraph() object to guess input type (AGraph object, file, dict-of-dicts, file)
- Add sfdp to layout options

See <https://networkx.lanl.gov/trac/query?group=status&milestone=pygraphviz-1.1>

4.4.7 pygraphviz-1.0.0

Release date: 30 July 2010

See: <https://networkx.lanl.gov/trac/timeline>

- Added to_string() and from_string methods
- Interface to graphviz “acyclic” and “tred”
- Better handling of user data on initialization of AGraph() object to guess input type (AGraph object, file, dict-of-dicts, file)
- Add handling of default attributes for subgraphs
- Improved error handling when using non-string data
- Fix bug in default attribute handling
- Make sure file handles are closed correctly

4.4.8 pygraphviz-0.99.1

Release date: 7 December 2008

See: <https://networkx.lanl.gov/trac/timeline>

- Use Graphviz libgraph instead of deprecated libagraph
- More closely match API to NetworkX
- edges() now produces two-tuples or three tuples if edges(keys=True)
- Edge and Node objects now have .name and .handle properties
- Warn without throwing exceptions for Graphviz errors
- Graph now has .strict and .directed properties
- Cleared up fontsize warnings in examples

4.4.9 pygraphviz-0.99

Release date: 18 November 2008

See: <https://networkx.lanl.gov/trac/timeline>

- New documentation at <http://networkx.lanl.gov/pygraphviz/>
- Developer's site at <https://networkx.lanl.gov/trac/wiki/PyGraphviz>

4.4.10 pygraphviz-0.37

Release date: 17 August 2008

See: <https://networkx.lanl.gov/trac/timeline>

- Handle default attributes for subgraphs, examples at <https://networkx.lanl.gov/trac/browser/pygraphviz/trunk/doc/examples/attributes.py> <https://networkx.lanl.gov/trac/browser/pygraphviz/trunk/doc/examples/subgraph.py>
- Buggy attribute assignment fixed by Graphviz team (use Graphviz>2.17.20080127)
- Encode all strings as UTF-8 as default
- Fix AGraph.clear() memory leak and attempt to address slow deletion of nodes and edges
- Allow pdf output and support all available output types on a given platform
- Fix number_of_edges() to use gv.agnedges to correctly report edges for graphs with self loops

4.4.11 pygraphviz-0.36

Release date: 13 January 2008

See: <https://networkx.lanl.gov/trac/timeline>

- Automatic handling of types on init of AGraph(data): data can be a filename, string in dot format, dictionary-of-dictionaries, or a SWIG AGraph pointer.
- Add interface to Graphviz programs acyclic and tred
- Refactor process handling to allow easier access to Graphviz layout and graph processing programs
- to_string() and from_string() methods
- Handle multiple anonymous edges correctly
- Attribute handling on add_node, add_edge and init of AGraph. So you can e.g. A=AGraph(ranksep='0.1'); A.add_node('a',color='red') A.add_edge('a','b',color='blue')

4.4.12 pygraphviz-0.35

Release date: 22 July 2007

See: <https://networkx.lanl.gov/trac/timeline>

- Rebuilt SWIG wrappers - works correctly now on 64 bit machines/python2.5
- Implement Graphviz subgraph functionality
- Better error reporting when attempting to set attributes, avoid segfault when using None

- pkg-config handling now works in more configurations (hopefully all)

4.4.13 pygraphviz-0.34

Release date: 11 April 2007

See: <https://networkx.lanl.gov/trac/timeline>

- run “python setup_egg.py test” for tests if you have setuptools
- added tests for layout code
- use pkg-config for finding graphviz (dotneato-config still works for older graphviz versions)
- use threads and temporary files for multiplatform nonblocking IO
- django example

4.4.14 pygraphviz-0.33

- Workaround for “nop” bug in graphviz-2.8, improved packaging, updated swig wrapper, better error handling.

4.4.15 pygraphviz-0.32

The release pygraphviz-0.32 is the second rewrite of the original project. It has improved attribute handling and drawing capabilities. It is not backward compatible with earlier versions. Earlier versions will always be available at the download site.

This version now inter-operates with many of the NetworkX algorithms and graph generators. See https://networkx.lanl.gov/trac/browser/networkx/trunk/doc/examples/pygraphviz_simple.py

4.5 Related Packages

- Python bindings distributed with Graphviz (graphviz-python): <http://www.graphviz.org/>
- pydot: <http://code.google.com/p/pydot/>
- mfGraph: <http://www.geocities.com/foetsch/mfgraph/index.htm>
- Yapgvb: <http://yapgvb.sourceforge.net/>

4.6 History

The original concept was developed and implemented by Manos Renieris at Brown University: <http://www.cs.brown.edu/~er/software/>

4.7 Credits

Thanks to Stephen North and the AT&T Graphviz team for creating and maintaining the Graphviz graph layout and drawing packages

Thanks to Manos Renieris for the original idea.

Thanks to the following people who have made contributions:

- Cyril Brulebois helped clean up the packaging for Debian and find bugs.
- Rene Hogendoorn developed the threads code to provide nonblocking, multiplatform IO.
- Ross Richardson suggested fixes and tested the attribute handling.
- Alexis Dinno debugged the setup and installation for OSX.
- Stefano Costa reported attribute bugs and contributed the code to run Graphviz “tred” and friends.
- Casey Deccio contributed unicode handling design and code.

4.8 Legal

4.8.1 PyGraphviz License

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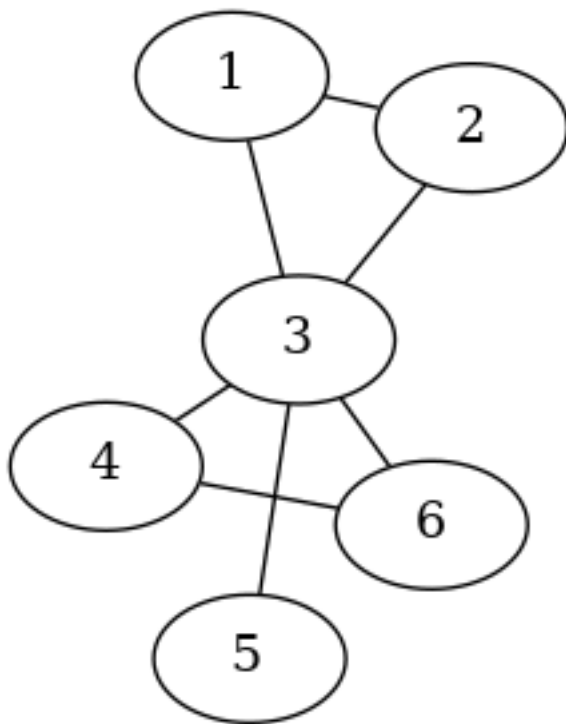
If SOFTWARE is modified to produce derivative works, such modified SOFTWARE should be clearly marked, so as not to confuse it with the version available from Los Alamos National Laboratory.

GALLERY

Graph visualization examples with pygraphviz.

5.1 Subgraph

Specify a subgraph in pygraphviz.



Out:

```
strict graph "" {
    subgraph s1 {
        graph [rank=same];
        4 -- 6;
        5;
    }
    1 -- 2;
    1 -- 3;
```

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```

2 -- 3;
3 -- 4;
3 -- 6;
3 -- 5;
}

```

```

import pygraphviz as pgv

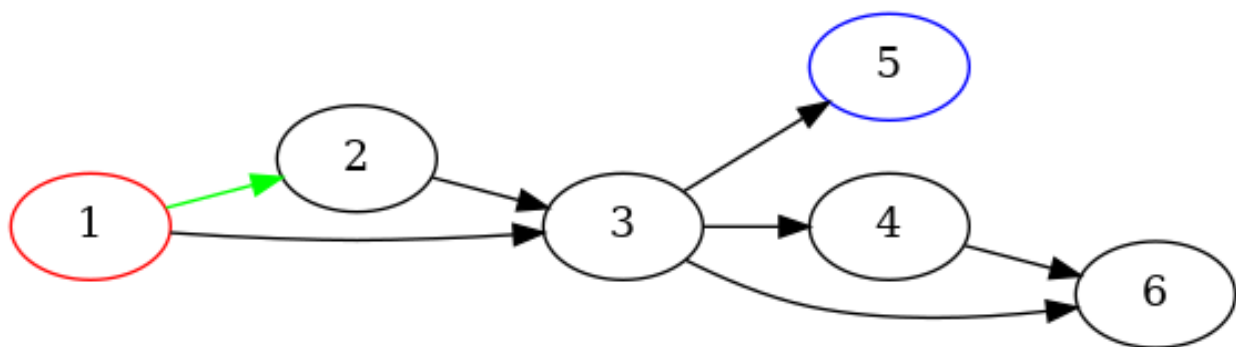
A = pgv.AGraph()
# add some edges
A.add_edge(1, 2)
A.add_edge(2, 3)
A.add_edge(1, 3)
A.add_edge(3, 4)
A.add_edge(3, 5)
A.add_edge(3, 6)
A.add_edge(4, 6)
# make a subgraph with rank='same'
B = A.add_subgraph([4, 5, 6], name="s1", rank="same")
B.graph_attr["rank"] = "same"
print(A.string()) # print dot file to standard output
A.draw("subgraph.png", prog="neato")

```

Total running time of the script: (0 minutes 0.104 seconds)

5.2 Attributes

Example illustrating how to set node, edge, and graph attributes for visualization.



Out:

```

strict digraph "" {
    graph [epsilon=0.001,
          rankdir=LR
    ];
    1      [color=red];

```

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```
1 -> 2 [color=green];
1 -> 3;
2 -> 3;
5 [color=blue];
3 -> 5;
3 -> 4;
3 -> 6;
4 -> 6;
}
```

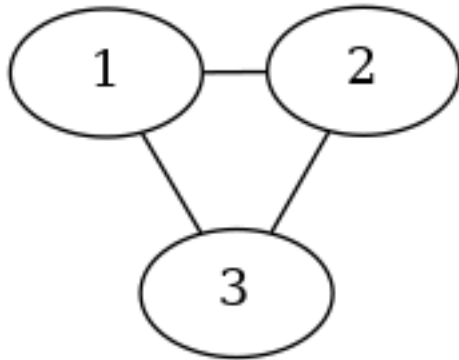
```
import pygraphviz as pgv

# strict (no parallel edges)
# digraph
# with attribute rankdir set to 'LR'
A = pgv.AGraph(directed=True, strict=True, rankdir="LR")
# add node 1 with color red
A.add_node(1, color="red")
A.add_node(5, color="blue")
# add some edges
A.add_edge(1, 2, color="green")
A.add_edge(2, 3)
A.add_edge(1, 3)
A.add_edge(3, 4)
A.add_edge(3, 5)
A.add_edge(3, 6)
A.add_edge(4, 6)
# adjust a graph parameter
A.graph_attr["epsilon"] = "0.001"
print(A.string()) # print dot file to standard output
A.layout("dot") # layout with dot
A.draw("foo.png") # write to file
```

Total running time of the script: (0 minutes 0.094 seconds)

5.3 Basic

A simple example to create a graphviz dot file and draw a graph.



Out:

```
strict graph "" {
    1 -- 2;
    1 -- 3;
    2 -- 3;
}
```

```
# Copyright (C) 2006 by
# Aric Hagberg <hagberg@lanl.gov>
# Dan Schult <dschult@colgate.edu>
# Manos Renieris, http://www.cs.brown.edu/~er/
# Distributed with BSD license.
# All rights reserved, see LICENSE for details.

__author__ = """Aric Hagberg (hagberg@lanl.gov)"""

import pygraphviz as pgv

A = pgv.AGraph()

A.add_edge(1, 2)
A.add_edge(2, 3)
A.add_edge(1, 3)

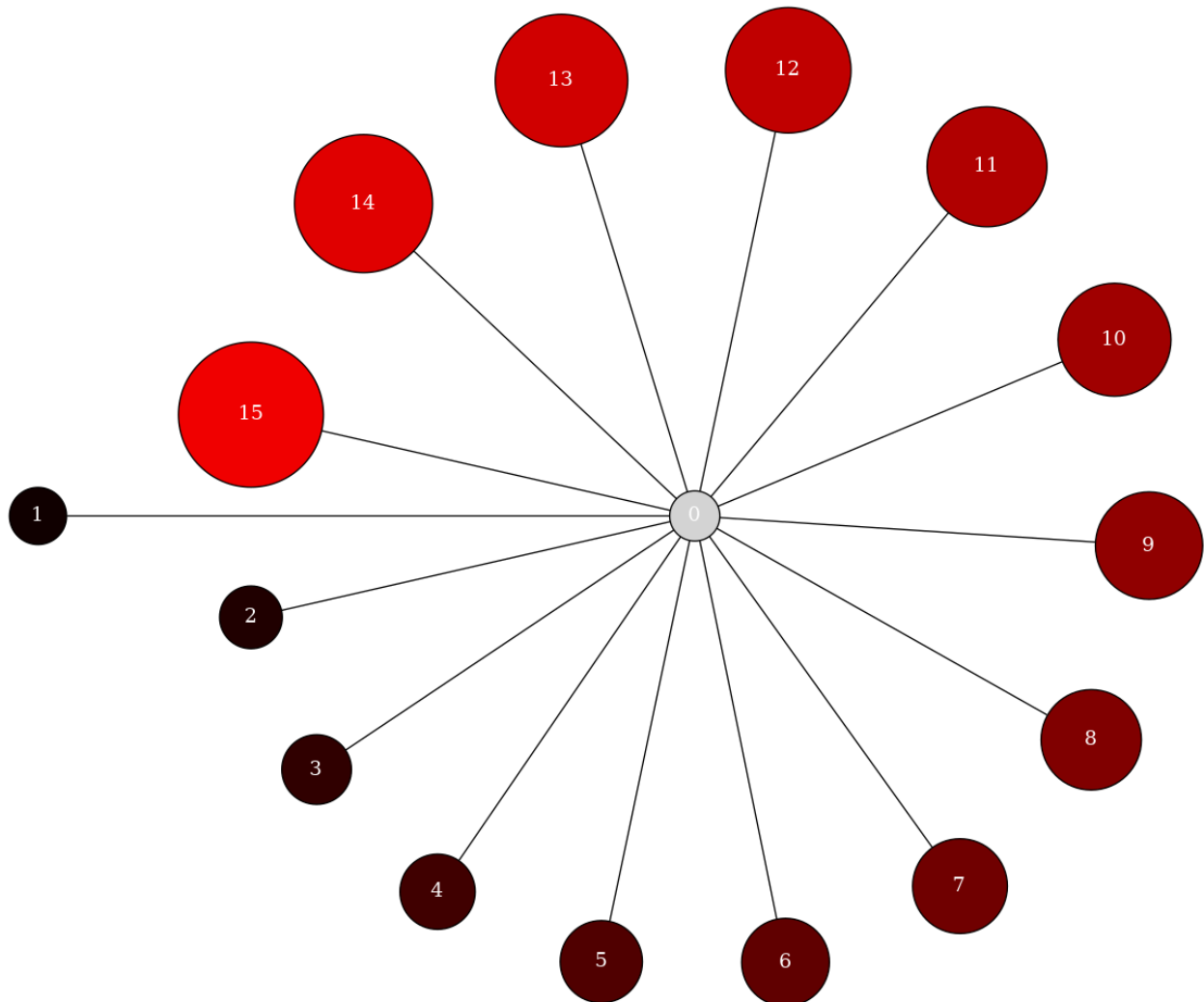
print(A.string()) # print to screen
A.write("simple.dot") # write to simple.dot

B = pgv.AGraph("simple.dot") # create a new graph from file
B.layout() # layout with default (neato)
B.draw("simple.png") # draw png
```

Total running time of the script: (0 minutes 0.090 seconds)

5.4 Star

Create and draw a star with varying node properties.



Out:

```
strict graph "" {
    node [fixedsize=true,
          fontcolor="#FFFFFF",
          shape=circle,
          style=filled
    ];
    1 [fillcolor="#100000",
      height=0.5625,
      width=0.5625];
    0 -- 1;
    2 [fillcolor="#200000",
      height=0.625,
      width=0.625];
    0 -- 2;
    3 [fillcolor="#300000",
```

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```
        height=0.6875,
        width=0.6875];
0 -- 3;
4      [fillcolor="#400000",
        height=0.75,
        width=0.75];
0 -- 4;
5      [fillcolor="#500000",
        height=0.8125,
        width=0.8125];
0 -- 5;
6      [fillcolor="#600000",
        height=0.875,
        width=0.875];
0 -- 6;
7      [fillcolor="#700000",
        height=0.9375,
        width=0.9375];
0 -- 7;
8      [fillcolor="#800000",
        height=1.0,
        width=1.0];
0 -- 8;
9      [fillcolor="#900000",
        height=1.0625,
        width=1.0625];
0 -- 9;
10     [fillcolor="#a00000",
        height=1.125,
        width=1.125];
0 -- 10;
11     [fillcolor="#b00000",
        height=1.1875,
        width=1.1875];
0 -- 11;
12     [fillcolor="#c00000",
        height=1.25,
        width=1.25];
0 -- 12;
13     [fillcolor="#d00000",
        height=1.3125,
        width=1.3125];
0 -- 13;
14     [fillcolor="#e00000",
        height=1.375,
        width=1.375];
0 -- 14;
15     [fillcolor="#f00000",
        height=1.4375,
        width=1.4375];
0 -- 15;
}
```

```

# Copyright (C) 2006 by
# Aric Hagberg <hagberg@lanl.gov>
# Dan Schult <dschult@colgate.edu>
# Manos Renieris, http://www.cs.brown.edu/~er/
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# All rights reserved, see LICENSE for details.

__author__ = """Aric Hagberg (hagberg@lanl.gov)"""

from pygraphviz import *

A = AGraph()

# set some default node attributes
A.node_attr["style"] = "filled"
A.node_attr["shape"] = "circle"
A.node_attr["fixedsize"] = "true"
A.node_attr["fontcolor"] = "#FFFFFF"

# make a star in shades of red
for i in range(1, 16):
    A.add_edge(0, i)
    n = A.get_node(i)
    n.attr["fillcolor"] = "#%2x0000" % (i * 16)
    n.attr["height"] = "%s" % (i / 16.0 + 0.5)
    n.attr["width"] = "%s" % (i / 16.0 + 0.5)

print(A.string()) # print to screen
A.write("star.dot") # write to simple.dot
A.draw("star.png", prog="circo") # draw to png using circo layout

```

Total running time of the script: (0 minutes 0.172 seconds)

5.5 Knuth Miles

An example that shows how to add your own positions to nodes and have graphviz “neato” position the edges.

miles_graph() returns an undirected graph over the 128 US cities from the datafile miles_dat.txt.

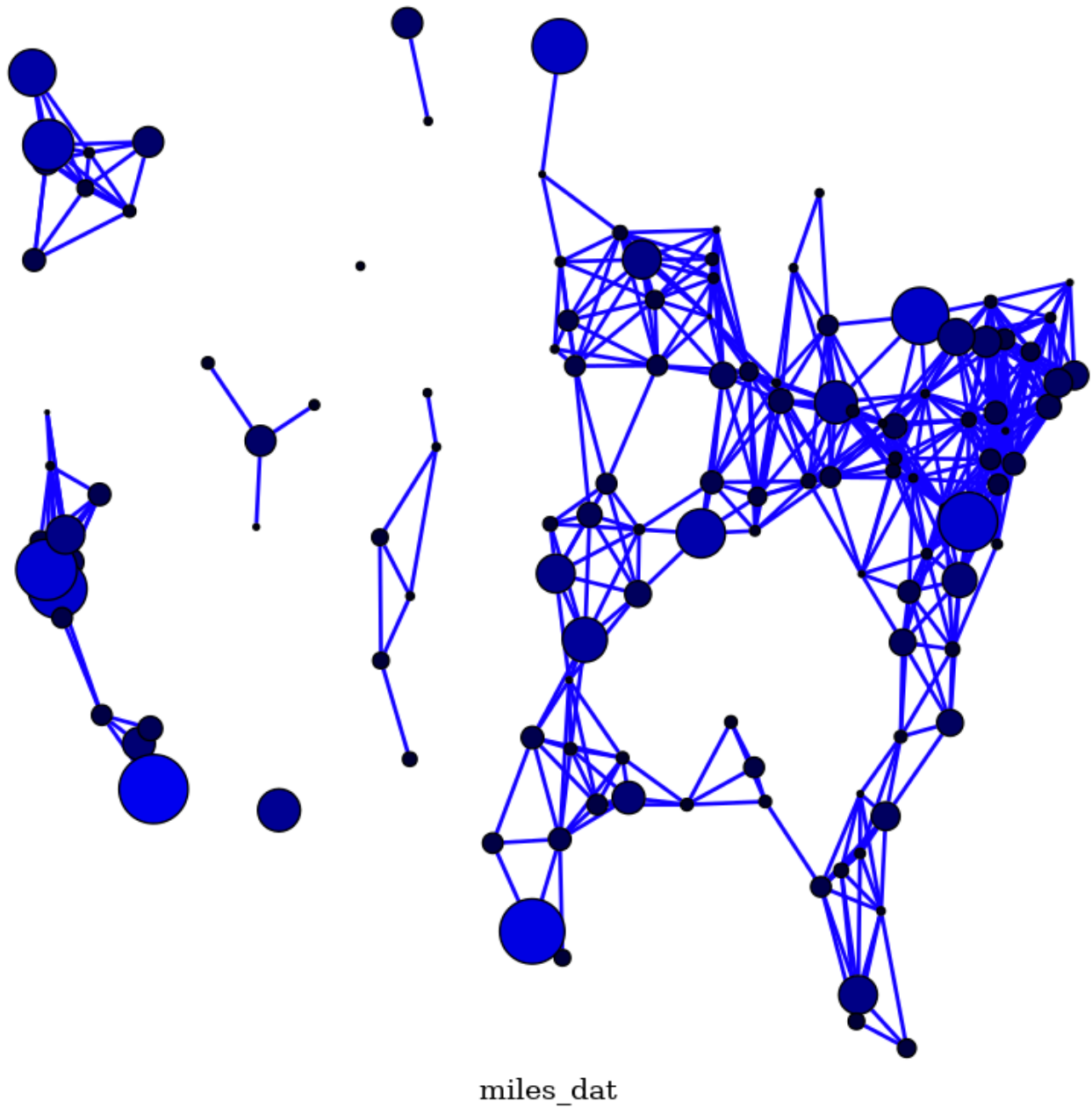
This example is described in Section 1.1 in Knuth’s book¹².

The data used in this example is copied from². The filename and header have been modified to adhere to the request of the author to not corrupt the original source file content and name.

¹ Donald E. Knuth, “The Stanford GraphBase: A Platform for Combinatorial Computing”, ACM Press, New York, 1993.

² <http://www-cs-faculty.stanford.edu/~knuth/sgb.html>

5.5.1 References.



Out:

```
Loaded miles_dat.txt containing 128 cities.  
Wrote miles.dot  
Wrote miles.png
```



```

__author__ = """Aric Hagberg (aric.hagberg@gmail.com)"""

def miles_graph():
    """Return a graph from the data in miles_dat.txt.

    Edges are made between cities that are less then 300 miles apart.
    """
    import math
    import re
    import gzip

    G = pgv.AGraph(name="miles_dat")
    G.node_attr["shape"] = "circle"
    G.node_attr["fixedsize"] = "true"
    G.node_attr["fontsize"] = "8"
    G.node_attr["style"] = "filled"
    G.graph_attr["outputorder"] = "edgesfirst"
    G.graph_attr["label"] = "miles_dat"
    G.graph_attr["ratio"] = "1.0"
    G.edge_attr["color"] = "#1100FF"
    G.edge_attr["style"] = "setlinewidth(2)"

    cities = []
    for line in gzip.open("miles_dat.txt.gz", "rt"):
        if line.startswith("#"): # skip comments
            continue
        numfind = re.compile(r"^\d+")

        if numfind.match(line): # this line is distances
            dist = line.split()
            for d in dist:
                if float(d) < 300: # connect if closer then 300 miles
                    G.add_edge(city, cities[i])
                    i = i + 1
        else: # this line is a city, position, population
            i = 1
            (city, coordpop) = line.split("(")
            cities.insert(0, city)
            (coord, pop) = coordpop.split("]")
            (y, x) = coord.split(",")
            G.add_node(city)
            n = G.get_node(city)
            # assign positions, scale to be something reasonable in points
            n.attr["pos"] = "%f,%f" % (
                -(float(x) - 7000) / 10.0,
                (float(y) - 2000) / 10.0,
            )
            # assign node size, in sqrt of 1,000,000's of people
            d = math.sqrt(float(pop) / 1000000.0)
            n.attr["height"] = "%s" % (d / 2)
            n.attr["width"] = "%s" % (d / 2)
            # assign node color
            n.attr["fillcolor"] = "#0000%2x" % (int(d * 256))
            # empty labels
            n.attr["label"] = " "

```

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```
    return G

if __name__ == "__main__":
    import warnings
    import pygraphviz as pgv

    # ignore Graphviz warning messages
    warnings.simplefilter("ignore", RuntimeWarning)

    G = miles_graph()
    print("Loaded miles_dat.txt containing 128 cities.")

    G.write("miles.dot")
    print("Wrote miles.dot")
    G.draw("miles.png", prog="neato", args="-n2")
    print("Wrote miles.png")
```

Total running time of the script: (0 minutes 0.159 seconds)

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