

# Installation of NumPy

```
In [3]: pip install jupyterlab
```

```
Requirement already satisfied: jupyterlab in /opt/anaconda3/lib/python3.12/site-packages (4.2.5)
Requirement already satisfied: async-lru>=1.0.0 in /opt/anaconda3/lib/python3.12/site-packages (from jupyterlab) (2.0.4)
Requirement already satisfied: httpx>=0.25.0 in /opt/anaconda3/lib/python3.12/site-packages (from jupyterlab) (0.27.0)
Requirement already satisfied: ipykernel>=6.5.0 in /opt/anaconda3/lib/python3.12/site-packages (from jupyterlab) (6.28.0)
Requirement already satisfied: jinja2>=3.0.3 in /opt/anaconda3/lib/python3.12/site-packages (from jupyterlab) (3.1.4)
Requirement already satisfied: jupyter-core in /opt/anaconda3/lib/python3.12/site-packages (from jupyterlab) (5.7.2)
Requirement already satisfied: jupyter-lsp>=2.0.0 in /opt/anaconda3/lib/python3.12/site-packages (from jupyterlab) (2.2.0)
Requirement already satisfied: jupyter-server<3,>=2.4.0 in /opt/anaconda3/lib/python3.12/site-packages (from jupyterlab) (2.14.1)
Requirement already satisfied: jupyterlab-server<3,>=2.27.1 in /opt/anaconda3/lib/python3.12/site-packages (from jupyterlab) (2.27.3)
Requirement already satisfied: notebook-shim>=0.2 in /opt/anaconda3/lib/python3.12/site-packages (from jupyterlab) (0.2.3)
Requirement already satisfied: packaging in /opt/anaconda3/lib/python3.12/site-packages (from jupyterlab) (24.1)
Requirement already satisfied: setuptools>=40.1.0 in /opt/anaconda3/lib/python3.12/site-packages (from jupyterlab) (75.1.0)
Requirement already satisfied: tornado>=6.2.0 in /opt/anaconda3/lib/python3.12/site-packages (from jupyterlab) (6.4.1)
Requirement already satisfied: traitlets in /opt/anaconda3/lib/python3.12/site-packages (from jupyterlab) (5.14.3)
Requirement already satisfied: anyio in /opt/anaconda3/lib/python3.12/site-packages (from httpx>=0.25.0->jupyterlab) (4.2.0)
Requirement already satisfied: certifi in /opt/anaconda3/lib/python3.12/site-packages (from httpx>=0.25.0->jupyterlab) (2024.8.30)
Requirement already satisfied: httpcore==1.* in /opt/anaconda3/lib/python3.12/site-packages (from httpx>=0.25.0->jupyterlab) (1.0.2)
Requirement already satisfied: idna in /opt/anaconda3/lib/python3.12/site-packages (from httpx>=0.25.0->jupyterlab) (3.7)
Requirement already satisfied: sniffio in /opt/anaconda3/lib/python3.12/site-packages (from httpx>=0.25.0->jupyterlab) (1.3.0)
Requirement already satisfied: h11<0.15,>=0.13 in /opt/anaconda3/lib/python3.12/site-packages (from httpcore==1.*->httpx>=0.25.0->jupyterlab) (0.14.0)
Requirement already satisfied: appnope in /opt/anaconda3/lib/python3.12/site-packages (from ipykernel>=6.5.0->jupyterlab) (0.1.3)
Requirement already satisfied: comm>=0.1.1 in /opt/anaconda3/lib/python3.12/site-packages (from ipykernel>=6.5.0->jupyterlab) (0.2.1)
Requirement already satisfied: debugpy>=1.6.5 in /opt/anaconda3/lib/python
```

3.12/site-packages (from ipykernel>=6.5.0->jupyterlab) (1.6.7)  
Requirement already satisfied: ipython>=7.23.1 in /opt/anaconda3/lib/python3.12/site-packages (from ipykernel>=6.5.0->jupyterlab) (8.27.0)  
Requirement already satisfied: jupyter-client>=6.1.12 in /opt/anaconda3/lib/python3.12/site-packages (from ipykernel>=6.5.0->jupyterlab) (8.6.0)  
Requirement already satisfied: matplotlib-inline>=0.1 in /opt/anaconda3/lib/python3.12/site-packages (from ipykernel>=6.5.0->jupyterlab) (0.1.6)  
Requirement already satisfied: nest-asyncio in /opt/anaconda3/lib/python3.12/site-packages (from ipykernel>=6.5.0->jupyterlab) (1.6.0)  
Requirement already satisfied: psutil in /opt/anaconda3/lib/python3.12/site-packages (from ipykernel>=6.5.0->jupyterlab) (5.9.0)  
Requirement already satisfied: pyzmq>=24 in /opt/anaconda3/lib/python3.12/site-packages (from ipykernel>=6.5.0->jupyterlab) (25.1.2)  
Requirement already satisfied: MarkupSafe>=2.0 in /opt/anaconda3/lib/python3.12/site-packages (from jinja2>=3.0.3->jupyterlab) (2.1.3)  
Requirement already satisfied: platformdirs>=2.5 in /opt/anaconda3/lib/python3.12/site-packages (from jupyter-core->jupyterlab) (3.10.0)  
Requirement already satisfied: argon2-cffi>=21.1 in /opt/anaconda3/lib/python3.12/site-packages (from jupyter-server<3,>=2.4.0->jupyterlab) (21.3.0)  
Requirement already satisfied: jupyter-events>=0.9.0 in /opt/anaconda3/lib/python3.12/site-packages (from jupyter-server<3,>=2.4.0->jupyterlab) (0.10.0)  
Requirement already satisfied: jupyter-server-terminals>=0.4.4 in /opt/anaconda3/lib/python3.12/site-packages (from jupyter-server<3,>=2.4.0->jupyterlab) (0.4.4)  
Requirement already satisfied: nbconvert>=6.4.4 in /opt/anaconda3/lib/python3.12/site-packages (from jupyter-server<3,>=2.4.0->jupyterlab) (7.16.4)  
Requirement already satisfied: nbformat>=5.3.0 in /opt/anaconda3/lib/python3.12/site-packages (from jupyter-server<3,>=2.4.0->jupyterlab) (5.10.4)  
Requirement already satisfied: overrides>=5.0 in /opt/anaconda3/lib/python3.12/site-packages (from jupyter-server<3,>=2.4.0->jupyterlab) (7.4.0)  
Requirement already satisfied: prometheus-client>=0.9 in /opt/anaconda3/lib/python3.12/site-packages (from jupyter-server<3,>=2.4.0->jupyterlab) (0.14.1)  
Requirement already satisfied: send2trash>=1.8.2 in /opt/anaconda3/lib/python3.12/site-packages (from jupyter-server<3,>=2.4.0->jupyterlab) (1.8.2)  
Requirement already satisfied: terminado>=0.8.3 in /opt/anaconda3/lib/python3.12/site-packages (from jupyter-server<3,>=2.4.0->jupyterlab) (0.17.1)  
Requirement already satisfied: websocket-client>=1.7 in /opt/anaconda3/lib/python3.12/site-packages (from jupyter-server<3,>=2.4.0->jupyterlab) (1.8.0)  
Requirement already satisfied: babel>=2.10 in /opt/anaconda3/lib/python3.12/site-packages (from jupyterlab-server<3,>=2.27.1->jupyterlab) (2.11.0)  
Requirement already satisfied: json5>=0.9.0 in /opt/anaconda3/lib/python3.12/site-packages (from jupyterlab-server<3,>=2.27.1->jupyterlab) (0.9.6)  
Requirement already satisfied: jsonschema>=4.18.0 in /opt/anaconda3/lib/python3.12/site-packages (from jupyterlab-server<3,>=2.27.1->jupyterlab) (4.23.0)  
Requirement already satisfied: requests>=2.31 in /opt/anaconda3/lib/python3.12/site-packages (from jupyterlab-server<3,>=2.27.1->jupyterlab) (2.32.3)  
Requirement already satisfied: argon2-cffi-bindings in /opt/anaconda3/lib/python3.12/site-packages (from argon2-cffi>=21.1->jupyter-server<3,>=2.4.0

->jupyterlab) (21.2.0)  
Requirement already satisfied: pytz>=2015.7 in /opt/anaconda3/lib/python3.12/site-packages (from babel>=2.1.0->jupyterlab-server<3,>=2.27.1->jupyterlab) (2024.1)  
Requirement already satisfied: decorator in /opt/anaconda3/lib/python3.12/site-packages (from ipython>=7.23.1->ipykernel>=6.5.0->jupyterlab) (5.1.1)  
Requirement already satisfied: jedi>=0.16 in /opt/anaconda3/lib/python3.12/site-packages (from ipython>=7.23.1->ipykernel>=6.5.0->jupyterlab) (0.19.1)  
Requirement already satisfied: prompt-toolkit<3.1.0,>=3.0.41 in /opt/anaconda3/lib/python3.12/site-packages (from ipython>=7.23.1->ipykernel>=6.5.0->jupyterlab) (3.0.43)  
Requirement already satisfied: pygments>=2.4.0 in /opt/anaconda3/lib/python3.12/site-packages (from ipython>=7.23.1->ipykernel>=6.5.0->jupyterlab) (2.15.1)  
Requirement already satisfied: stack-data in /opt/anaconda3/lib/python3.12/site-packages (from ipython>=7.23.1->ipykernel>=6.5.0->jupyterlab) (0.2.0)  
Requirement already satisfied: pexpect>4.3 in /opt/anaconda3/lib/python3.12/site-packages (from ipython>=7.23.1->ipykernel>=6.5.0->jupyterlab) (4.8.0)  
Requirement already satisfied: attrs>=22.2.0 in /opt/anaconda3/lib/python3.12/site-packages (from jsonschema>=4.18.0->jupyterlab-server<3,>=2.27.1->jupyterlab) (23.1.0)  
Requirement already satisfied: jsonschema-specifications>=2023.03.6 in /opt/anaconda3/lib/python3.12/site-packages (from jsonschema>=4.18.0->jupyterlab-server<3,>=2.27.1->jupyterlab) (2023.7.1)  
Requirement already satisfied: referencing>=0.28.4 in /opt/anaconda3/lib/python3.12/site-packages (from jsonschema>=4.18.0->jupyterlab-server<3,>=2.27.1->jupyterlab) (0.30.2)  
Requirement already satisfied: rpds-py>=0.7.1 in /opt/anaconda3/lib/python3.12/site-packages (from jsonschema>=4.18.0->jupyterlab-server<3,>=2.27.1->jupyterlab) (0.10.6)  
Requirement already satisfied: python-dateutil>=2.8.2 in /opt/anaconda3/lib/python3.12/site-packages (from jupyter-client>=6.1.12->ipykernel>=6.5.0->jupyterlab) (2.9.0.post0)  
Requirement already satisfied: python-json-logger>=2.0.4 in /opt/anaconda3/lib/python3.12/site-packages (from jupyter-events>=0.9.0->jupyter-server<3,>=2.4.0->jupyterlab) (2.0.7)  
Requirement already satisfied: pyyaml>=5.3 in /opt/anaconda3/lib/python3.12/site-packages (from jupyter-events>=0.9.0->jupyter-server<3,>=2.4.0->jupyterlab) (6.0.1)  
Requirement already satisfied: rfc3339-validator in /opt/anaconda3/lib/python3.12/site-packages (from jupyter-events>=0.9.0->jupyter-server<3,>=2.4.0->jupyterlab) (0.1.4)  
Requirement already satisfied: rfc3986-validator>=0.1.1 in /opt/anaconda3/lib/python3.12/site-packages (from jupyter-events>=0.9.0->jupyter-server<3,>=2.4.0->jupyterlab) (0.1.1)  
Requirement already satisfied: beautifulsoup4 in /opt/anaconda3/lib/python3.12/site-packages (from nbconvert>=6.4.4->jupyter-server<3,>=2.4.0->jupyterlab) (4.12.3)  
Requirement already satisfied: bleach!=5.0.0 in /opt/anaconda3/lib/python3.12/site-packages (from nbconvert>=6.4.4->jupyter-server<3,>=2.4.0->jupyterlab)

erlab) (4.1.0)

Requirement already satisfied: defusedxml in /opt/anaconda3/lib/python3.12/site-packages (from nbconvert>=6.4.4->jupyter-server<3,>=2.4.0->jupyterlab) (0.7.1)

Requirement already satisfied: jupyterlab-pygments in /opt/anaconda3/lib/python3.12/site-packages (from nbconvert>=6.4.4->jupyter-server<3,>=2.4.0->jupyterlab) (0.1.2)

Requirement already satisfied: mistune<4,>=2.0.3 in /opt/anaconda3/lib/python3.12/site-packages (from nbconvert>=6.4.4->jupyter-server<3,>=2.4.0->jupyterlab) (2.0.4)

Requirement already satisfied: nbclient>=0.5.0 in /opt/anaconda3/lib/python3.12/site-packages (from nbconvert>=6.4.4->jupyter-server<3,>=2.4.0->jupyterlab) (0.8.0)

Requirement already satisfied: pandocfilters>=1.4.1 in /opt/anaconda3/lib/python3.12/site-packages (from nbconvert>=6.4.4->jupyter-server<3,>=2.4.0->jupyterlab) (1.5.0)

Requirement already satisfied: tinycss2 in /opt/anaconda3/lib/python3.12/site-packages (from nbconvert>=6.4.4->jupyter-server<3,>=2.4.0->jupyterlab) (1.2.1)

Requirement already satisfied: fastjsonschema>=2.15 in /opt/anaconda3/lib/python3.12/site-packages (from nbformat>=5.3.0->jupyter-server<3,>=2.4.0->jupyterlab) (2.16.2)

Requirement already satisfied: charset-normalizer<4,>=2 in /opt/anaconda3/lib/python3.12/site-packages (from requests>=2.31->jupyterlab-server<3,>=2.27.1->jupyterlab) (3.3.2)

Requirement already satisfied: urllib3<3,>=1.21.1 in /opt/anaconda3/lib/python3.12/site-packages (from requests>=2.31->jupyterlab-server<3,>=2.27.1->jupyterlab) (2.2.3)

Requirement already satisfied: ptyprocess in /opt/anaconda3/lib/python3.12/site-packages (from terminado>=0.8.3->jupyter-server<3,>=2.4.0->jupyterlab) (0.7.0)

Requirement already satisfied: six>=1.9.0 in /opt/anaconda3/lib/python3.12/site-packages (from bleach!=5.0.0->nbconvert>=6.4.4->jupyter-server<3,>=2.4.0->jupyterlab) (1.16.0)

Requirement already satisfied: webencodings in /opt/anaconda3/lib/python3.12/site-packages (from bleach!=5.0.0->nbconvert>=6.4.4->jupyter-server<3,>=2.4.0->jupyterlab) (0.5.1)

Requirement already satisfied: parso<0.9.0,>=0.8.3 in /opt/anaconda3/lib/python3.12/site-packages (from jedi>=0.16->ipython>=7.23.1->ipykernel>=6.5.0->jupyterlab) (0.8.3)

Collecting fqdn (from jsonschema[format-nongpl]>=4.18.0->jupyter-events>=0.9.0->jupyter-server<3,>=2.4.0->jupyterlab)

Downloading fqdn-1.5.1-py3-none-any.whl.metadata (1.4 kB)

Collecting isoduration (from jsonschema[format-nongpl]>=4.18.0->jupyter-events>=0.9.0->jupyter-server<3,>=2.4.0->jupyterlab)

Downloading isoduration-20.11.0-py3-none-any.whl.metadata (5.7 kB)

Requirement already satisfied: jsonpointer>1.13 in /opt/anaconda3/lib/python3.12/site-packages (from jsonschema[format-nongpl]>=4.18.0->jupyter-events>=0.9.0->jupyter-server<3,>=2.4.0->jupyterlab) (2.1)

Collecting uri-template (from jsonschema[format-nongpl]>=4.18.0->jupyter-events>=0.9.0->jupyter-server<3,>=2.4.0->jupyterlab)

Downloading uri-template-1.3.0-py3-none-any.whl.metadata (8.8 kB)

Collecting webcolors>=24.6.0 (from jsonschema[format-nongpl]>=4.18.0->jupyterlab)

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ter-events>=0.9.0->jupyter-server<3,>=2.4.0->jupyterlab)
  Downloading webcolors-24.11.1-py3-none-any.whl.metadata (2.2 kB)
Requirement already satisfied: wcwidth in /opt/anaconda3/lib/python3.12/site-packages (from prompt-toolkit<3.1.0,>=3.0.41->ipython>=7.23.1->ipykernel>=6.5.0->jupyterlab) (0.2.5)
Requirement already satisfied: cffi>=1.0.1 in /opt/anaconda3/lib/python3.12/site-packages (from argon2-cffi-bindings->argon2-cffi>=21.1->jupyter-server<3,>=2.4.0->jupyterlab) (1.17.1)
Requirement already satisfied: soupsieve>1.2 in /opt/anaconda3/lib/python3.12/site-packages (from beautifulsoup4->nbconvert>=6.4.4->jupyter-server<3,>=2.4.0->jupyterlab) (2.5)
Requirement already satisfied: executing in /opt/anaconda3/lib/python3.12/site-packages (from stack-data->ipython>=7.23.1->ipykernel>=6.5.0->jupyterlab) (0.8.3)
Requirement already satisfied: asttokens in /opt/anaconda3/lib/python3.12/site-packages (from stack-data->ipython>=7.23.1->ipykernel>=6.5.0->jupyterlab) (2.0.5)
Requirement already satisfied: pure-eval in /opt/anaconda3/lib/python3.12/site-packages (from stack-data->ipython>=7.23.1->ipykernel>=6.5.0->jupyterlab) (0.2.2)
Requirement already satisfied: pycparser in /opt/anaconda3/lib/python3.12/site-packages (from cffi>=1.0.1->argon2-cffi-bindings->argon2-cffi>=21.1->jupyter-server<3,>=2.4.0->jupyterlab) (2.21)
Requirement already satisfied: arrow>=0.15.0 in /opt/anaconda3/lib/python3.12/site-packages (from isoduration->jsonschema[format-nongpl]>=4.18.0->jupyter-events>=0.9.0->jupyter-server<3,>=2.4.0->jupyterlab) (1.2.3)
Downloading webcolors-24.11.1-py3-none-any.whl (14 kB)
Downloading fqdn-1.5.1-py3-none-any.whl (9.1 kB)
Downloading isoduration-20.11.0-py3-none-any.whl (11 kB)
Downloading uri_template-1.3.0-py3-none-any.whl (11 kB)
Installing collected packages: webcolors, uri-template, fqdn, isoduration
Successfully installed fqdn-1.5.1 isoduration-20.11.0 uri-template-1.3.0 webcolors-24.11.1
Note: you may need to restart the kernel to use updated packages.

```

```
In [1]: pip -V
```

```

pip 24.2 from /opt/anaconda3/lib/python3.12/site-packages/pip (python 3.12)
Note: you may need to restart the kernel to use updated packages.

```

```
In [1]: !pip install numpy
```

```

Requirement already satisfied: numpy in /opt/anaconda3/lib/python3.12/site-packages (1.26.4)

```

```
In [3]: numpy -V
```

```

-
NameError                                Traceback (most recent call las
t)
Cell In[3], line 1
----> 1 numpy -V

NameError: name 'numpy' is not defined

```

```
In [7]: !pip freeze
```

```

aext-assistant @ file:///private/var/folders/c_/qfmhj66j0tn016nkx_th4hxm00
00gp/T/abs_24994515xd/croot/aext-assistant_1717062163042/work
aext-assistant-server @ file:///private/var/folders/sy/f16zz6x50xz3113nwtb
9bvq00000gp/T/abs_4boob09gv8/croot/aext-assistant-server_1717059973985/wor
k
aext-core @ file:///private/var/folders/sy/f16zz6x50xz3113nwtb9bvq00000gp/
T/abs_3etmw5tx6d/croot/aext-core_1717056386167/work
aext-core-server @ file:///private/var/folders/c_/qfmhj66j0tn016nkx_th4hxm
0000gp/T/abs_68sv0mesk_/croot/aext-core-server_1717075032630/work
aext-panels @ file:///private/var/folders/c_/qfmhj66j0tn016nkx_th4hxm0000g
p/T/abs_892vjkd1/croot/aext-panels_1717062179502/work
aext-panels-server @ file:///private/var/folders/c_/qfmhj66j0tn016nkx_th4h
xm0000gp/T/abs_7cdpxd64im/croot/aext-panels-server_1717060126704/work
aext-share-notebook @ file:///private/var/folders/sy/f16zz6x50xz3113nwtb9b
vq00000gp/T/abs_e5jlgef0/croot/aext-share-notebook_1717059291973/work
aext-share-notebook-server @ file:///private/var/folders/sy/f16zz6x50xz311
3nwtb9bvq00000gp/T/abs_9fjepxgus_/croot/aext-share-notebook-server_1717057
945219/work
aext-shared @ file:///private/var/folders/sy/f16zz6x50xz3113nwtb9bvq00000g
p/T/abs_b8kj3d7nes/croot/aext-shared_1716991096609/work
aiobotocore @ file:///private/var/folders/sy/f16zz6x50xz3113nwtb9bvq00000g
p/T/abs_d5vpncfh71/croot/aiobotocore_1714464397445/work
aiohappyeyeballs @ file:///private/var/folders/c_/qfmhj66j0tn016nkx_th4hxm
0000gp/T/abs_15gsua8xj2/croot/aiohappyeyeballs_1725434021301/work
aiohttp @ file:///private/var/folders/sy/f16zz6x50xz3113nwtb9bvq00000gp/T/
abs_09lqy3yoen/croot/aiohttp_1725527765804/work
aioitertools @ file:///tmp/build/80754af9/aioitertools_1607109665762/work
aiosignal @ file:///tmp/build/80754af9/aiosignal_1637843061372/work
alabaster @ file:///private/var/folders/c_/qfmhj66j0tn016nkx_th4hxm0000gp/
T/abs_fadeblw4_u/croot/alabaster_1718201487017/work
altair @ file:///Users/builder/cbouss/perseverance-python-buildout/croot/a
ltair_1699283258090/work
anaconda-anon-usage @ file:///private/var/folders/sy/f16zz6x50xz3113nwtb9b
vq00000gp/T/abs_b9r8fbjsvb/croot/anaconda-anon-usage_1710965086703/work
anaconda-catalogs @ file:///Users/builder/cbouss/perseverance-python-build
out/croot/anaconda-catalogs_1707347535535/work
anaconda-client @ file:///private/var/folders/c_/qfmhj66j0tn016nkx_th4hxm0
000gp/T/abs_4b0movhtkt/croot/anaconda-client_1708643341618/work
anaconda-cloud-auth @ file:///private/var/folders/sy/f16zz6x50xz3113nwtb9b
vq00000gp/T/abs_2fcwl3hx32/croot/anaconda-cloud-auth_1713991390572/work
anaconda-navigator @ file:///private/var/folders/c_/qfmhj66j0tn016nkx_th4h
xm0000gp/T/abs_f16zd04fsw/croot/anaconda-navigator_1727709709743/work
anaconda-project @ file:///private/var/folders/sy/f16zz6x50xz3113nwtb9bvq0

```

0000gp/T/abs\_12\_wppfswu/croot/anaconda-project\_1706049206816/work  
annotated-types @ file:///private/var/folders/c\_/qfmhj66j0tn016nkx\_th4hxm0  
000gp/T/abs\_fbh4enbns2/croot/annotated-types\_1709542919423/work  
anyio @ file:///private/var/folders/c\_/qfmhj66j0tn016nkx\_th4hxm0000gp/T/ab  
s\_646d7rz2z6/croot/anyio\_1706220176177/work  
appdirs==1.4.4  
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9160/work
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PyQtWebEngine==5.15.6
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tenacity @ file:///private/var/folders/sy/f16zz6x50xz3113nwtb9bvq00000gp/T/abs\_29tpjkynmo/croot/tenacity\_1721222515217/work  
terminado @ file:///Users/builder/cbouss/perseverance-python-buildout/croot/terminado\_1699284203253/work  
text-unidecode @ file:///Users/ktietz/demo/mc3/conda-bld/text-unidecode\_1629401354553/work  
textdistance @ file:///tmp/build/80754af9/textdistance\_1612461398012/work  
threadpoolctl @ file:///private/var/folders/c/\_qfmhj66j0tn016nkx\_th4hxm00000gp/T/abs\_83z9rmqojb/croot/threadpoolctl\_1719407811780/work  
three-merge @ file:///tmp/build/80754af9/three-merge\_1607553261110/work  
tiffiff @ file:///Users/builder/cbouss/perseverance-python-buildout/croot/tiffiff\_1699250821262/work  
tinycss2 @ file:///Users/builder/cbouss/perseverance-python-buildout/croot/tinycss2\_1699262458881/work  
tldextract @ file:///private/var/folders/c/\_qfmhj66j0tn016nkx\_th4hxm00000gp/T/abs\_e1yx82kx3f/croot/tldextract\_1723064390847/work  
toml @ file:///tmp/build/80754af9/toml\_1616166611790/work  
tomli @ file:///Users/builder/cbouss/perseverance-python-buildout/croot/tomli\_1699238675700/work  
tomlkit @ file:///Users/builder/cbouss/perseverance-python-buildout/croot/tomlkit\_1699241429121/work  
toolz @ file:///Users/builder/cbouss/perseverance-python-buildout/croot/toolz\_1699240342066/work  
tornado @ file:///private/var/folders/c/\_qfmhj66j0tn016nkx\_th4hxm00000gp/T/abs\_7e0ruwlfec/croot/tornado\_1718740118099/work  
tqdm @ file:///private/var/folders/c/\_qfmhj66j0tn016nkx\_th4hxm00000gp/T/abs\_5akmb2c3eu/croot/tqdm\_1724853941623/work  
traitlets @ file:///private/var/folders/sy/f16zz6x50xz3113nwtb9bvq00000gp/T/abs\_f49losghmg/croot/traitlets\_1718227069025/work  
truststore @ file:///Users/builder/cbouss/perseverance-python-buildout/croot/truststore\_1701811390284/work  
Twisted @ file:///private/var/folders/c/\_qfmhj66j0tn016nkx\_th4hxm00000gp/T/abs\_1ci0\_ly4iu/croot/twisted\_1708705445231/work  
typing\_extensions @ file:///private/var/folders/c/\_qfmhj66j0tn016nkx\_th4hxm00000gp/T/abs\_0b3pj9yhn2/croot/typing\_extensions\_1715268854415/work  
tzdata @ file:///croot/python-tzdata\_1690578112552/work  
uc-micro-py @ file:///Users/builder/cbouss/perseverance-python-buildout/croot/uc-micro-py\_1699262916237/work  
ujson @ file:///private/var/folders/c/\_qfmhj66j0tn016nkx\_th4hxm00000gp/T/abs\_s\_285w4aewnz/croot/ujson\_1717597803207/work  
unicodedata2 @ file:///private/var/folders/sy/f16zz6x50xz3113nwtb9bvq00000gp/T/abs\_1anajuo38r/croot/unicodedata2\_1713212953928/work  
Unidecode @ file:///private/var/folders/sy/f16zz6x50xz3113nwtb9bvq00000gp/T/abs\_aacp17wle0/croot/unidecode\_1724790053243/work  
uri-template==1.3.0  
urllib3 @ file:///private/var/folders/c/\_qfmhj66j0tn016nkx\_th4hxm00000gp/T/abs\_7dvsr0a5y0/croot/urllib3\_1727769823716/work  
w3lib @ file:///Users/builder/cbouss/perseverance-python-buildout/croot/w3lib\_1709225391438/work

```

watchdog @ file:///Users/builder/cbouss/crwatchdog/watchdog_1717165253549/work
wcwidth @ file:///Users/ktietz/demo/mc3/conda-bld/wcwidth_1629357192024/work
webcolors==24.11.1
webencodings @ file:///Users/builder/cbouss/perseverance-python-buildout/croot/webencodings_1699250987289/work
websocket-client @ file:///private/var/folders/c_/qfmhj66j0tn016nkx_th4hxm0000gp/T/abs_8c3cjp8r36/croot/websocket-client_1715878317325/work
Werkzeug @ file:///private/var/folders/sy/f16zz6x50xz3113nwtb9bvq0000gp/T/abs_53yi9ymayw/croot/werkzeug_1716533323400/work
whatthepatch @ file:///Users/builder/cbouss/perseverance-python-buildout/croot/whatthepatch_1699251044124/work
wheel==0.44.0
widgetsnextension @ file:///private/var/folders/c_/qfmhj66j0tn016nkx_th4hxm0000gp/T/abs_55iz0tfo89/croot/widgetsnextension_1710960056659/work
wrapt @ file:///Users/builder/cbouss/perseverance-python-buildout/croot/wrapt_1699245094349/work
wurlitzer @ file:///Users/builder/cbouss/perseverance-python-buildout/croot/wurlitzer_1699296593258/work
xarray @ file:///Users/builder/cbouss/perseverance-python-buildout/croot/xarray_1699245129880/work
xlwings @ file:///private/var/folders/c_/qfmhj66j0tn016nkx_th4hxm0000gp/T/abs_838do436jw/croot/xlwings_1725400106901/work
xyzservices @ file:///Users/builder/cbouss/perseverance-python-buildout/croot/xyzservices_1699251070342/work
yapf @ file:///private/var/folders/sy/f16zz6x50xz3113nwtb9bvq0000gp/T/abs_eaaxlq87mt/croot/yapf_1708964321438/work
yarl @ file:///private/var/folders/sy/f16zz6x50xz3113nwtb9bvq0000gp/T/abs_e1e9t55odx/croot/yarl_1725976505882/work
zict @ file:///Users/builder/cbouss/perseverance-python-buildout/croot/zict_1699263607025/work
zipp @ file:///Users/builder/cbouss/perseverance-python-buildout/croot/zipp_1707361439201/work
zope.interface @ file:///Users/builder/cbouss/perseverance-python-buildout/croot/zope.interface_1699251096669/work
zstandard @ file:///private/var/folders/sy/f16zz6x50xz3113nwtb9bvq0000gp/T/abs_2bqnms2ngq/croot/zstandard_1728569218033/work

```

```
In [9]: import numpy
```

```
In [11]: arr = numpy.array([1,2,3,4,5])
         print(arr)
```

```
[1 2 3 4 5]
```

## NumPy as np

```
In [14]: import numpy as np
```

```
In [16]: arr = np.array([1,2,3,4,5])
```

```
print(arr)
```

```
[1 2 3 4 5]
```

```
In [20]: np.__version__
```

```
Out[20]: '1.26.4'
```

## Create a NumPy ndarray Object

```
In [23]: arr = np.array([1,2,3,4,5])  
print(arr)  
print(type(arr))
```

```
[1 2 3 4 5]
```

```
<class 'numpy.ndarray'>
```

**we can pass a list, tuple or any array-like object into the array()**

```
In [26]: arr = np.array((1,2,3,4))  
print(arr)
```

```
[1 2 3 4]
```

```
In [28]: print(type(arr))
```

```
<class 'numpy.ndarray'>
```

## 0-D Arrays

```
In [31]: arr = np.array(42)  
print(arr)
```

```
42
```

## 1-D Arrays

```
In [37]: arr = np.array([1,2,3,4,5])  
print(arr)
```

```
[1 2 3 4 5]
```

## 2-D Arrays

```
In [42]: arr = np.array([[1,2,3],[4,5,6]])
         print(arr)

[[1 2 3]
 [4 5 6]]
```

## 3-D arrays

```
In [51]: arr = np.array([[[1,2,3],[4,5,6]],[[7,8,9],[11,12,13]])
         print(arr)

[[[ 1  2  3]
  [ 4  5  6]]

 [[ 7  8  9]
  [11 12 13]]]
```

## Check Number of Dimensions?

```
In [93]: arr0 = np.array(42)
         arr1 = np.array([1,2,3])
         arr2 = np.array([1,2,3],[4,5,6])
         arr3 = np.array([[[1,2,3],[4,5,6]],[[7,8,9],[10,11,12]])
         arr4 = np.array([[[[1,2][3,4]],[[5,6],[7,8]]],[[1,2][3,4]],[[5,6],[7,8]]])
         print(arr0.ndim)
         print(arr1.ndim)
         print(arr2.ndim)
         print(arr3.ndim)
         print(arr4.ndim)
```

```
<>:5: SyntaxWarning: list indices must be integers or slices, not tuple; p
erhaps you missed a comma?
<>:5: SyntaxWarning: list indices must be integers or slices, not tuple; p
erhaps you missed a comma?
<>:5: SyntaxWarning: list indices must be integers or slices, not tuple; p
erhaps you missed a comma?
<>:5: SyntaxWarning: list indices must be integers or slices, not tuple; p
erhaps you missed a comma?
/var/folders/n4/9fb88mxd4g56nzmtw5s0l00c0000gn/T/ipykernel_1349/881659054.
py:5: SyntaxWarning: list indices must be integers or slices, not tuple; p
erhaps you missed a comma?
    arr4 = np.array([[[[1,2][3,4]],[[5,6],[7,8]]],[[1,2][3,4]],[[5,6],[7,
8]]]])
/var/folders/n4/9fb88mxd4g56nzmtw5s0l00c0000gn/T/ipykernel_1349/881659054.
py:5: SyntaxWarning: list indices must be integers or slices, not tuple; p
erhaps you missed a comma?
    arr4 = np.array([[[[1,2][3,4]],[[5,6],[7,8]]],[[1,2][3,4]],[[5,6],[7,
8]]]])
/var/folders/n4/9fb88mxd4g56nzmtw5s0l00c0000gn/T/ipykernel_1349/881659054.
py:5: SyntaxWarning: list indices must be integers or slices, not tuple; p
```

```

erhaps you missed a comma?
arr4 = np.array([[[[1,2][3,4]], [[5,6], [7,8]]], [[1,2][3,4]], [[5,6], [7,8]]])
/var/folders/n4/9fb88mxd4g56nzmtw5s0l00c0000gn/T/ipykernel_1349/881659054.
py:5: SyntaxWarning: list indices must be integers or slices, not tuple; p
erhaps you missed a comma?
arr4 = np.array([[[[1,2][3,4]], [[5,6], [7,8]]], [[1,2][3,4]], [[5,6], [7,8]]])
/var/folders/n4/9fb88mxd4g56nzmtw5s0l00c0000gn/T/ipykernel_1349/881659054.
py:5: SyntaxWarning: list indices must be integers or slices, not tuple; p
erhaps you missed a comma?
arr4 = np.array([[[[1,2][3,4]], [[5,6], [7,8]]], [[1,2][3,4]], [[5,6], [7,8]]])
/var/folders/n4/9fb88mxd4g56nzmtw5s0l00c0000gn/T/ipykernel_1349/881659054.
py:5: SyntaxWarning: list indices must be integers or slices, not tuple; p
erhaps you missed a comma?
arr4 = np.array([[[[1,2][3,4]], [[5,6], [7,8]]], [[1,2][3,4]], [[5,6], [7,8]]])
/var/folders/n4/9fb88mxd4g56nzmtw5s0l00c0000gn/T/ipykernel_1349/881659054.
py:5: SyntaxWarning: list indices must be integers or slices, not tuple; p
erhaps you missed a comma?
arr4 = np.array([[[[1,2][3,4]], [[5,6], [7,8]]], [[1,2][3,4]], [[5,6], [7,8]]])
/var/folders/n4/9fb88mxd4g56nzmtw5s0l00c0000gn/T/ipykernel_1349/881659054.
py:5: SyntaxWarning: list indices must be integers or slices, not tuple; p
erhaps you missed a comma?
arr4 = np.array([[[[1,2][3,4]], [[5,6], [7,8]]], [[1,2][3,4]], [[5,6], [7,8]]])
/var/folders/n4/9fb88mxd4g56nzmtw5s0l00c0000gn/T/ipykernel_1349/881659054.
py:5: SyntaxWarning: list indices must be integers or slices, not tuple; p
erhaps you missed a comma?
arr4 = np.array([[[[1,2][3,4]], [[5,6], [7,8]]], [[1,2][3,4]], [[5,6], [7,8]]])
/var/folders/n4/9fb88mxd4g56nzmtw5s0l00c0000gn/T/ipykernel_1349/881659054.
py:5: SyntaxWarning: list indices must be integers or slices, not tuple; p
erhaps you missed a comma?
arr4 = np.array([[[[1,2][3,4]], [[5,6], [7,8]]], [[1,2][3,4]], [[5,6], [7,8]]])
/var/folders/n4/9fb88mxd4g56nzmtw5s0l00c0000gn/T/ipykernel_1349/881659054.
py:5: SyntaxWarning: list indices must be integers or slices, not tuple; p
erhaps you missed a comma?
arr4 = np.array([[[[1,2][3,4]], [[5,6], [7,8]]], [[1,2][3,4]], [[5,6], [7,8]]])

```

```
/var/folders/n4/9fb88mxd4g56nzm5s0l00c0000gn/T/ipykernel_1349/881659054.py:5: SyntaxWarning: list indices must be integers or slices, not tuple; perhaps you missed a comma?
  arr4 = np.array([[[[1,2][3,4]], [[5,6], [7,8]]], [[1,2][3,4]], [[5,6], [7,8]]]])
```

```
-----
TypeError                                Traceback (most recent call last)
Cell In[93], line 5
      3 arr2 = np.array([1,2,3], [4,5,6])
      4 arr3 = np.array([[[1,2,3], [4,5,6]], [[7,8,9], [10,11,12]]])
----> 5 arr4 = np.array([[[[1,2][3,4]], [[5,6], [7,8]]], [[1,2][3,4]], [[5,6], [7,8]]]])
      6 print(arr0.ndim)
      7 print(arr1.ndim)

TypeError: list indices must be integers or slices, not tuple
```

In [ ]:

In [ ]:

## Higher Dimensional Arrays

```
In [89]: arr = np.array([1, 2, 3, 4], ndmin=5)
         print(arr)
         print(arr.ndim)
```

```
[[[[[1 2 3 4]]]]]
5
```

In [ ]:

```
In [95]: arr4d = np.zeros((2,3,4,5))
         print(arr4d)
```

```
[[[0. 0. 0. 0. 0.]
  [0. 0. 0. 0. 0.]
  [0. 0. 0. 0. 0.]
  [0. 0. 0. 0. 0.]
```

```
[0. 0. 0. 0. 0.]
[0. 0. 0. 0. 0.]
[0. 0. 0. 0. 0.]
[0. 0. 0. 0. 0.]
```

```
[0. 0. 0. 0. 0.]
[0. 0. 0. 0. 0.]
[0. 0. 0. 0. 0.]
[0. 0. 0. 0. 0.]
```

```
[[[0. 0. 0. 0. 0.]
  [0. 0. 0. 0. 0.]
  [0. 0. 0. 0. 0.]
  [0. 0. 0. 0. 0.]
```

```
[0. 0. 0. 0. 0.]
[0. 0. 0. 0. 0.]
[0. 0. 0. 0. 0.]
[0. 0. 0. 0. 0.]
```

```
[0. 0. 0. 0. 0.]
[0. 0. 0. 0. 0.]
[0. 0. 0. 0. 0.]
[0. 0. 0. 0. 0.]
```

In [ ]:

```
In [97]: arr4d = np.ones((2,3,4,5))
print(arr4d)
```



```
[[[1. 1. 1. 1. 1.]
  [1. 1. 1. 1. 1.]
  [1. 1. 1. 1. 1.]
  [1. 1. 1. 1. 1.]
```

```
[1. 1. 1. 1. 1.]
[1. 1. 1. 1. 1.]
[1. 1. 1. 1. 1.]
[1. 1. 1. 1. 1.]
```

```
[1. 1. 1. 1. 1.]
[1. 1. 1. 1. 1.]
[1. 1. 1. 1. 1.]
[1. 1. 1. 1. 1.]
```

```
[[[1. 1. 1. 1. 1.]
  [1. 1. 1. 1. 1.]
  [1. 1. 1. 1. 1.]
  [1. 1. 1. 1. 1.]
```

```
[1. 1. 1. 1. 1.]
[1. 1. 1. 1. 1.]
[1. 1. 1. 1. 1.]
[1. 1. 1. 1. 1.]
```

```
[1. 1. 1. 1. 1.]
[1. 1. 1. 1. 1.]
[1. 1. 1. 1. 1.]
[1. 1. 1. 1. 1.]
```

In [ ]:

In [ ]:

In [ ]:

In [ ]:

```
In [99]: arr4d = np.twos((2,3,4,5))
print(arr4d)
```

```

-----
AttributeError                                Traceback (most recent call last)
Cell In[99], line 1
----> 1 arr4d = np.twos((2,3,4,5))
      2 print(arr4d)

File /opt/anaconda3/lib/python3.12/site-packages/numpy/__init__.py:333, in
__getattr__(attr)
    330     "Removed in NumPy 1.25.0"
    331     raise RuntimeError("Tester was removed in NumPy 1.25.")
--> 333 raise AttributeError("module {!r} has no attribute "
    334                        "{!r}".format(__name__, attr))

AttributeError: module 'numpy' has no attribute 'twos'

```

## data-type for the array

In [ ]:

```
In [103...] arr = np.array([1,2,3,4], dtype=float)
print(arr)
```

[1. 2. 3. 4.]

In [ ]:

```
In [105...] arr = np.array([1,2,3,4], dtype=complex)
print(arr)
```

[1.+0.j 2.+0.j 3.+0.j 4.+0.j]

```
In [107...] arr = np.array([1,2,3,4], dtype=bool)
print(arr)
```

[ True True True True]

## arange

In [ ]:

```
In [111...] arr = np.arange(1,25)
print(arr)
```

[ 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24]

```
In [115...] arr = np.arange(1,25,2)
print(arr)
```

```
[ 1  3  5  7  9 11 13 15 17 19 21 23]
```

```
In [119... arr = np.arange(1,25,1)
           print(arr)
```

```
[ 1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24]
```

```
In [ ]:
```

## reshape

```
In [135... np.arange(1,13).reshape(4,3)
```

```
Out[135... array([[ 1,  2,  3],
                  [ 4,  5,  6],
                  [ 7,  8,  9],
                  [10, 11, 12]])
```

```
In [ ]:
```

```
In [ ]:
```

```
In [ ]:
```

```
In [ ]:
```

```
In [ ]:
```

```
In [ ]:
```

```
In [ ]:
```

```
In [ ]:
```