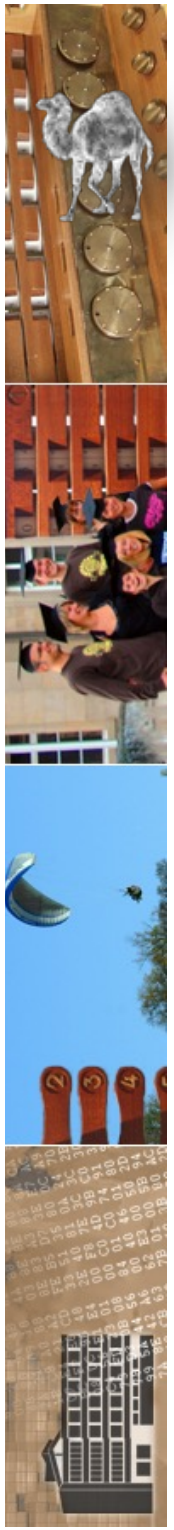

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MATHEMATISCH-
NATURWISSENSCHAFTLICHE FAKULTÄT
FACHBEREICH INFORMATIK
INFORMATIONSDIENSTE

Grundlagen Internet-Technologien

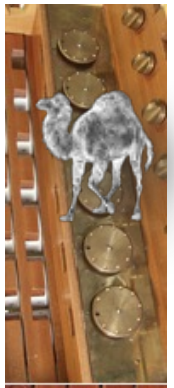
INF3171

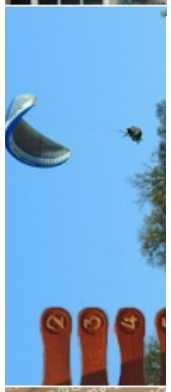
Serverseitige Web-Programmierung mit CGI, Teil II: Python im Web

Version 1.0

26.06.2025

python™






Aktuelles

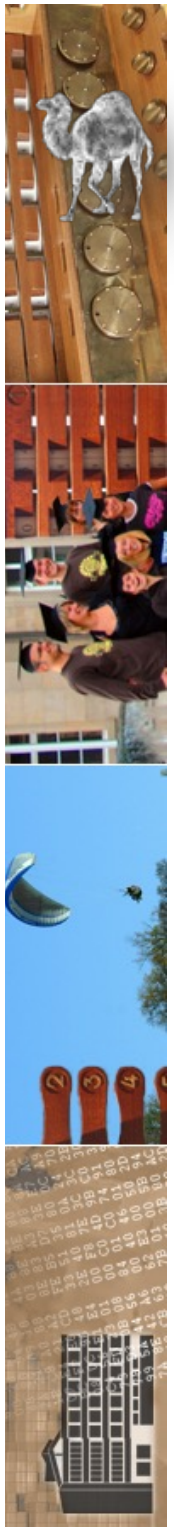
- Sommerfest auf dem Sand

findet am 27.06.2025 ab 17h statt!!!!!!

Hallo ihr Lieben,

bald ist es endlich wieder so weit! Am **27. Juni** von **17 bis 24 Uhr** laden euch die Fachschaften Informatik und Kognitionswissenschaft herzlich zum Sommerfest auf dem Sand ein!

Ob ihr nur kurz vorbeischaut oder den ganzen Abend mit uns verbringt - ihr seid herzlich willkommen!



Reddit-Crawler für Aktien in Python bauen: So geht es Schritt für Schritt

Reddits r/wallstreetbets ist ein riesiges Forum für Börsenwetten. Welche Aktien die Mitglieder diskutieren, verrät ein Python-Crawler, den wir hier erstellen.

Artikel verschenken 64

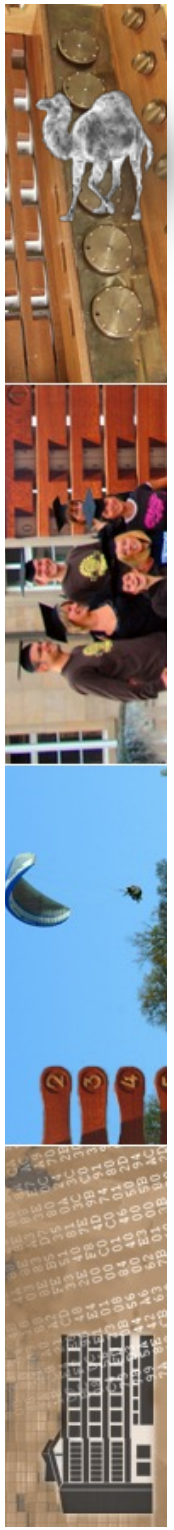
(Bild: KI Midjourney)

23.06.2025, 12:16 Uhr **Lesezeit: 30 Min.** | **heise+ exklusiv**

Von Denny Gille

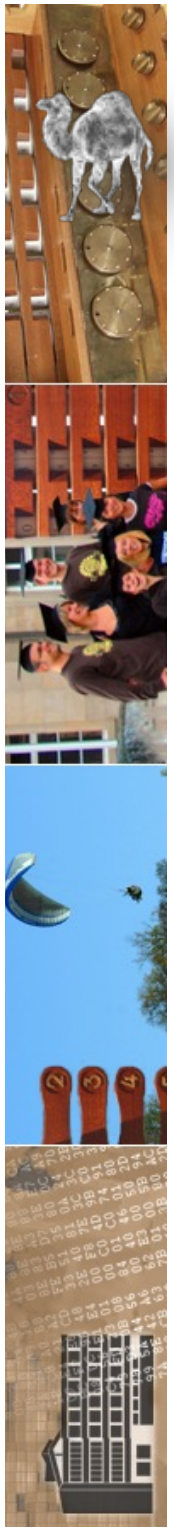
INHALTSVERZEICHNIS

Am Aktienmarkt tauchen regelmäßig Unternehmen auf, deren Aktienwerte innerhalb kurzer Zeit stark zulegen, sich mitunter sogar vervielfachen. Leider erfährt man oft erst von ihnen, wenn es für einen Einstieg bereits zu spät scheint. Konkret hätte man allein in den vergangenen zwei Jahren mit Investitionen in vergleichsweise unbekannte Unternehmen wie Carvana (+1200 Prozent), Microstrategy (+1200 Prozent) oder Palantir (+900 Prozent) enorme Gewinne machen können.



am 05.07. ist es soweit

- ...die 114. Tour de France startet!
- Finale am 27.07. in Paris
- 21 Etappen



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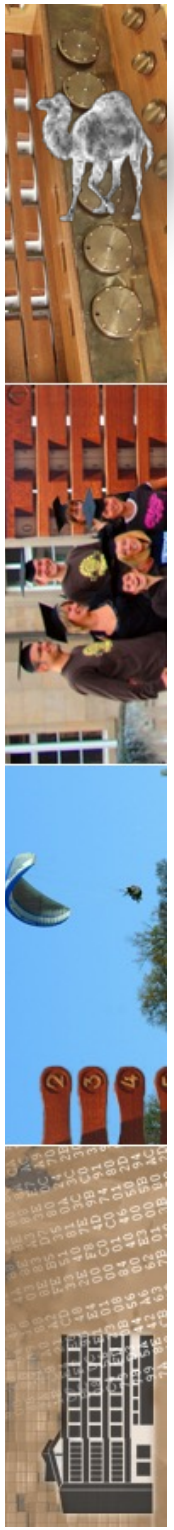
Evaluation

- Danke für Teilnahme und Feedback!
- zentrale Frage: Anzahl der verwendeten Sprachen
  - JavaScript
  - Python
  - PHP



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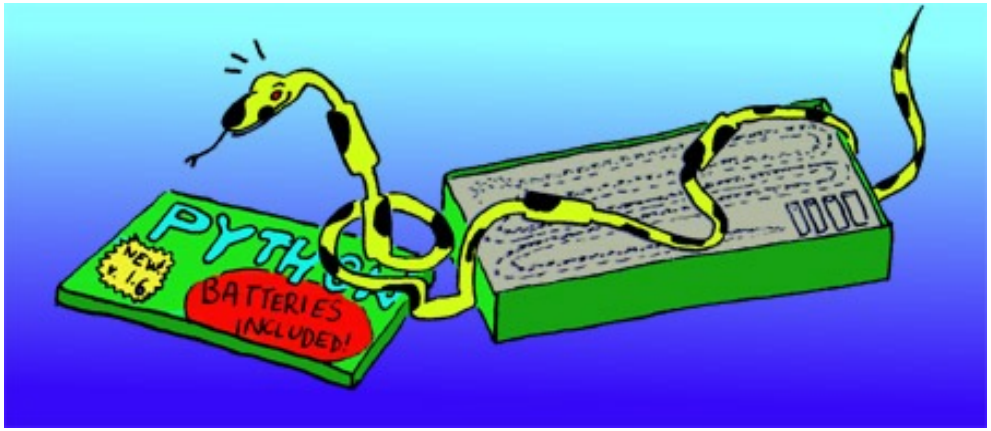
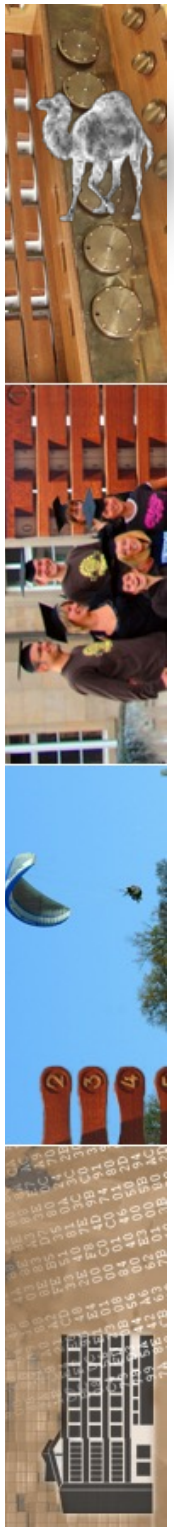
Python Module

- zum Python-»Paket« gehören zahlreiche Module, die verschiedenste Funktionalitäten bereitstellen
- Module werden durch die Umgebungsvariable **`PYTHONPATH`** lokalisiert
  - Module liegen (typischerweise) in *vorcompilierter Form* als **`.pyc`** vor



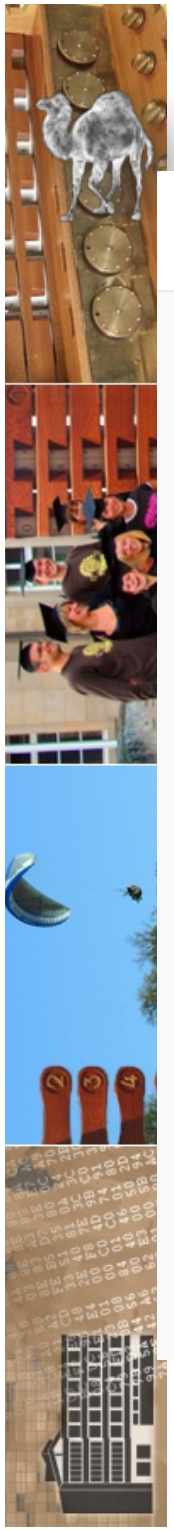


noch mehr: Paketmanager

- darüber hinaus:
  Erweiterung von Programmiersprachen über Paketmanager

- Python: pip (Python installs packages)
  (bzw. pip3)

  https://pip.pypa.io/en/stable/



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pip.pypa.io/en/stable/getting-started/

Update abschließen

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pip documentation
v24.0

Search

- Getting Started
- Installation
- User Guide
- Topic Guides
- Reference
- Commands

PROJECT

- Development
- UX Research & Design
- Changelog
- Code of Conduct
- GitHub

v: stable

Getting Started

To get started with using pip, you should install Python on your system.

Ensure you have a working pip

As a first step, you should check that you have a working Python with pip installed. This can be done by running the following commands and making sure that the output looks similar.

Linux MacOS Windows

```
$ python --version
Python 3.N.N
$ python -m pip --version
pip X.Y.Z from ... (python 3.N.N)
```

If that worked, congratulations! You have a working pip in your environment.

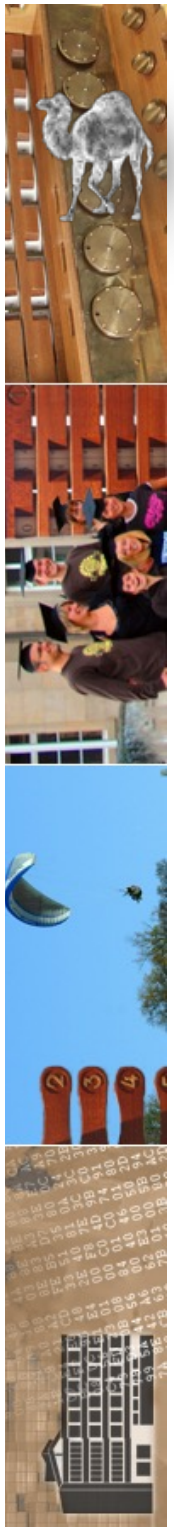
If you got output that does not look like the sample above, please read the Installation page. It provides guidance on how to install pip within a Python environment that doesn't have it.

Common tasks

Install a package

Linux MacOS Windows

```
$ python -m pip install sampleproject
[...]
```



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pip.pypa.io/en/stable/cli/pip_show/

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pip documentation
v24.0

Search

- Getting Started
- Installation
- User Guide
- Topic Guides
- Reference
- Commands
  - pip
  - pip install
  - pip uninstall
  - pip inspect
  - pip list
  - **pip show**
  - pip freeze
  - pip check
  - pip download
  - pip wheel

v: stable

pip show

Usage

Unix/macOS | Windows

```
python -m pip show [options] <package> ...
```

Description

Show information about one or more installed packages.

The output is in RFC-compliant mail header format.

Options

`-f, --files`

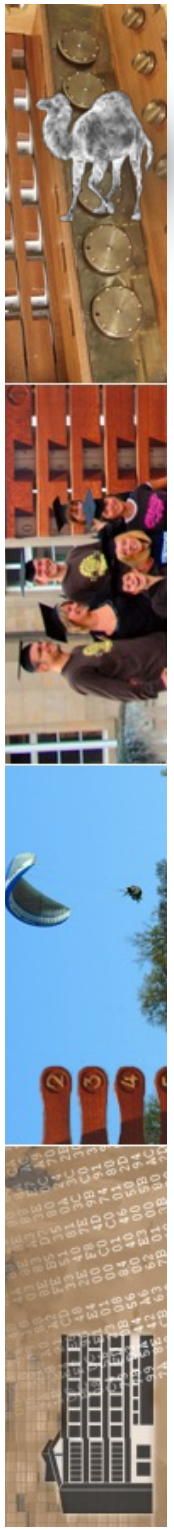
Show the full list of installed files for each package.

Examples

1. Show information about a package:

Unix/macOS | Windows

```
$ python -m pip show sphinx
Name: Sphinx
```



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Beispiel: jupyter Notebook

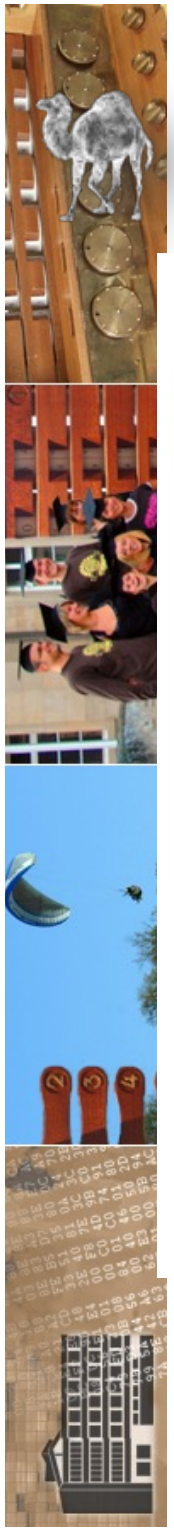
Jupyter Notebook

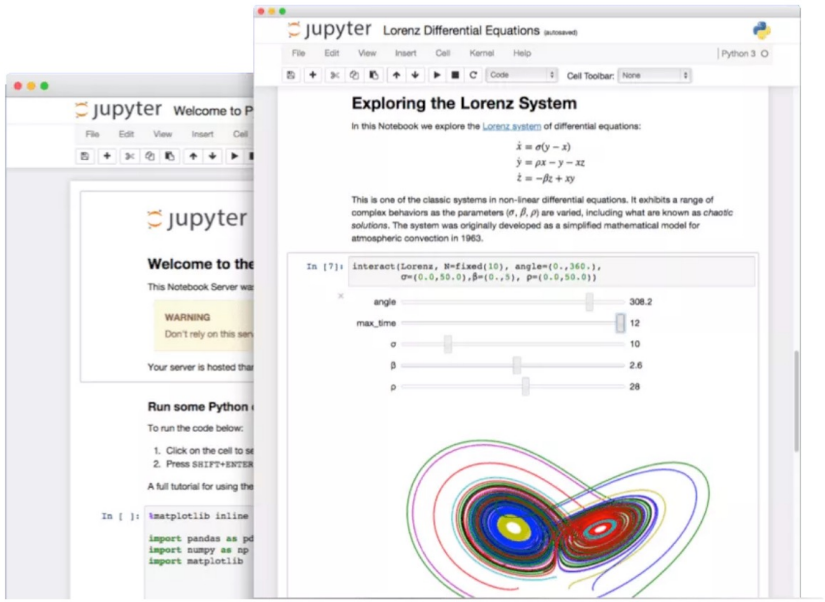
Install the classic Jupyter Notebook with:

```
pip install notebook
```

To run the notebook:

```
jupyter notebook
```





Jupyter Notebook: The Classic Notebook Interface

The Jupyter Notebook is the original web application for creating and sharing computational documents. It offers a simple, streamlined, document-centric experience.

Try it in your browser | Install the Notebook

Language of choice

Jupyter supports over 40 programming languages, including Python, R, Julia, and Scala.

Share notebooks

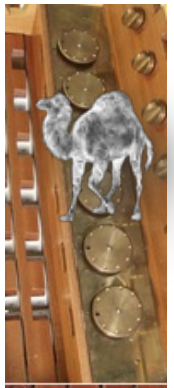
Notebooks can be shared with others using email, Dropbox, GitHub and the Jupyter Notebook Viewer.

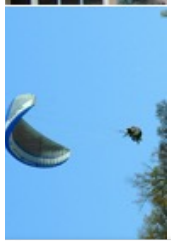
Interactive output

Your code can produce rich, interactive output: HTML, images, videos, LaTeX, and custom MIME types.

Big data integration

Leverage big data tools, such as Apache Spark, from Python, R, and Scala. Explore that same data with pandas, scikit-learn, ggplot2, and TensorFlow.





```
thomas@PetitMouton =>
thomas@PetitMouton => pip3 install notebook
Collecting notebook
  Downloading notebook-6.5.4-py3-none-any.whl (529 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 529.8/529.8 KB 2.5 MB/s eta 0:00:00
Collecting jupyter-core>=4.6.1
  Downloading jupyter_core-5.3.0-py3-none-any.whl (93 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 93.2/93.2 KB 3.4 MB/s eta 0:00:00
Collecting nbformat
  Downloading nbformat-5.9.0-py3-none-any.whl (77 kB)
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Collecting traitlets>=4.2.1
  Downloading traitlets-5.9.0-py3-none-any.whl (117 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 117.4/117.4 KB 3.6 MB/s eta 0:00:00
Collecting terminado>=0.8.3
  Downloading terminado-0.17.1-py3-none-any.whl (17 kB)
Collecting ipython-genutils
  Downloading ipython_genutils-0.2.0-py2.py3-none-any.whl (26 kB)
Collecting jupyter-client>=5.3.4
  Downloading jupyter_client-8.2.0-py3-none-any.whl (103 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 103.2/103.2 KB 3.4 MB/s eta 0:00:00
Collecting pyzmq>=17
  Downloading pyzmq-25.1.0-cp310-cp310-macosx_10_15_universal2.whl (1.8 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 1.8/1.8 MB 4.9 MB/s eta 0:00:00
Collecting jinja2
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     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 133.1/133.1 KB 6.7 MB/s eta 0:00:00
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Collecting nbconvert>=5
```

```
nstalling collected packages: webencodings, wcwidth, pure-eval, ptyprocess, pickleshare, mistune, ipython-genutils, fastjsonschema, executing, backcall, appnope, w
socket-client, webcolors, uri-template, traitlets, tornado, tinycss2, soupsieve, sniffio, six, Send2Trash, rfc3986-validator, pyzmq, pyyaml, python-json-logger, py
istent, pygments, pycparser, psutil, prompt-toolkit, prometheus-client, platformdirs, pexpect, parso, pandocfilters, packaging, overrides, nest-asyncio, markupsafe
jupyterlab-pygments, jsonpointer, idna, fqdn, exceptiongroup, defusedxml, decorator, debugpy, attrs, terminado, rfc3339-validator, python-dateutil, matplotlib-inli
, jupyter-core, jsonschema, jinja2, jedi, comm, cffi, bleach, beautifulsoup4, asttokens, anyio, stack-data, nbformat, jupyter-server-terminals, jupyter-client, arr
, argon2-cffi-bindings, nbclient, isoduration, ipython, argon2-cffi, nbconvert, ipykernel, jupyter-events, jupyter-server, notebook-shim, nbclassic, notebook
uccessfully installed Send2Trash-1.8.2 anyio-3.7.0 appnope-0.1.3 argon2-cffi-21.3.0 argon2-cffi-bindings-21.2.0 arrow-1.2.3 asttokens-2.2.1 attrs-23.1.0 backcall-0
.0 beautifulsoup4-4.12.2 bleach-6.0.0 cffi-1.15.1 comm-0.1.3 debugpy-1.6.7 decorator-5.1.1 defusedxml-0.7.1 exceptiongroup-1.1.1 executing-1.2.0 fastjsonschema-2.1
1 fqdn-1.5.1 idna-3.4 ipykernel-6.23.1 ipython-8.14.0 ipython-genutils-0.2.0 isoduration-20.11.0 jedi-0.18.2 jinja2-3.1.2 jsonpointer-2.3 jsonschema-4.17.3 jupyter-
lient-8.2.0 jupyter-core-5.3.0 jupyter-events-0.6.3 jupyter-server-2.6.0 jupyter-server-terminals-0.4.4 jupyterlab-pygments-0.2.2 markupsafe-2.1.3 matplotlib-inlin
0.1.6 mistune-2.0.5 nbclassic-1.0.0 nbclient-0.8.0 nbconvert-7.4.0 nbformat-5.9.0 nest-asyncio-1.5.6 notebook-6.5.4 notebook-shim-0.2.3 overrides-7.3.1 packaging-23
1 pandocfilters-1.5.0 parso-0.8.3 pexpect-4.8.0 pickleshare-0.7.5 platformdirs-3.5.3 prometheus-client-0.17.0 prompt-toolkit-3.0.38 psutil-5.9.5 ptyprocess-0.7.0 p
e-eval-0.2.2 pycparser-2.21 pygments-2.15.1 pyrsistent-0.19.3 python-dateutil-2.8.2 python-json-logger-2.0.7 pyyaml-6.0 pyzmq-25.1.0 rfc3339-validator-0.1.4 rfc398
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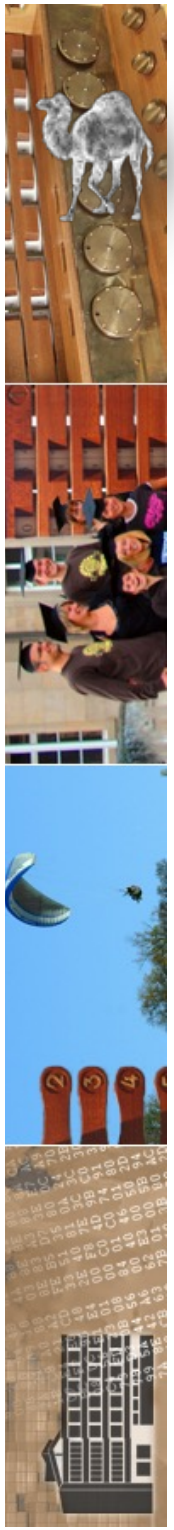
2.6 webcolors-1.13 webencodings-0.5.1 websocket-client-1.5.3
```


```
Collecting argon2-cffi
  Downloading argon2_cffi-21.3.0-py3-none-any.whl (14 kB)
Collecting nest-asyncio>=1.5
```



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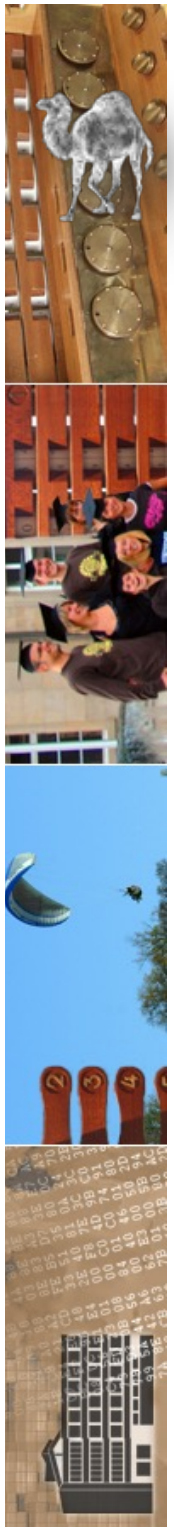
Importieren von Modulen

- wir unterscheiden
  - **`import modulname`**
    - Importiert das Modul <modulname>
    - erweitert Namensraum entsprechend (modulname dann bekannt)
  - **`from modulname import obj1, obj2, obj3`**
    - importiert nur die Klassen obj1, obj2 und obj3 vom Modul modulname
    - Namensraum wird nur um diese Klassen erweitert



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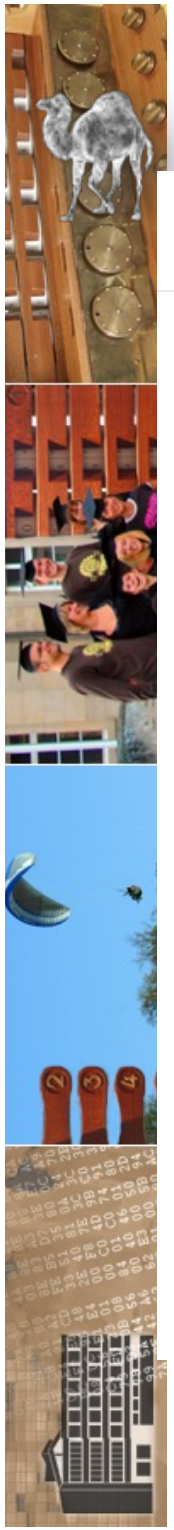
Dokumentation zu den Modulen

- unter
  - https://docs.python.org/3/py-modindex.html

  gibt es Informationen zu allen Modulen des Python-Systems

- Hinweis: umfangreich!



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docs.python.org/3/py-modindex.html

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Python » English 3.12.4 3.12.4 Documentation » Python Module Index Theme Auto | Quick search Go | modules | index

Python Module Index

_ | a | b | c | d | e | f | g | h | i | j | k | l | m | n | o | p | q | r | s | t | u | v | w | x | z

_

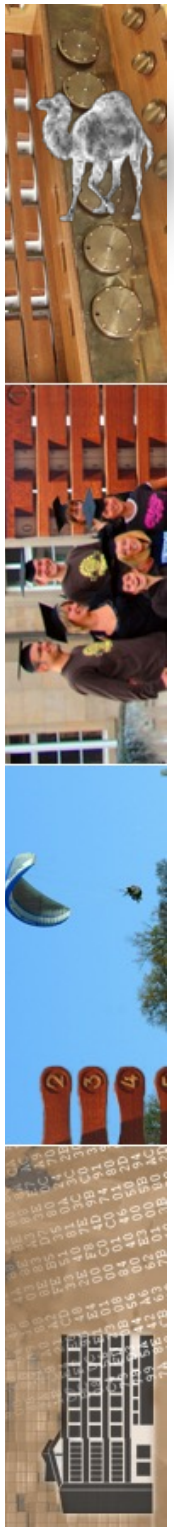
`__future__`	*Future statement definitions*
`__main__`	*The environment where top-level code is run. Covers command-line interfaces, import-time behavior, and ``__name__ == '__main__'``.*
`_thread`	*Low-level threading API.*
`_tkinter`	*A binary module that contains the low-level interface to Tcl/Tk.*

a

`abc`	*Abstract base classes according to :pep:`3119`.*
`aifc`	**Deprecated:** *Read and write audio files in AIFF or AIFC format.*
`argparse`	*Command-line option and argument parsing library.*
`array`	*Space efficient arrays of uniformly typed numeric values.*
`ast`	*Abstract Syntax Tree classes and manipulation.*
`asyncio`	*Asynchronous I/O.*
`atexit`	*Register and execute cleanup functions.*
`audioop`	**Deprecated:** *Manipulate raw audio data.*

b

`base64`	*RFC 4648: Base16, Base32, Base64 Data Encodings; Base85 and Ascii85*
`bdb`	*Debugger framework.*



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Standard-Module

- Modul **`string`**
  - stellt grundlegende Funktionalität für Zeichenketten zur Verfügung
  - wesentliche Teile sind inzwischen in den Kernsprachumfang von Python integriert
    - ab Python 3.0 entfallen Funktionen wie **`split`** im Modul und gehören direkt zu Python

`string` — Common string operations

Source code: Lib/string.py

See also: Text Sequence Type — str

String Methods

String constants

The constants defined in this module are:

`string.`**`ascii_letters`**
The concatenation of the `ascii_lowercase` and `ascii_uppercase` constants described below. This value is not locale-dependent.

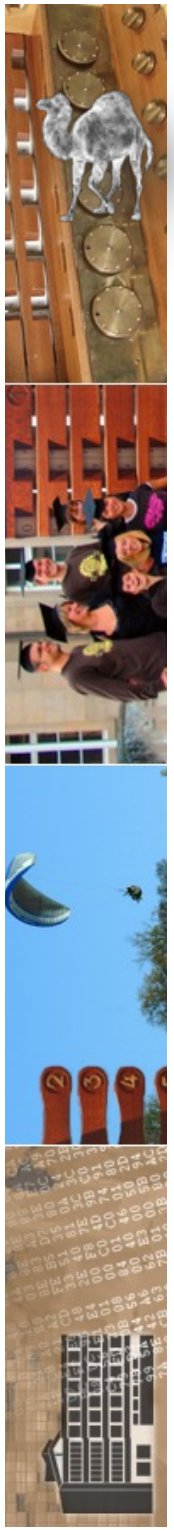
`string.`**`ascii_lowercase`**
The lowercase letters `'abcdefghijklmnopqrstuvwxyz'`. This value is not locale-dependent and will not change.

`string.`**`ascii_uppercase`**
The uppercase letters `'ABCDEFGHIJKLMNOPQRSTUVWXYZ'`. This value is not locale-dependent and will not change.

`string.`**`digits`**
The string `'0123456789'`.

`string.`**`hexdigits`**
The string `'0123456789abcdefABCDEF'`.

`string.`**`octdigits`**
The string `'01234567'`



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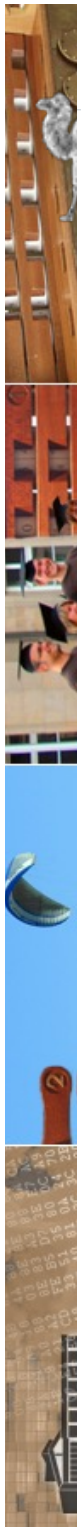
Modul `math`

- Mathematische Funktionalität
  - Attribute:
    - Konstante pi
    - Konstante e
  - Methoden: zahlreiche mathematische Funktionen
    - `sqrt(x)`
    - `pow(x,y)`
    - `sin(x), sinh(x), cos(x), cosh(x), ...`
  - Modul `cmath` für *komplexe* Funktionen



`math` — Mathematical functions

This module provides access to the mathematical functions defined by the C standard.

These functions cannot be used with complex numbers; use the functions of the same name from the `cmath` module if you require support for complex numbers. The distinction between functions which support complex numbers and those which don't is made since most users do not want to learn quite as much mathematics as required to understand complex numbers. Receiving an exception instead of a complex result allows earlier detection of the unexpected complex number used as a parameter, so that the programmer can determine how and why it was generated in the first place.

The following functions are provided by this module. Except when explicitly noted otherwise, all return values are floats.

Number-theoretic and representation functions

`math.`**`ceil`**(*x*)

Return the ceiling of *x*, the smallest integer greater than or equal to *x*. If *x* is not a float, delegates to `x.__ceil__()`, which should return an `Integral` value.

`math.`**`comb`**(*n*, *k*)

Return the number of ways to choose *k* items from *n* items without repetition and without order.

Evaluates to `n! / (k! * (n - k)!)` when `k <= n` and evaluates to zero when `k > n`.

Also called the binomial coefficient because it is equivalent to the coefficient of k-th term in polynomial expansion of the expression `(1 + x) ** n`.

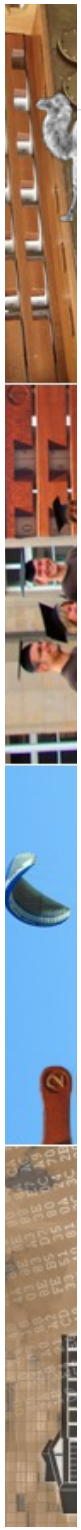
Raises `TypeError` if either of the arguments are not integers. Raises `ValueError` if either of the arguments are negative.

New in version 3.8.

`math.`**`copysign`**(*x*, *y*)

Return a float with the magnitude (absolute value) of *x* but the sign of *y*. On platforms that support signed zeros, `copysign(1.0, -0.0)` returns *-1.0*.

`math.`**`fabs`**(*x*)



`cmath` — Mathematical functions for complex numbers

This module provides access to mathematical functions for complex numbers. The functions in this module accept integers, floating-point numbers or complex numbers as arguments. They will also accept any Python object that has either a `__complex__()` or a `__float__()` method: these methods are used to convert the object to a complex or floating-point number, respectively, and the function is then applied to the result of the conversion.

Note: On platforms with hardware and system-level support for signed zeros, functions involving branch cuts are continuous on *both* sides of the branch cut: the sign of the zero distinguishes one side of the branch cut from the other. On platforms that do not support signed zeros the continuity is as specified below.

Conversions to and from polar coordinates

A Python complex number `z` is stored internally using *rectangular* or *Cartesian* coordinates. It is completely determined by its *real part* `z.real` and its *imaginary part* `z.imag`. In other words:

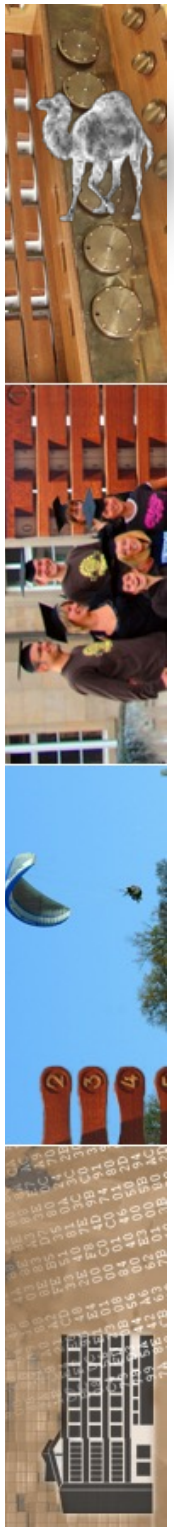
```
z == z.real + z.imag*1j
```

Polar coordinates give an alternative way to represent a complex number. In polar coordinates, a complex number *z* is defined by the modulus *r* and the phase angle *phi*. The modulus *r* is the distance from *z* to the origin, while the phase *phi* is the counterclockwise angle, measured in radians, from the positive x-axis to the line segment that joins the origin to *z*.

The following functions can be used to convert from the native rectangular coordinates to polar coordinates and back.

`cmath.`**`phase`**`(x)`

Return the phase of *x* (also known as the *argument* of *x*), as a float. `phase(x)` is equivalent to `math.atan2(x.imag, x.real)`. The result lies in the range [$-\pi$, π], and the branch cut for this operation lies along the negative real axis, continuous from above. On systems with support for signed zeros (which includes most systems in current use), this means that the sign of the result is the same as the sign of `x.imag`, even when `x.imag` is zero:



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Modul `time`

- Python-Modul für Zeitformatierungen
- Der Nullpunkt ist Unix-typisch der 1.1.1970, 0h
- die Methoden
  - **`gmtime()`**
  - **`localtime()`**
- geben typische Liste mit Zeitinformationen zurück
  - (Beispiel in Verbindung mit CGI)

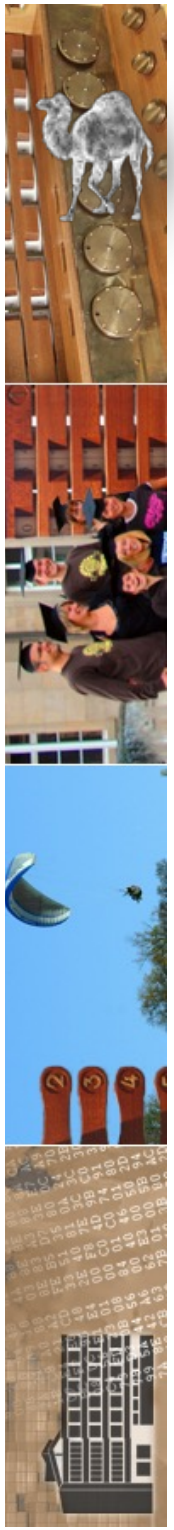
time — Time access and conversions

This module provides various time-related functions. For related functionality, see also the datetime and calendar modules.

Although this module is always available, not all functions are available on all platforms. Most of the functions defined in this module call platform C library functions with the same name. It may sometimes be helpful to consult the platform documentation, because the semantics of these functions varies among platforms.

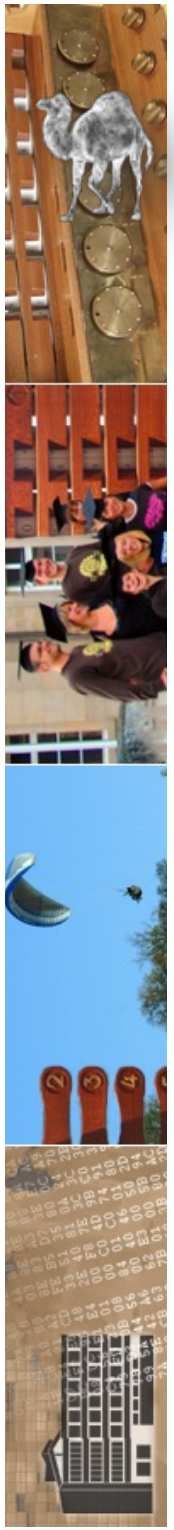
An explanation of some terminology and conventions is in order.

- The *epoch* is the point where the time starts, and is platform dependent. For Unix, the epoch is January 1, 1970, 00:00:00 (UTC). To find out what the epoch is on a given platform, look at `time.gmtime(0)`.
- The term *seconds since the epoch* refers to the total number of elapsed seconds since the epoch, typically excluding leap seconds. Leap seconds are excluded from this total on all POSIX-compliant platforms.
- The functions in this module may not handle dates and times before the epoch or far in the future. The cut-off point in the future is determined by the C library; for 32-bit systems, it is typically in 2038.
- **Year 2000 (Y2K) issues**: Python depends on the platform's C library, which generally doesn't have year 2000 issues, since all dates and times are represented internally as seconds since the epoch. Function `strptime()` can parse 2-digit years when given `%y` format code. When 2-digit years are parsed, they are converted according to the POSIX and ISO C standards: values 69–99 are mapped to 1969–1999, and values 0–68 are mapped to 2000–2068.
- UTC is Coordinated Universal Time (formerly known as Greenwich Mean Time, or GMT). The acronym UTC is not a mistake but a compromise between English and French.



gmtime() und localtime()

Index	Field	Values
0	year	(for example, 1993)
1	month	range [1,12]
2	day	range [1,31]
3	hour	range [0,23]
4	minute	range [0,59]
5	second	range [0,61]
6	weekday	range [0,6], Monday is 0
7	Julian day range	[1,366]
8	daylight savings flag	0, 1 or -1



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Modul os

- Modul, um (u.a.) Multitasking zu ermöglichen
- os -- *Miscellaneous* operating system interfaces
- “This module provides a portable way of using operating system dependent functionality.“

  – fork()
    - Fork a child process. Return 0 in the child, the child's process id in the parent. Availability: Unix.

os — Miscellaneous operating system interfaces

Source code: Lib/os.py

This module provides a portable way of using operating system dependent functionality. If you just want to read or write a file see `open()`, if you want to manipulate paths, see the `os.path` module, and if you want to read all the lines in all the files on the command line see the `fileinput` module. For creating temporary files and directories see the `tempfile` module, and for high-level file and directory handling see the `shutil` module.

Notes on the availability of these functions:

- The design of all built-in operating system dependent modules of Python is such that as long as the same functionality is available, it uses the same interface; for example, the function `os.stat(path)` returns stat information about *path* in the same format (which happens to have originated with the POSIX interface).
- Extensions peculiar to a particular operating system are also available through the `os` module, but using them is of course a threat to portability.
- All functions accepting path or file names accept both bytes and string objects, and result in an object of the same type, if a path or file name is returned.

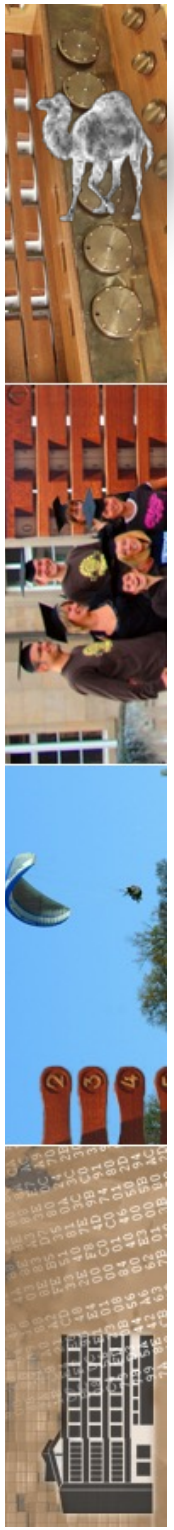
Note: All functions in this module raise `OSError` in the case of invalid or inaccessible file names and paths, or other arguments that have the correct type, but are not accepted by the operating system.

exception os.**error**

An alias for the built-in `OSError` exception.

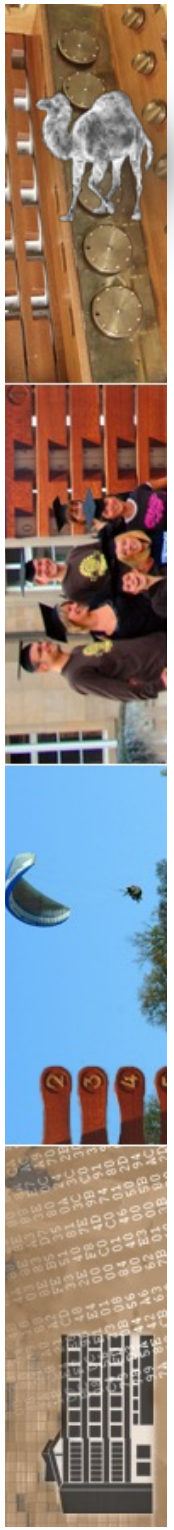
os.**name**

The name of the operating system dependent module imported. The following names have currently been registered: 'posix', 'nt', 'java'



Situation

- bisher: Python ist einfache und nützliche (Systemadministration) Programmiersprache
- nun: wir nutzen Python als **CGI-Sprache**
- Fragen:
  - keine direkt ausführbaren Codes mit Python
  - was ist alles zu tun für CGI mit Python
  - **Formularverarbeitung** mit Python
  - Generation von HTML mit Python



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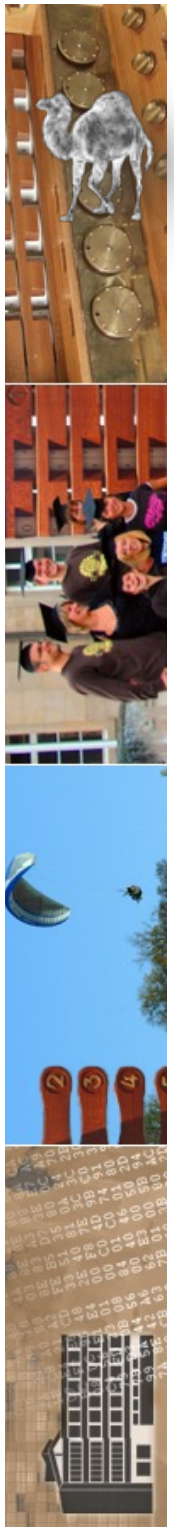
Python und das Internet

- Python ist – ähnlich wie Java – eine *für das Internet optimierte* Programmiersprache
- schon zum Standard-Umfang gehört eine sehr große Bibliothek nützlicher Klassen – ähnlich wie das Paket java.net
- dabei u.a. die Klasse cgi (vergleichbar ist etwa das PERL-Modul CGI.pm)



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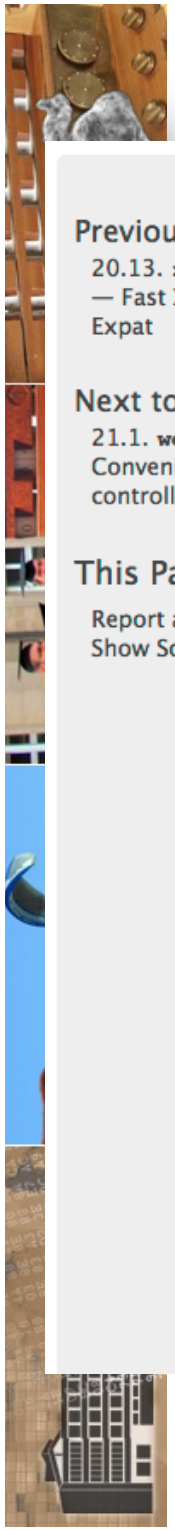
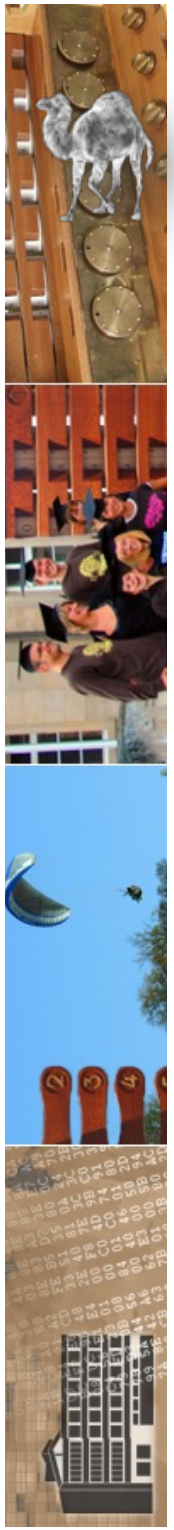
ganz typisch

- typische Aufgabe:
  - Formular (HTML-<FORM>) wird ausgefüllt und an ein CGI-Script gesendet
    (mit HTTP-GET oder HTTP-POST)
  - Formular besteht aus mehreren <INPUT>-Feldern
  - CGI-Script muss die einzelnen Formular-Felder auswerten
  - möglich mit CGI-Umgebungsvariablen **QUERY_STRING** – aber nicht sinnvoll



21. Internet Protocols and Support

The modules described in this chapter implement Internet protocols and support for related technology. They are all implemented in Python. Most of these modules require the presence of the system-dependent module `socket`, which is currently supported on most popular platforms. Here is an overview:



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cgi Essentials (!!!)

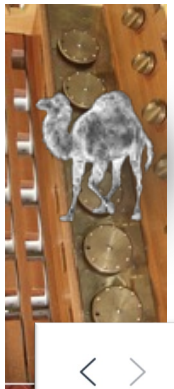
cgi-Programm muss **ausführbar** sein

Code liegt im Unterordner cgi-bin

Ausgabe beginnt mit:

Content-type: text/html
\n

Zugriff: URL beginnt mit „cgi-bin“



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134.2.6.146/~zrvwa01/cgi-bin/python/cgi_3.py

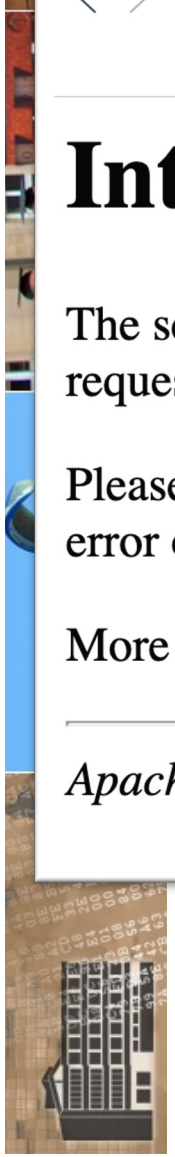
Internal Server Error

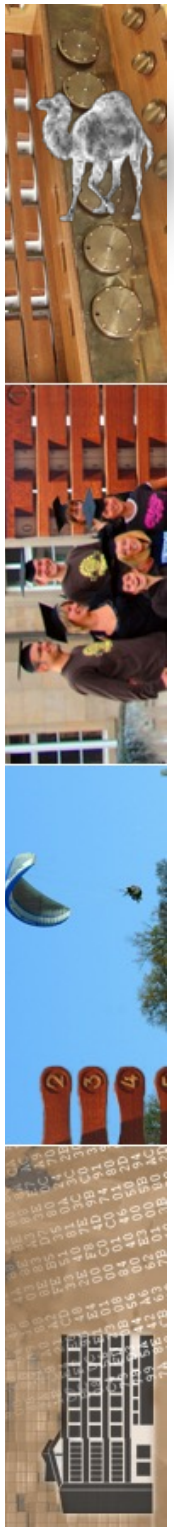
The server encountered an internal error or misconfiguration and was unable to complete your request.

Please contact the server administrator at webmaster@localhost to inform them of the time this error occurred, and the actions you performed just before this error.

More information about this error may be available in the server error log.

Apache/2.4.25 (Debian) Server at 134.2.6.146 Port 80





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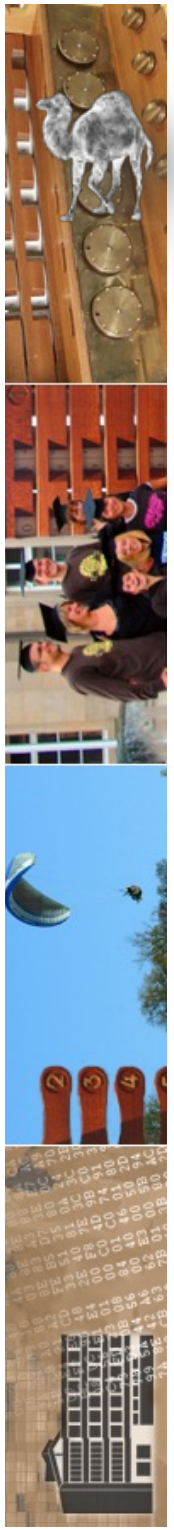
Wie wird Python ausführbar?

- …durch die **Shebang-Zeile**:

  erste (!!!) Zeile im Scriptprogramm ist ein besonderer Kommentar:

  ```
  #!<path_to_python>/python3
  ```

- zusätzlich auf Unix x-bit setzen:
  ```
  chmod +x <pythonscript>
  ```
  - und schon ist's ausführbar!
  - gilt für *alle Scriptsprachen*



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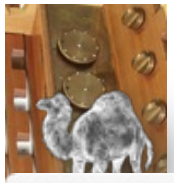
HelloWorld-CGI in Python

- wir können direkt ein erstes Python-HelloWorld schreiben
- dafür brauchen wir lediglich die richtige *Shebang-Zeile*
- nützlich: typisches **Here-Document** **(``` Text ```)**



hellocgi.py — /Users/thomas/Documents/Eberhardina/InformationsDienste/Lehre/source/python

Book.pyc
BookPublisher.py
BookPublisher.pyc
Buch.pyc
Buchhandlung.py
Buchhandlung2.py
BuchPublisher.pyc
cgi_1.py
cgi_1a.py
cgi_2.py
cgi_3.py
fakultaet.py
fork.py
hash.py
hello.py
hellocgi.py
helloworld.py
helloworld2.py
helloworld3.py
helloworld4.py

math.py | HTTPclient.py | hellocgi.py | time.py

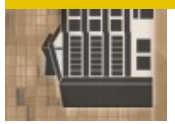
```
1  #!/usr/bin/python3
2  #
3  # Grundlagen Internet-Technologien
4  #
5  # Formularverarbeitung mit dem Python-Modul CGI
6
7  print ('''Content-type: text/html
8
9  <!DOCTYPE html>
10 <HTML>
11 <HEAD>
12     <TITLE>HelloWorld-CGI in python</TITLE>
13     <link rel="stylesheet" type="text/css" href="./css/webkompendium.css">
14 </HEAD>
15 <BODY>
16     <BR /><CENTER><H3>
17     Hello World<BR />GIT likes Python
18     </H3></CENTER><BR />
19 </BODY>
20 </HTML>''')
```

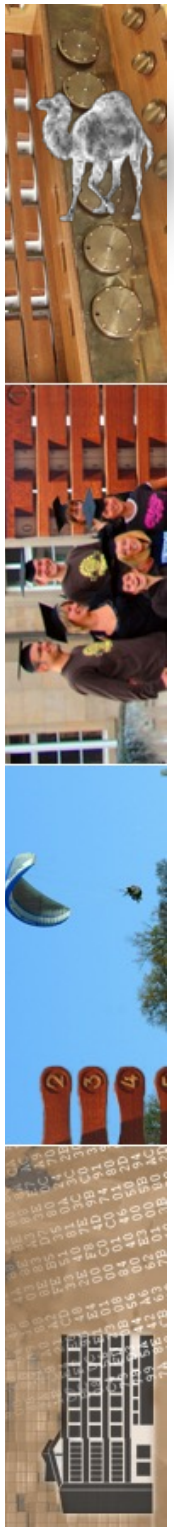
hellocgi.py 1:1 LF ISO 8859-15 Python 1 update


```
zrvwa01@infodienste =>
zrvwa01@infodienste => more hellocgi.py
#!/usr/bin/python3
#
# Grundlagen Internet-Technologien
#
# CGI mit Python

# here-Dokument in Python
print ('''Content-type: text/html

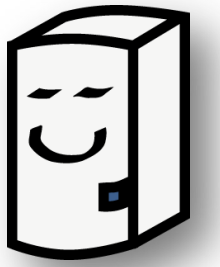
<!DOCTYPE html>
<HTML>
<HEAD>
    <TITLE>HelloWorld-CGI in python</TITLE>
    <link rel="stylesheet" type="text/css" href="./css/webkompendium.css">
</HEAD>
<BODY>
    <BR /><CENTER><H3>
    Hello World<BR />GIT likes Python
    </H3></CENTER><BR />
</BODY>
</HTML>''')
zrvwa01@infodienste =>
```





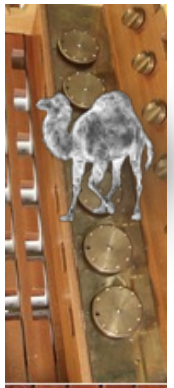
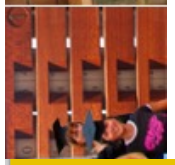
nächste Schritte

- kopieren nach cgi-bin
- x-bit setzen (Unix/Linux)

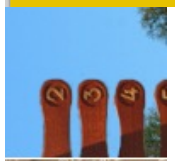


- Testen des Scripts **lokal** ("ohne Web")
  - *Script muss auch ohne Web fehlerfrei laufen!*
  - ohne explizit den PYTHON-Interpreter zu starten

- Aufruf aus Client-Browser

```
[zrvwa01@infodienste =>
[zrvwa01@infodienste =>
[zrvwa01@infodienste => ll hellocgi.py
-rwxr-xr-x 1 zrvwa01 443 29. Mai 13:34 hellocgi.py
[zrvwa01@infodienste =>
[zrvwa01@infodienste =>
```

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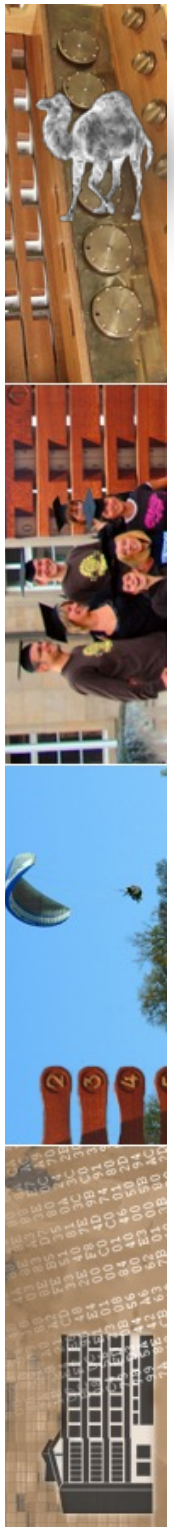
```
[zrvwa01@infodienste =>
[zrvwa01@infodienste => ./hellocgi.py
Content-type: text/html

<!DOCTYPE html>
<HTML>
<HEAD>
    <TITLE>HelloWorld-CGI in python</TITLE>
    <link rel="stylesheet" type="text/css" href="./css/webkompendium.css">
</HEAD>
<BODY>
    <BR /><CENTER><H3>
    Hello World<BR />GIT likes Python
    </H3></CENTER><BR />
</BODY>
</HTML>
[zrvwa01@infodienste =>
```



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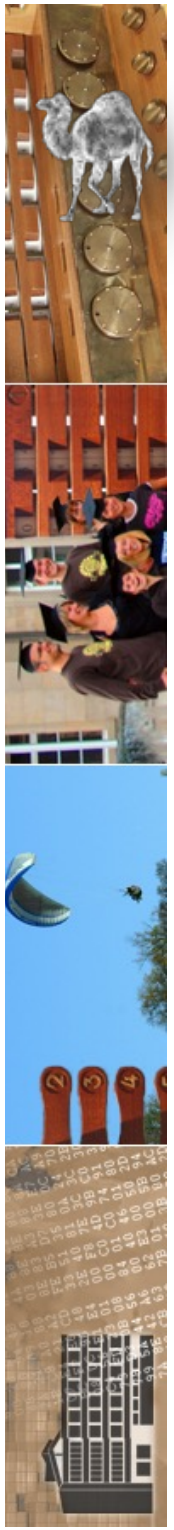
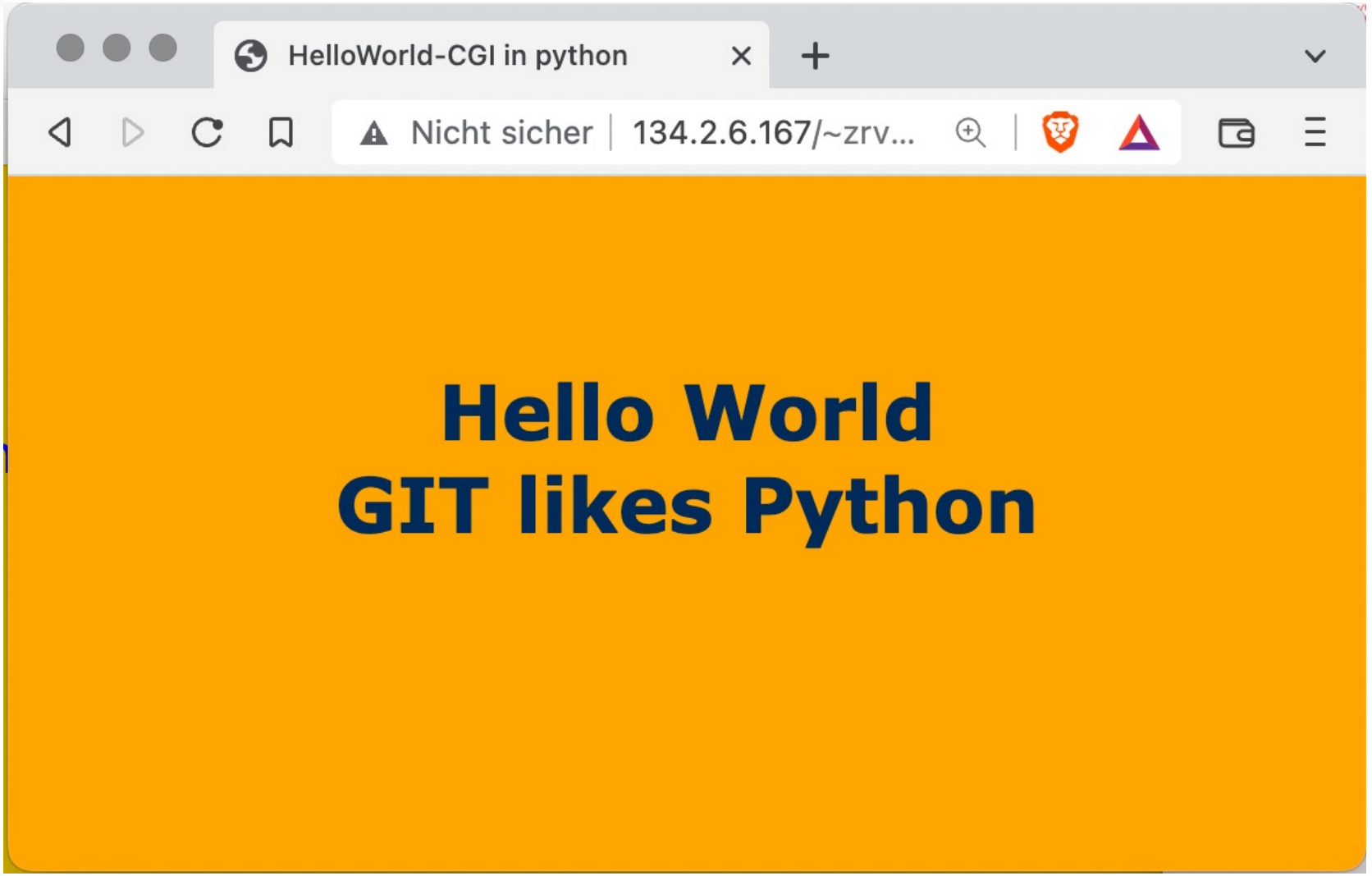
Ausführen im Web

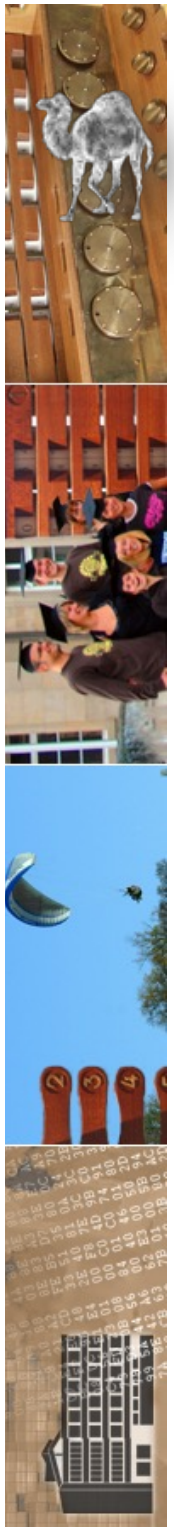
- über die Default-cgi-URL

  http://.../cgi-bin/name_des_scripts.py

  (Default wegen der Default-Apache-Config ScriptAlias cgi-bin)




HelloWorld-CGI in python
Nicht sicher
134.2.6.167/~zrv...
Hello World
GIT likes Python



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Here-Documents

- einbetten größerer „Raw-Texte“ in Python mittels

  dreier Anführungszeichen “‘ oder “““

- für CGIs praktisch

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SITÄT
GEN

Welcome to Python.org | HelloWorld-CGI in pytho

VPN Nicht sicher 134.2.6.167/~zrvwa01/c

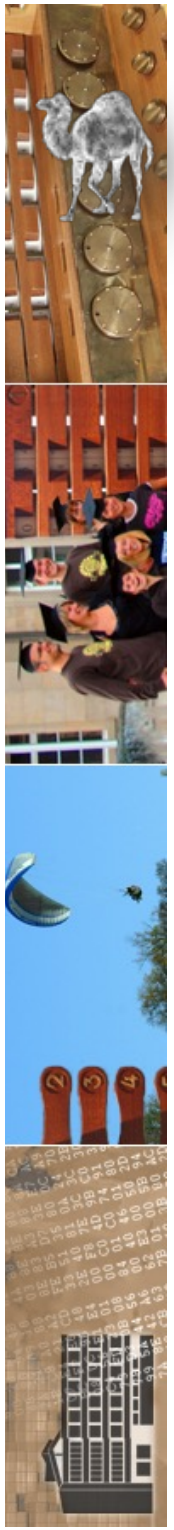
Hello Giro d'Italia
Tad

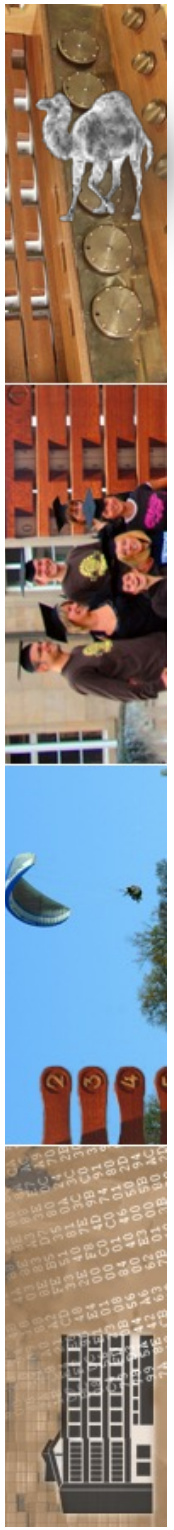
```
zrvwa01@infodienste =>
zrvwa01@infodienste => more giro.py
#!/usr/bin/python3
#
# Grundlagen Internet-Technologien
#
# grundlegendes CGI mit Python

# here-Dokument in Python - Begrenzt durch '''

print ('''Content-type: text/html

<!DOCTYPE html>
<HTML>
<HEAD>
    <TITLE>HelloWorld-CGI in python</TITLE>
    <link rel="stylesheet" type="text/css" href="./css/webkompendium.css">
</HEAD>
<BODY>
    <BR /><CENTER><H3>
    Hello Giro d'Italia<BR />Tadej Pogacar wins
    </H3></CENTER><BR />
</BODY>
</HTML>''')
zrvwa01@infodienste =>
```





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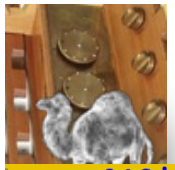
erste Dynamik

- als erstes Beispiel einer CGI-Dynamit integrieren wir eine Angabe der Serverzeit
- mittels Python-Modul **`time`** einfach möglich



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```
zrvwa01@infodienste =>
zrvwa01@infodienste => more time.py
#!/usr/bin/python3
#
# Grundlagen Internet-Technologien
#
# CGI mit Python: Zeitausgabe

import time;

print ("""Content-type: text/html

<!DOCTYPE html>
<HTML>
   <HEAD>
       <TITLE>Zeitausgabe als Python-cgi</TITLE>
       <link rel="stylesheet" type="text/css" href="./css/webkompendium.css">
   </HEAD>
   <BODY""")

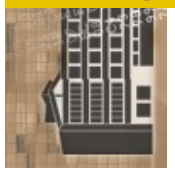
zeit = time.time()

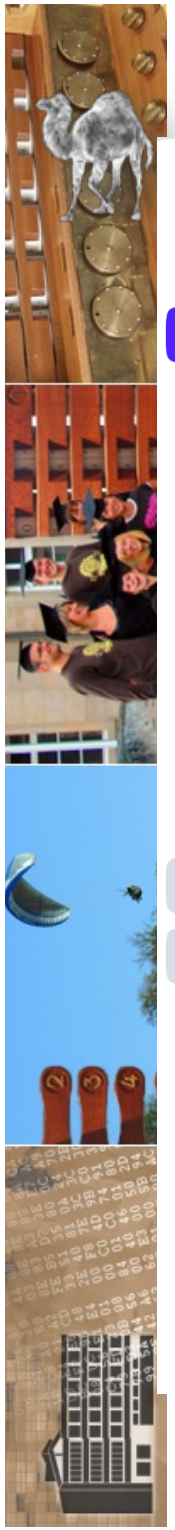
print ("      <center><p><h2>Grundlagen Internet-Technologien</h2></p><p><hr></p><p><h3>Zeit auf dem Server: ")

print (zeit)

print ("""      </h3></p></center>
      <p><hr></p><p><center><font size=\"-1\">
      <script>document.write(document.lastModified);</script></font></center></p>
   </BODY>
</HTML>""")

zrvwa01@infodienste =>
```





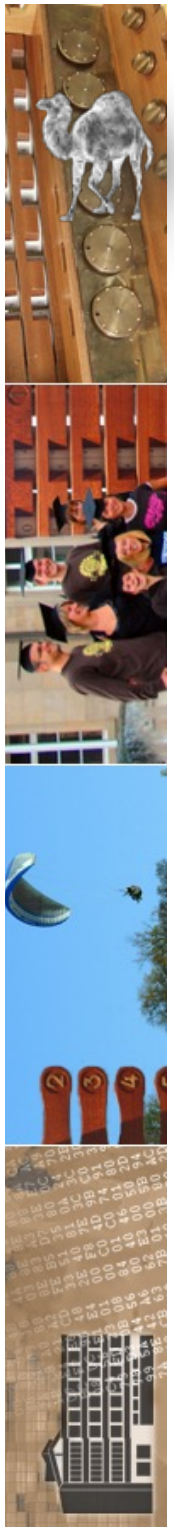
Welcome to Python.org | Zeitausgabe als Python-

Nicht sicher 134.2.6.167/~zrvwa01/cgi-bin/python/time.py

Grundlagen Internet-Technologien

Zeit auf dem Server: 1718206337.6872528

06/12/2024 17:32:17



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Python Modul cgi

- stellt u.a. die benötigte Funktionalität für *Formularverarbeitung* her
- darüber hinaus zahlreiche weitere nützliche Funktionen für die cgi-Programmierung

cgi — Common Gateway Interface support

Source code: Lib/cgi.py

Support module for Common Gateway Interface (CGI) scripts.

This module defines a number of utilities for use by CGI scripts written in Python.

Introduction

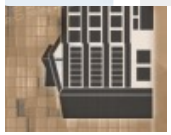
A CGI script is invoked by an HTTP server, usually to process user input submitted through an HTML `<FORM>` or `<ISINDEX>` element.

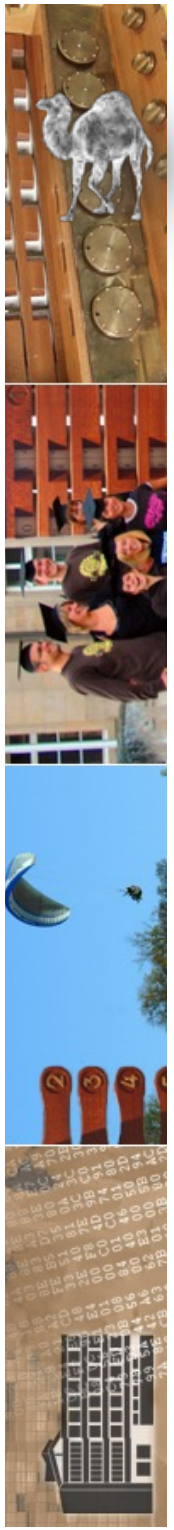
Most often, CGI scripts live in the server's special `cgi-bin` directory. The HTTP server places all sorts of information about the request (such as the client's hostname, the requested URL, the query string, and lots of other goodies) in the script's shell environment, executes the script, and sends the script's output back to the client.

The script's input is connected to the client too, and sometimes the form data is read this way; at other times the form data is passed via the "query string" part of the URL. This module is intended to take care of the different cases and provide a simpler interface to the Python script. It also provides a number of utilities that help in debugging scripts, and the latest addition is support for file uploads from a form (if your browser supports it).

The output of a CGI script should consist of two sections, separated by a blank line. The first section contains a number of headers, telling the client what kind of data is following. Python code to generate a minimal header section looks like this:

```
print("Content-Type: text/html")    # HTML is following
print()                             # blank line, end of headers
```





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Formularverarbeitung

- cgi-Modul enthält Klasse **`FieldStorage`**, welche die Verarbeitung komplexer Eingabeformulare ermöglicht
  - Objekt der Klasse FieldStorage verhält sich ähnlich wie ass. Array
  - ein einzelner Eintrag - also ein ausgefülltes Formularelement - ist ein Objekt der Klasse **`MiniFieldStorage`**; im Normalfall ist dies ein key-value-Paar
  - Beispiel:
    - ```
      FieldStorage()
      print FieldStorage("eingabe").value
      ```
      ```

```
zrvwa01@infodienste => more cgi_1.py
#!/usr/bin/python3
#
# Grundlagen Internet-Technologien
#
# Formularverarbeitung mit dem Python-Modul CGI

### Import des CGI-Moduls
import cgi

print('''Content-Type: text/html

<!DOCTYPE html>
<html><head><title>Python-CGI mit Formularverarbeitung</title><link rel="stylesheet"
type="text/css" href="./css/webkompendium.css"></head>
<body><p><center><h2>GIT - Python</h2></p><hr>
<h3>Auswertung aller Formularfelder<br><br>''')

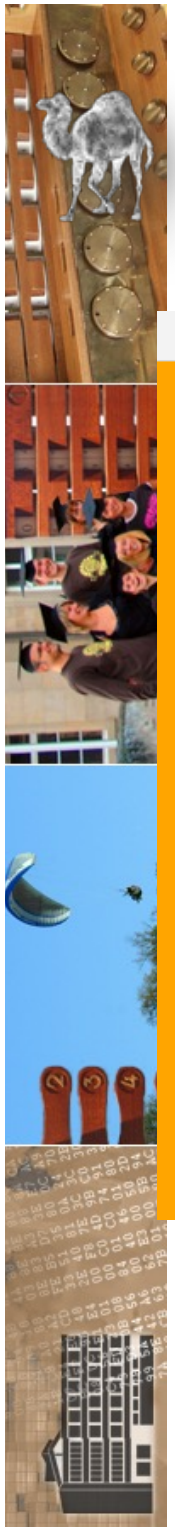
############ Auswertung des Formulars ###############

form = cgi.FieldStorage()

### Ausgabe aller values des Formulars
for key in form.keys():
    print('<br>Schl&uuml;ssel: ',key,' hat value ',form[key].value)

#####################################################

print ('''</h3><hr></center></body></html>''')
zrvwa01@infodienste =>
```



GIT - Python

Auswertung aller Formularfelder

Schlüssel: Giro hat value Roglic
Schlüssel: Tour hat value Vingegaard

Funktionen Modul cgi

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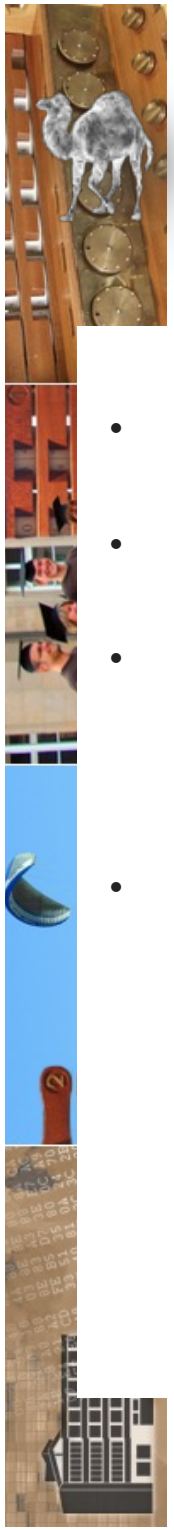
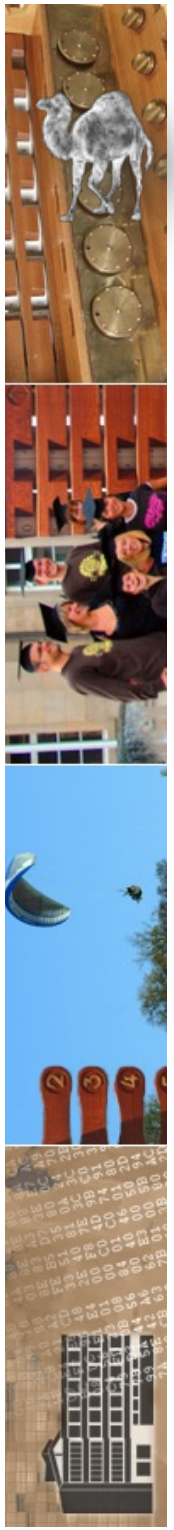
- `cgi.`**`parse`**(*fp=None*, *environ=os.environ*, *keep_blank_values=False*, *strict_parsing=Fal*
  Parse a query in the environment or from a file (the file defaults to `sys.stdin`).
  The *keep_blank_values* and *strict_parsing* parameters are passed to `urllib.parse.parse_qs()` unchanged.
- `cgi.`**`parse_qs`**(*qs*, *keep_blank_values=False*, *strict_parsing=False*)
  This function is deprecated in this module. Use `urllib.parse.parse_qs()` instead.
  It is maintained here only for backward compatibility.
- `cgi.`**`parse_qsl`**(*qs*, *keep_blank_values=False*, *strict_parsing=False*)
  This function is deprecated in this module. Use `urllib.parse.parse_qs()` instead.
  It is maintained here only for backward compatibility.
- `cgi.`**`parse_multipart`**(*fp*, *pdict*)
  Parse input of type *multipart/form-data* (for file uploads). Arguments are *fp* for the inpu
  file and *pdict* for a dictionary containing other parameters in the *Content-Type* header.
  Returns a dictionary just like `urllib.parse.parse_qs()` keys are the field names,
  each value is a list of values for that field. This is easy to use but not much good if you
  are expecting megabytes to be uploaded — in that case, use the `FieldStorage` class inst
  which is much more flexible.
  Note that this does not parse nested multipart parts — use `FieldStorage` for that.
- `cgi.`**`parse_header`**(*string*)
  Parse a MIME header (such as *Content-Type*) into a main value and a dictionary of paran
  `cgi.`**`test`**()
  Robust test CGI script, usable as main program. Writes minimal HTTP headers and forma
  all information provided to the script in HTML form.



Funktionen Modul cgi

- `cgi.`**`print_environ`**()
  Format the shell environment in HTML.
- `cgi.`**`print_form`**(*form*)
  Format a form in HTML.
- `cgi.`**`print_directory`**()
  Format the current directory in HTML.
  `cgi.`**`print_environ_usage`**()
  Print a list of useful (used by CGI) environment variables in HTML.
- `cgi.`**`escape`**(*s*, *quote=False*)
  Convert the characters `'&'`, `'<'` and `'>'` in string *s* to HTML-safe sequences.
  Use this if you need to display text that might contain such characters in HTML.
  If the optional flag *quote* is true, the quotation mark character (`"`) is also translated;
  this helps for inclusion in an HTML attribute value delimited by double quotes, as in
  `<a href="...">`. Note that single quotes are never translated.
  Deprecated since version 3.2: This function is unsafe because *quote* is false by defau
  and therefore deprecated. Use `html.escape()` instead.



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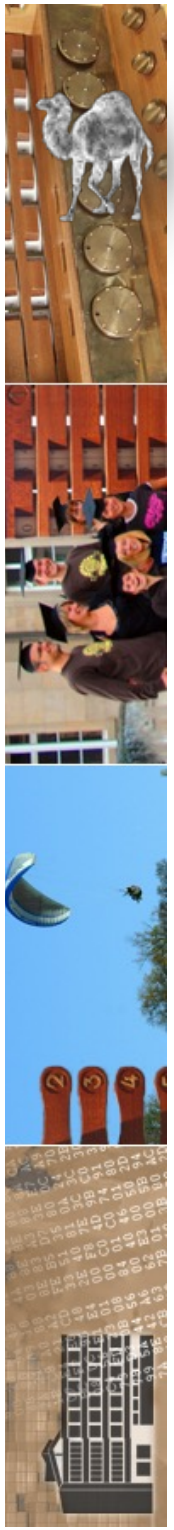
Fehlersuche

- das wichtige Modul **`cgitb`** liefert TraceBack-Funktionalität für cgi-Scripte (erst ab Python 2.2)

- Syntax:
  - **`import cgitb; cgitb.enable()`**

    `enable([display[, logdir[, context[, format]]]])`



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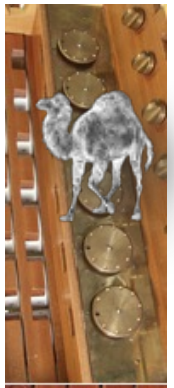
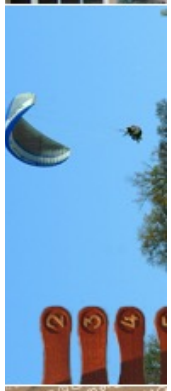
Syntax Methode `enable`

- `enable([`*`display`*`[, `*`logdir`*`[, `*`context`*`[, `*`format`*`]]]])`
  - The optional argument *display* defaults to 1 and can be set to 0 to suppress sending the traceback to the browser. If the argument *logdir* is present, the traceback reports are written to files. The value of *logdir* should be a directory where these files will be placed. The optional argument *context* is the number of lines of context to display around the current line of source code in the traceback; this defaults to 5. If the optional argument *format* is "html", the output is formatted as HTML. Any other value forces plain text output. The default value is "html".






```
zrvwa01@infodienste => more cgi_2.py
#!/usr/bin/python3
#
# Grundlagen Internet-Technologien
#
# Python-CGI mit TB

### Import der Module
import cgi
import cgitb

### Aktivierung TB
cgitb.enable(display=1, logdir="/tmp")


print("""Content-Type: text/html

<!DOCTYPE html>
<html>
<head>
<title>Python-CGI mit Formularverarbeitung und TB</title>
<link rel="stylesheet" type="text/css" href="./css/webkompendium.css">
</head>
<body><p>
<center><h2>Grundlagen Internet-Technologien</h2></p><hr><p><h3>""")

############ Auswertung des Formulars ###############

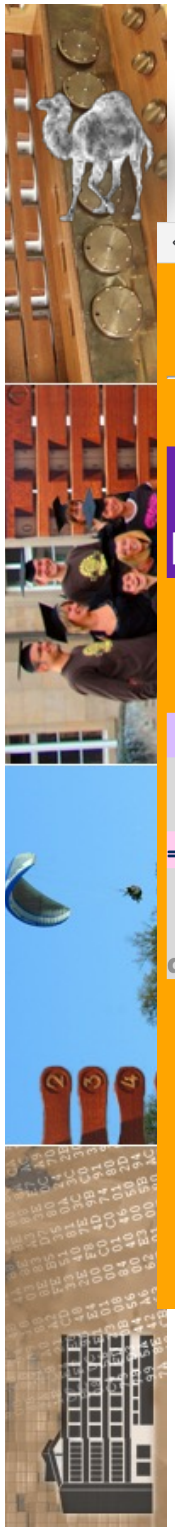
form = cgi.FieldStorage()

### Ausgabe aller values des Formulars
for key in form.keys():
    print('<br>Schl&uuml;ssel: ',key,' hat value ',form[key].value)

#####################################################

### Absichtlicher Fehler!
drucke("Hallo")

print ('</h3></p></center></body></html>')
zrvwa01@infodienste =>
```



Nicht sicher | 134.2.6.167/~zrvwa01/cgi-bin/python/cgi_2.py

VPN Aktualisieren

Grundlagen Internet-Technologien

--> -->

NameError

Python 3.9.2: /usr/bin/python3
Sun Jun 11 11:08:39 2023

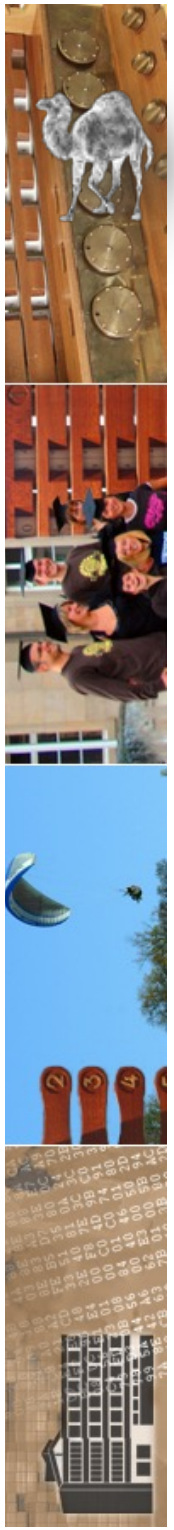
A problem occurred in a Python script. Here is the sequence of function calls leading up to the error, in the order they occurred.

/home/zrvwa01/public_html/cgi-bin/python/cgi_2.py in <module>

```
    35
    36 ### Absichtlicher Fehler!
=>  37 drucke("Hallo")
    38
    39 print ('</h3></p></center></body></html>')
drucke undefined
```

NameError: name 'drucke' is not defined
args = ("name 'drucke' is not defined",)
with_traceback = <built-in method with_traceback of NameError object>

/tmp/tmp1a7_4kji.html contains the description of this error.



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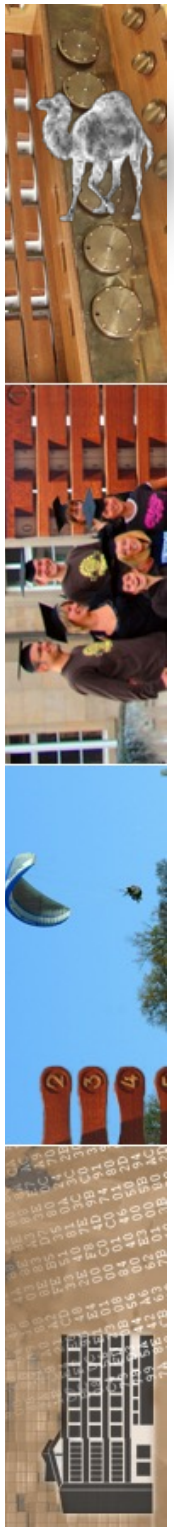
URLs und Python

- ...kennen sich gut:
- Modul **`urllib`** stellt viele Funktionen bereit (wie PERL-Modul LWP)
  - **`urlopen(url)`** öffnet url wie eine Datei (zum Lesen)
  - **`read()`**
  - **`readlines()`**
  - **`readline()`**
  - **`close()`**
- erweitere Klasse: **`urllib2`**



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das Modul html

- neu ab Version 3.2: Modul html

  optionale „Erleichterungen“ beim Umgang mit HTML

Previous topic
Structured Markup Processing Tools

Next topic
html.parser — Simple HTML and XHTML parser

This Page
Report a Bug
Show Source

`html` — HyperText Markup Language support

Source code: Lib/html/__init__.py

This module defines utilities to manipulate HTML.

`html.`**escape**(*s*, *quote=True*)

Convert the characters `&`, `<` and `>` in string *s* to HTML-safe sequences. Use this if you need to display text that might contain such characters in HTML. If the optional flag *quote* is true, the characters (`"`) and (`'`) are also translated; this helps for inclusion in an HTML attribute value delimited by quotes, as in `<a href="...">`.

New in version 3.2.

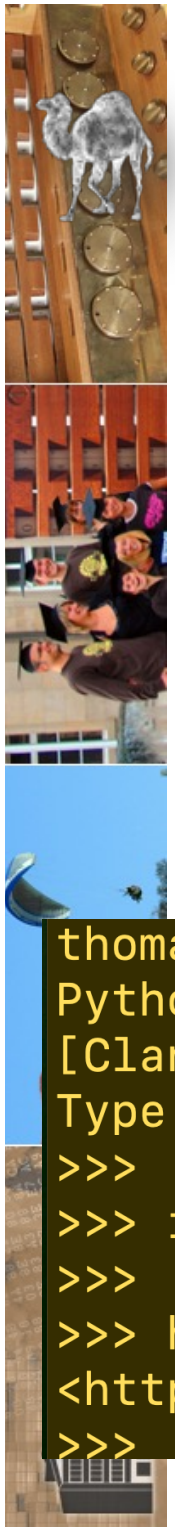
`html.`**unescape**(*s*)

Convert all named and numeric character references (e.g. `>`, `&#62;`, `&#x3e;`) in the string *s* to the corresponding Unicode characters. This function uses the rules defined by the HTML 5 standard for both valid and invalid character references, and the `list of HTML 5 named character references`.

New in version 3.4.

Submodules in the `html` package are:

- `html.parser` – HTML/XHTML parser with lenient parsing mode
- `html.entities` – HTML entity definitions



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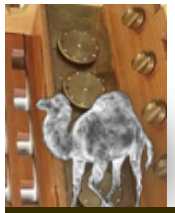
das Modul http.client

- mit diesem Modul kann Python als *HTTP-Client* eingesetzt werden
  - zahlreiche Anwendungen wie Link-Checker, Crawler, Performance-Test, …
    - in PERL: LWP

```
thomas@PetitMouton => python3
Python 3.8.3 (v3.8.3:6f8c8320e9, May 13 2020, 16:29:34)
[Clang 6.0 (clang-600.0.57)] on darwin
Type "help", "copyright", "credits" or "license" for more information.
>>>
>>> import http.client
>>>
>>> http.client.HTTPConnection('www.dfn.de')
<http.client.HTTPConnection object at 0x7ffc9011bdf0>
>>>
```



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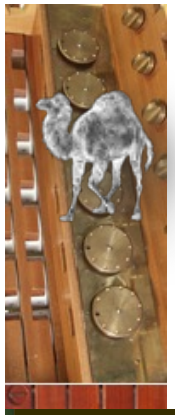
```
thomas@petitmouton-2 =>
thomas@petitmouton-2 => more HTTPclient.py
# Grundlagen Internet-Technologien
#
# HTTP-Client mit Python

import http.client

conn = http.client.HTTPSConnection("www.uni-tuebingen.de")
conn.request("GET", "/")
response1 = conn.getresponse()

print(response1.status, response1.reason,"\n\n")

data = response1.read()
print (data)
thomas@petitmouton-2 =>
```



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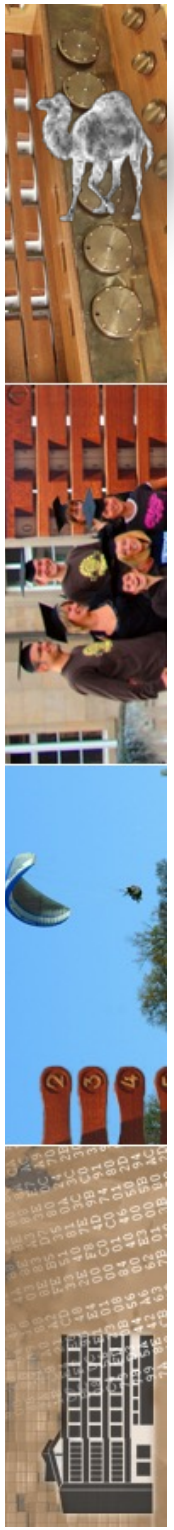
```
thomas@PetitMouton =>
thomas@PetitMouton =>
thomas@PetitMouton => python3 ./HTTPclient.py
301 Moved Permanently


b'<!DOCTYPE HTML PUBLIC "-//IETF//DTD HTML 2.0//EN">\n<html><head>\n
<title>301 Moved Permanently</title>\n</head><body>\n<h1>Moved Perma
nently</h1>\n<p>The document has moved <a href="https://uni-tuebinge
n.de/">here</a>.</p>\n</body></html>\n'
thomas@PetitMouton =>
thomas@PetitMouton =>
```



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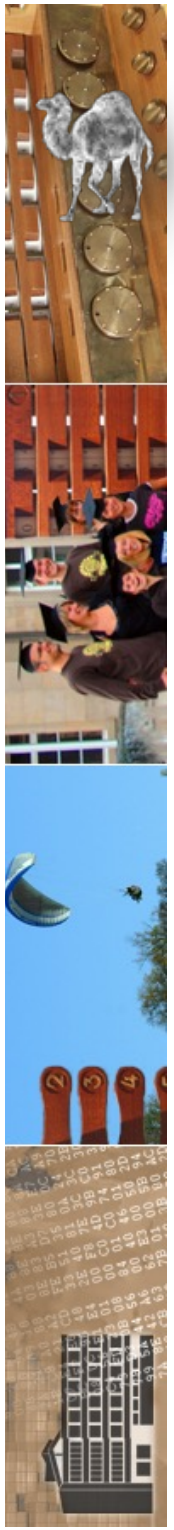
Python und Datenbanken

- Python lässt sich ideal mit Datenbanken verbinden
  - Modul DBI bietet Abstraktionsschicht zum Datenbankmanagementsystem
- *wir behandeln DB-Anbindungen am Beispiel PHP*



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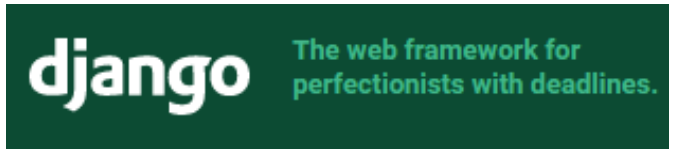
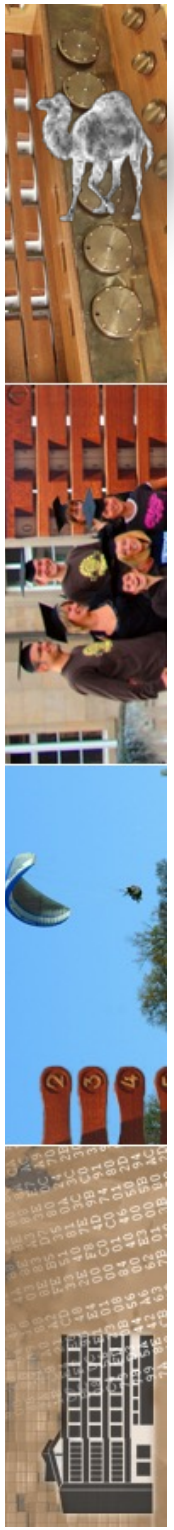
Python Frameworks

- Python ist auch Basis mehrerer Frameworks für die Web-Entwicklung
  - ➔ Grundlagen der Web-Entwicklung im Wintersemester
  - Django
    https://www.djangoproject.com/

  - TurboGears



Webframework: Django 4.2 führt Spalten- und Tabellenkommentare ein

Das neue LTS-Release des Django-Webframeworks ist auf den PostgreSQL-Adapter Psycopg 3 vorbereitet und stellt Kommentaroptionen für Spalten und Tabellen bereit.

Lesezeit: **2 Min.** In Pocket speichern

(Bild: PureSolution/Shutterstock.com)

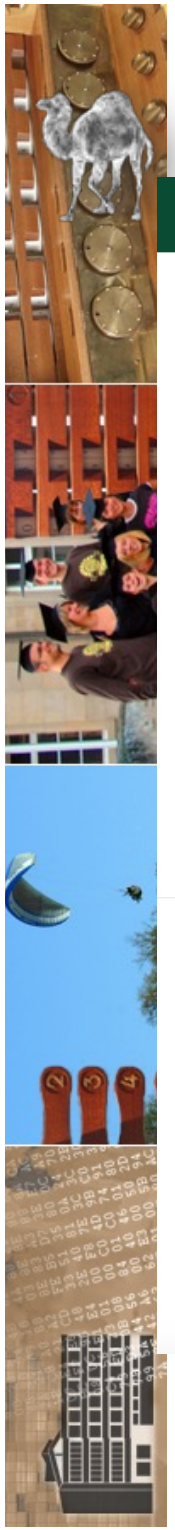
03.04.2023 16:44 Uhr | **Developer**

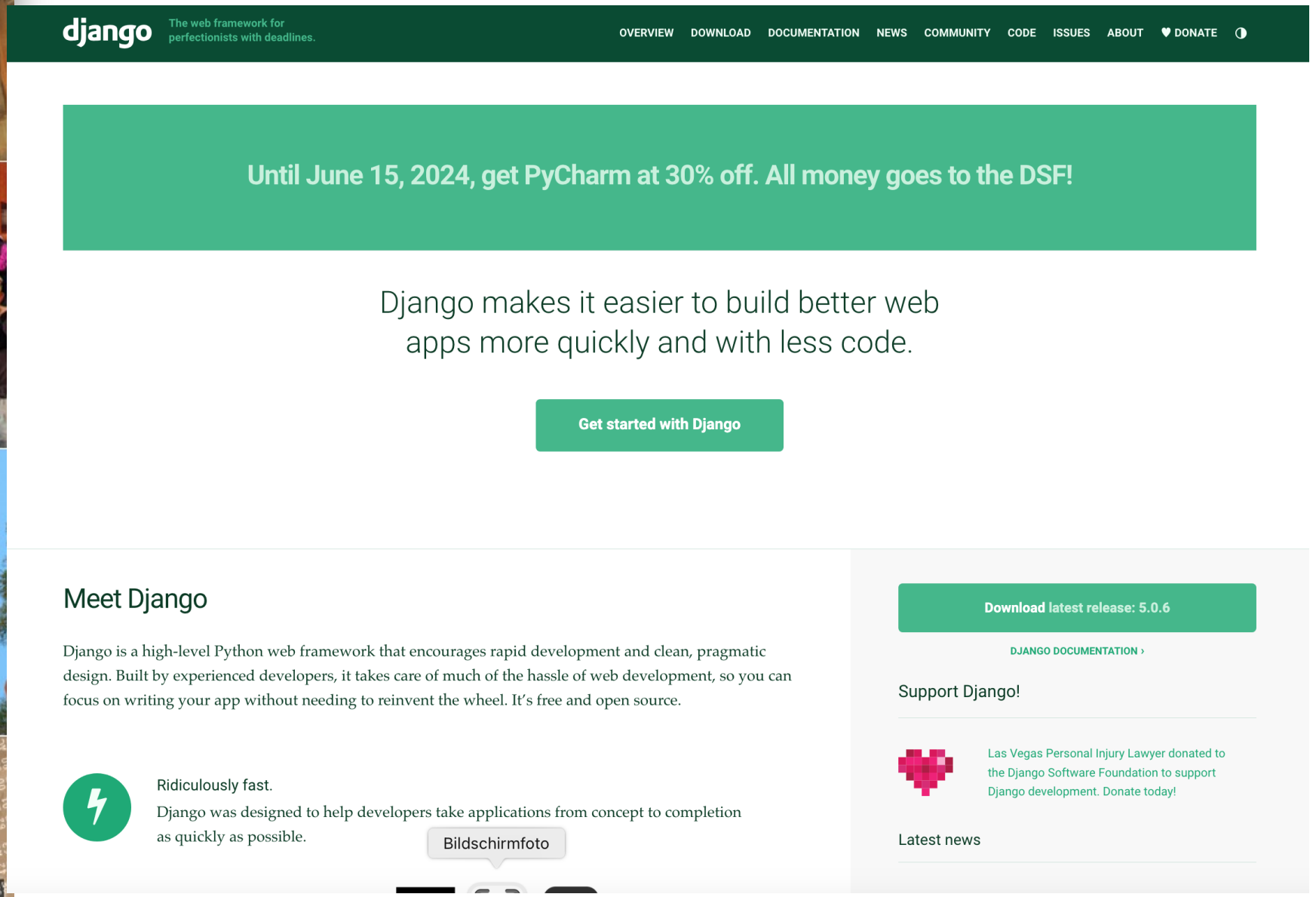
Von Matthias Parbel

Das in Python entwickelte Open-Source-Webframework Django hat Version 4.2 erreicht. Damit liegt ein neues LTS-Release (Long-term Support) vor, das Security-Updates und Bugfixes zum Schutz vor Datenverlust bis mindestens April 2026 garantiert. Wichtige Neuerungen in Version 4.2 umfassen die Anpassung an den PostgreSQL-Adapter Psycopg 3 und Optionen zum Anlegen von Kommentaren in Spalten und Tabellen.

Neues LTS-Release mit erweitertem Support

Während der allgemeine Support für Django 4.1 ebenso wie der erweiterte für Version 4.0 ausläuft, übernimmt Django 4.2 die Rolle des aktuellen LTS-Release. Bis zum Jahresende liefert das Django-Entwicklungsteam Abhilfe bei

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Django makes it easier to build better web apps more quickly and with less code.
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Meet Django
Django is a high-level Python web framework that encourages rapid development and clean, pragmatic design. Built by experienced developers, it takes care of much of the hassle of web development, so you can focus on writing your app without needing to reinvent the wheel. It's free and open source.
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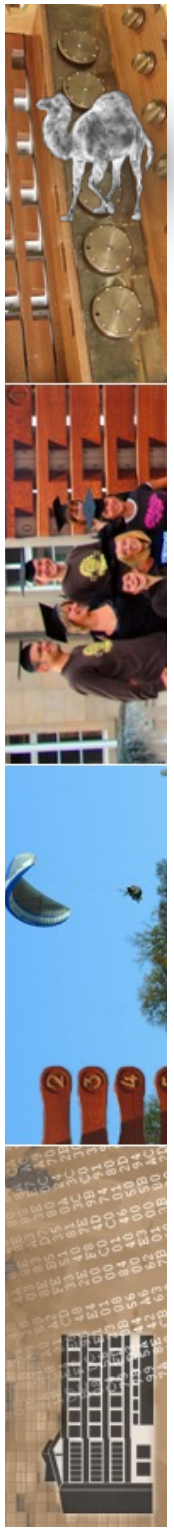

EBERHARD KARLS
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TÜBINGEN

…und nun…

- haben wir die Möglichkeiten von Python als cgi-Sprache kennen gelernt
  - dabei auch die Erweiterung von Python durch Module
  - und speziell das Python-Modul cgi

- als nächstes
  - **serverseitige Web-Programmierung mit PHP**