
chardet Documentation

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Contents

1	Documentation	3
1.1	Frequently asked questions	3
1.2	Supported encodings	4
1.3	Usage	5
1.4	How it works	6
1.5	chardet	8
2	Indices and tables	19
	Python Module Index	21
	Index	23

Character encoding auto-detection in Python. As smart as your browser. Open source.

1.1 Frequently asked questions

1.1.1 What is character encoding?

When you think of “text”, you probably think of “characters and symbols I see on my computer screen”. But computers don’t deal in characters and symbols; they deal in bits and bytes. Every piece of text you’ve ever seen on a computer screen is actually stored in a particular *character encoding*. There are many different character encodings, some optimized for particular languages like Russian or Chinese or English, and others that can be used for multiple languages. Very roughly speaking, the character encoding provides a mapping between the stuff you see on your screen and the stuff your computer actually stores in memory and on disk.

In reality, it’s more complicated than that. Many characters are common to multiple encodings, but each encoding may use a different sequence of bytes to actually store those characters in memory or on disk. So you can think of the character encoding as a kind of decryption key for the text. Whenever someone gives you a sequence of bytes and claims it’s “text”, you need to know what character encoding they used so you can decode the bytes into characters and display them (or process them, or whatever).

1.1.2 What is character encoding auto-detection?

It means taking a sequence of bytes in an unknown character encoding, and attempting to determine the encoding so you can read the text. It’s like cracking a code when you don’t have the decryption key.

1.1.3 Isn’t that impossible?

In general, yes. However, some encodings are optimized for specific languages, and languages are not random. Some character sequences pop up all the time, while other sequences make no sense. A person fluent in English who opens a newspaper and finds “txzqJv 2!dasd0a QqdKjvz” will instantly recognize that that isn’t English (even though it is composed entirely of English letters). By studying lots of “typical” text, a computer algorithm can simulate this kind of fluency and make an educated guess about a text’s language.

In other words, encoding detection is really language detection, combined with knowledge of which languages tend to use which character encodings.

1.1.4 Who wrote this detection algorithm?

This library is a port of [the auto-detection code in Mozilla](#). I have attempted to maintain as much of the original structure as possible (mostly for selfish reasons, to make it easier to maintain the port as the original code evolves). I have also retained the original authors' comments, which are quite extensive and informative.

You may also be interested in the research paper which led to the Mozilla implementation, [A composite approach to language/encoding detection](#).

1.1.5 Yippie! Screw the standards, I'll just auto-detect everything!

Don't do that. Virtually every format and protocol contains a method for specifying character encoding.

- HTTP can define a `charset` parameter in the `Content-type` header.
- HTML documents can define a `<meta http-equiv="content-type">` element in the `<head>` of a web page.
- XML documents can define an `encoding` attribute in the XML prolog.

If text comes with explicit character encoding information, you should use it. If the text has no explicit information, but the relevant standard defines a default encoding, you should use that. (This is harder than it sounds, because standards can overlap. If you fetch an XML document over HTTP, you need to support both standards *and* figure out which one wins if they give you conflicting information.)

Despite the complexity, it's worthwhile to follow standards and [respect explicit character encoding information](#). It will almost certainly be faster and more accurate than trying to auto-detect the encoding. It will also make the world a better place, since your program will interoperate with other programs that follow the same standards.

1.1.6 Why bother with auto-detection if it's slow, inaccurate, and non-standard?

Sometimes you receive text with verifiably inaccurate encoding information. Or text without any encoding information, and the specified default encoding doesn't work. There are also some poorly designed standards that have no way to specify encoding at all.

If following the relevant standards gets you nowhere, *and* you decide that processing the text is more important than maintaining interoperability, then you can try to auto-detect the character encoding as a last resort. An example is my [Universal Feed Parser](#), which calls this auto-detection library *only after exhausting all other options*.

1.2 Supported encodings

Universal Encoding Detector currently supports over two dozen character encodings.

- Big5, GB2312/GB18030, EUC-TW, HZ-GB-2312, and ISO-2022-CN (Traditional and Simplified Chinese)
- EUC-JP, SHIFT_JIS, and ISO-2022-JP (Japanese)
- EUC-KR and ISO-2022-KR (Korean)
- KOI8-R, MacCyrillic, IBM855, IBM866, ISO-8859-5, and windows-1251 (Russian)
- ISO-8859-2 and windows-1250 (Hungarian)

- ISO-8859-5 and windows-1251 (Bulgarian)
- ISO-8859-1 and windows-1252 (Western European languages)
- ISO-8859-7 and windows-1253 (Greek)
- ISO-8859-8 and windows-1255 (Visual and Logical Hebrew)
- TIS-620 (Thai)
- UTF-32 BE, LE, 3412-ordered, or 2143-ordered (with a BOM)
- UTF-16 BE or LE (with a BOM)
- UTF-8 (with or without a BOM)
- ASCII

Warning: Due to inherent similarities between certain encodings, some encodings may be detected incorrectly. In my tests, the most problematic case was Hungarian text encoded as ISO-8859-2 or windows-1250 (encoded as one but reported as the other). Also, Greek text encoded as ISO-8859-7 was often mis-reported as ISO-8859-2. Your mileage may vary.

1.3 Usage

1.3.1 Basic usage

The easiest way to use the Universal Encoding Detector library is with the `detect` function.

1.3.2 Example: Using the `detect` function

The `detect` function takes one argument, a non-Unicode string. It returns a dictionary containing the auto-detected character encoding and a confidence level from 0 to 1.

```
>>> import urllib
>>> rawdata = urllib.urlopen('http://yahoo.co.jp/').read()
>>> import chardet
>>> chardet.detect(rawdata)
{'encoding': 'EUC-JP', 'confidence': 0.99}
```

1.3.3 Advanced usage

If you're dealing with a large amount of text, you can call the Universal Encoding Detector library incrementally, and it will stop as soon as it is confident enough to report its results.

Create a `UniversalDetector` object, then call its `feed` method repeatedly with each block of text. If the detector reaches a minimum threshold of confidence, it will set `detector.done` to `True`.

Once you've exhausted the source text, call `detector.close()`, which will do some final calculations in case the detector didn't hit its minimum confidence threshold earlier. Then `detector.result` will be a dictionary containing the auto-detected character encoding and confidence level (the same as the `chardet.detect` function returns).

1.3.4 Example: Detecting encoding incrementally

```
import urllib
from chardet.universaldetector import UniversalDetector

usock = urllib.urlopen('http://yahoo.co.jp/')
detector = UniversalDetector()
for line in usock.readlines():
    detector.feed(line)
    if detector.done: break
detector.close()
usock.close()
print detector.result
```

```
{'encoding': 'EUC-JP', 'confidence': 0.99}
```

If you want to detect the encoding of multiple texts (such as separate files), you can re-use a single `UniversalDetector` object. Just call `detector.reset()` at the start of each file, call `detector.feed` as many times as you like, and then call `detector.close()` and check the `detector.result` dictionary for the file's results.

1.3.5 Example: Detecting encodings of multiple files

```
import glob
from chardet.universaldetector import UniversalDetector

detector = UniversalDetector()
for filename in glob.glob('*.xml'):
    print filename.ljust(60),
    detector.reset()
    for line in file(filename, 'rb'):
        detector.feed(line)
        if detector.done: break
    detector.close()
    print detector.result
```

1.4 How it works

This is a brief guide to navigating the code itself.

First, you should read [A composite approach to language/encoding detection](#), which explains the detection algorithm and how it was derived. This will help you later when you stumble across the huge character frequency distribution tables like `big5freq.py` and language models like `langcyrillicmodel.py`.

The main entry point for the detection algorithm is `universaldetector.py`, which has one class, `UniversalDetector`. (You might think the main entry point is the `detect` function in `chardet/__init__.py`, but that's really just a convenience function that creates a `UniversalDetector` object, calls it, and returns its result.)

There are 5 categories of encodings that `UniversalDetector` handles:

1. UTF-*n* with a BOM. This includes UTF-8, both BE and LE variants of UTF-16, and all 4 byte-order variants of UTF-32.

2. Escaped encodings, which are entirely 7-bit ASCII compatible, where non-ASCII characters start with an escape sequence. Examples: ISO-2022-JP (Japanese) and HZ-GB-2312 (Chinese).
3. Multi-byte encodings, where each character is represented by a variable number of bytes. Examples: Big5 (Chinese), SHIFT_JIS (Japanese), EUC-KR (Korean), and UTF-8 without a BOM.
4. Single-byte encodings, where each character is represented by one byte. Examples: KOI8-R (Russian), windows-1255 (Hebrew), and TIS-620 (Thai).
5. windows-1252, which is used primarily on Microsoft Windows; its subset, ISO-8859-1 is widely used for legacy 8-bit-encoded text. chardet, like many encoding detectors, defaults to guessing this encoding when no other can be reliably established.

1.4.1 UTF-*n* with a BOM

If the text starts with a BOM, we can reasonably assume that the text is encoded in UTF-8, UTF-16, or UTF-32. (The BOM will tell us exactly which one; that's what it's for.) This is handled inline in `UniversalDetector`, which returns the result immediately without any further processing.

1.4.2 Escaped encodings

If the text contains a recognizable escape sequence that might indicate an escaped encoding, `UniversalDetector` creates an `EscCharSetProber` (defined in `escprober.py`) and feeds it the text.

`EscCharSetProber` creates a series of state machines, based on models of HZ-GB-2312, ISO-2022-CN, ISO-2022-JP, and ISO-2022-KR (defined in `escsm.py`). `EscCharSetProber` feeds the text to each of these state machines, one byte at a time. If any state machine ends up uniquely identifying the encoding, `EscCharSetProber` immediately returns the positive result to `UniversalDetector`, which returns it to the caller. If any state machine hits an illegal sequence, it is dropped and processing continues with the other state machines.

1.4.3 Multi-byte encodings

Assuming no BOM, `UniversalDetector` checks whether the text contains any high-bit characters. If so, it creates a series of “probers” for detecting multi-byte encodings, single-byte encodings, and as a last resort, windows-1252.

The multi-byte encoding prober, `MBCSGroupProber` (defined in `mbcsgroupprober.py`), is really just a shell that manages a group of other probers, one for each multi-byte encoding: Big5, GB2312, EUC-TW, EUC-KR, EUC-JP, SHIFT_JIS, and UTF-8. `MBCSGroupProber` feeds the text to each of these encoding-specific probers and checks the results. If a prober reports that it has found an illegal byte sequence, it is dropped from further processing (so that, for instance, any subsequent calls to `UniversalDetector.feed` will skip that prober). If a prober reports that it is reasonably confident that it has detected the encoding, `MBCSGroupProber` reports this positive result to `UniversalDetector`, which reports the result to the caller.

Most of the multi-byte encoding probers are inherited from `MultiByteCharSetProber` (defined in `mbcharsetprober.py`), and simply hook up the appropriate state machine and distribution analyzer and let `MultiByteCharSetProber` do the rest of the work. `MultiByteCharSetProber` runs the text through the encoding-specific state machine, one byte at a time, to look for byte sequences that would indicate a conclusive positive or negative result. At the same time, `MultiByteCharSetProber` feeds the text to an encoding-specific distribution analyzer.

The distribution analyzers (each defined in `chardistribution.py`) use language-specific models of which characters are used most frequently. Once `MultiByteCharSetProber` has fed enough text to the distribution analyzer, it calculates a confidence rating based on the number of frequently-used characters, the total number of characters,

and a language-specific distribution ratio. If the confidence is high enough, `MultiByteCharSetProber` returns the result to `MBCSGroupProber`, which returns it to `UniversalDetector`, which returns it to the caller.

The case of Japanese is more difficult. Single-character distribution analysis is not always sufficient to distinguish between `EUC-JP` and `SHIFT_JIS`, so the `SJISProber` (defined in `sjisprober.py`) also uses 2-character distribution analysis. `SJISContextAnalysis` and `EUCJPContextAnalysis` (both defined in `jpctx.py` and both inheriting from a common `JapaneseContextAnalysis` class) check the frequency of Hiragana syllabary characters within the text. Once enough text has been processed, they return a confidence level to `SJISProber`, which checks both analyzers and returns the higher confidence level to `MBCSGroupProber`.

1.4.4 Single-byte encodings

The single-byte encoding prober, `SBCSGroupProber` (defined in `sbcsgroupprober.py`), is also just a shell that manages a group of other probers, one for each combination of single-byte encoding and language: `windows-1251`, `KOI8-R`, `ISO-8859-5`, `MacCyrillic`, `IBM855`, and `IBM866` (Russian); `ISO-8859-7` and `windows-1253` (Greek); `ISO-8859-5` and `windows-1251` (Bulgarian); `ISO-8859-2` and `windows-1250` (Hungarian); `TIS-620` (Thai); `windows-1255` and `ISO-8859-8` (Hebrew).

`SBCSGroupProber` feeds the text to each of these encoding+language-specific probers and checks the results. These probers are all implemented as a single class, `SingleByteCharSetProber` (defined in `sbcharsetprober.py`), which takes a language model as an argument. The language model defines how frequently different 2-character sequences appear in typical text. `SingleByteCharSetProber` processes the text and tallies the most frequently used 2-character sequences. Once enough text has been processed, it calculates a confidence level based on the number of frequently-used sequences, the total number of characters, and a language-specific distribution ratio.

Hebrew is handled as a special case. If the text appears to be Hebrew based on 2-character distribution analysis, `HebrewProber` (defined in `hebrewprober.py`) tries to distinguish between Visual Hebrew (where the source text actually stored “backwards” line-by-line, and then displayed verbatim so it can be read from right to left) and Logical Hebrew (where the source text is stored in reading order and then rendered right-to-left by the client). Because certain characters are encoded differently based on whether they appear in the middle of or at the end of a word, we can make a reasonable guess about direction of the source text, and return the appropriate encoding (`windows-1255` for Logical Hebrew, or `ISO-8859-8` for Visual Hebrew).

1.4.5 windows-1252

If `UniversalDetector` detects a high-bit character in the text, but none of the other multi-byte or single-byte encoding probers return a confident result, it creates a `Latin1Prober` (defined in `latin1prober.py`) to try to detect English text in a `windows-1252` encoding. This detection is inherently unreliable, because English letters are encoded in the same way in many different encodings. The only way to distinguish `windows-1252` is through commonly used symbols like smart quotes, curly apostrophes, copyright symbols, and the like. `Latin1Prober` automatically reduces its confidence rating to allow more accurate probers to win if at all possible.

1.5 chardet

1.5.1 chardet package

Submodules

`chardet.big5freq` module

chardet.big5prober module

```
class chardet.big5prober.Big5Prober
    Bases: chardet.mbcharsetprober.MultiByteCharSetProber

    charset_name

    language
```

chardet.chardetect module

chardet.chardistribution module

```
class chardet.chardistribution.Big5DistributionAnalysis
    Bases: chardet.chardistribution.CharDistributionAnalysis

    get_order(byte_str)

class chardet.chardistribution.CharDistributionAnalysis
    Bases: object

    ENOUGH_DATA_THRESHOLD = 1024
    MINIMUM_DATA_THRESHOLD = 3
    SURE_NO = 0.01
    SURE_YES = 0.99

    feed(char, char_len)
        feed a character with known length

    get_confidence()
        return confidence based on existing data

    get_order(byte_str)

    got_enough_data()

    reset()
        reset analyser, clear any state

class chardet.chardistribution.EUCJPDistributionAnalysis
    Bases: chardet.chardistribution.CharDistributionAnalysis

    get_order(byte_str)

class chardet.chardistribution.EUCKRDistributionAnalysis
    Bases: chardet.chardistribution.CharDistributionAnalysis

    get_order(byte_str)

class chardet.chardistribution.EUCTWDistributionAnalysis
    Bases: chardet.chardistribution.CharDistributionAnalysis

    get_order(byte_str)

class chardet.chardistribution.GB2312DistributionAnalysis
    Bases: chardet.chardistribution.CharDistributionAnalysis

    get_order(byte_str)

class chardet.chardistribution.SJISDistributionAnalysis
    Bases: chardet.chardistribution.CharDistributionAnalysis
```

`get_order (byte_str)`

chardet.charsetgroupprober module

class `chardet.charsetgroupprober.CharSetGroupProber (lang_filter=None)`

Bases: `chardet.charsetprober.CharSetProber`

charset_name

feed (*byte_str*)

get_confidence ()

language

reset ()

chardet.charsetprober module

class `chardet.charsetprober.CharSetProber (lang_filter=None)`

Bases: `object`

SHORTCUT_THRESHOLD = 0.95

charset_name

feed (*buf*)

static filter_high_byte_only (*buf*)

static filter_international_words (*buf*)

We define three types of bytes: alphabet: english alphabets [a-zA-Z] international: international characters [-ÿ] marker: everything else [^a-zA-Z-ÿ]

The input buffer can be thought to contain a series of words delimited by markers. This function works to filter all words that contain at least one international character. All contiguous sequences of markers are replaced by a single space ascii character.

This filter applies to all scripts which do not use English characters.

static filter_with_english_letters (*buf*)

Returns a copy of *buf* that retains only the sequences of English alphabet and high byte characters that are not between <> characters. Also retains English alphabet and high byte characters immediately before occurrences of >.

This filter can be applied to all scripts which contain both English characters and extended ASCII characters, but is currently only used by `Latin1Prober`.

get_confidence ()

reset ()

state

chardet.codingstatemachine module

class `chardet.codingstatemachine.CodingStateMachine (sm)`

Bases: `object`

A state machine to verify a byte sequence for a particular encoding. For each byte the detector receives, it will feed that byte to every active state machine available, one byte at a time. The state machine changes its state

based on its previous state and the byte it receives. There are 3 states in a state machine that are of interest to an auto-detector:

START state: This is the state to start with, or a legal byte sequence (i.e. a valid code point) for character has been identified.

ME state: This indicates that the state machine identified a byte sequence that is specific to the charset it is designed for and that there is no other possible encoding which can contain this byte sequence. This will lead to an immediate positive answer for the detector.

ERROR state: This indicates the state machine identified an illegal byte sequence for that encoding. This will lead to an immediate negative answer for this encoding. Detector will exclude this encoding from consideration from here on.

```
get_coding_state_machine()
get_current_charlen()
language
next_state(c)
reset()
```

chardet.compat module

chardet.constants module

chardet.cp949prober module

```
class chardet.cp949prober.CP949Prober
    Bases: chardet.mbcharsetprober.MultiByteCharSetProber
    charset_name
    language
```

chardet.escprober module

```
class chardet.escprober.EscCharSetProber (lang_filter=None)
    Bases: chardet.charsetprober.CharSetProber
```

This CharSetProber uses a “code scheme” approach for detecting encodings, whereby easily recognizable escape or shift sequences are relied on to identify these encodings.

```
charset_name
feed(byte_str)
get_confidence()
language
reset()
```

chardet.escsm module

chardet.eucjpprober module

```
class chardet.eucjpprober.EUCJPProber
    Bases: chardet.mbcharsetprober.MultiByteCharSetProber

    charset_name
    feed(byte_str)
    get_confidence()
    language
    reset()
```

chardet.euckrfreq module

chardet.euckrprober module

```
class chardet.euckrprober.EUCKRProber
    Bases: chardet.mbcharsetprober.MultiByteCharSetProber

    charset_name
    language
```

chardet.euctwfreq module

chardet.euctwprober module

```
class chardet.euctwprober.EUCTWProber
    Bases: chardet.mbcharsetprober.MultiByteCharSetProber

    charset_name
    language
```

chardet.gb2312freq module

chardet.gb2312prober module

```
class chardet.gb2312prober.GB2312Prober
    Bases: chardet.mbcharsetprober.MultiByteCharSetProber

    charset_name
    language
```

chardet.hebrewprober module

```
class chardet.hebrewprober.HebrewProber
    Bases: chardet.charsetprober.CharSetProber

    FINAL_KAF = 234
```



```
FINAL_MEM = 237
FINAL_NUN = 239
FINAL_PE = 243
FINAL_TSADI = 245
LOGICAL_HEBREW_NAME = 'windows-1255'
MIN_FINAL_CHAR_DISTANCE = 5
MIN_MODEL_DISTANCE = 0.01
NORMAL_KAF = 235
NORMAL_MEM = 238
NORMAL_NUN = 240
NORMAL_PE = 244
NORMAL_TSADI = 246
VISUAL_HEBREW_NAME = 'ISO-8859-8'

charset_name
feed(byte_str)
is_final(c)
is_non_final(c)
language
reset()
set_model_probers(logicalProber, visualProber)
state
```

chardet.jisfreq module

chardet.jpctx module

```
class chardet.jpctx.EUCJPContextAnalysis
    Bases: chardet.jpctx.JapaneseContextAnalysis
    get_order(byte_str)

class chardet.jpctx.JapaneseContextAnalysis
    Bases: object
    DONT_KNOW = -1
    ENOUGH_REL_THRESHOLD = 100
    MAX_REL_THRESHOLD = 1000
    MINIMUM_DATA_THRESHOLD = 4
    NUM_OF_CATEGORY = 6
    feed(byte_str, num_bytes)
    get_confidence()
```

```
get_order (byte_str)
got_enough_data ()
reset ()
```

```
class chardet.jpctx.SJISContextAnalysis
    Bases: chardet.jpctx.JapaneseContextAnalysis
    charset_name
    get_order (byte_str)
```

chardet.langbulgarianmodel module

chardet.langcyrillicmodel module

chardet.langgreekmodel module

chardet.langhebrewmodel module

chardet.langhungarianmodel module

chardet.langthaimodel module

chardet.latin1prober module

```
class chardet.latin1prober.Latin1Prober
    Bases: chardet.charsetprober.CharSetProber
    charset_name
    feed (byte_str)
    get_confidence ()
    language
    reset ()
```

chardet.mbcharsetprober module

```
class chardet.mbcharsetprober.MultiByteCharSetProber (lang_filter=None)
    Bases: chardet.charsetprober.CharSetProber
    charset_name
    feed (byte_str)
    get_confidence ()
    language
    reset ()
```

chardet.mbcsgroupprober module

```
class chardet.mbcsgroupprober.MBCSGroupProber (lang_filter=None)
    Bases: chardet.charsetgroupprober.CharSetGroupProber
```

chardet.mbcssm module

chardet.sbcharsetprober module

```
class chardet.sbcharsetprober.SingleByteCharSetProber(model, reversed=False,  
                                                    name_prober=None)
```

Bases: *chardet.charsetprober.CharSetProber*

NEGATIVE_SHORTCUT_THRESHOLD = 0.05

POSITIVE_SHORTCUT_THRESHOLD = 0.95

SAMPLE_SIZE = 64

SB_ENOUGH_REL_THRESHOLD = 1024

charset_name

feed(*byte_str*)

get_confidence()

language

reset()

chardet.sbcsgroupprober module

```
class chardet.sbcsgroupprober.SBCSGroupProber
```

Bases: *chardet.charsetgroupprober.CharSetGroupProber*

chardet.sjisprober module

```
class chardet.sjisprober.SJISProber
```

Bases: *chardet.mbcharsetprober.MultiByteCharSetProber*

charset_name

feed(*byte_str*)

get_confidence()

language

reset()

chardet.universaldetector module

Module containing the UniversalDetector detector class, which is the primary class a user of chardet should use.

author Mark Pilgrim (initial port to Python)

author Shy Shalom (original C code)

author Dan Blanchard (major refactoring for 3.0)

author Ian Cordasco

class `chardet.universaldetector.UniversalDetector` (*lang_filter=31*)

Bases: `object`

The `UniversalDetector` class underlies the `chardet.detect` function and coordinates all of the different charset probers.

To get a dict containing an encoding and its confidence, you can simply run:

```
u = UniversalDetector()
u.feed(some_bytes)
u.close()
detected = u.result
```

ESC_DETECTOR = `re.compile(b'(\x1b|~{})')`

HIGH_BYTE_DETECTOR = `re.compile(b'[\x80-\xff]')`

ISO_WIN_MAP = {'iso-8859-1': 'Windows-1252', 'iso-8859-13': 'Windows-1257', 'iso-885

MINIMUM_THRESHOLD = 0.2

WIN_BYTE_DETECTOR = `re.compile(b'[\x80-\x9f]')`

close()

Stop analyzing the current document and come up with a final prediction.

Returns The `result` attribute, a dict with the keys *encoding*, *confidence*, and *language*.

feed (*byte_str*)

Takes a chunk of a document and feeds it through all of the relevant charset probers.

After calling `feed`, you can check the value of the `done` attribute to see if you need to continue feeding the `UniversalDetector` more data, or if it has made a prediction (in the `result` attribute).

Note: You should always call `close` when you're done feeding in your document if `done` is not already `True`.

reset()

Reset the `UniversalDetector` and all of its probers back to their initial states. This is called by `__init__`, so you only need to call this directly in between analyses of different documents.

chardet.utf8prober module

class `chardet.utf8prober.UTF8Prober`

Bases: `chardet.charsetprober.CharSetProber`

ONE_CHAR_PROB = 0.5

charset_name

feed (*byte_str*)

get_confidence()

language

reset()

Module contents

`chardet.detect` (*byte_str*)

Detect the encoding of the given byte string.

Parameters `byte_str` (bytes or bytearray) – The byte sequence to examine.

CHAPTER 2

Indices and tables

- `genindex`
- `modindex`
- `search`

C

- `chardet`, 17
- `chardet.big5freq`, 8
- `chardet.big5prober`, 9
- `chardet.chardistribution`, 9
- `chardet.charsetgroupprober`, 10
- `chardet.charsetprober`, 10
- `chardet.codingstatemachine`, 10
- `chardet.compat`, 11
- `chardet.cp949prober`, 11
- `chardet.escprober`, 11
- `chardet.esccsm`, 12
- `chardet.eucjpprober`, 12
- `chardet.euckrfreq`, 12
- `chardet.euckrprober`, 12
- `chardet.euctwfreq`, 12
- `chardet.euctwprober`, 12
- `chardet.gb2312freq`, 12
- `chardet.gb2312prober`, 12
- `chardet.hebrewprober`, 12
- `chardet.jisfreq`, 13
- `chardet.jpctx`, 13
- `chardet.langbulgarianmodel`, 14
- `chardet.langcyrillicmodel`, 14
- `chardet.langgreekmodel`, 14
- `chardet.langhebrewmodel`, 14
- `chardet.langhungarianmodel`, 14
- `chardet.langthaimodel`, 14
- `chardet.latinlprober`, 14
- `chardet.mbcharsetprober`, 14
- `chardet.mbcsgroupprober`, 14
- `chardet.mbcscsm`, 15
- `chardet.sbcharsetprober`, 15
- `chardet.sbcsgroupprober`, 15
- `chardet.sjisprober`, 15
- `chardet.universaldetector`, 15
- `chardet.utf8prober`, 16

B

Big5DistributionAnalysis (class in
 chardet.chardistribution), 9
Big5Prober (class in *chardet.big5prober*), 9

C

chardet (module), 17
chardet.big5freq (module), 8
chardet.big5prober (module), 9
chardet.chardistribution (module), 9
chardet.charsetgroupprober (module), 10
chardet.charsetprober (module), 10
chardet.codingstatemachine (module), 10
chardet.compat (module), 11
chardet.cp949prober (module), 11
chardet.escprober (module), 11
chardet.escsm (module), 12
chardet.eucjpprober (module), 12
chardet.euckrfreq (module), 12
chardet.euckrprober (module), 12
chardet.euctwfreq (module), 12
chardet.euctwprober (module), 12
chardet.gb2312freq (module), 12
chardet.gb2312prober (module), 12
chardet.hebrewprober (module), 12
chardet.jisfreq (module), 13
chardet.jpctx (module), 13
chardet.langbulgarianmodel (module), 14
chardet.langcyrillicmodel (module), 14
chardet.langgreekmodel (module), 14
chardet.langhebrewmodel (module), 14
chardet.langhungarianmodel (module), 14
chardet.lanthaimodel (module), 14
chardet.latin1prober (module), 14
chardet.mbcharsetprober (module), 14
chardet.mbcsgroupprober (module), 14
chardet.mbcssm (module), 15
chardet.sbcharsetprober (module), 15
chardet.sbcsgroupprober (module), 15

chardet.sjisprober (module), 15
chardet.universaldetector (module), 15
chardet.utf8prober (module), 16
CharDistributionAnalysis (class in
 chardet.chardistribution), 9
charset_name (chardet.big5prober.Big5Prober
 attribute), 9
charset_name (chardet.charsetgroupprober.CharSetGroupProber
 attribute), 10
charset_name (chardet.charsetprober.CharSetProber
 attribute), 10
charset_name (chardet.cp949prober.CP949Prober
 attribute), 11
charset_name (chardet.escprober.EscCharSetProber
 attribute), 11
charset_name (chardet.eucjpprober.EUCJPProber
 attribute), 12
charset_name (chardet.euckrprober.EUCKRProber
 attribute), 12
charset_name (chardet.euctwprober.EUCTWProber
 attribute), 12
charset_name (chardet.gb2312prober.GB2312Prober
 attribute), 12
charset_name (chardet.hebrewprober.HebrewProber
 attribute), 13
charset_name (chardet.jpctx.SJISContextAnalysis
 attribute), 14
charset_name (chardet.latin1prober.Latin1Prober at-
 tribute), 14
charset_name (chardet.mbcharsetprober.MultiByteCharSetProber
 attribute), 14
charset_name (chardet.sbcharsetprober.SingleByteCharSetProber
 attribute), 15
charset_name (chardet.sjisprober.SJISProber at-
 tribute), 15
charset_name (chardet.utf8prober.UTF8Prober at-
 tribute), 16
CharSetGroupProber (class in
 chardet.charsetgroupprober), 10
CharSetProber (class in *chardet.charsetprober*), 10

`close()` (*chardet.universaldetector.UniversalDetector* method), 16

`CodingStateMachine` (class in *chardet.codingstatemachine*), 10

`CP949Prober` (class in *chardet.cp949prober*), 11

D

`detect()` (in module *chardet*), 17

`DONT_KNOW` (*chardet.jpcntx.JapaneseContextAnalysis* attribute), 13

E

`ENOUGH_DATA_THRESHOLD` (*chardet.chardistribution.CharDistributionAnalysis* attribute), 9

`ENOUGH_REL_THRESHOLD` (*chardet.jpcntx.JapaneseContextAnalysis* attribute), 13

`ESC_DETECTOR` (*chardet.universaldetector.UniversalDetector* attribute), 16

`EscCharSetProber` (class in *chardet.escprober*), 11

`EUCJPContextAnalysis` (class in *chardet.jpcntx*), 13

`EUCJPDistributionAnalysis` (class in *chardet.chardistribution*), 9

`EUCJPProber` (class in *chardet.eucjpprober*), 12

`EUCKRDistributionAnalysis` (class in *chardet.chardistribution*), 9

`EUCKRProber` (class in *chardet.euckrprober*), 12

`EUCTWDistributionAnalysis` (class in *chardet.chardistribution*), 9

`EUCTWProber` (class in *chardet.euctwprober*), 12

F

`feed()` (*chardet.chardistribution.CharDistributionAnalysis* method), 9

`feed()` (*chardet.charsetgroupprober.CharSetGroupProber* method), 10

`feed()` (*chardet.charsetprober.CharSetProber* method), 10

`feed()` (*chardet.escprober.EscCharSetProber* method), 11

`feed()` (*chardet.eucjpprober.EUCJPProber* method), 12

`feed()` (*chardet.hebrewprober.HebrewProber* method), 13

`feed()` (*chardet.jpcntx.JapaneseContextAnalysis* method), 13

`feed()` (*chardet.latin1prober.Latin1Prober* method), 14

`feed()` (*chardet.mbcharsetprober.MultiByteCharSetProber* method), 14

`feed()` (*chardet.sbcharsetprober.SingleByteCharSetProber* method), 15

`feed()` (*chardet.sjisprober.SJISProber* method), 15

`feed()` (*chardet.universaldetector.UniversalDetector* method), 16

`feed()` (*chardet.utf8prober.UTF8Prober* method), 16

`filter_high_byte_only()` (*chardet.charsetprober.CharSetProber* static method), 10

`filter_international_words()` (*chardet.charsetprober.CharSetProber* static method), 10

`filter_with_english_letters()` (*chardet.charsetprober.CharSetProber* static method), 10

`FINAL_KAF` (*chardet.hebrewprober.HebrewProber* attribute), 12

`FINAL_MEM` (*chardet.hebrewprober.HebrewProber* attribute), 12

`FINAL_NUN` (*chardet.hebrewprober.HebrewProber* attribute), 13

`FINAL_PE` (*chardet.hebrewprober.HebrewProber* attribute), 13

`FINAL_TSADI` (*chardet.hebrewprober.HebrewProber* attribute), 13

G

`GB2312DistributionAnalysis` (class in *chardet.chardistribution*), 9

`GB2312Prober` (class in *chardet.gb2312prober*), 12

`get_coding_state_machine()` (*chardet.codingstatemachine.CodingStateMachine* method), 11

`get_confidence()` (*chardet.chardistribution.CharDistributionAnalysis* method), 9

`get_confidence()` (*chardet.charsetgroupprober.CharSetGroupProber* method), 10

`get_confidence()` (*chardet.charsetprober.CharSetProber* method), 10

`get_confidence()` (*chardet.escprober.EscCharSetProber* method), 11

`get_confidence()` (*chardet.eucjpprober.EUCJPProber* method), 12

`get_confidence()` (*chardet.jpcntx.JapaneseContextAnalysis* method), 13

`get_confidence()` (*chardet.latin1prober.Latin1Prober* method), 14

`get_confidence()` (*chardet.mbcharsetprober.MultiByteCharSetProber* method), 14

`get_confidence()` (*chardet.sbcharsetprober.SingleByteCharSetProber* method), 15

`get_confidence()` (*chardet.sjisprober.SJISProber* method), 15

`get_confidence()` (*chardet.utf8prober.UTF8Prober* method), 16

`get_current_charlen()` (*chardet.codingstatemachine.CodingStateMachine* method), 11

method), 11
 get_order() (chardet.chardistribution.Big5DistributionAnalysis attribute), 11
 method), 9
 get_order() (chardet.chardistribution.CharDistributionAnalysis attribute), 12
 method), 9
 get_order() (chardet.chardistribution.EUCJPDistributionAnalysis attribute), 12
 method), 9
 get_order() (chardet.chardistribution.EUCKRDistributionAnalysis attribute), 12
 method), 9
 get_order() (chardet.chardistribution.EUCTWDistributionAnalysis attribute), 12
 method), 9
 get_order() (chardet.chardistribution.GB2312DistributionAnalysis attribute), 13
 method), 9
 get_order() (chardet.chardistribution.SJISDistributionAnalysis attribute), 14
 method), 9
 get_order() (chardet.jpcntx.EUCJPContextAnalysis attribute), 14
 method), 13
 get_order() (chardet.jpcntx.JapaneseContextAnalysis attribute), 15
 method), 13
 get_order() (chardet.jpcntx.SJISContextAnalysis attribute), 16
 method), 14
 got_enough_data() (chardet.chardistribution.CharDistributionAnalysis attribute), 9
 got_enough_data() (chardet.jpcntx.JapaneseContextAnalysis attribute), 14
 method), 14

H

HebrewProber (class in chardet.hebrewprober), 12
 HIGH_BYTE_DETECTOR (chardet.universaldetector.UniversalDetector attribute), 16

I

is_final() (chardet.hebrewprober.HebrewProber attribute), 13
 is_non_final() (chardet.hebrewprober.HebrewProber attribute), 13
 ISO_WIN_MAP (chardet.universaldetector.UniversalDetector attribute), 16

J

JapaneseContextAnalysis (class in chardet.jpcntx), 13

L

language (chardet.big5prober.Big5Prober attribute), 9
 language (chardet.charsetgroupprober.CharSetGroupProber attribute), 10
 language (chardet.codingstatemachine.CodingStateMachine attribute), 11
 language (chardet.cp949prober.CP949Prober attribute), 11
 language (chardet.escprober.EscCharSetProber attribute), 11
 language (chardet.eucjpprober.EUCJPProber attribute), 12
 language (chardet.euckrprober.EUCKRProber attribute), 12
 language (chardet.euctwprober.EUCTWProber attribute), 12
 language (chardet.gb2312prober.GB2312Prober attribute), 12
 language (chardet.hebrewprober.HebrewProber attribute), 13
 language (chardet.latin1prober.Latin1Prober attribute), 14
 language (chardet.mbcharsetprober.MultiByteCharSetProber attribute), 14
 language (chardet.sbcharsetprober.SingleByteCharSetProber attribute), 15
 language (chardet.sjisprober.SJISProber attribute), 15
 language (chardet.utf8prober.UTF8Prober attribute), 16
 Latin1Prober (class in chardet.latin1prober), 14
 LOGICAL_HEBREW_NAME (chardet.hebrewprober.HebrewProber attribute), 13

M

MAX_REL_THRESHOLD (chardet.jpcntx.JapaneseContextAnalysis attribute), 13
 MBCSGroupProber (class in chardet.mbcsgroupprober), 14
 MIN_FINAL_CHAR_DISTANCE (chardet.hebrewprober.HebrewProber attribute), 13
 MIN_MODEL_DISTANCE (chardet.hebrewprober.HebrewProber attribute), 13
 MINIMUM_DATA_THRESHOLD (chardet.chardistribution.CharDistributionAnalysis attribute), 9
 MINIMUM_DATA_THRESHOLD (chardet.jpcntx.JapaneseContextAnalysis attribute), 13
 MINIMUM_THRESHOLD (chardet.universaldetector.UniversalDetector attribute), 16
 MultiByteCharSetProber (class in chardet.mbcharsetprober), 14

N

NEGATIVE_SHORTCUT_THRESHOLD (chardet.sbcharsetprober.SingleByteCharSetProber attribute), 15

[next_state\(\)](#) (*chardet.codingstatemachine.CodingStateMachine* attribute), [15](#)
 method), [11](#)
[NORMAL_KAF](#) (*chardet.hebrewprober.HebrewProber* attribute), [13](#)
[NORMAL_MEM](#) (*chardet.hebrewprober.HebrewProber* attribute), [13](#)
[NORMAL_NUN](#) (*chardet.hebrewprober.HebrewProber* attribute), [13](#)
[NORMAL_PE](#) (*chardet.hebrewprober.HebrewProber* attribute), [13](#)
[NORMAL_TSADI](#) (*chardet.hebrewprober.HebrewProber* attribute), [13](#)
[NUM_OF_CATEGORY](#) (*chardet.jpctx.JapaneseContextAnalysis* attribute), [13](#)
O
[ONE_CHAR_PROB](#) (*chardet.utf8prober.UTF8Prober* attribute), [16](#)
P
[POSITIVE_SHORTCUT_THRESHOLD](#) (*chardet.sbcharsetprober.SingleByteCharSetProber* attribute), [15](#)
R
[reset\(\)](#) (*chardet.chardistribution.CharDistributionAnalysis* method), [9](#)
[reset\(\)](#) (*chardet.charsetgroupprober.CharSetGroupProber* method), [10](#)
[reset\(\)](#) (*chardet.charsetprober.CharSetProber* method), [10](#)
[reset\(\)](#) (*chardet.codingstatemachine.CodingStateMachine* method), [11](#)
[reset\(\)](#) (*chardet.escprober.EscCharSetProber* method), [11](#)
[reset\(\)](#) (*chardet.eucjpprober.EUCJPProber* method), [12](#)
[reset\(\)](#) (*chardet.hebrewprober.HebrewProber* method), [13](#)
[reset\(\)](#) (*chardet.jpctx.JapaneseContextAnalysis* method), [14](#)
[reset\(\)](#) (*chardet.latin1prober.Latin1Prober* method), [14](#)
[reset\(\)](#) (*chardet.mbcharsetprober.MultiByteCharSetProber* method), [14](#)
[reset\(\)](#) (*chardet.sbcharsetprober.SingleByteCharSetProber* method), [15](#)
[reset\(\)](#) (*chardet.sjisprober.SJISProber* method), [15](#)
[reset\(\)](#) (*chardet.universaldetector.UniversalDetector* method), [16](#)
[reset\(\)](#) (*chardet.utf8prober.UTF8Prober* method), [16](#)
S
[SAMPLE_SIZE](#) (*chardet.sbcharsetprober.SingleByteCharSetProber*
 [SB_ENOUGH_REL_THRESHOLD](#) (*chardet.sbcharsetprober.SingleByteCharSetProber* attribute), [15](#)
 [SBCSGroupProber](#) (class in *chardet.sbcsgroupprober*), [15](#)
 [set_model_probers\(\)](#) (*chardet.hebrewprober.HebrewProber* method), [13](#)
 [SHORTCUT_THRESHOLD](#) (*chardet.charsetprober.CharSetProber* attribute), [10](#)
 [SingleByteCharSetProber](#) (class in *chardet.sbcharsetprober*), [15](#)
 [SJISContextAnalysis](#) (class in *chardet.jpctx*), [14](#)
 [SJISDistributionAnalysis](#) (class in *chardet.chardistribution*), [9](#)
 [SJISProber](#) (class in *chardet.sjisprober*), [15](#)
 [state](#) (*chardet.charsetprober.CharSetProber* attribute), [10](#)
 [state](#) (*chardet.hebrewprober.HebrewProber* attribute), [13](#)
 [SURE_NO](#) (*chardet.chardistribution.CharDistributionAnalysis* attribute), [9](#)
 [SURE_YES](#) (*chardet.chardistribution.CharDistributionAnalysis* attribute), [9](#)
 U
 [UniversalDetector](#) (class in *chardet.universaldetector*), [15](#)
 [UTF8Prober](#) (class in *chardet.utf8prober*), [16](#)
 V
 [VISUAL_HEBREW_NAME](#) (*chardet.hebrewprober.HebrewProber* attribute), [13](#)
 W
 [WIN_BYTE_DETECTOR](#) (*chardet.universaldetector.UniversalDetector* attribute), [16](#)