Object Internals and Custom Attributes

Robert Smallshire
COFOUNDER – SIXTY NORTH
@robsmallshire rob@sixty-north.com

Summary

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Internal object representation

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The `__dict__` dictionary

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Manipulating `__dict__`

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- `__getattr__()`

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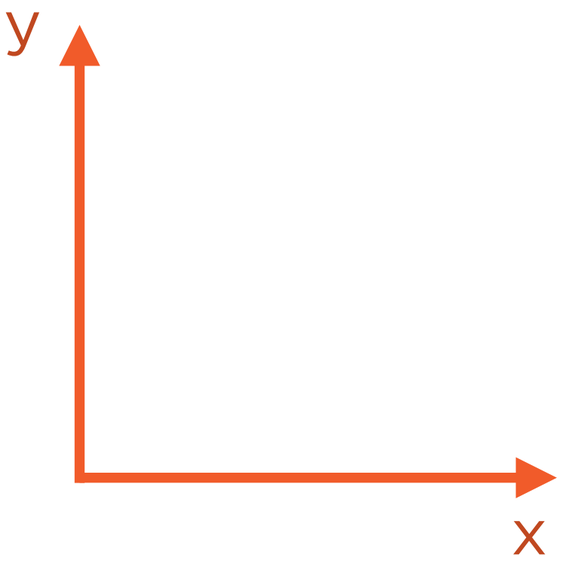
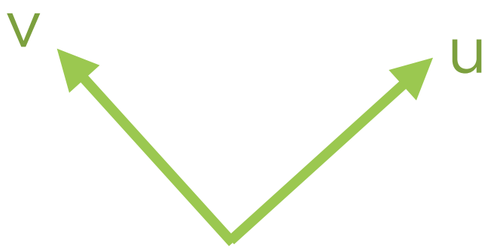
Faking attributes with

- `__getattr__()`
- `__getattribute__()`
- `__setattr__()`
- `__delattr__()`

How are Python Objects Represented?

The convenience of different notations for different coordinate systems





Overriding `__getattr__()`

Customising **Attribute Access**

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Fallback

`__getattr__()`

Invoked **after** requested attribute/ property not found by normal lookup

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Invoked **after** requested attribute/ property not found by normal lookup

Preemptive

`__getattribute__()`

Invoked **instead of** normal lookup

Overriding `__setattr__()`

Pitfalls with `__getattr__()`


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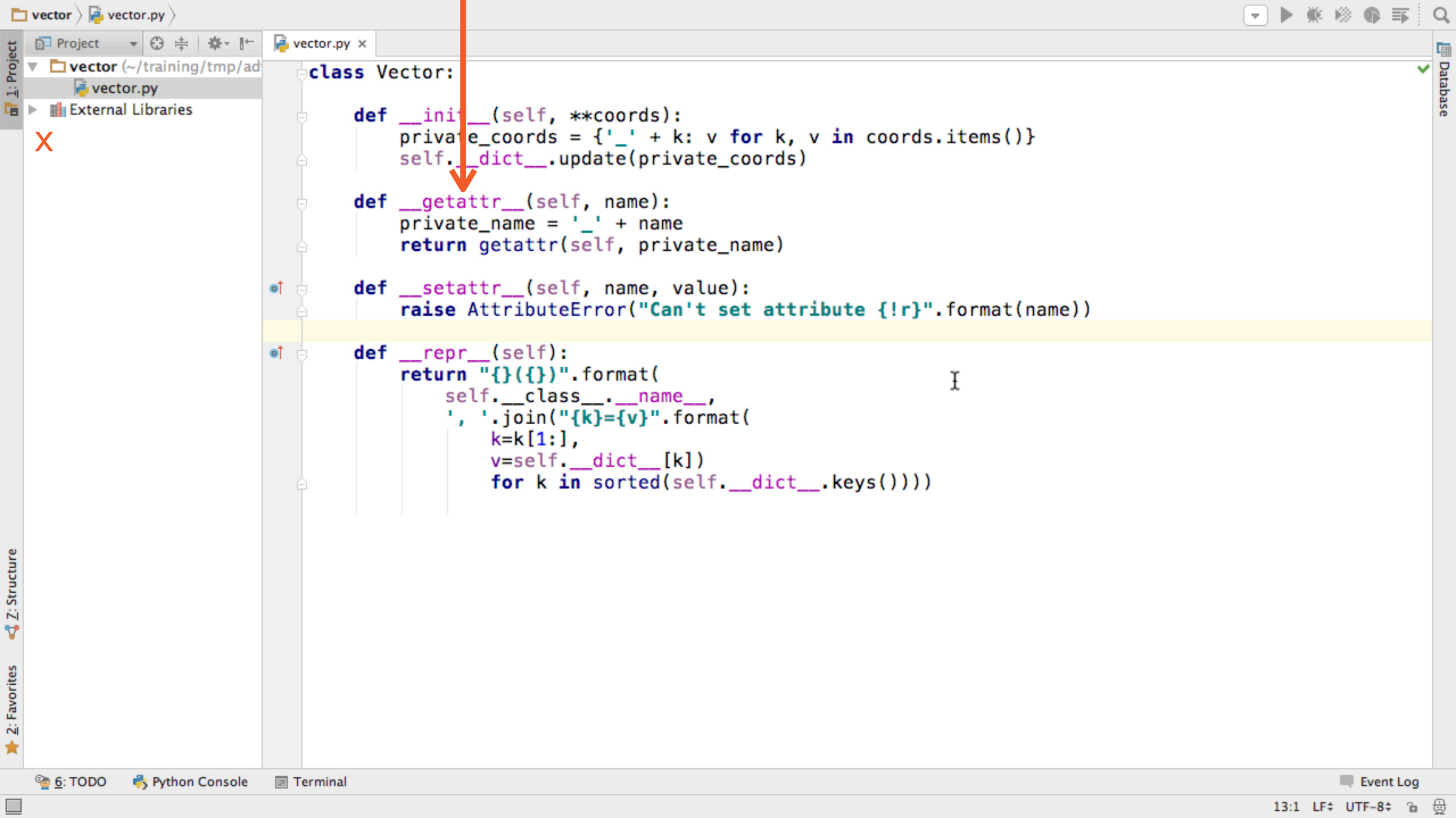
7: Structure
Database
6: TODO
Python Console
Terminal
Event Log
13:1
LF
UTF-8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Event Log
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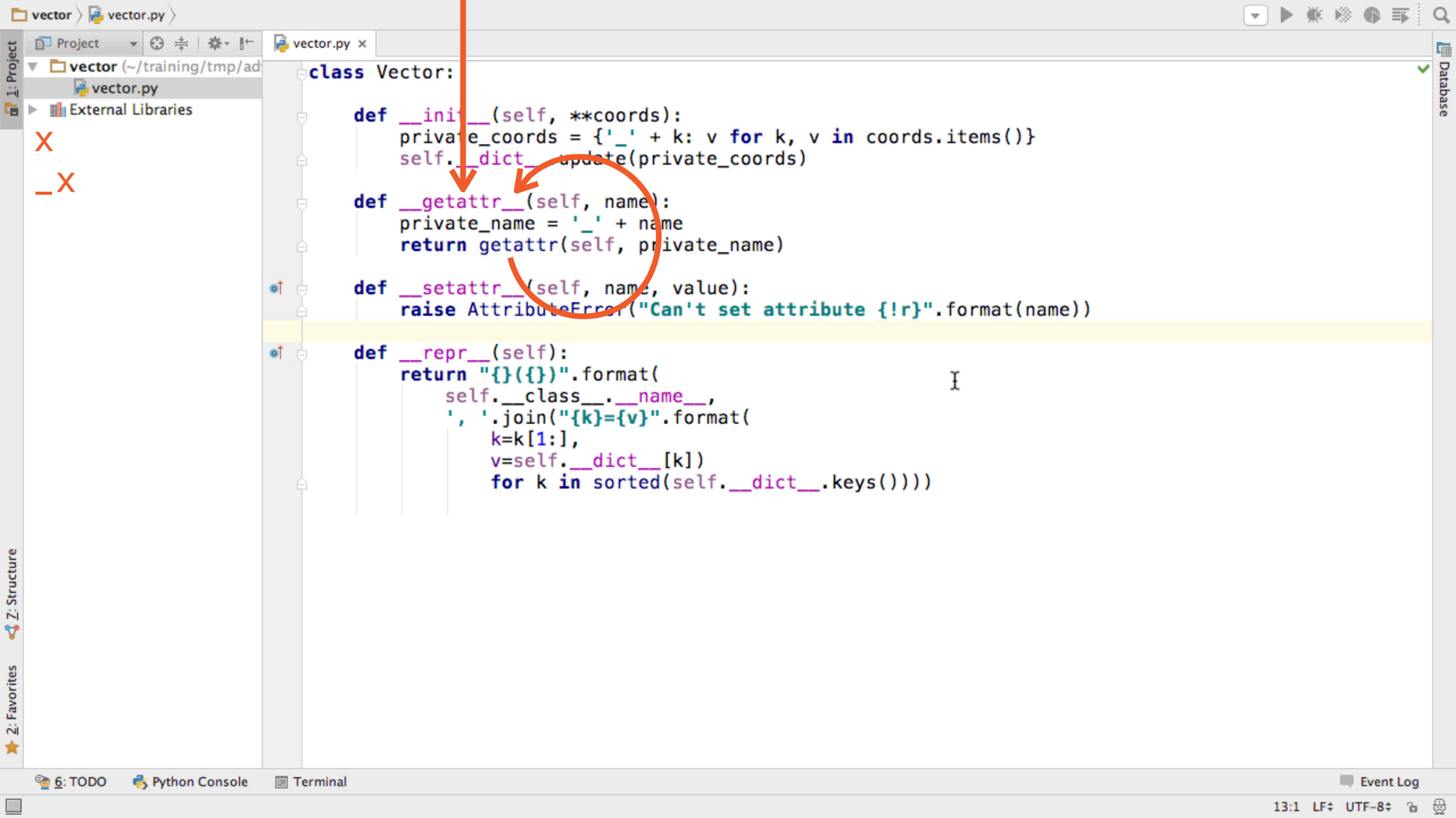
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Event Log
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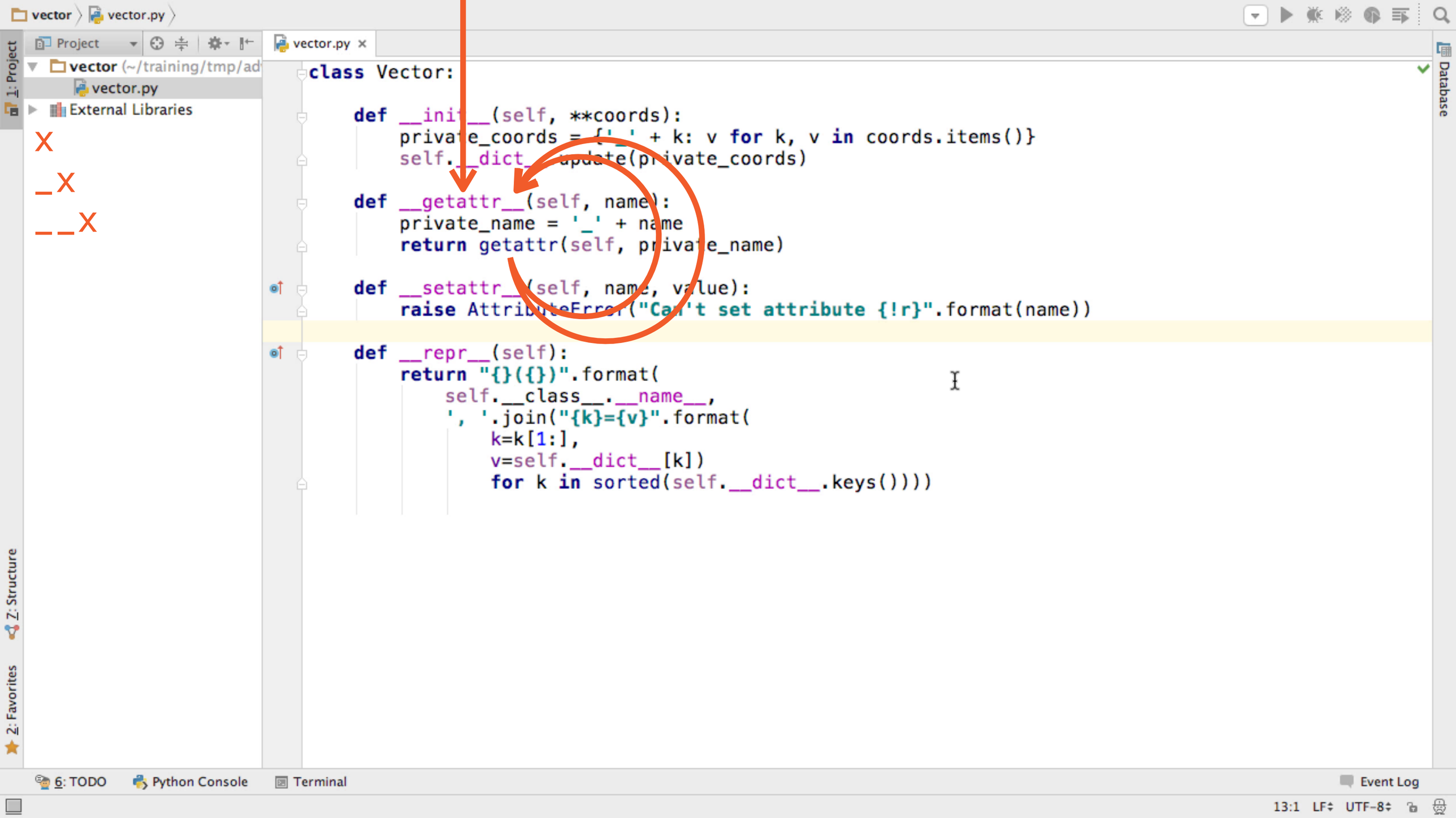
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Event Log
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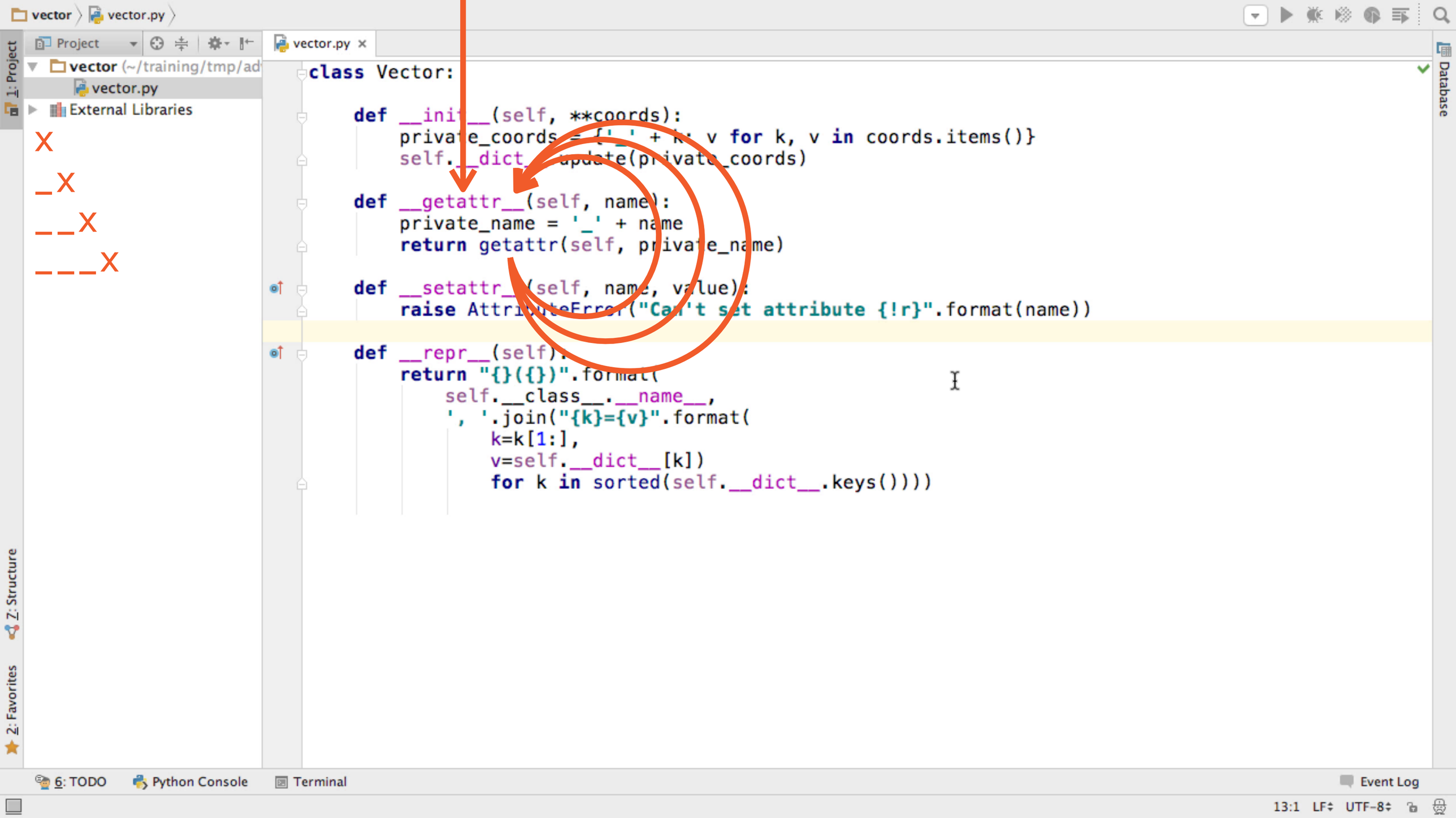
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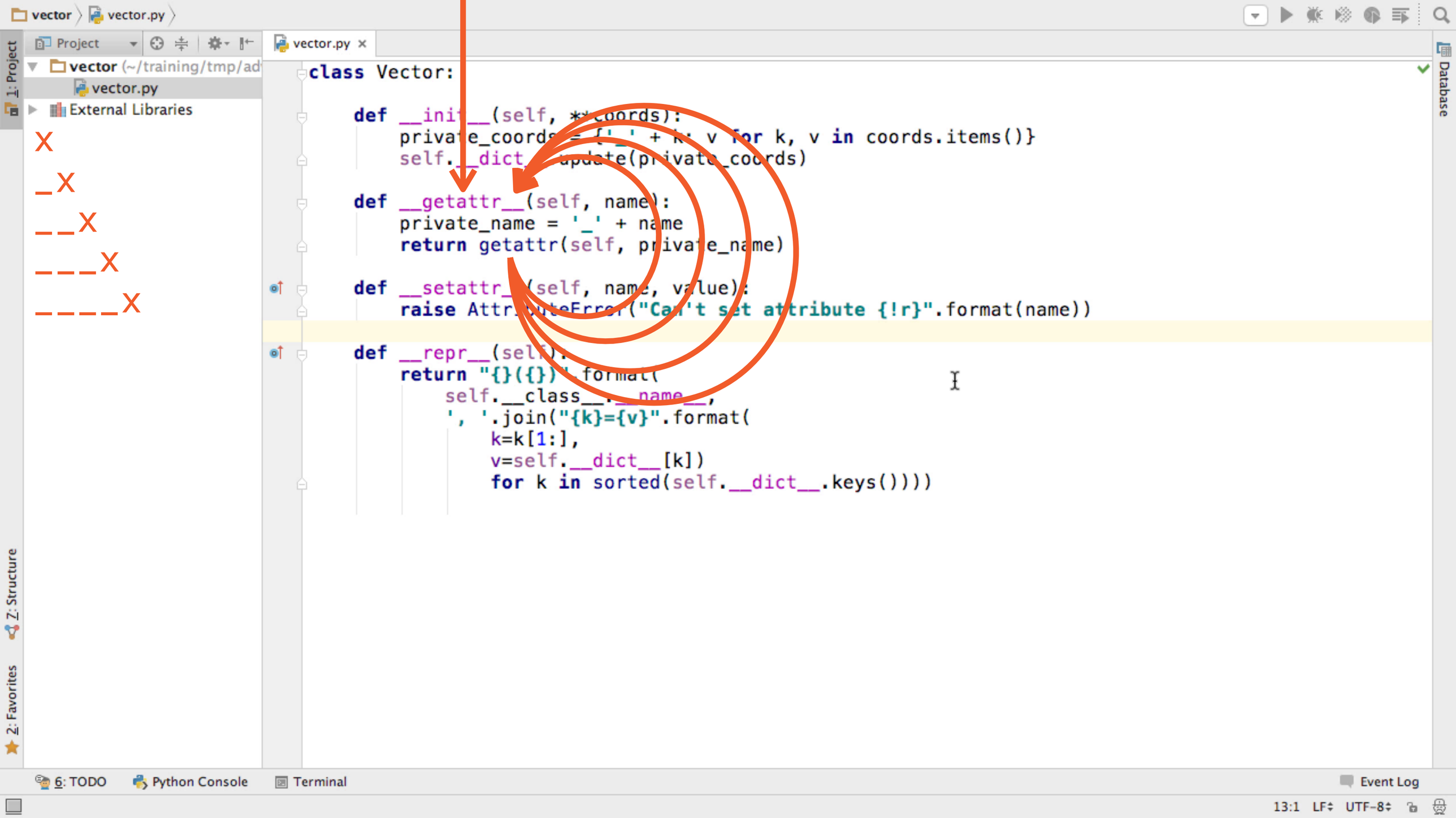
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Event Log
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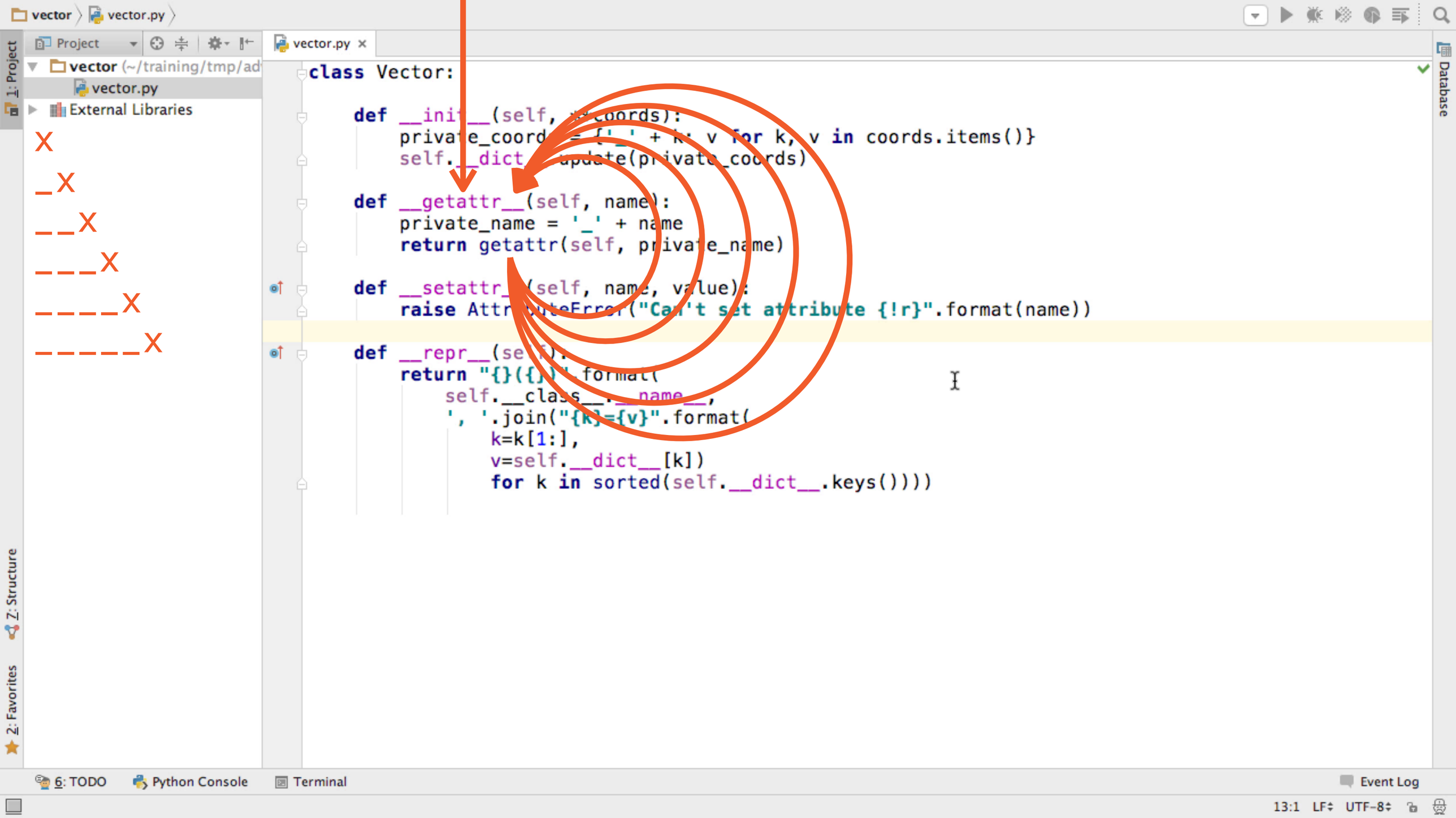
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Event Log
13:1
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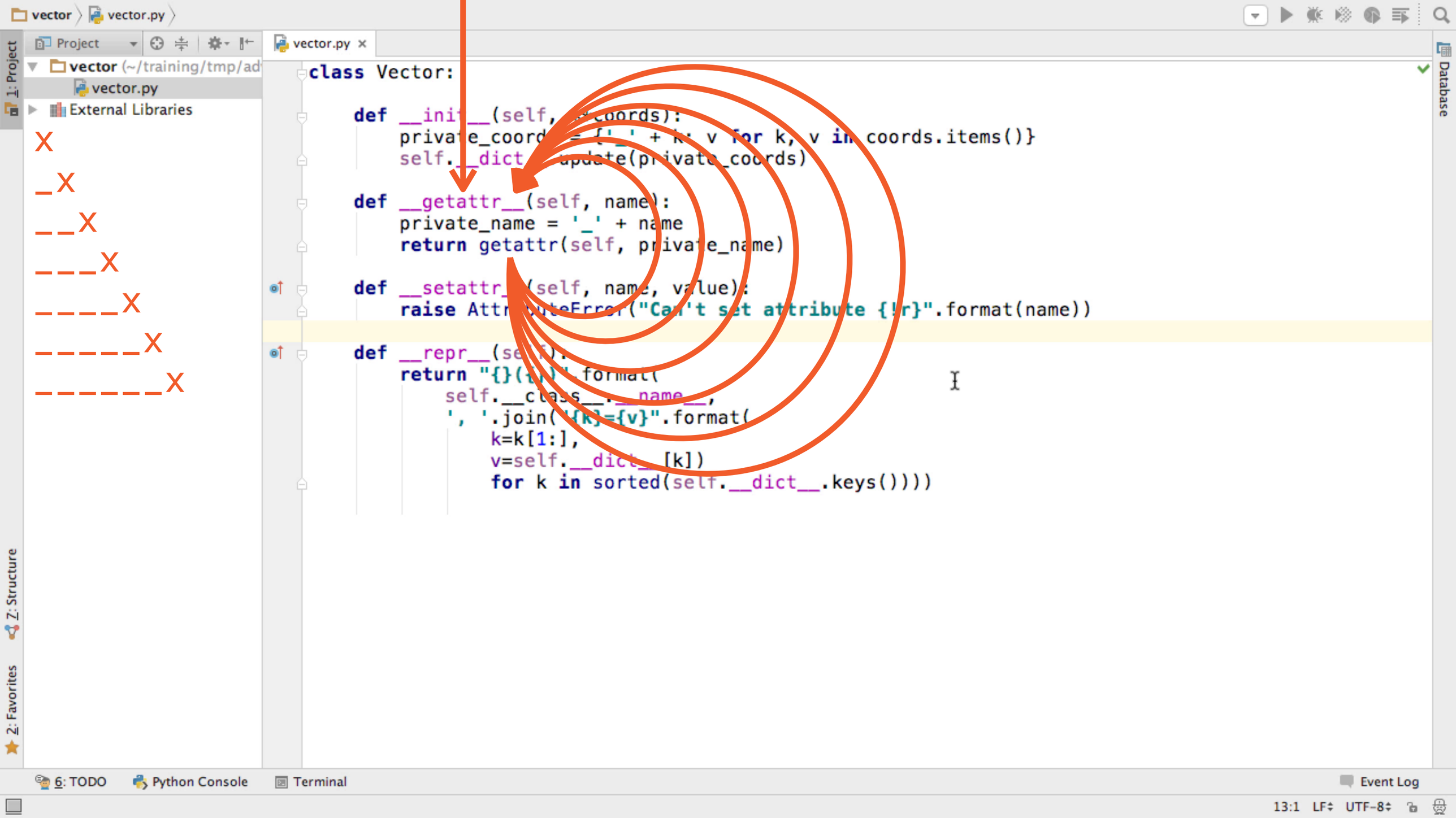
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Terminal
Event Log
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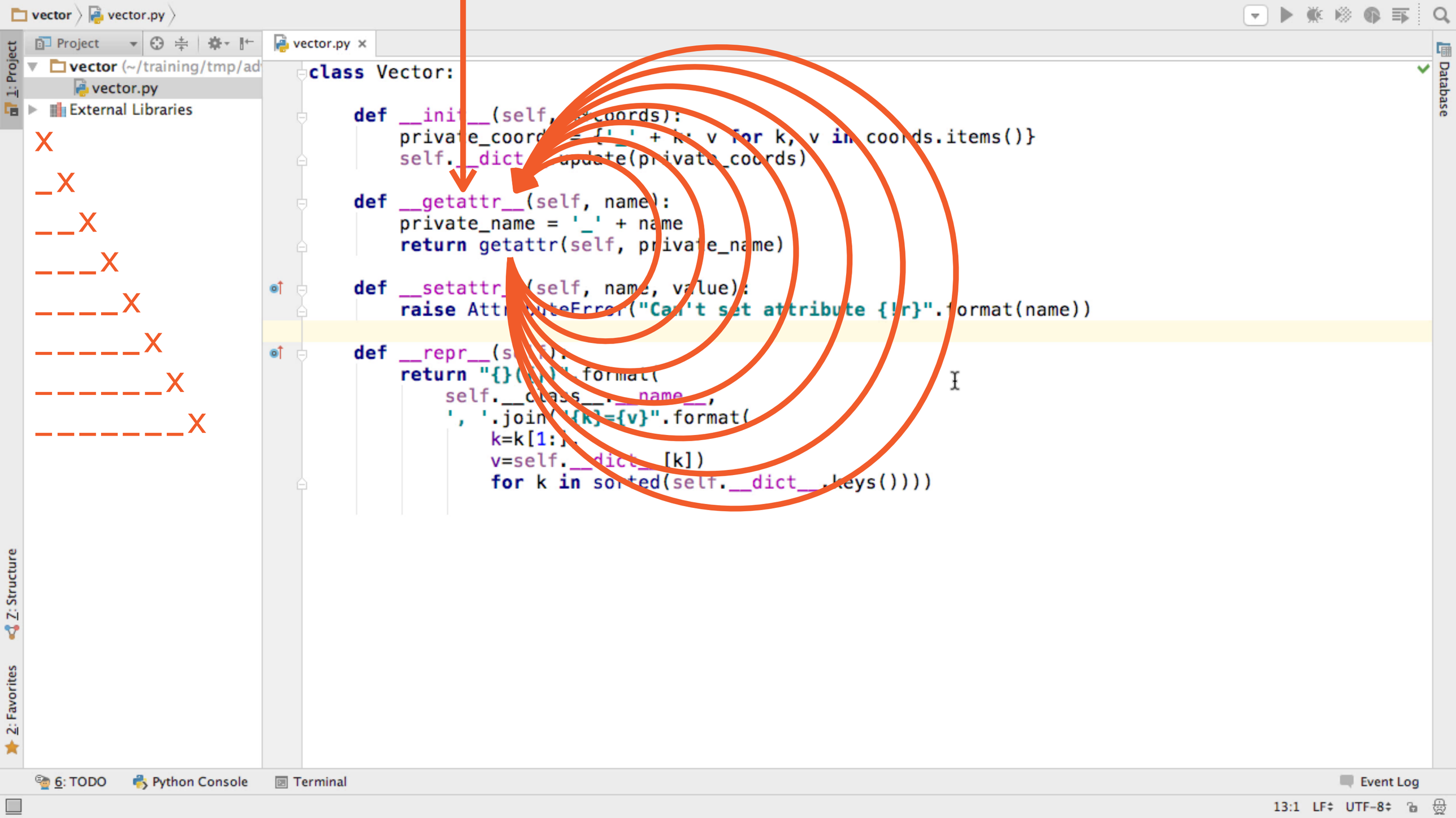
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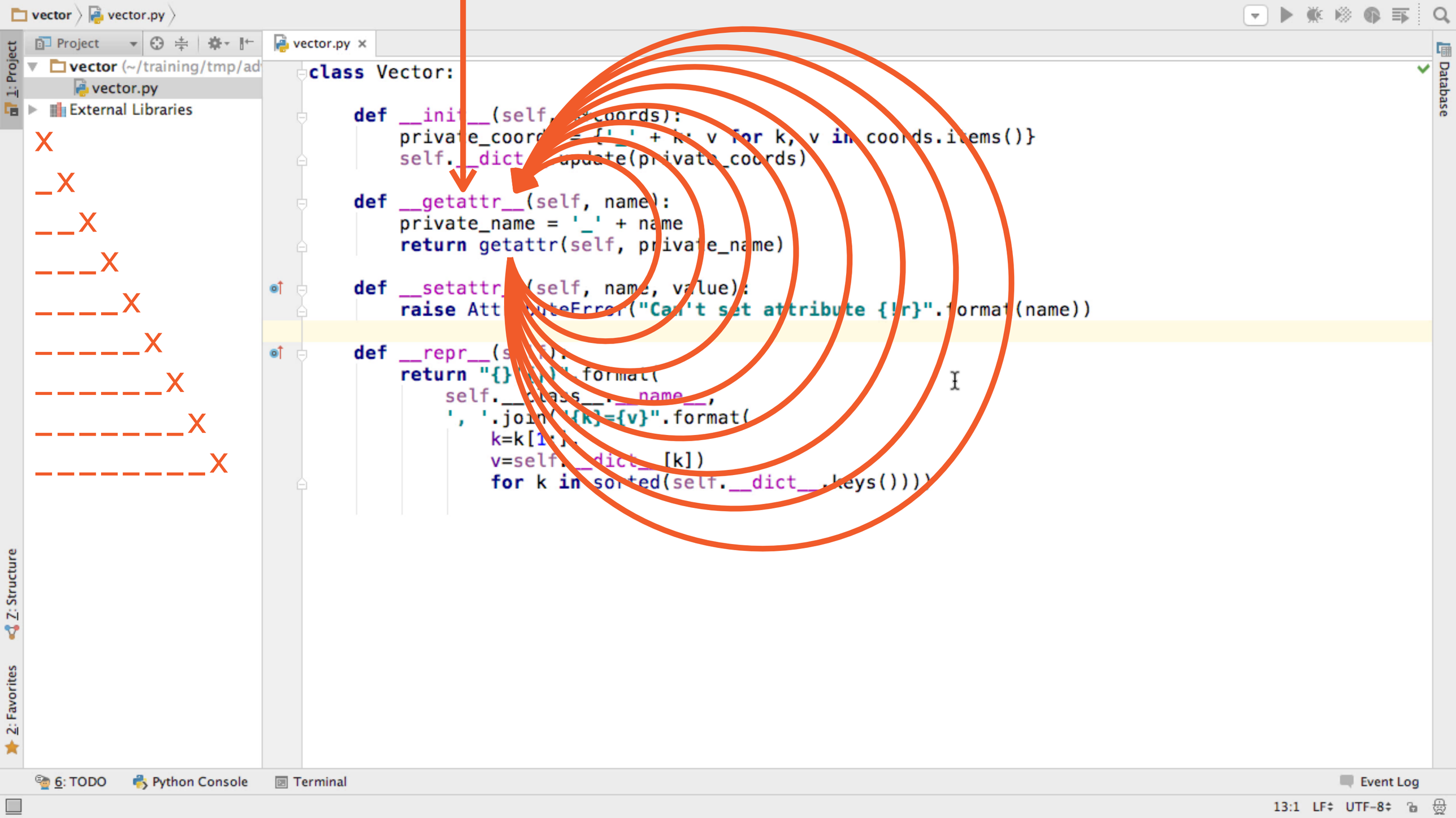
Python Console
Terminal
Event Log
13:1
LF
UTF-8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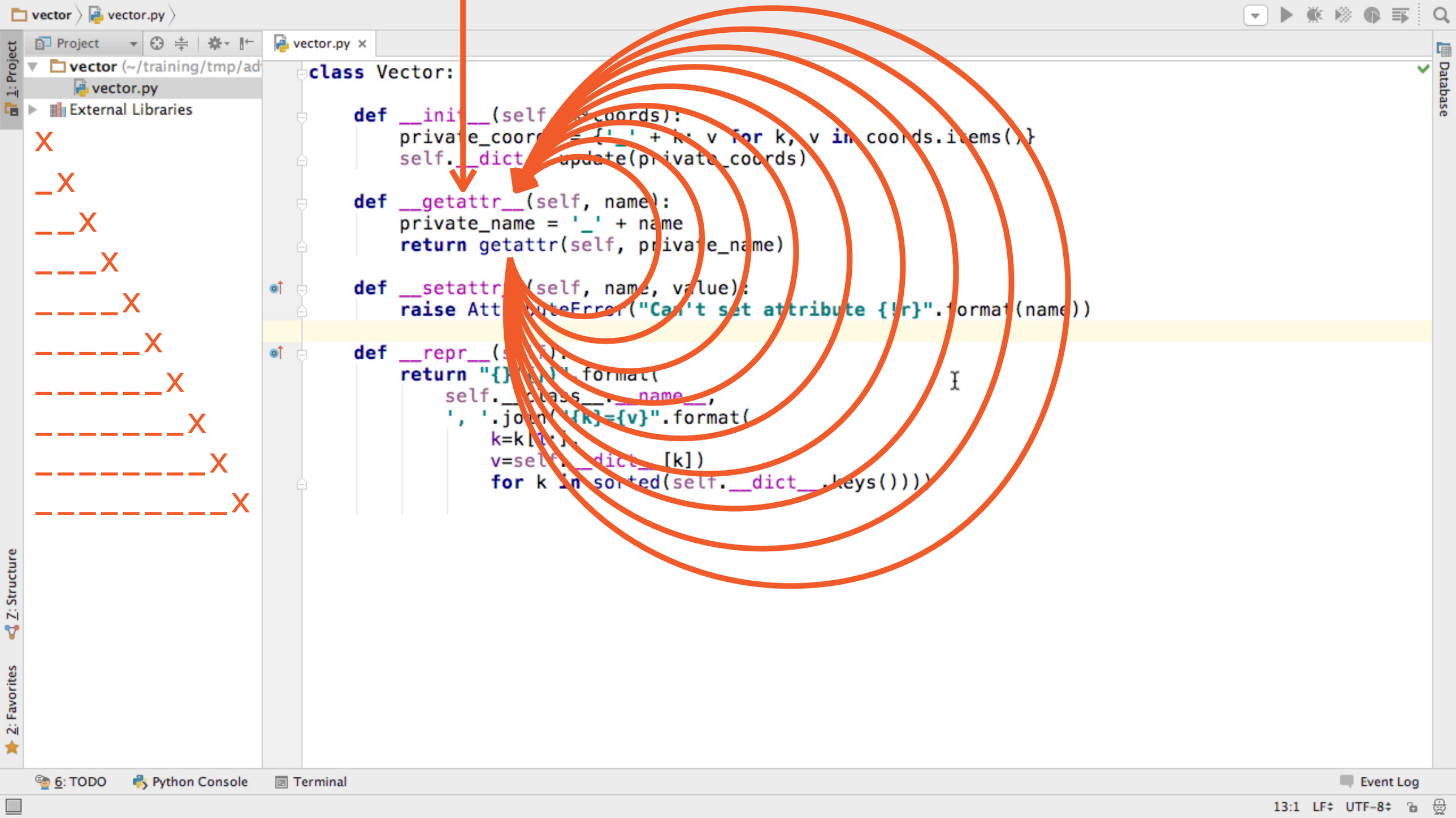
2: Favorites
Z: Structure
Database
6: TODO
Python Console
Terminal
Event Log
13:1
LF
UTF-8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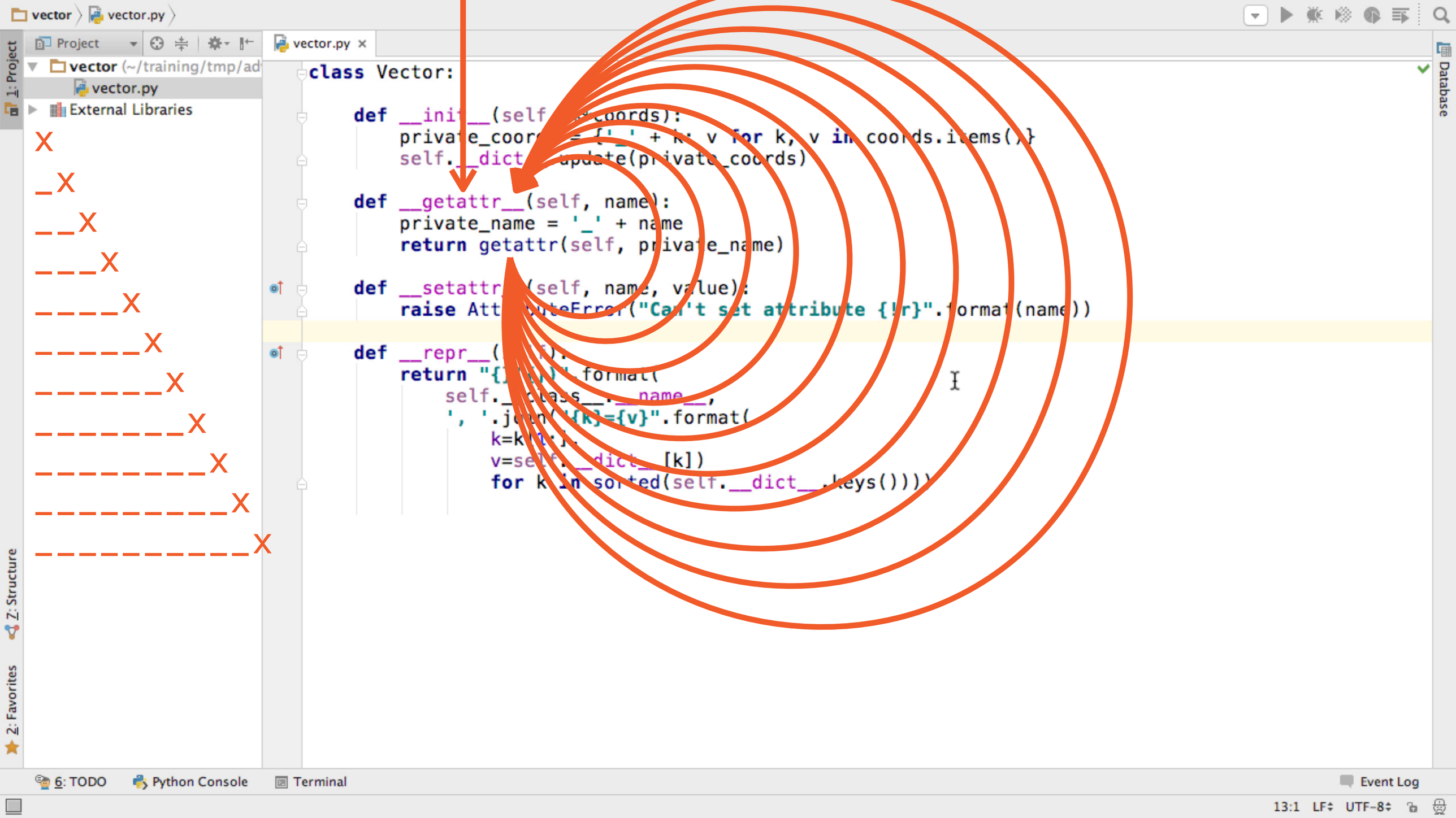
2: Favorites
Database
6: TODO
Python Console
Terminal
Event Log
13:1
LF
UTF-8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Terminal
Event Log
13:1
LF
UTF-8
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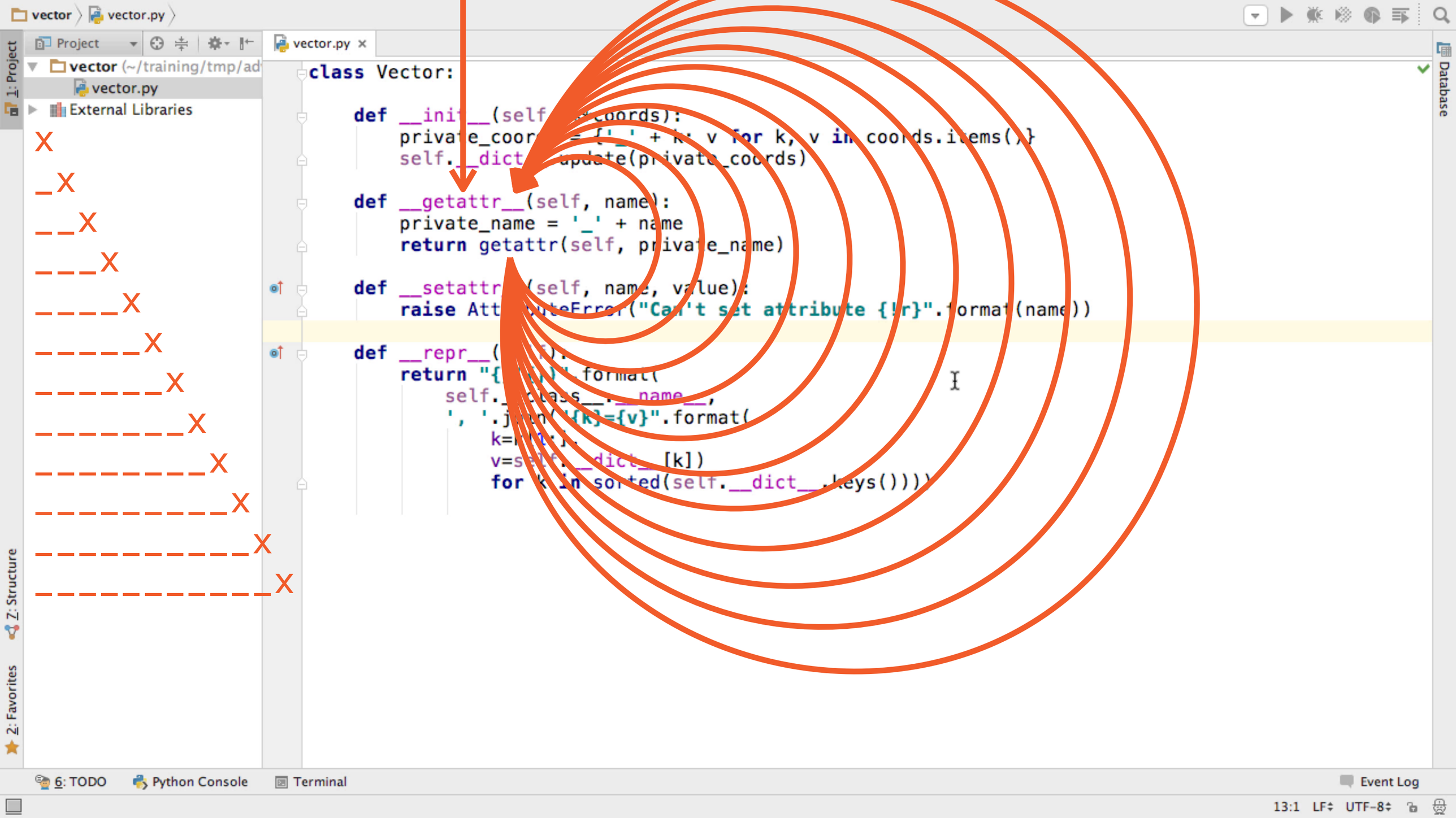
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Event Log
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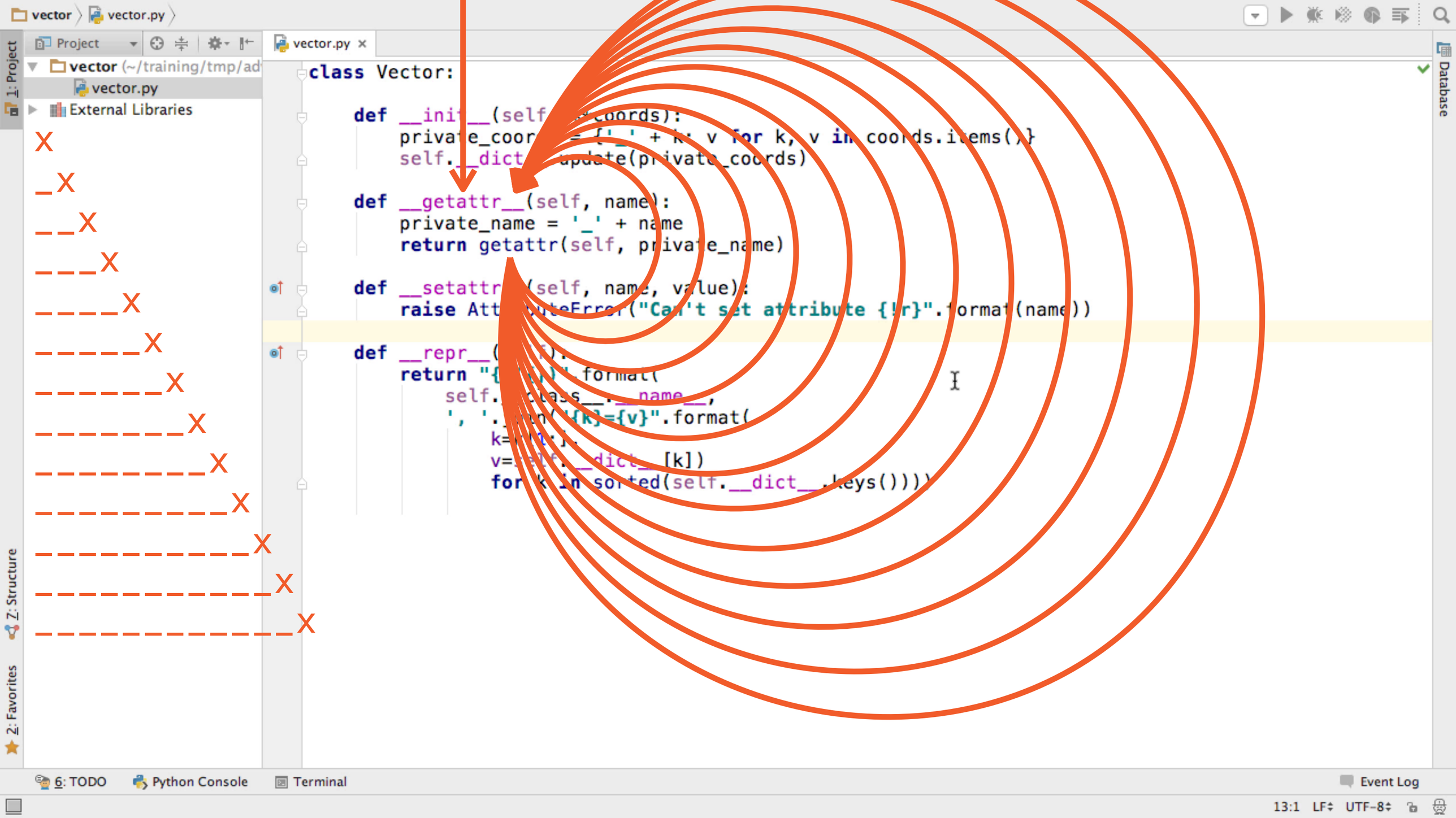
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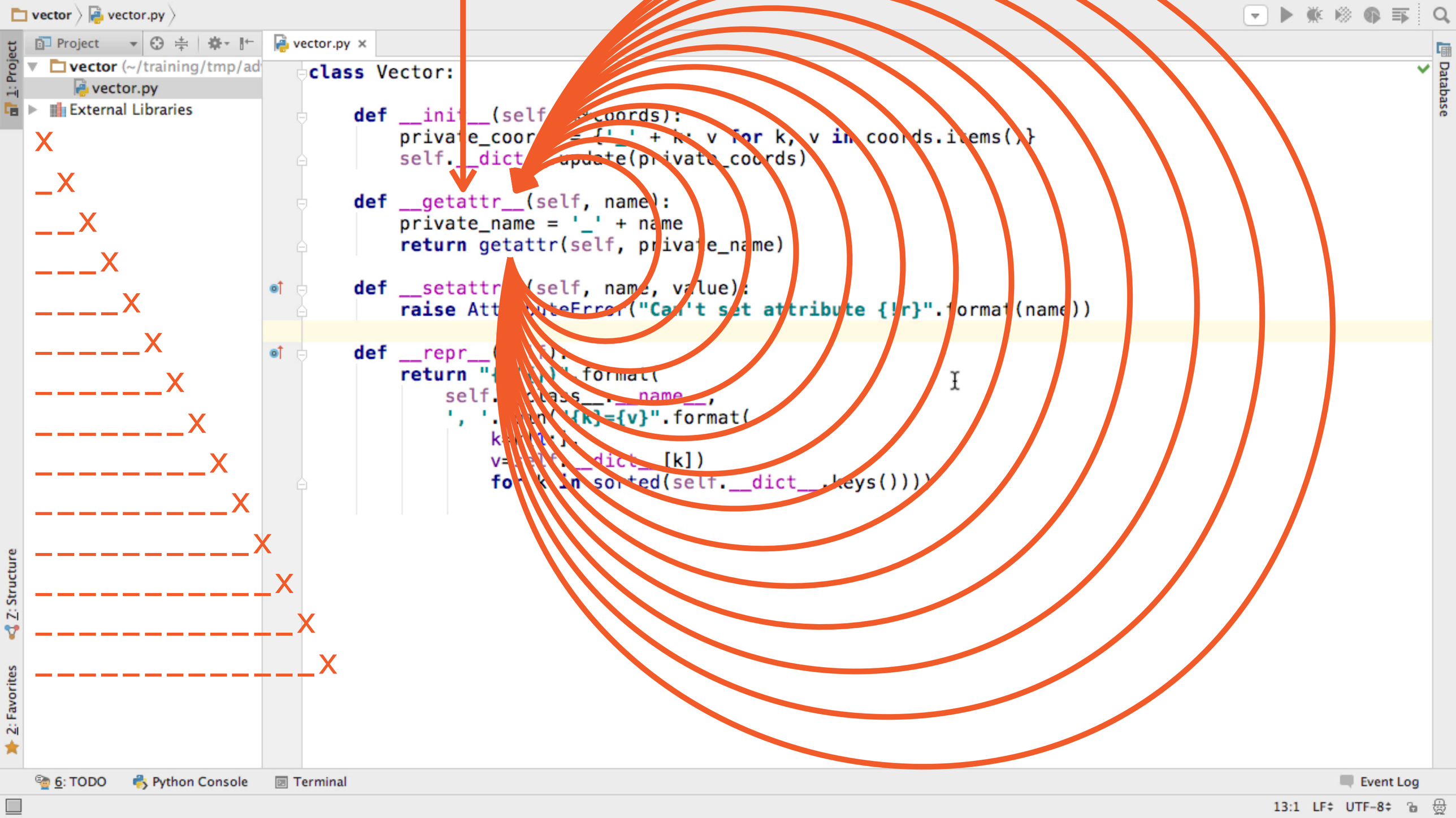
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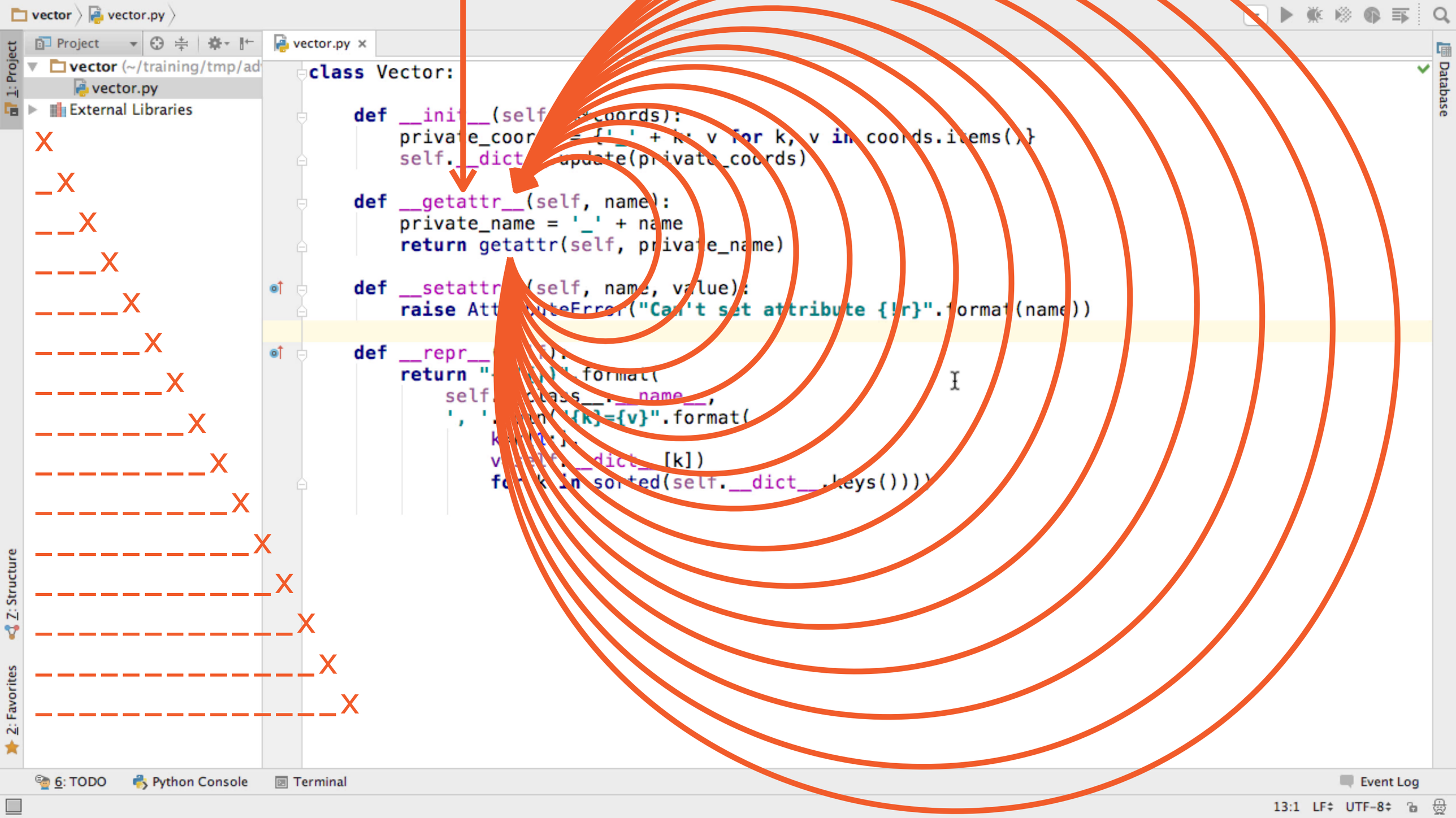
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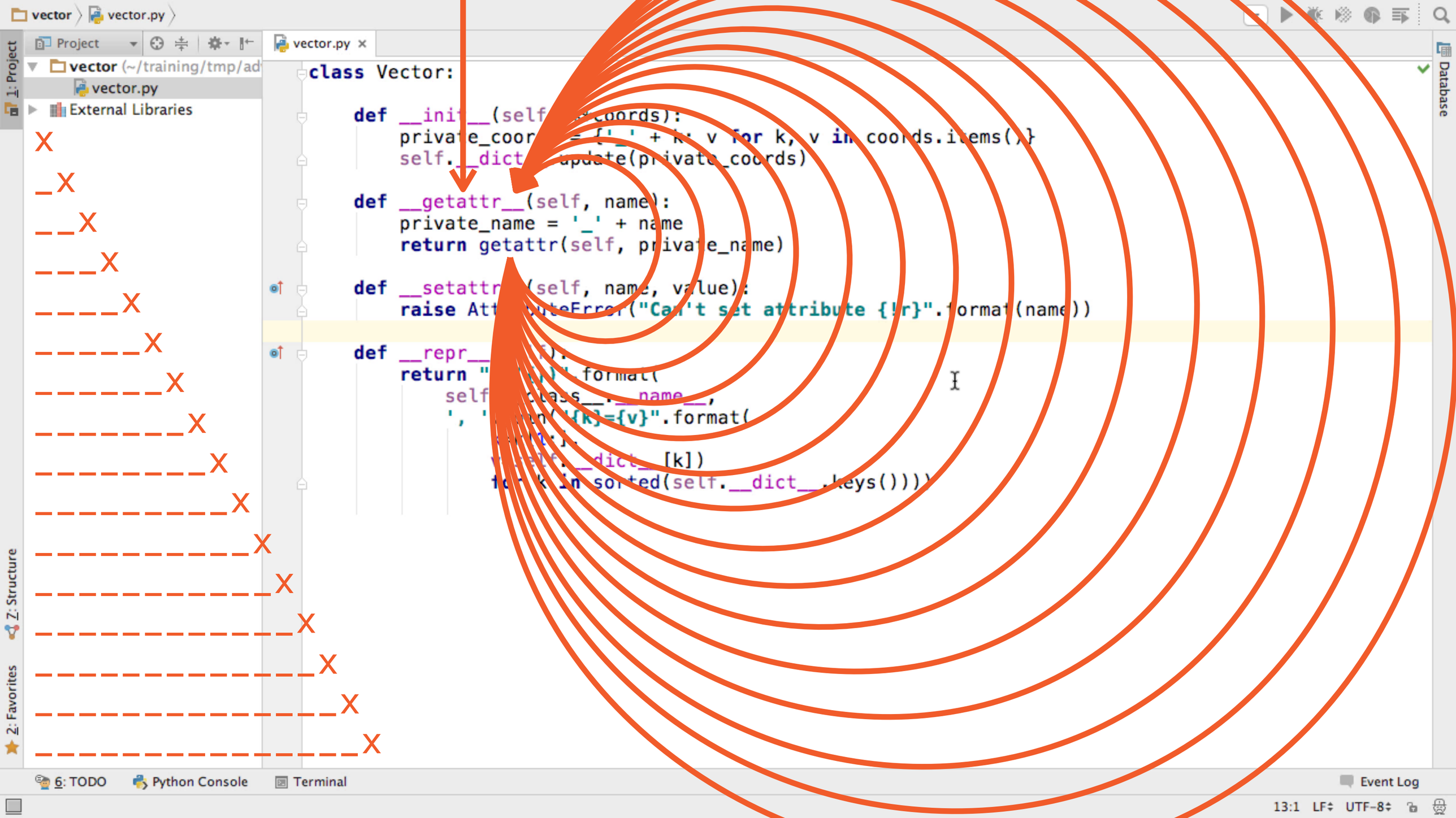
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v=self.__dict__[k])
for k in sorted(self.__dict__.keys())))
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____________X
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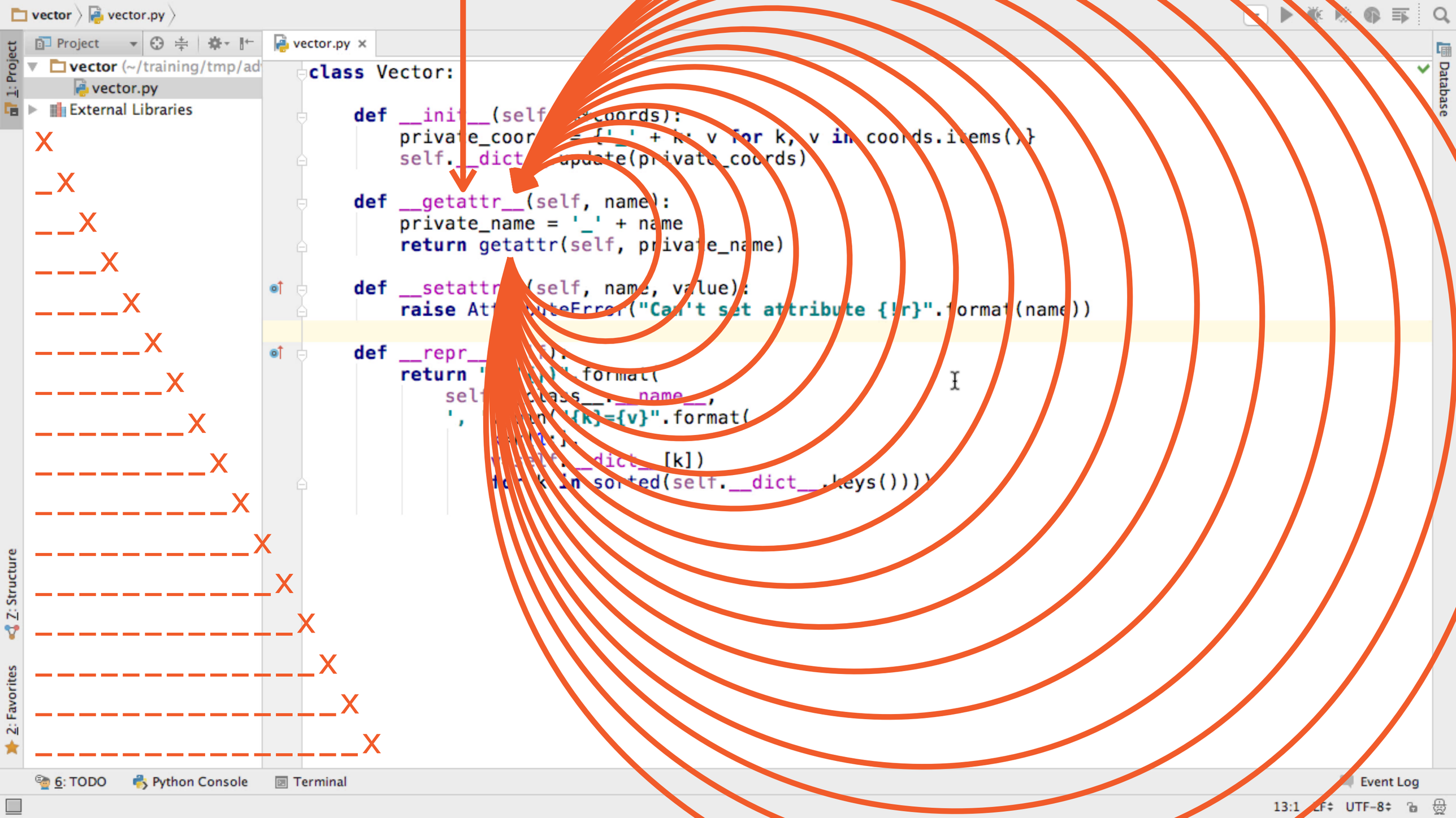
6: TODO
Python Console
Terminal
Event Log
13:1
LF
UTF-8


vector
vector.py
Project
vector (~/training/tmp/ad
vector.py
External Libraries
vector.py
class Vector:
def __init__(self
coords):
private_coor
= {'_' + k: v for k, v in coords.items()}
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update(private_coords)
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def __setattr
(self, name, value):
raise Att
uteError("Can't set attribute {!r}".format(name))
def __repr__
):
return '
}'.format(
self
class__.__name__,
',
n("{k}={v}".format(
[k])
k in sorted(self.__dict__.keys())))
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1: Project
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1: Project
2: Favorites
7: Structure
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6: TODO
Python Console
Terminal
Event Log
11:37
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6: TODO
Python Console
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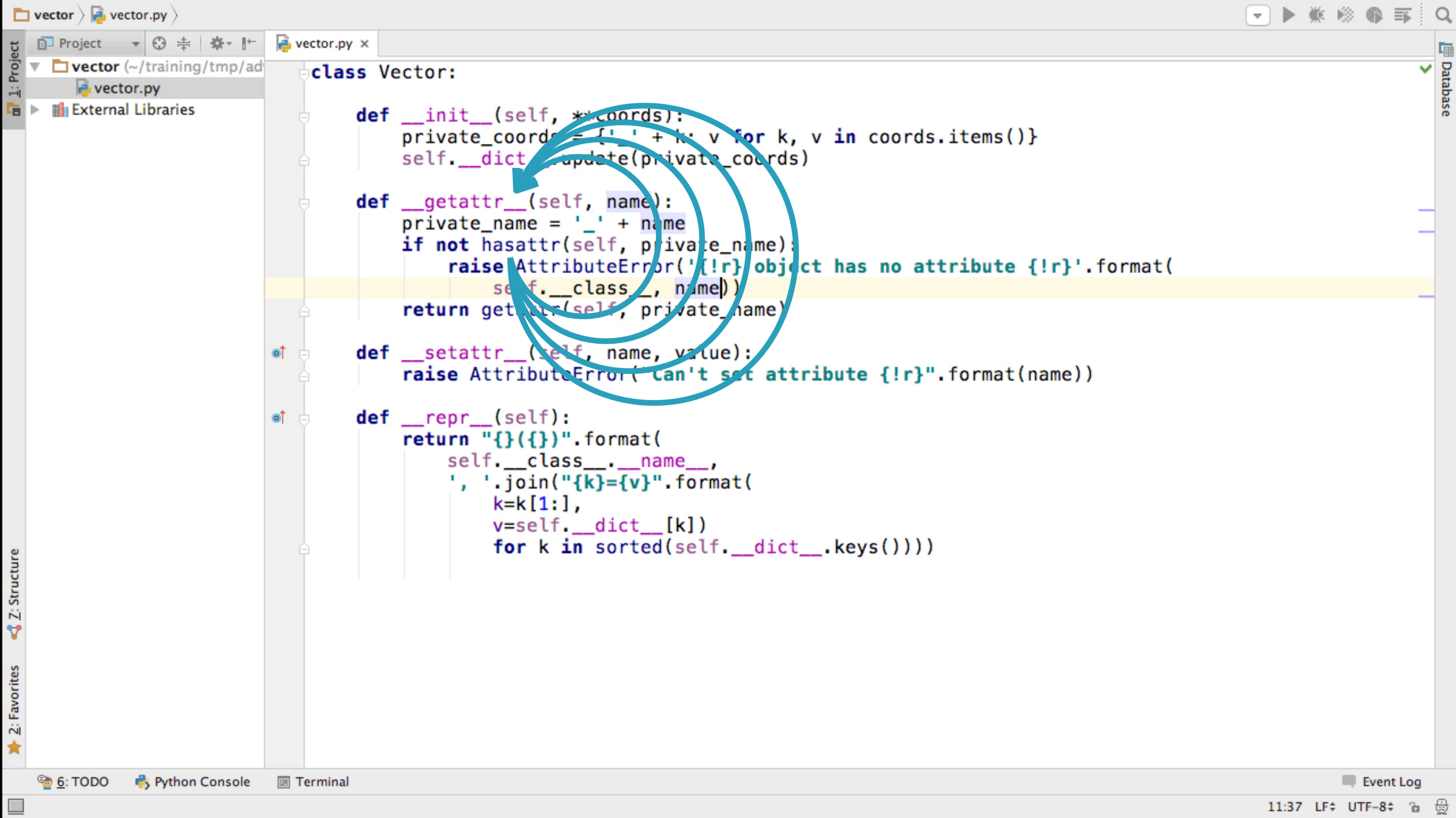
vector
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Python Console
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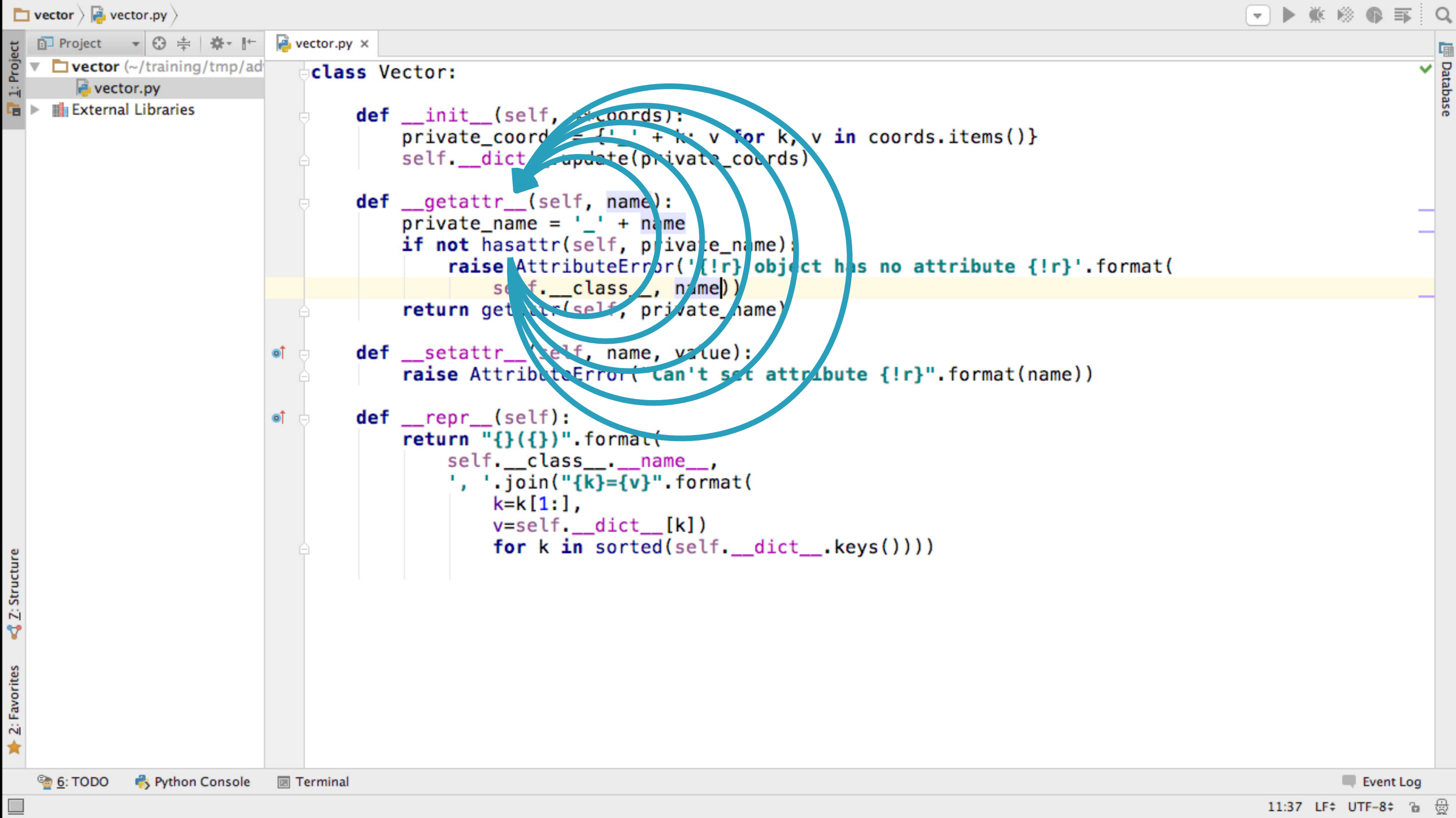
vector
vector.py
Project
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External Libraries
vector.py
class Vector:
def __init__(self, **coords):
private_coord = {'_' + k: v for k, v in coords.items()}
self.__dict__.update(private_coords)
def __getattr__(self, name):
private_name = '_' + name
if not hasattr(self, private_name):
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Database
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Python Console
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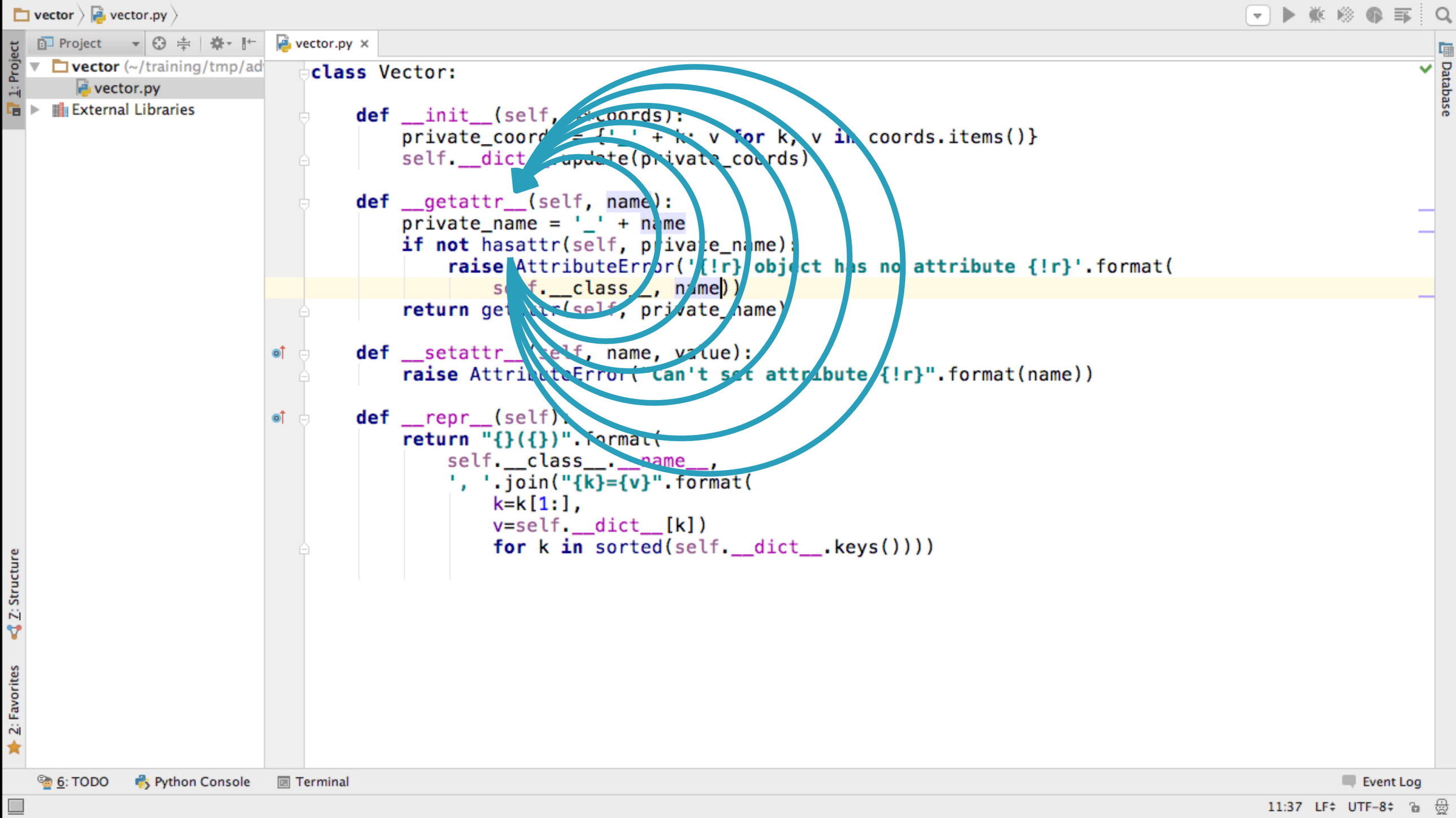
vector
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Project
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Database
7: Structure
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6: TODO
Python Console
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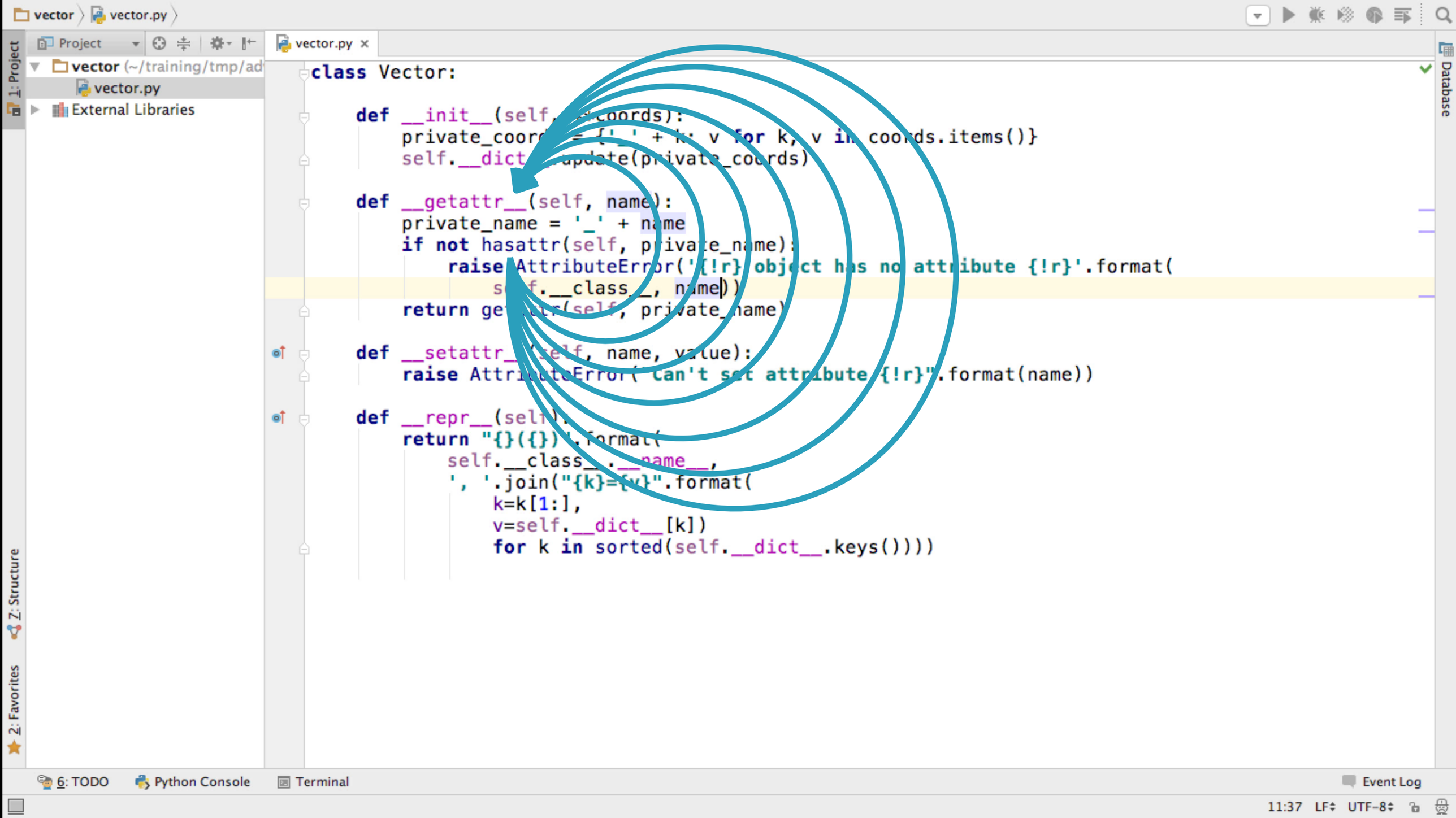
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1: Project
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Python Console
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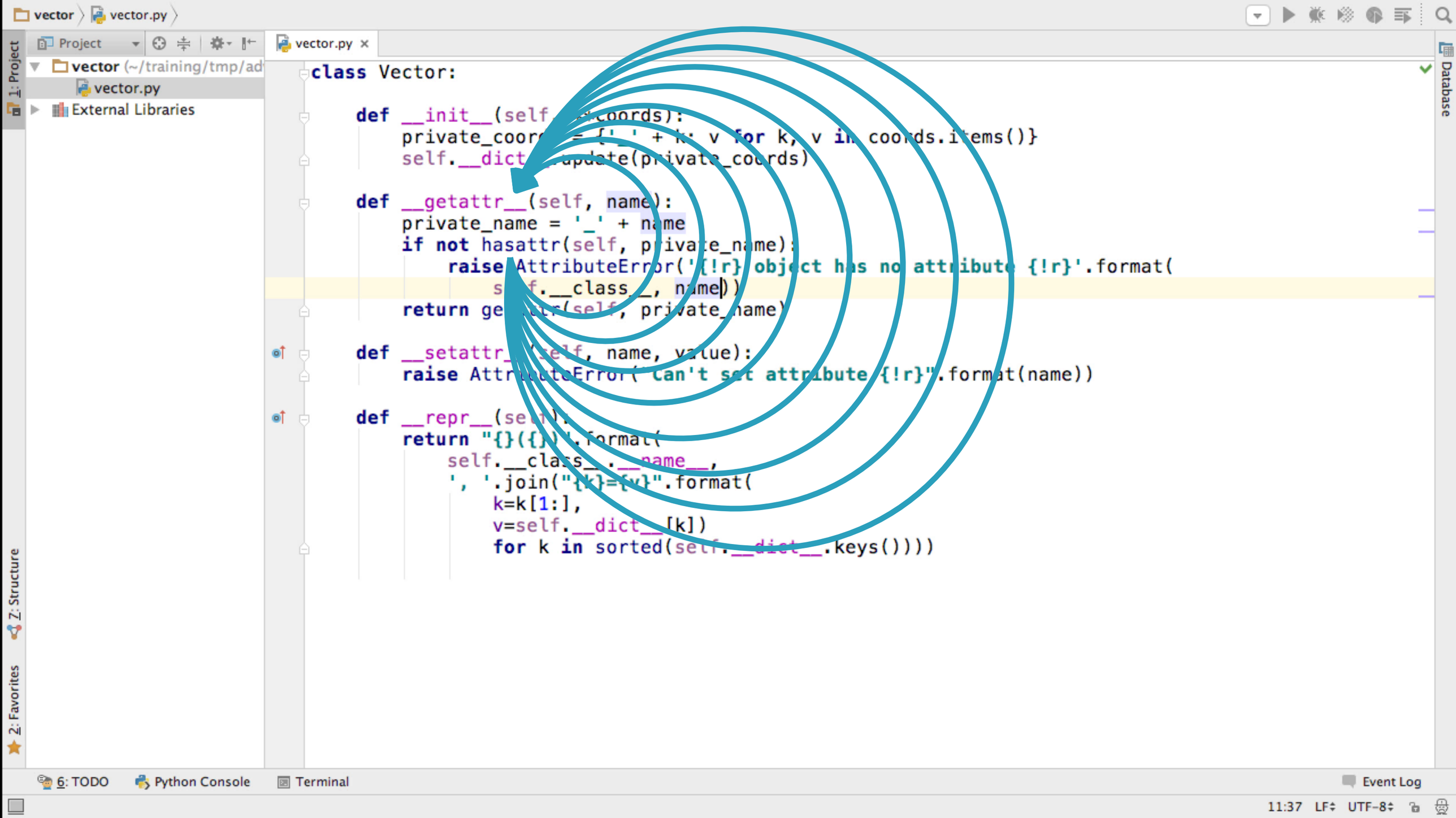
vector
vector.py
Project
vector (~/training/tmp/ad
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External Libraries
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class Vector:
def __init__(self
coords):
private_coor
= {'_' + k: v for k, v in coords.items()}
self.__dict
update(private_coords)
def __getattr__(self, name):
private_name = '_' + name
if not hasattr(self, private_name):
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f.__class__, name))
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Python Console
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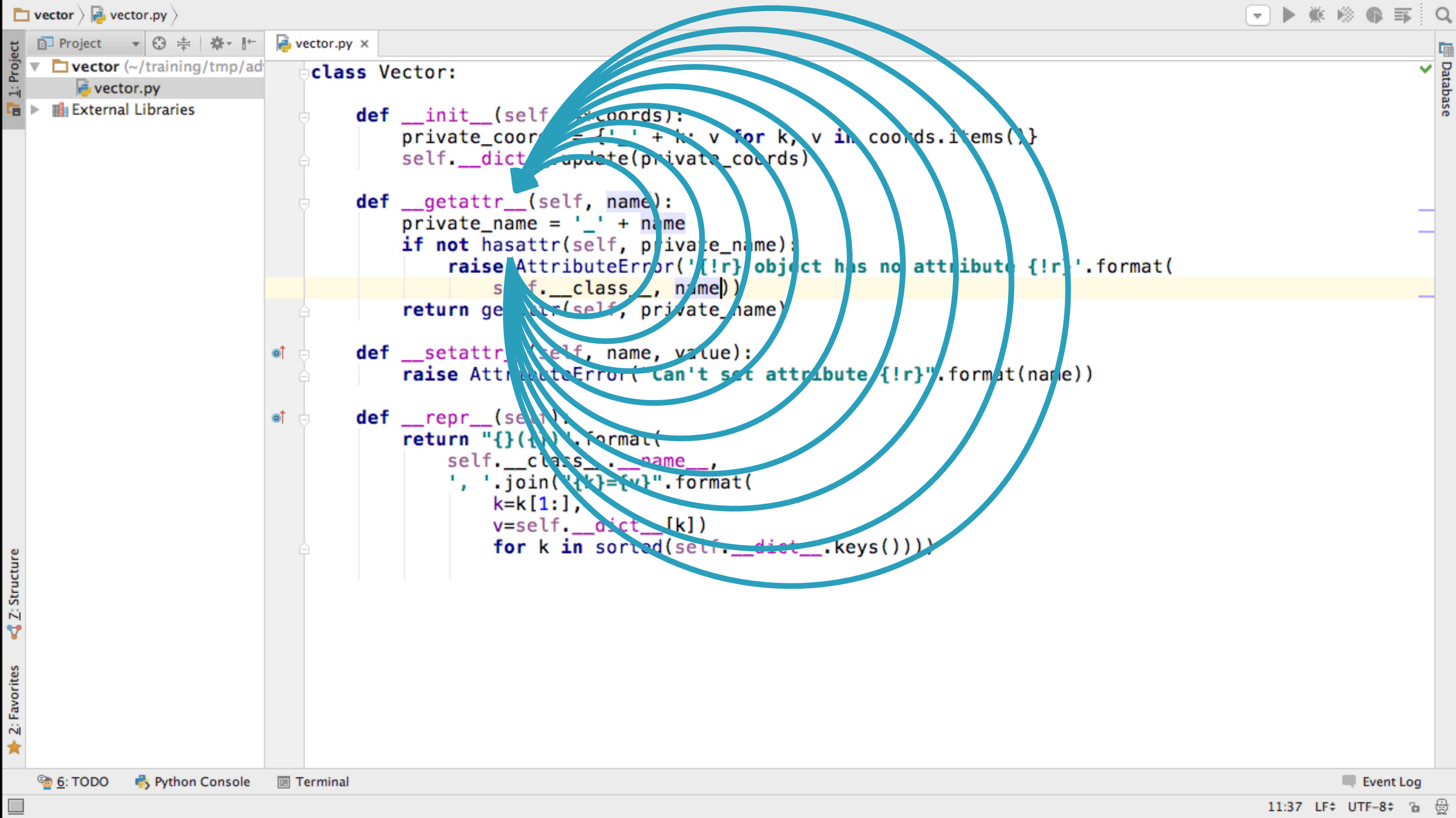
UTF-8


vector
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Database
7: Structure
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6: TODO
Python Console
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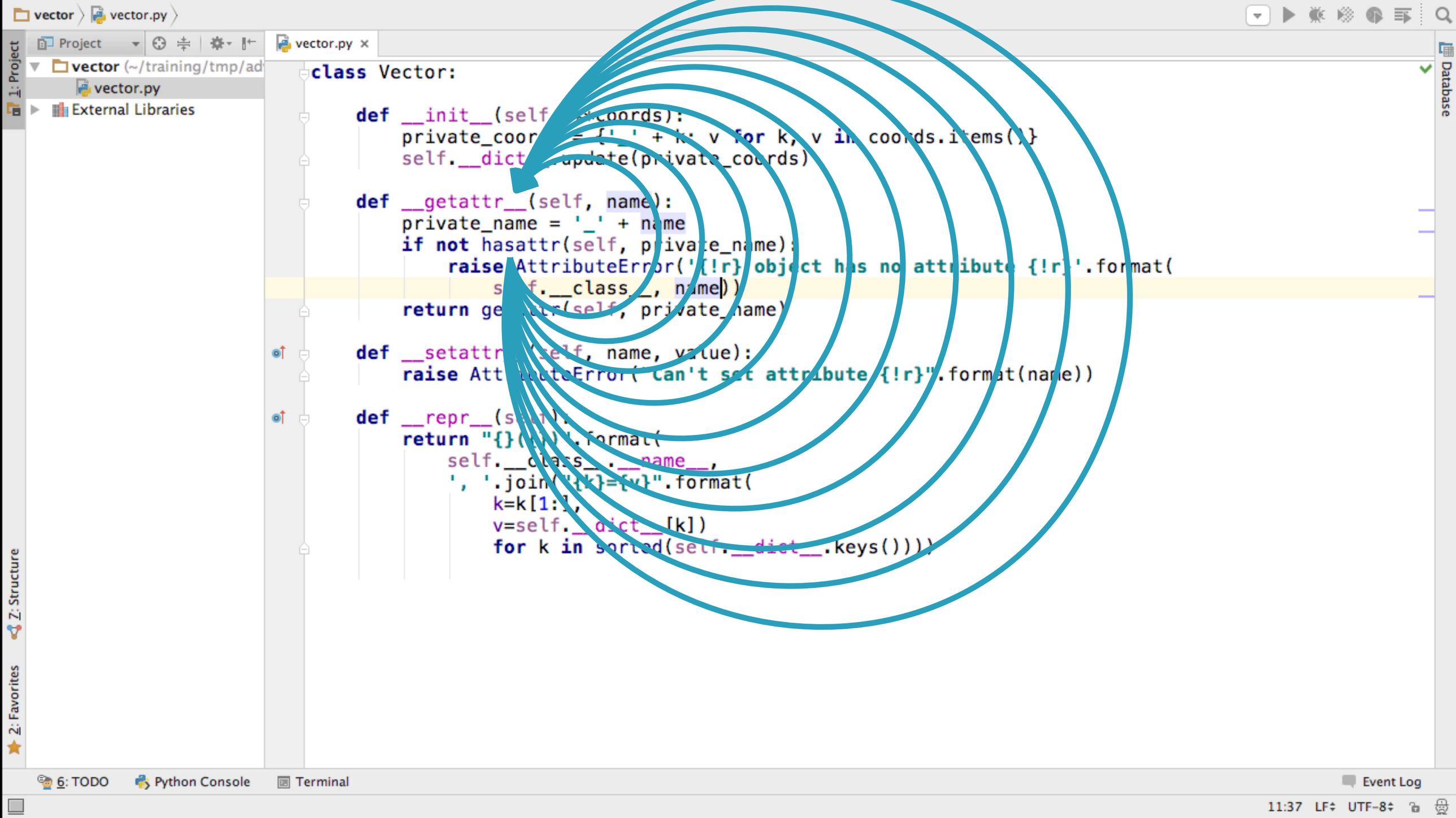
UTF-8


vector
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vector (~/training/tmp/ad
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).format(
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6: TODO
Python Console
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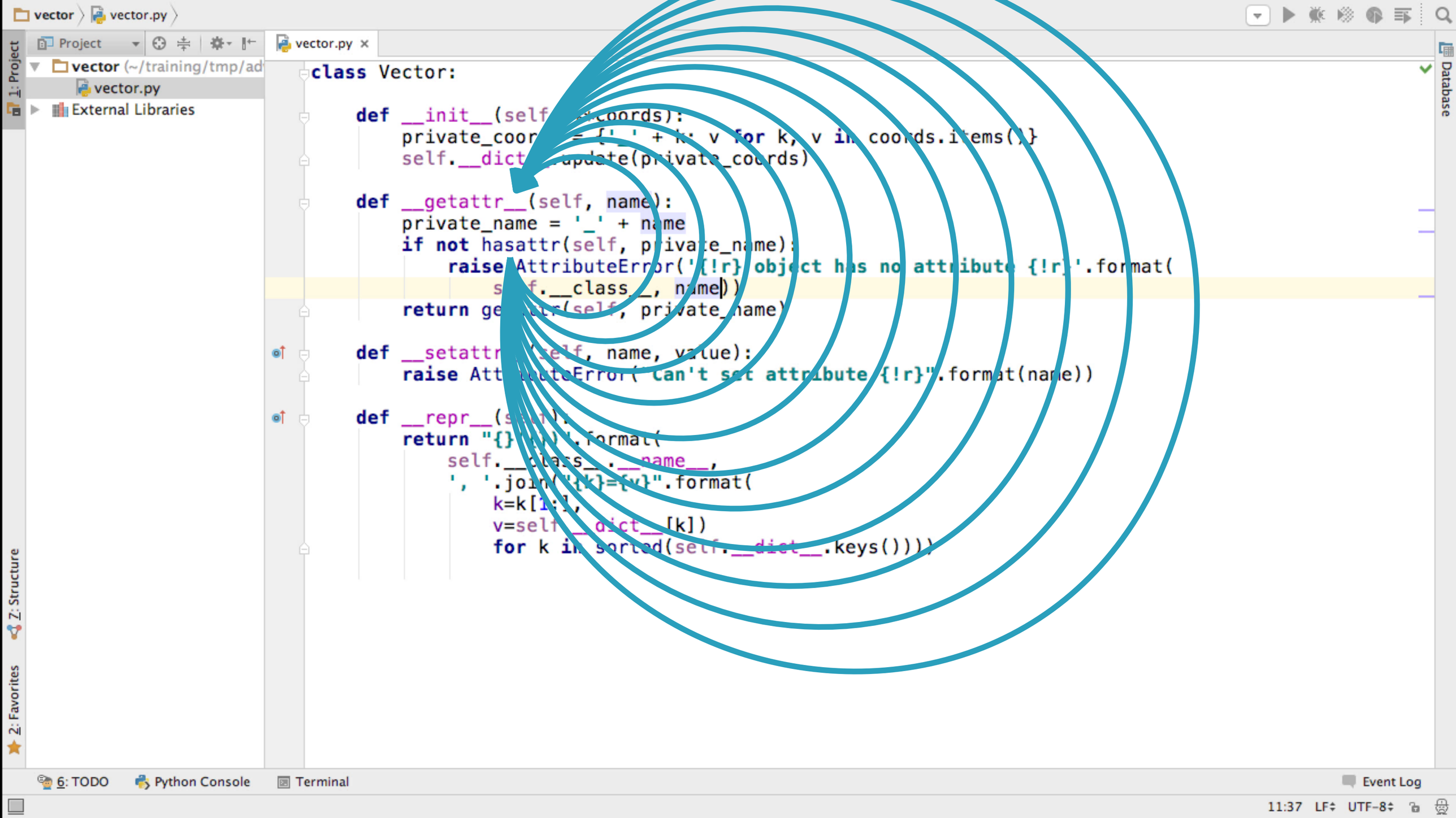
1: Project
2: Favorites
7: Structure
Database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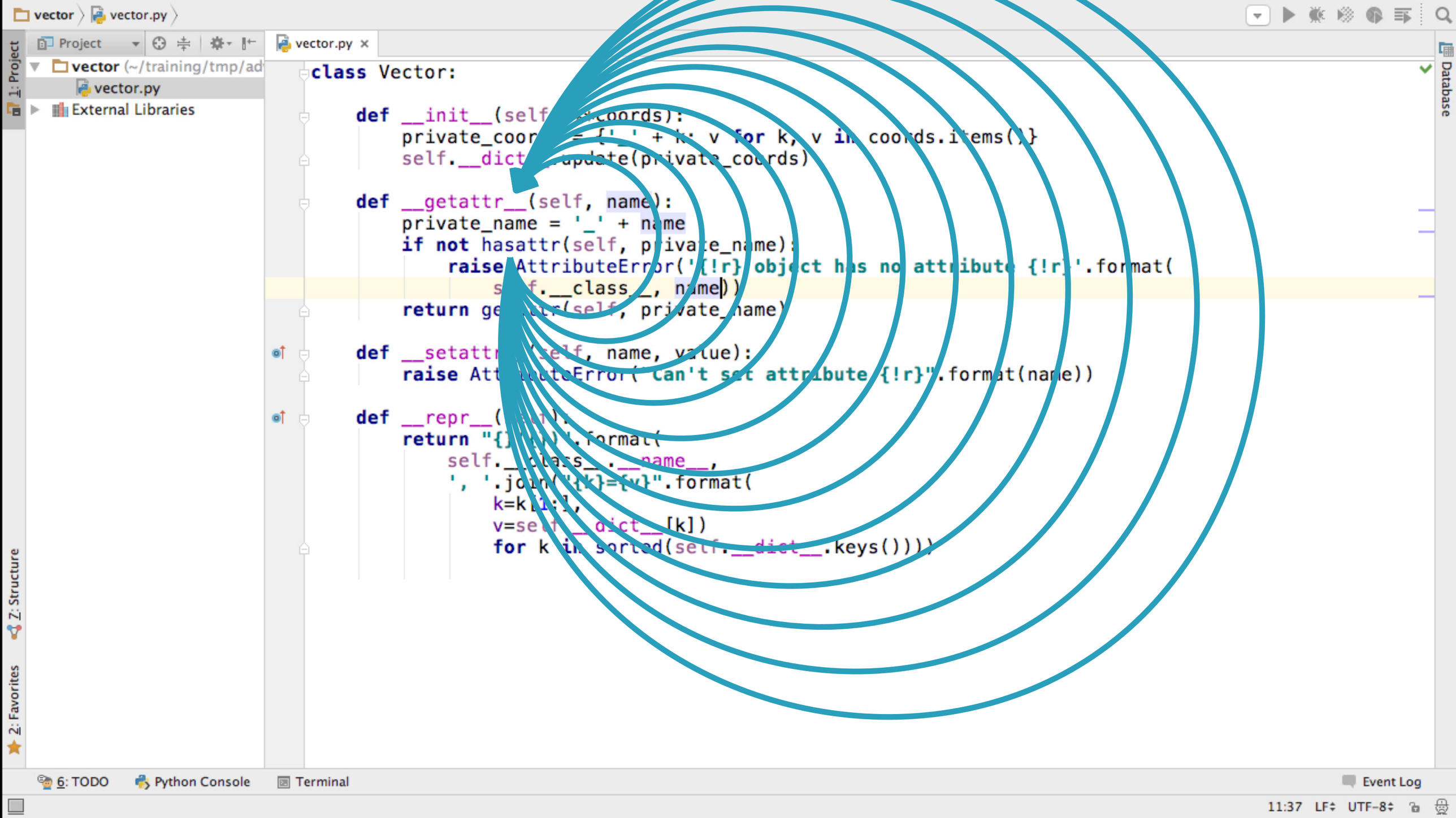
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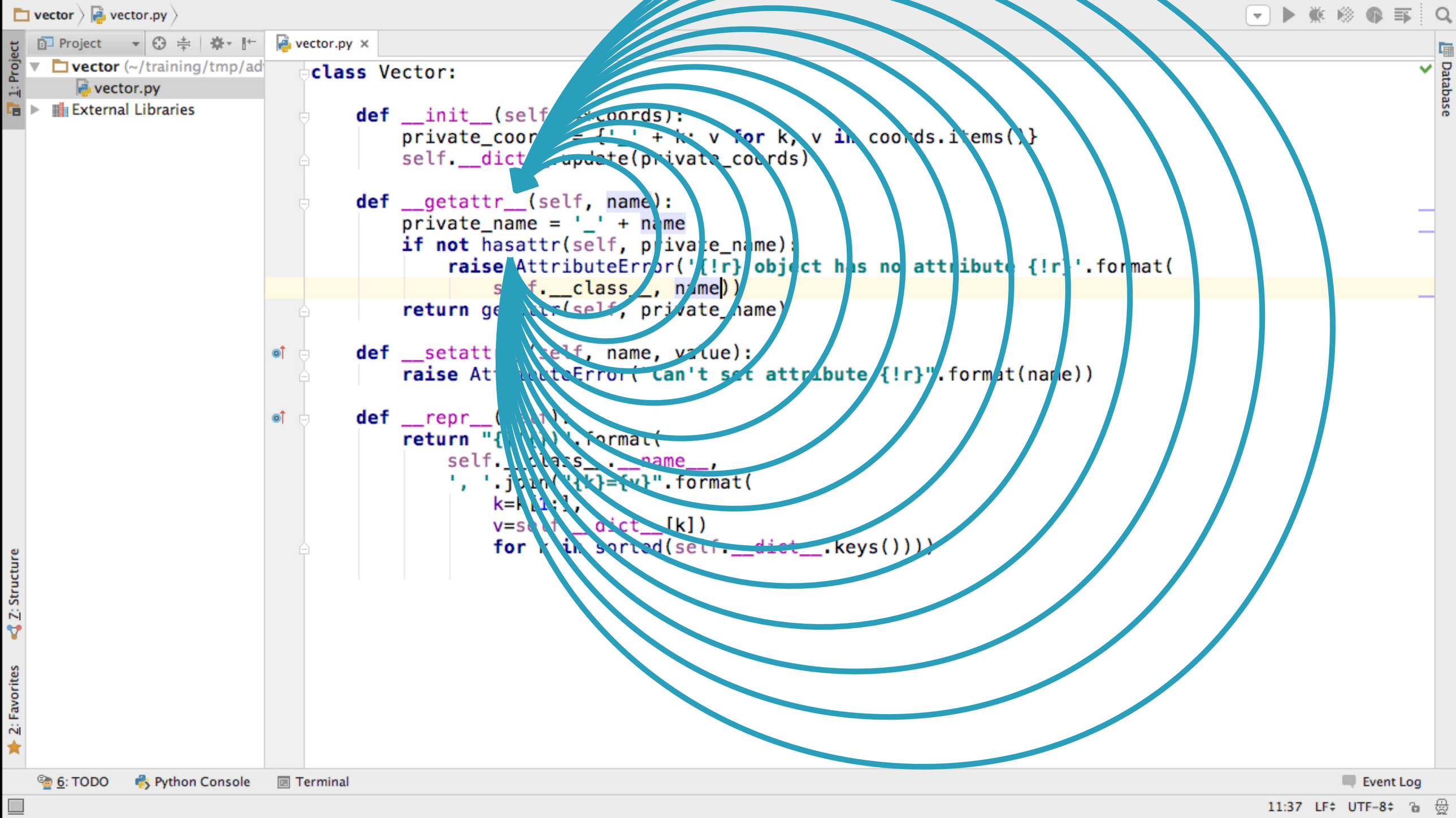
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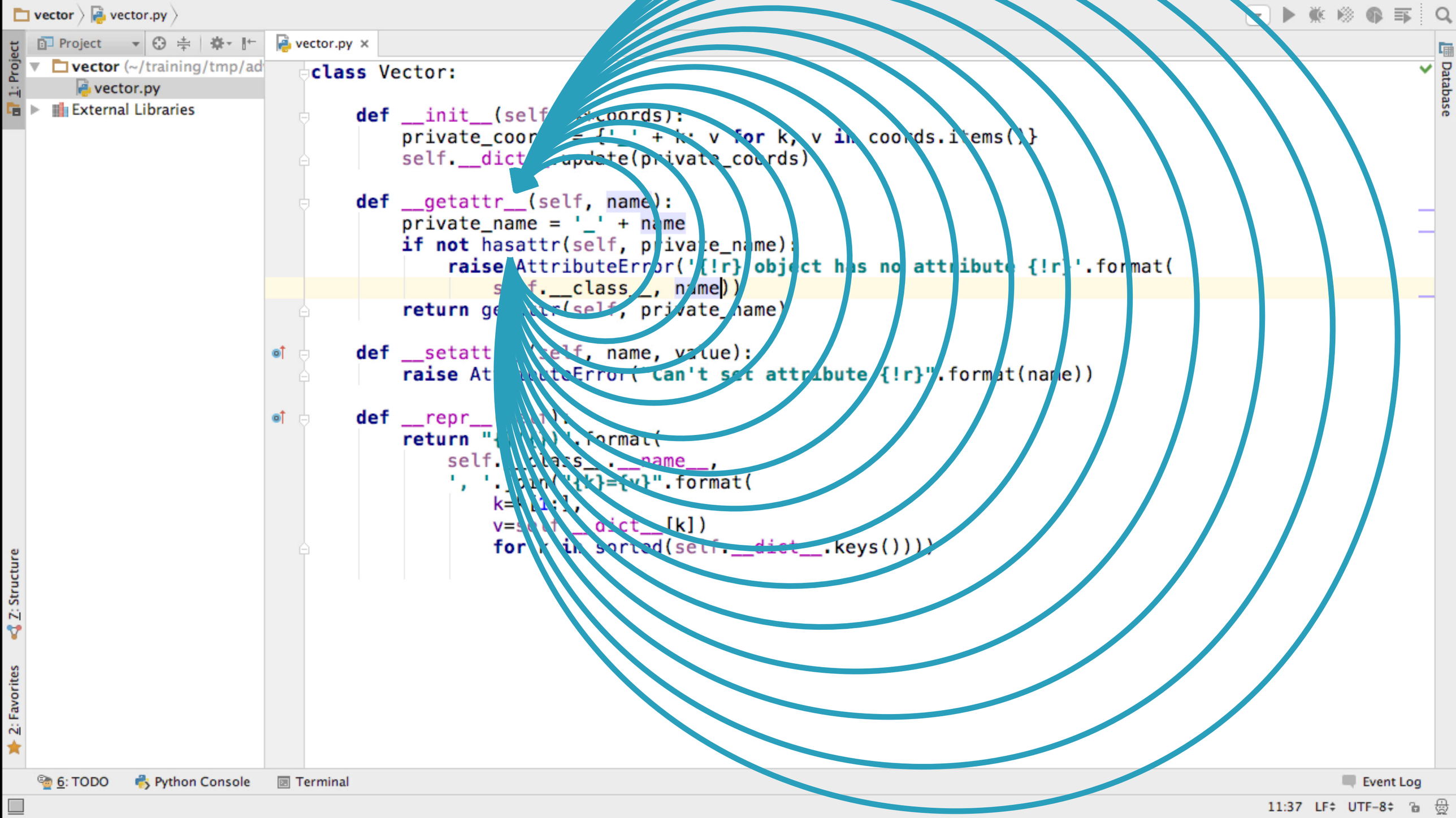
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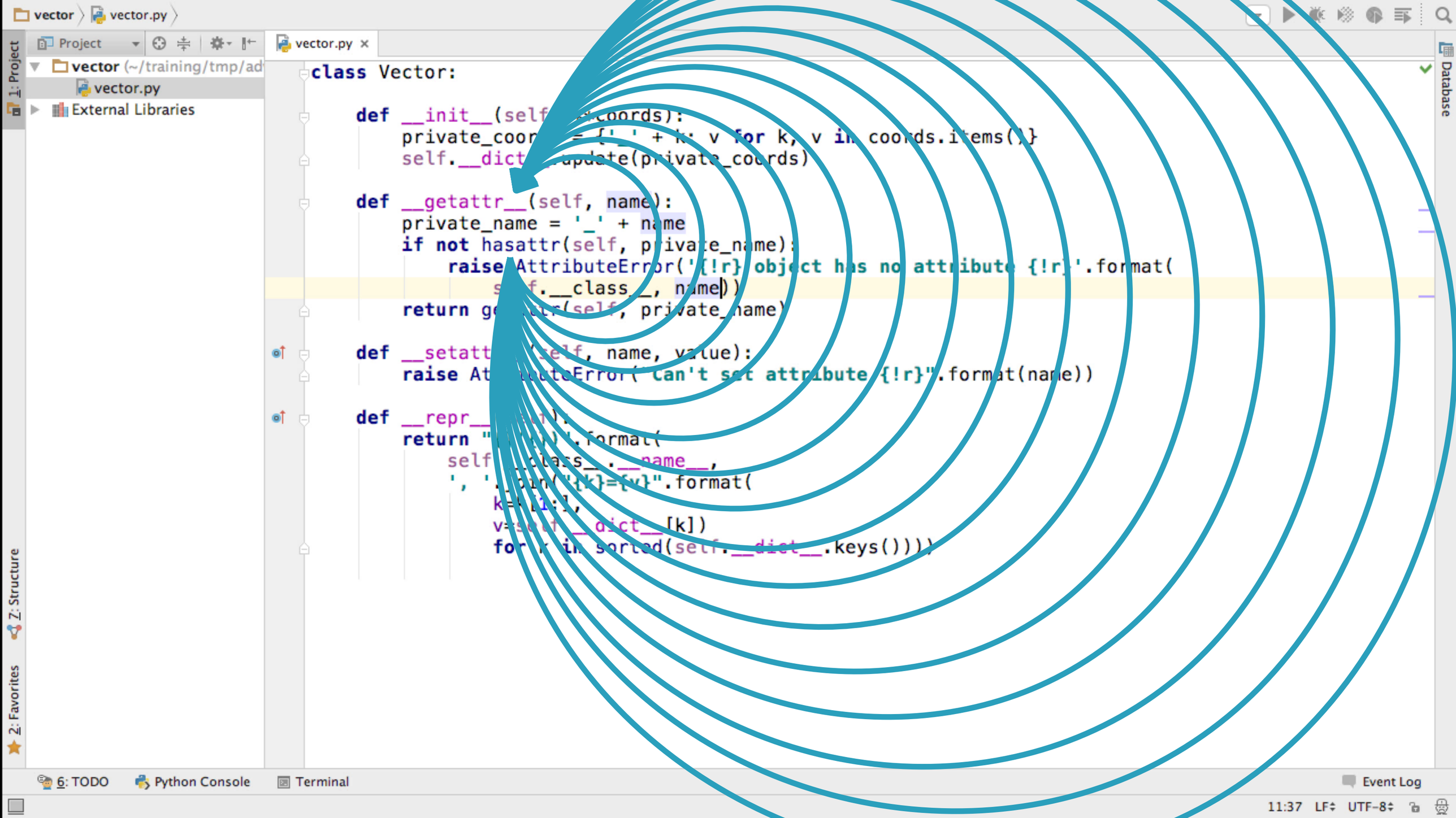
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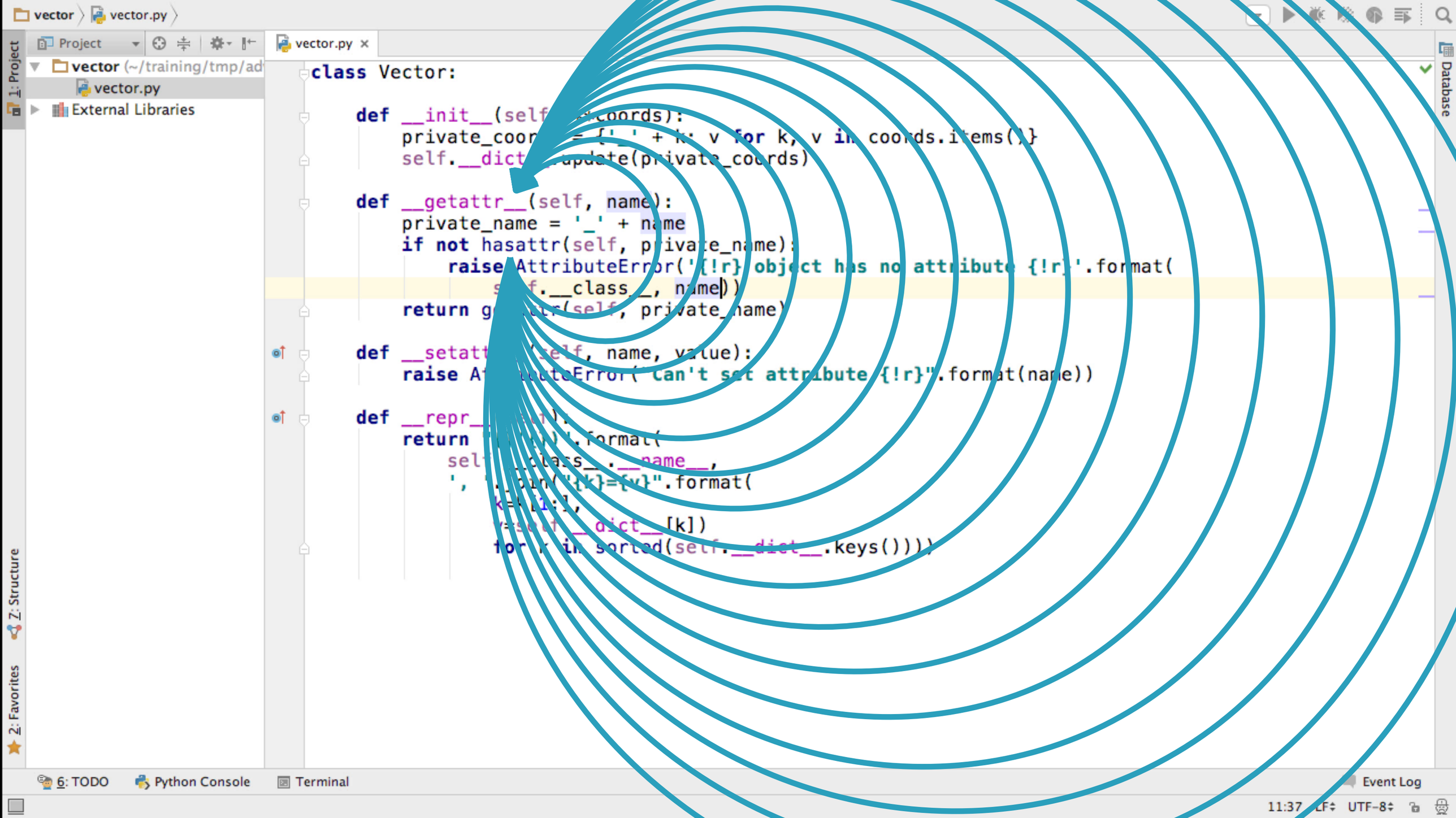
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self.__class__, name))
return g
r(self, private_name)
def __setatt
(self, name, value):
raise A
tteError("Can't set attribute {!r}".format(name))
def __repr__
):
return
}'.format(
sel
class__.__name__,
', '.join("{k}={v}".format(
k=k[1:],
v=self.__dict__[k])
for k in sorted(self.__dict__.keys())))
6: TODO
Python Console
Terminal
Event Log
11:37
LF
UTF-8
1: Project
2: Favorites
7: Structure
Database

Overriding `__delattr__()`

Customising Attribute Storage

Direct Versus Indirect Access to `__dict__`

Using `vars()` to Access `__dict__`

Unpythonic?

Pythonic

Using `vars()` to Access `__dict__`

Unpythonic?

```
obj.__dict__
```

Pythonic

Using `vars()` to Access `__dict__`

Unpythonic?

```
obj.__dict__
```

Pythonic

```
vars(obj)
```

Using `vars()` to Access `__dict__`

Unpythonic?

```
obj.__dict__
```

Pythonic

```
vars(obj)
```

```
len(collection)
```

Using `vars()` to Access `__dict__`

Unpythonic?

```
obj.__dict__
```

```
collection.__len__()
```

Pythonic

```
vars(obj)
```

```
len(collection)
```

Using `vars()` to Access `__dict__`

Unpythonic?

```
obj.__dict__
```

```
collection.__len__()
```

```
self.__dict__['color'] = [red, green, blue]
```

Pythonic

```
vars(obj)
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```
len(collection)
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Using `vars()` to Access `__dict__`

Unpythonic?

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obj.__dict__
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collection.__len__()
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```
self.__dict__['color'] = [red, green, blue]
```

Pythonic

```
vars(obj)
```

```
len(collection)
```

```
vars(self)['color'] = [red, green, blue]
```

Overriding `__getattribute__`

Customising **Attribute Access**

Customising **Attribute Access**

Fallback

`__getattr__()`

Invoked **after** requested attribute/ property not found by normal lookup

Customising **Attribute Access**

Fallback

`__getattr__()`

Invoked **after** requested attribute/ property not found by normal lookup

Preemptive

`__getattribute__()`

Invoked **instead of** normal lookup

Attribute Lookup for Special Methods

Where Are Methods Stored?

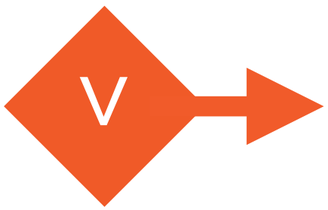
Where are the Methods?

Where are the Methods?

object
reference

Where are the Methods?

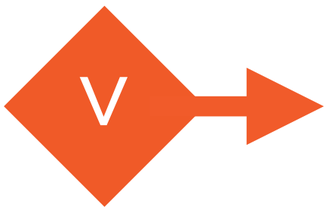
object
reference



Where are the Methods?

object reference

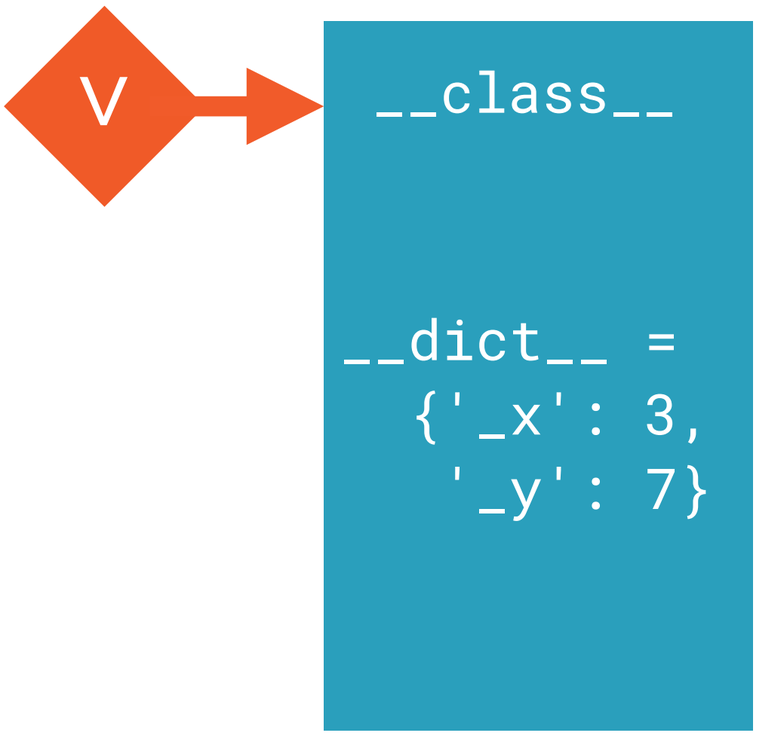
Vector instance



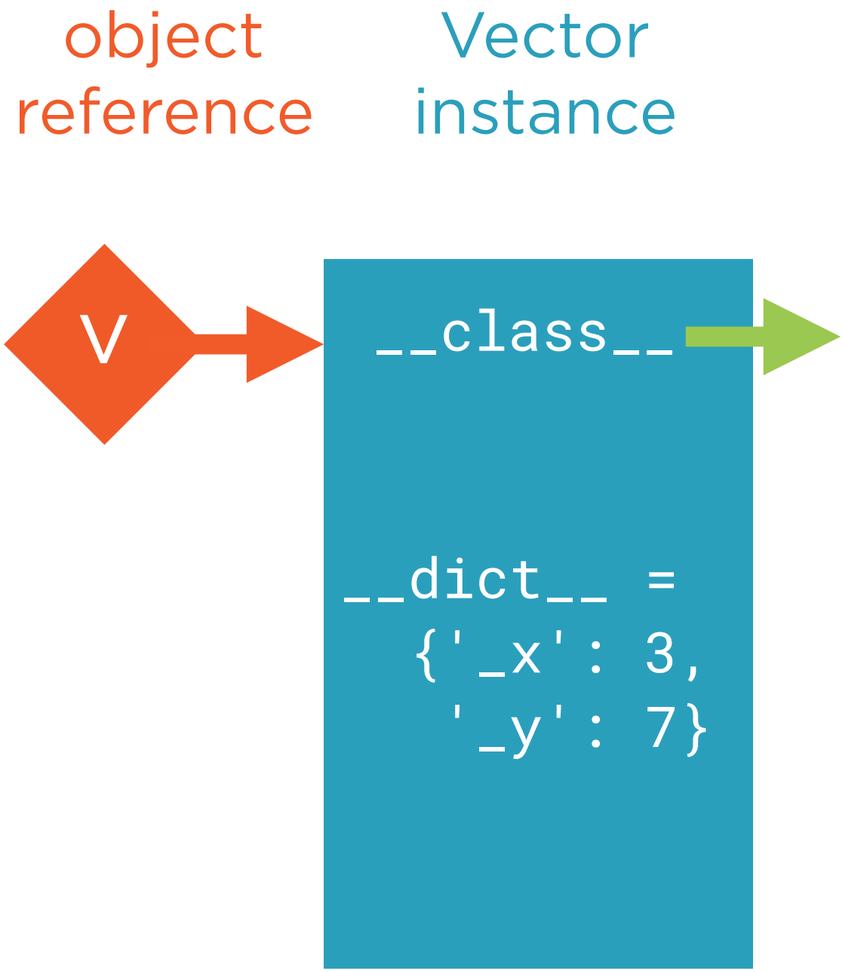
Where are the Methods?

object reference

Vector instance



Where are the Methods?

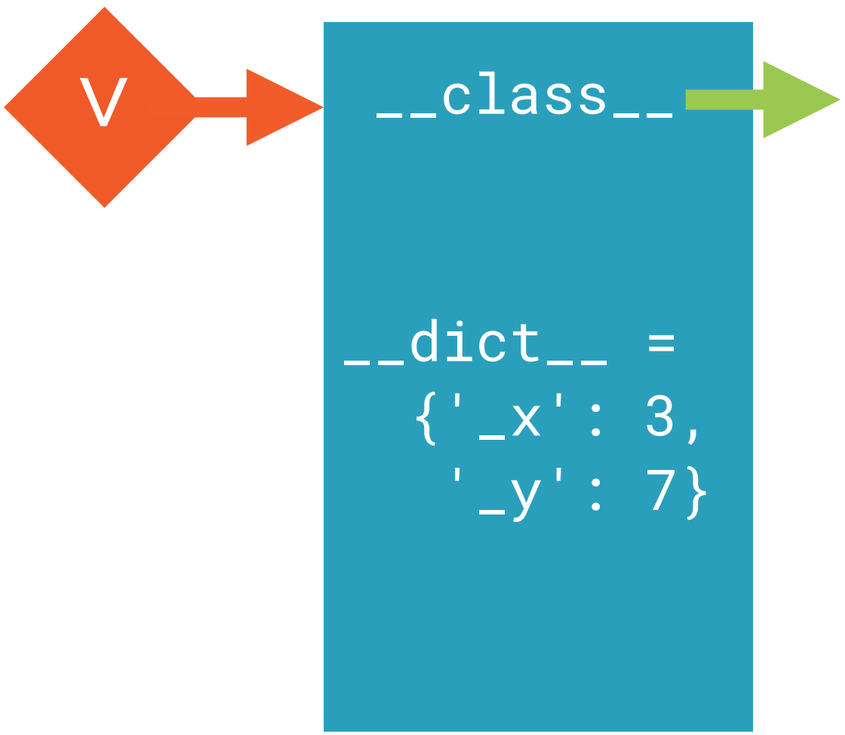


Where are the Methods?

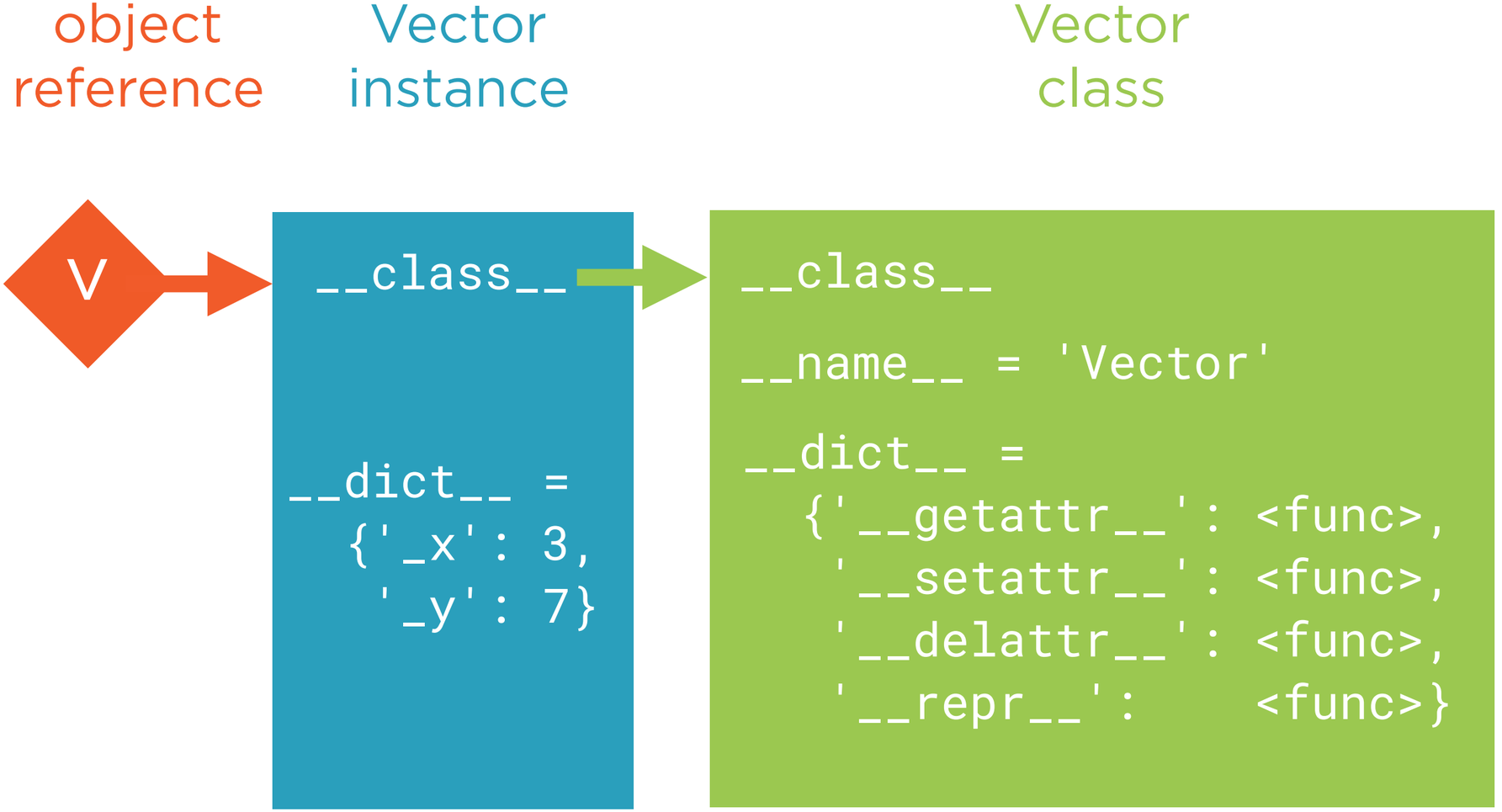
object reference

Vector instance

Vector class



Where are the Methods?



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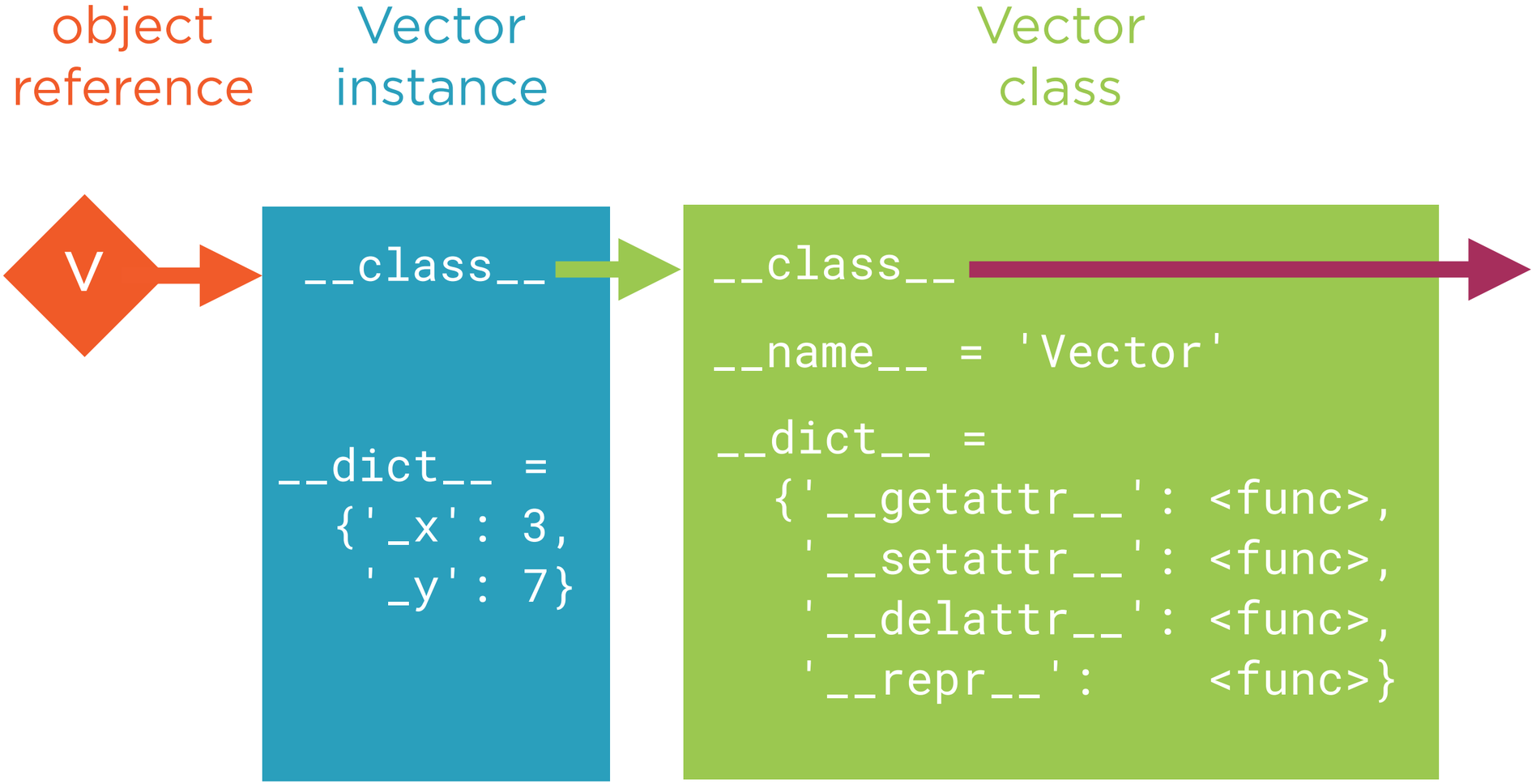

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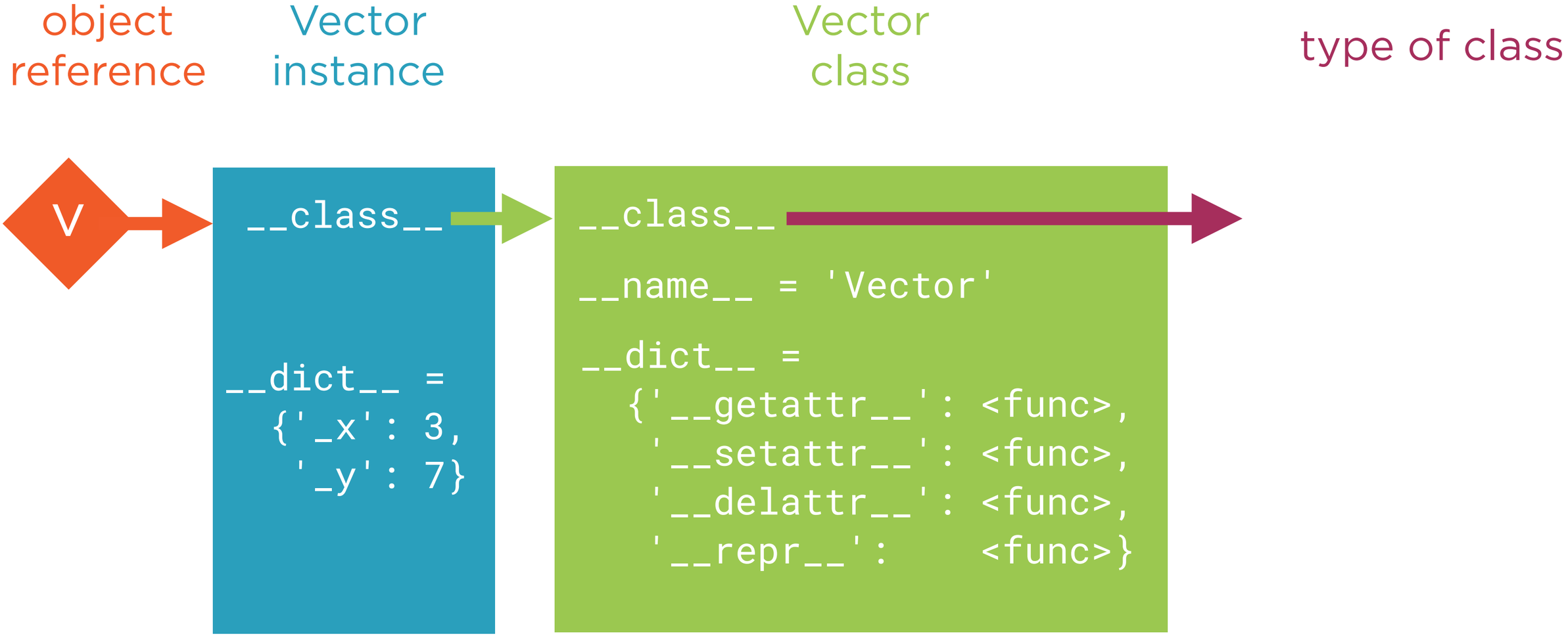
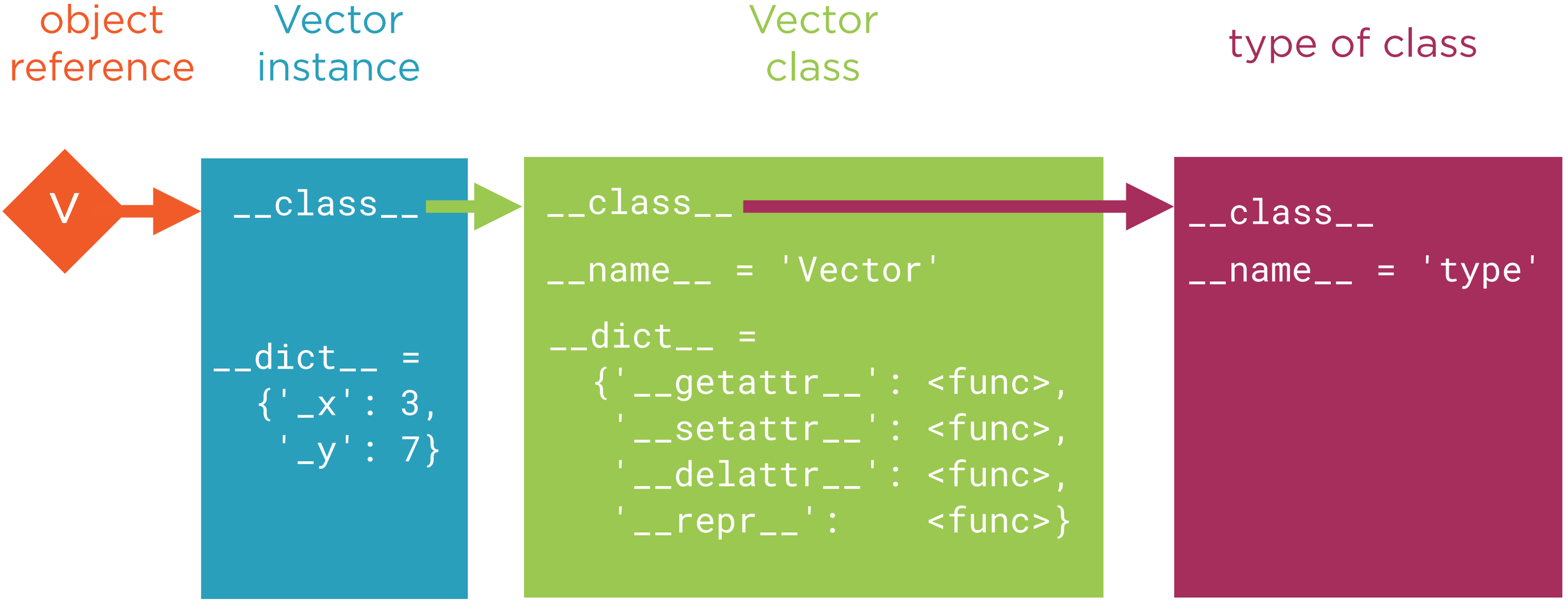


Where are the Methods?



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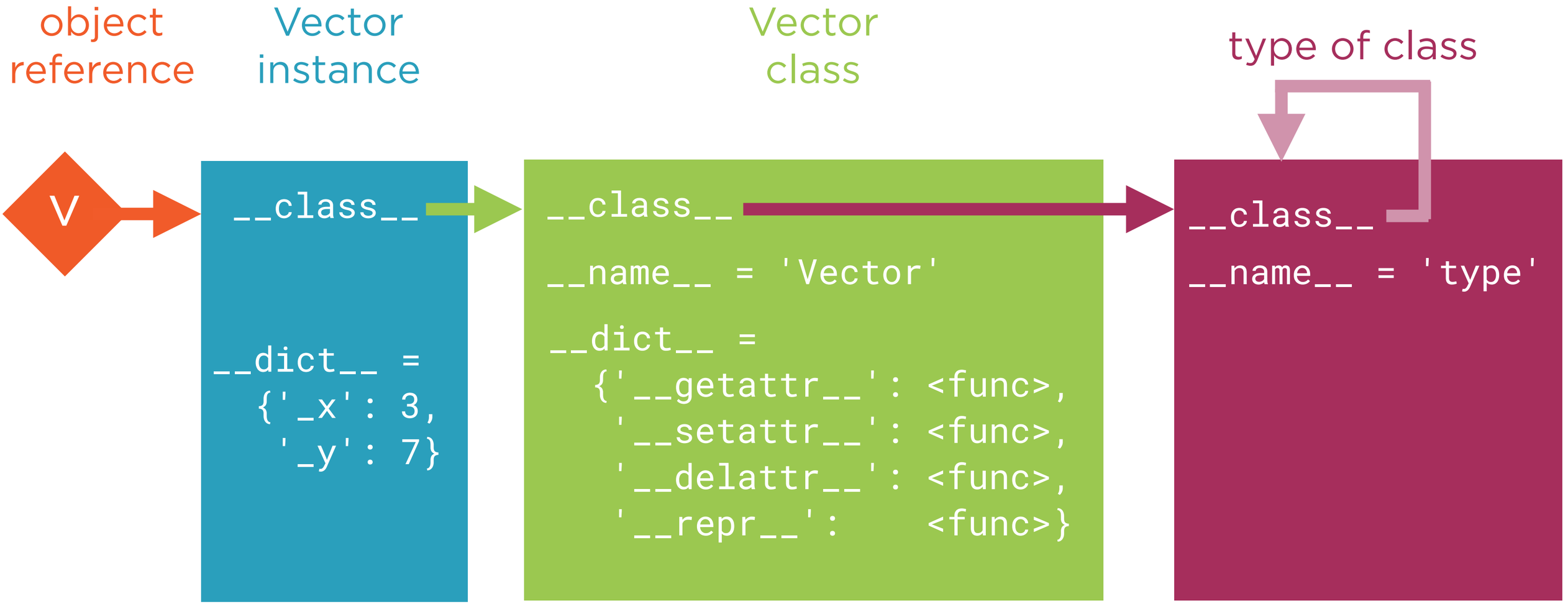


100 GB

Trading Size for Dynamism with Slots

Summary

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Instance attributes stored in `__dict__`

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`__dict__` can be manipulated directly

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Fallback lookup with `__getattr__`

Attribute assignment with `__setattr__`

Summary

Summary

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`hasattr()` **built-in calls** `__getattr__`

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Intercept with `__getattribute__`

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`hasattr()` **built-in calls** `__getattr__`

Intercept with `__getattribute__`

Methods in `__class__.__dict__`