

# Classes and Objects II

Digging deeper

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## Vectors

What do we need?

- Addition:  $\mathbf{x} + \mathbf{y} = (x_0 + y_0, x_1 + y_1, \dots, x_{n-1} + y_{n-1})$
- Magnitude:  $\|\mathbf{x}\| = (x_0^2 + x_1^2 + \dots + x_{n-1}^2)^{1/2}$
- Direction:  $\mathbf{x}/\|\mathbf{x}\| = (x_0/\|\mathbf{x}\|, \dots, x_{n-1}/\|\mathbf{x}\|)$
- Dot product:  $\mathbf{x}^\top \mathbf{y} = x_0 y_0 + x_1 y_1 + \dots + x_{n-1} y_{n-1}$
- ...

## mutable or immutable?

In [13]:

```
class Vector:
    def __init__(self, v):
        self.coords = v
```

In [14]:

```
a = [1, 2]
v = Vector(a)
print(v.coords)
```

[1, 2]

In [15]:

```
a[0] = 3
print(a)
print(v.coords)
```

[3, 2]

[3, 2]

In [16]:

```
print(v.coords)
```

[3, 2]

## [Why?](#)

How to combat?

- copy
- enforce immutability

In [12]:

```
class Vector:
    def __init__(self,v):
        self.coords = list(v) # creates a new list from the data v

a = [1,2]
v = Vector(a)
print(v.coords)
a[0] = 3
print(a)
print(v.coords)
```

```
[1, 2]
[3, 2]
[1, 2]
```

## immutable (mostly) better

**Pros:**

- safer (prevents unwanted changes)
- allows for hashing

**Cons:**

- more memory

Live coding ...

## composing classes/objects

Supplement slides and live coding

## notebook config

ignore the cells below

In [2]:

```
from notebook.services.config import ConfigManager
cm = ConfigManager()
cm.update('livereveal', {
    'theme': 'White',
    'transition': 'None',
```

```
'start_slideshow_at': 'selected',  
'width': 1024,  
'height': 768,  
'minScale': 1.0  
})
```

Out[2]:

```
{'center': True,  
 'controls': True,  
 'height': 768,  
 'minScale': 1.0,  
 'mousewheel': True,  
 'progress': True,  
 'scroll': True,  
 'slideNumber': True,  
 'start_slideshow_at': 'selected',  
 'theme': 'White',  
 'transition': 'None',  
 'width': 1024}
```

In [7]:

```
%%HTML  
<style>  
.reveal #notebook-container { width: 90% !important; }  
.reveal pre { width: 100% !important; }  
.CodeMirror { max-width: 100% !important; }  
.container {width:95% !important; }  
pre, code, .CodeMirror-code, .reveal pre, .reveal code {  
    font-family: "Consolas", "Source Code Pro", "Courier New", Courier, monos  
pace;  
}  
pre, code, .CodeMirror-code {  
    font-size: inherit !important;  
}  
.reveal .code_cell {  
    font-size: 130% !important;  
    line-height: 130% !important;  
}  
</style>
```