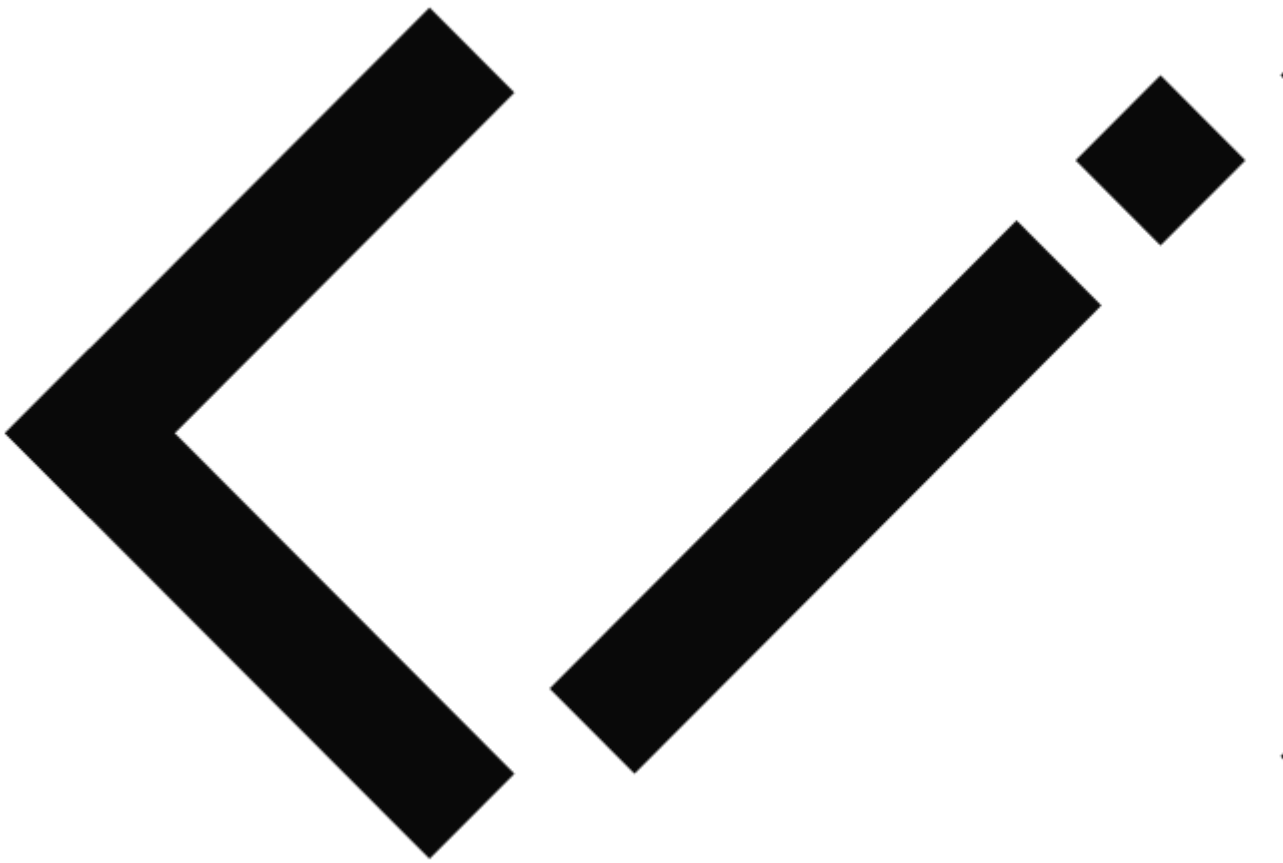
IDOM - It's React, but in Python

IDOM is a new declarative Python package for building highly interactive and composable user interfaces.



IDOM takes inspiration from React, and wherever possible, attempts to achieve parity with the features it cop
than the version of React's often lauded "Hooks" that IDOM implements in Python.

At a glance, the similarities between IDOM and React are rather striking. Below is a React component which d
that updates when a user clicks on it. Immediately following that is the same view implemented in Python us

```
import React, { useState } from react;

function Slideshow() {
  const [index, setIndex] = useState(0);
  return (
```

```
    <img
      src={ `https://picsum.photos/400?image=${index}` }
      onClick={ () => setIndex(index + 1) }
      style={ {cursor: "pointer"} }
    />
  )
}
```

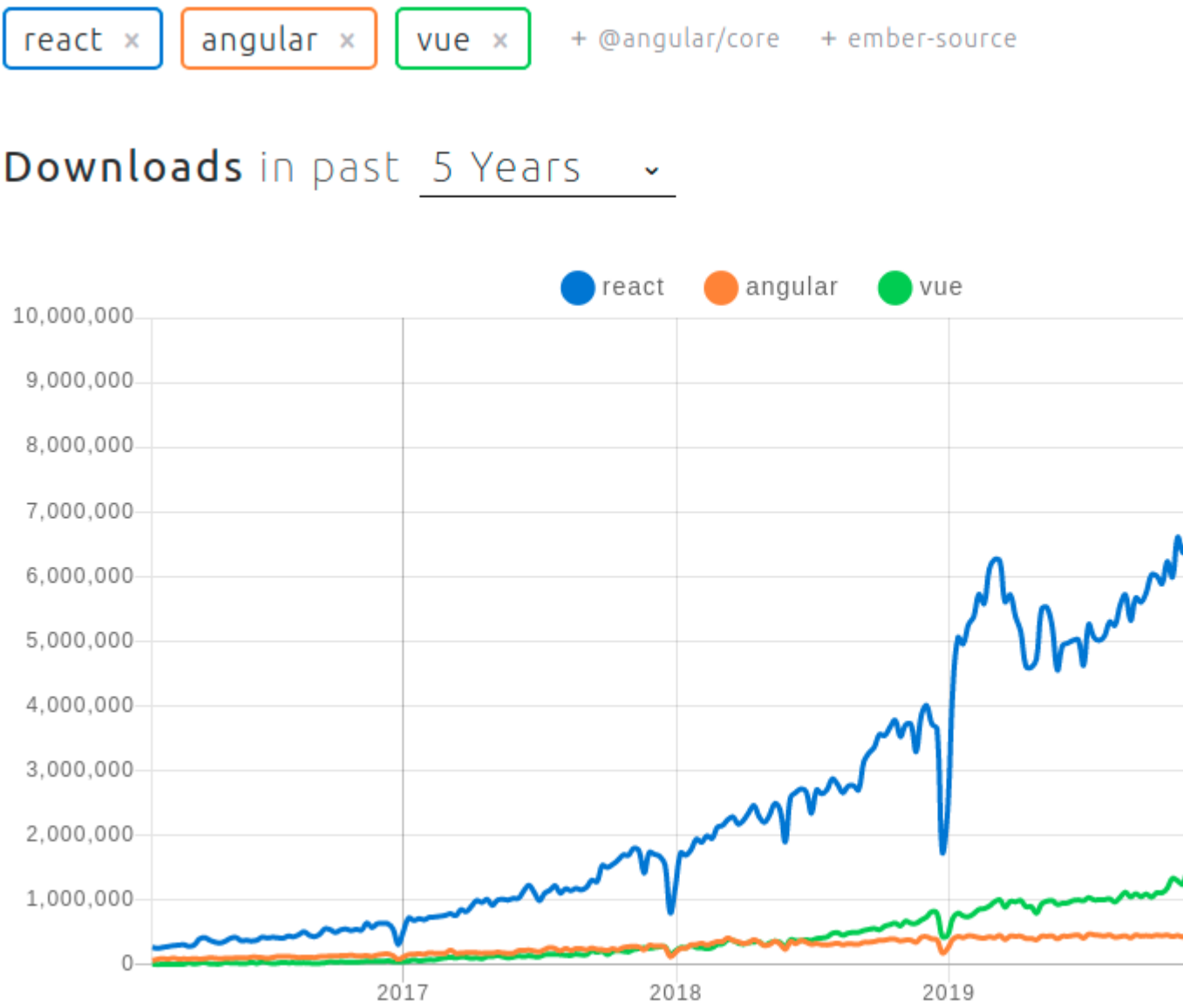
```
import idom

@idom.component
def Slideshow():
    index, set_index = idom.hooks.use_state(0)
    return idom.html.img(
        {
            "src": f"https://picsum.photos/400?image={index}",
            "onClick": lambda event: set_index(index + 1),
            "style": {"cursor": "pointer"},
        }
    )

idom.run(Slideshow)
```

Why Do We Need IDOM?

Over the past 5 years front-end developers seem to have arrived at the conclusion that declarative programm
more simply, mutable state in programs can quickly lead to unsustainable complexity. This trend is largely e
like Vue and React which describe the logic of computations without explicitly stating their control flow.



So what does this have to do with Python and IDOM? Well, because browsers are the de facto "operating syst like Python have had to figure out clever ways to integrate with them. While standard REST APIs are well suit modern browser users expect a higher degree of interactivity than this alone can achieve.

A variety of Python packages have since been created to help solve this problem:

- IPyWidgets - Adds interactive widgets to Jupyter Notebooks
- Plotly Dash - Allows data scientists to produces enterprise-ready analytic apps
- Streamlit - Turns simple Python scripts into interactive dashboards
- Bokeh - An interactive visualization library for modern web browsers

However they each have drawbacks that can make them difficult to use.

1. **Restrictive ecosystems** - UI components developed for one framework cannot be easily ported to any of complex, undocumented, or are structurally inaccesible.

2. **Imperative paradigm** - IPyWidgets and Bokeh have not embraced the same declarative design principles p
3. **Limited layouts** - At their initial inception, the developers of these libraries were driven by the visualizatio create complex UI layouts may not have been a primary engineering goal.

A future article will address specific comparisons to each of the projects mentioned above, but for now we'll the problems above.

Ecosystem Independence

IDOM has a flexible set of core abstractions that allow it to easily interface with its peers. At the time of writi supported while Streamlit, Bokeh, and Iooxa (another scientific collaboration tool), are in the works:

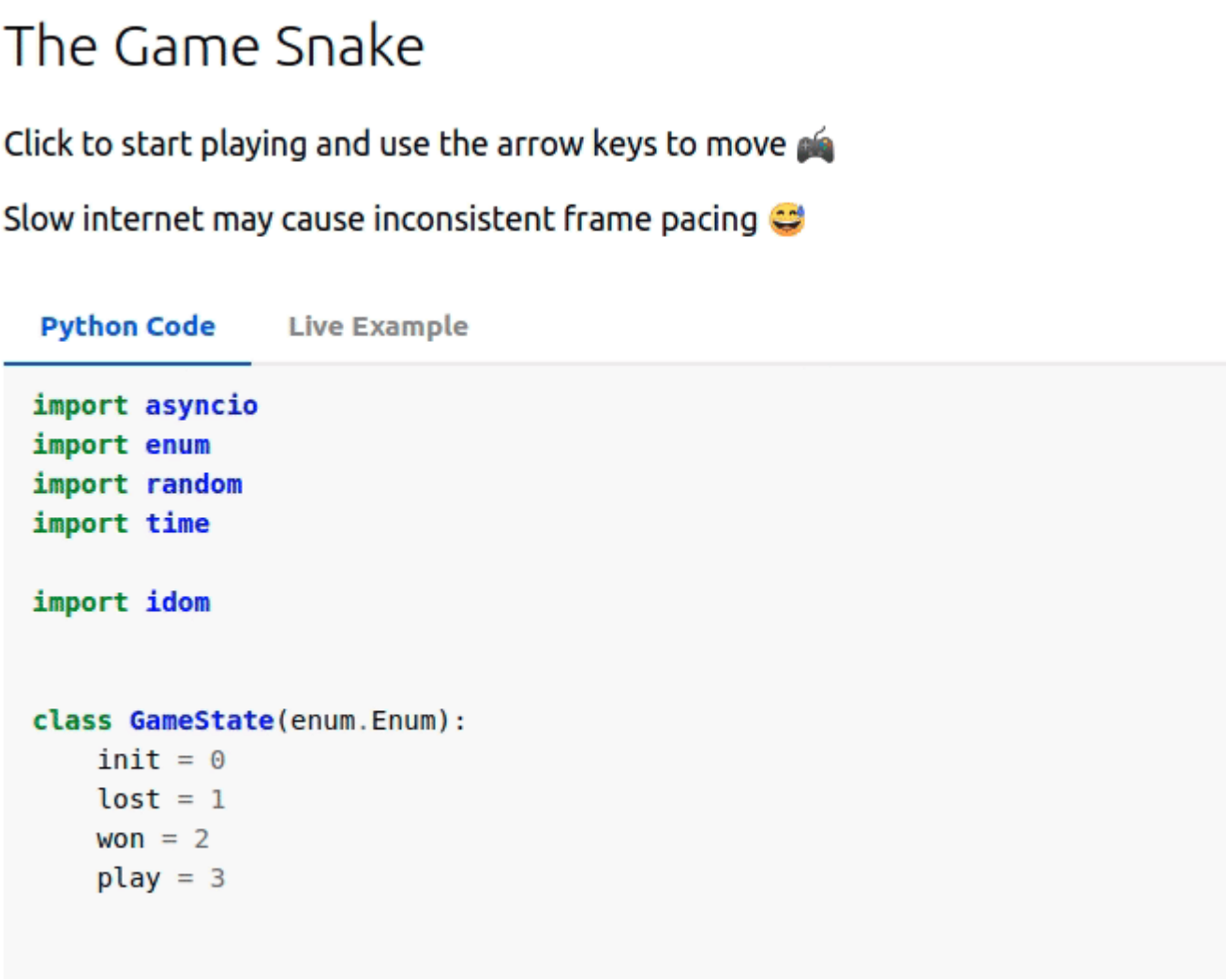
- idom-jupyter (try it now with Binder)
- idom-dash

By providing well defined interfaces and straighforward protocols, IDOM makes it easy to swap out any part you need to. For example, if you need to use a different web server for your application, IDOM already has 3 create your own.

- Sanic
- Flask
- Tornado

You can even target your usage of IDOM in your production-grade applications with IDOM's Javascript React c and connect a back-end websocket that's serving up IDOM models. Instead of creating your whole applicatio need it. Further, the ability to leverage custom or existing javascript components in IDOM means that you can your particular use cases.

IDOM's own documentation acts as a prime example for this targeted usage - most of the page is static HTML that feature live views being served from a web socket:

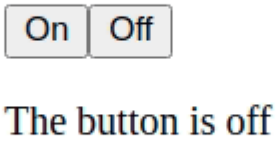


Declarative Components

IDOM, by adopting the hook design pattern from React, inherits many of its aesthetic and functional character
interfaces are composed of basic HTML elements which are constructed and returned by special functions ca
hooks, those functions can be made to have state. Consider the component below which returns two button
pressed:

```
import idom

@idom.component
def OnOff():
    state, set_state = idom.hooks.use_state(False)
    return idom.html.div(
        idom.html.button({"onClick": lambda event: set_state(True), "On"),
        idom.html.button({"onClick": lambda event: set_state(False), "Off"),
        idom.html.p("The button is " + ("on" if state else "off")),
    )
```



The first time a view of the component above is rendered, the `OnOff` function is called where the initial `stat` of to return a series of HTML elements with callbacks. Machinery behind the scenes then realizes that declara text `"The button is off"`. When a user clicks the now visible `"On"` button, its callback is triggered, the `sta` called, and the machinery again goes to work. This time though, the text displayed will read `"The button is`

This behavior of defining outcomes without stating the means by which to achieve them is what makes comp comparison, a hypothetical, and a more imperative approach to defining the same interface might look simila

```
layout = Layout()

def on_off():
    state_text = html.p(children="The button is off")

    def set_on(event):
        state_text.update(children="The button is on")

    def set_off(event):
        state_text.update(children="The button is off")

    return html.div(
        html.button(on_click=set_on, children="On"),
        html.button(on_click=set_off, children="Off"),
        state_text,
    )

layout.add_element(on_off())
```

In this imperative incarnation, we must explicitely state how the `count_button` updates `count_text` via its `o` `state` is mutated by ammending its `'count'`, a side effect which can be avoided with hooks.

It's important to note that neither declarative nor imperative design principle are inherently better in all circu asserting the way a view should look is easier than describing how it should come to look that way.

Flexible Layouts

Constructing complex layouts is also made easier when done declaratively because the elements, state, and l
in the `OnOff` component shown above, code responsible for managing business logic and manipulating state
responsible for structuring the elements of the layout. The great advantage of this approach is that these se
separate functions if either the logic or the structure becomes too complex:

```
@idom.component
def OnOff():
    return on_off_buttons(*use_on_off_state())

def use_on_off_state():
    """manage logic and state"""
    state, set_state = idom.hooks.use_state(False)

    def set_on():
        set_state(True)

    def set_off()
        set_state(False)

    return state, set_on, set_off

def on_off_buttons(state, set_on, set_off):
    """define element structure"""
    return idom.html.div(
        idom.html.button({"onClick": lambda event: set_on(), "On"),
        idom.html.button({"onClick": lambda event: set_off(), "Off"),
        idom.html.p("The button is " + ("on" if state else "off")),
    )
```

While the refactoring above is overkill in such a simple case, attempting something similar with the ealier im
straighforward because callbacks responsible for defining business logic must hold a reference to the eleme
description of the layout in code is often muddled by semantic limitations of the business logic that make it
grows old.

Conclusion

Building highly interactive web applications as a Python developer has historically been a great challenge. Ho
HTML, CSS, and Python, you can make everything from slideshows to dashboards and use it wherever you ne
an existing web application.

To learn more check it out:

- installation instructions
- where to get started
- interactive examples

- and much more!