How to Program Your Raspberry Pi to Control LED Lights

Looking for an easy Raspberry Pi project to get started with coding and electronics? Try connecting some LEDs and coding them to turn on and off!

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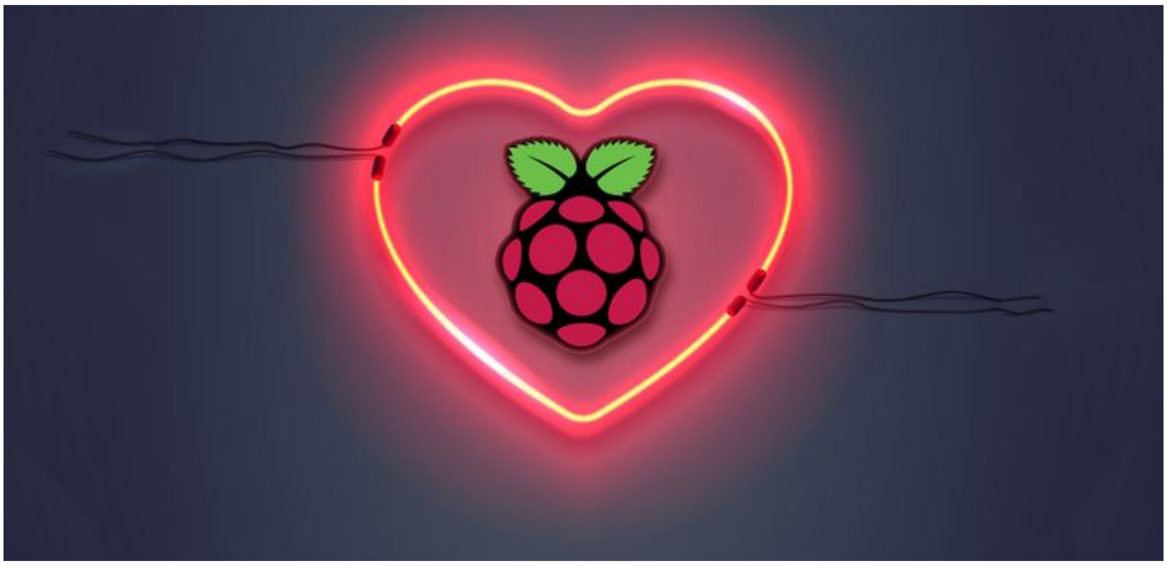
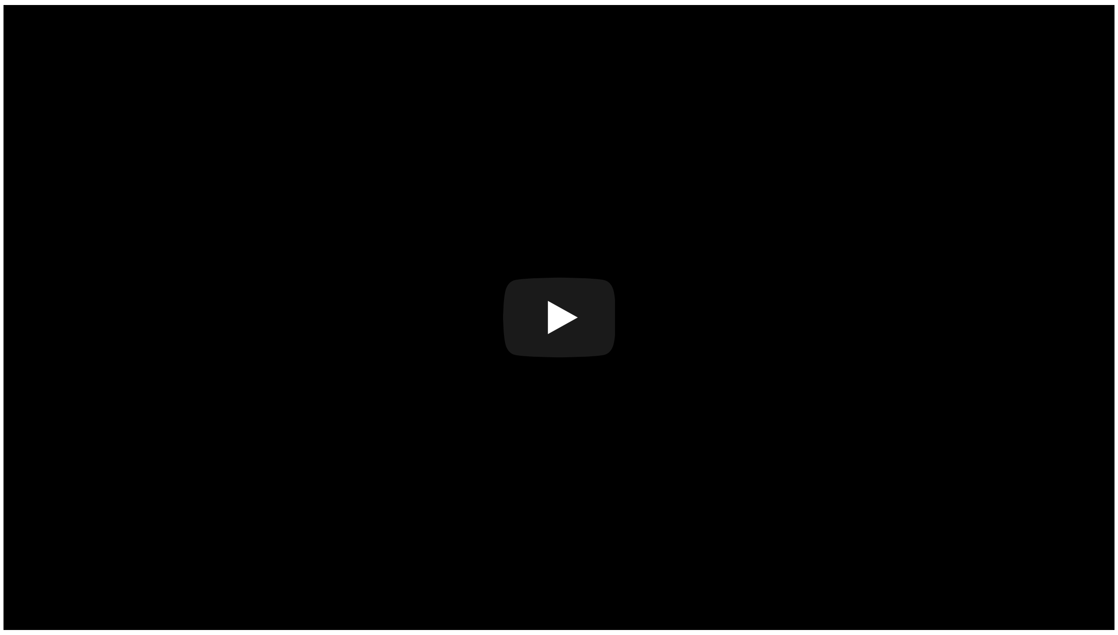
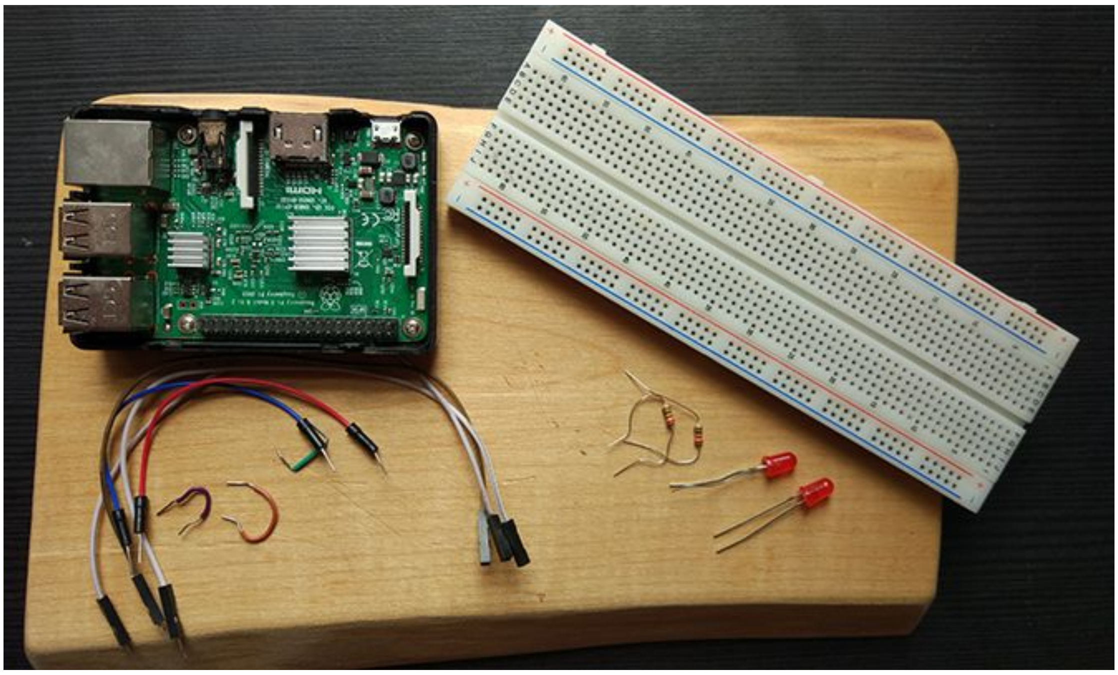


Starting out with the Raspberry Pi can be an exciting experience. It's never been easier for a beginner to get started with both coding and DIY electronics.

One easy project is to make a simple circuit with two LEDs and control one of them using code. Here's how to do it!



Required Components



Before starting, you'll need to make sure you have an operating system on your Pi. Installing **Raspbian via NOOBS** is by far the quickest way to get going.

Boot up your Pi, and attach it to a screen, mouse, and keyboard like a regular desktop computer. Alternatively, you can **connect to your Pi via SSH** to save the clutter of extra wires. We will cover how to control LEDs whichever method you choose.

Once you are sure the Raspberry Pi is booting up correctly, turn it off again while you build your circuit, to avoid damaging your Pi.

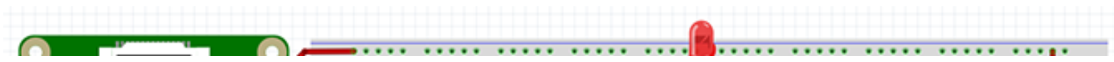
Along with your Raspberry Pi, you will need:

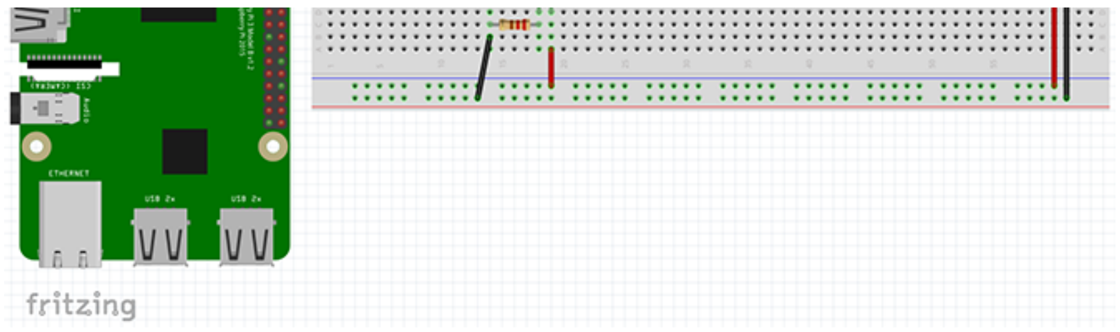
1. A breadboard
2. 2 x LEDs
3. 2 x resistors (anything from 220 Ohm to 1 kOhm)
4. Hookup cables

If you got your **Raspberry Pi with a starter kit**, you will likely already have everything on this list. Now let's build our circuit.

A Simple LED Circuit

Set up your components as shown in this Fritzing diagram:





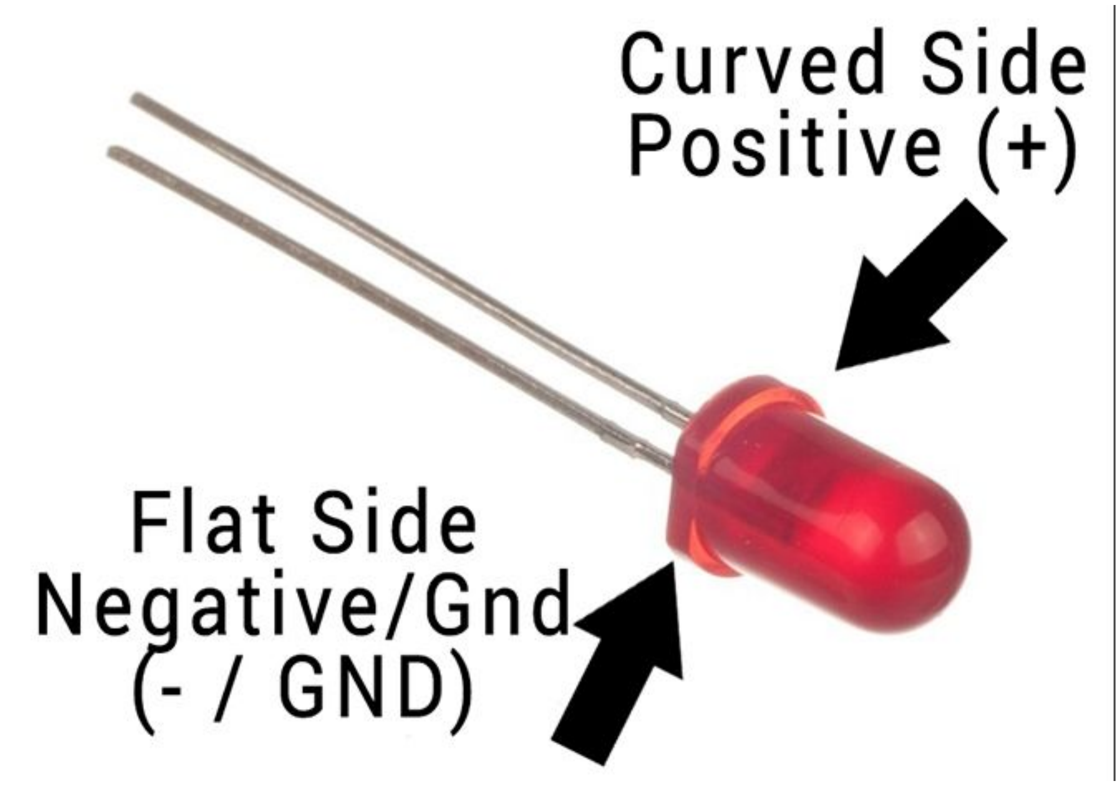
This circuit does two things. The **5v** and **GND** pins of the Pi attach to the **Power Rails** of the breadboard.

Note: To get a better idea of what the breadboard is and how it works, take a look at our breadboard crash course.

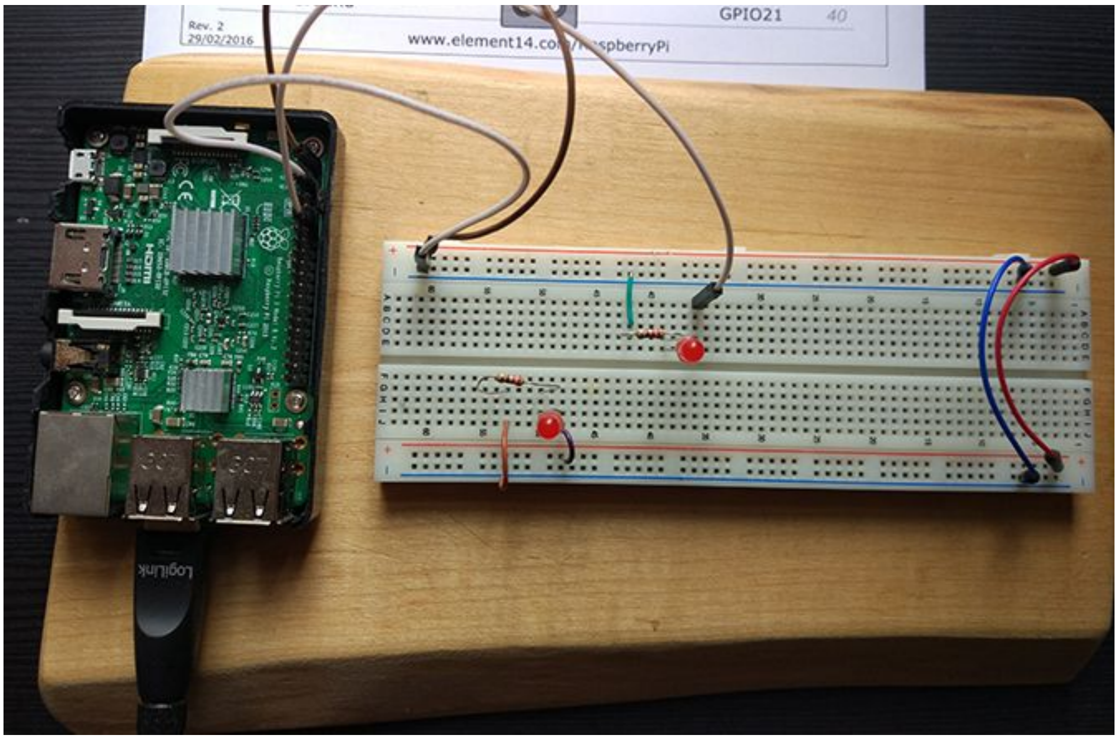
The two power rails are linked at the end, and a line runs from the **positive** power rail into the **positive** (anode) side of the bottom LED. The **negative** side of the LED is attached to a resistor, which is connected back to the **GND** power line.

The top LED is wired up differently. A line runs from **pin 12** (GPIO18) of the Raspberry Pi into the positive side of the LED, which runs through the resistor and back into the **GND** rail. Pin 12 is also GPIO18, as confusing as that sounds, our guide to Raspberry Pi GPIO pins will help clear things up!

It isn't important which way round you set up the resistors, but it is essential to get the LEDs the right way round. Luckily, it is easy to tell which side is which:



Once you have everything set up it should look something like this:

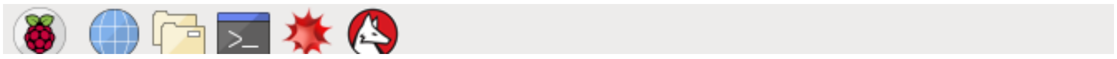


Note that I am using an external Wi-Fi dongle here, it's only needed if you suffer from the curse of the weak Wi-Fi!

Make sure everything is set up correctly, then boot up your Raspberry Pi. The LED attached directly to the 5v pin should turn on immediately. The other LED is the one you will control from code.

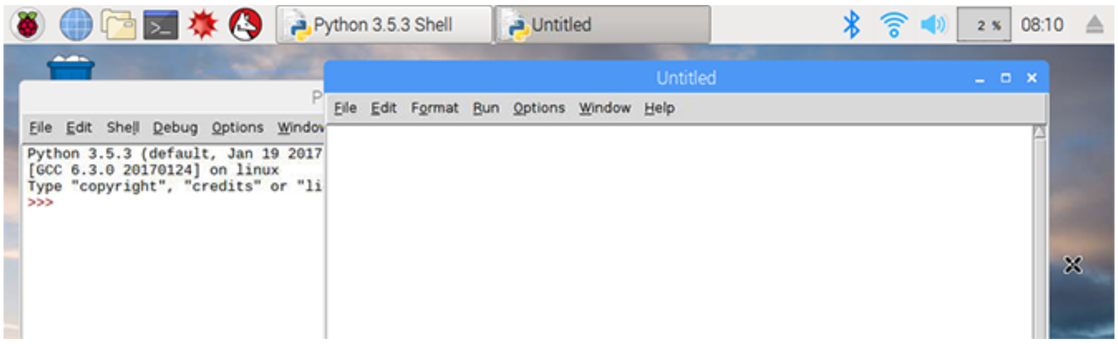
Method 1: Python via IDLE

If you are using your Raspberry Pi in desktop mode, open the applications menu in the top left of your screen, and navigate to **Programming > Python 3 (IDLE)**. This will open the Python shell. If you are using SSH mode, instructions are provided later in the article.



The Raspbian operating system comes with Python already installed. Python is a perfect programming language for beginners, and there are **many great websites** out there to help you get started. We will create a short Python together, though if you'd rather grab the finished script you can **copy the code from Pastebin**.

You could program directly into the shell, but it would be nice to create a program you can save and use again. Open a new file by clicking **File > New File**.


Python 3.5.3 Shell
Untitled
08:10
Untitled
File Edit Shell Debug Options Window
File Edit Format Run Options Window Help

```
Python 3.5.3 (default, Jan 19 2017
[GCC 6.3.0 20170124] on linux
Type "copyright", "credits" or "li
>>>
```

You are going to create a simple **blink** sketch which will turn the LED on and off. To begin, you need to import the **RPi.GPIO** and **time** modules.

```
import RPi.GPIO as GPIO

import time
```

Importing **as GPIO** saves you from typing RPi.GPIO every time, and you will need the **time** module for the delays between the LED turning on and off. Now, set up the GPIO pin.

```
GPIO.setmode(GPIO.BOARD)

GPIO.setwarnings(False)

ledPin = 12

GPIO.setup(ledPin, GPIO.OUT)
```

Set up the GPIO pins to use **BOARD** numbering and set GPIO warnings to false. Don't worry if you do not understand this at this stage! Next, set your **ledPin** to be pin 12 (GPIO18) of your Pi. Finally, set up the ledPin to **OUTPUT**. Now the pin is ready to control the LED.

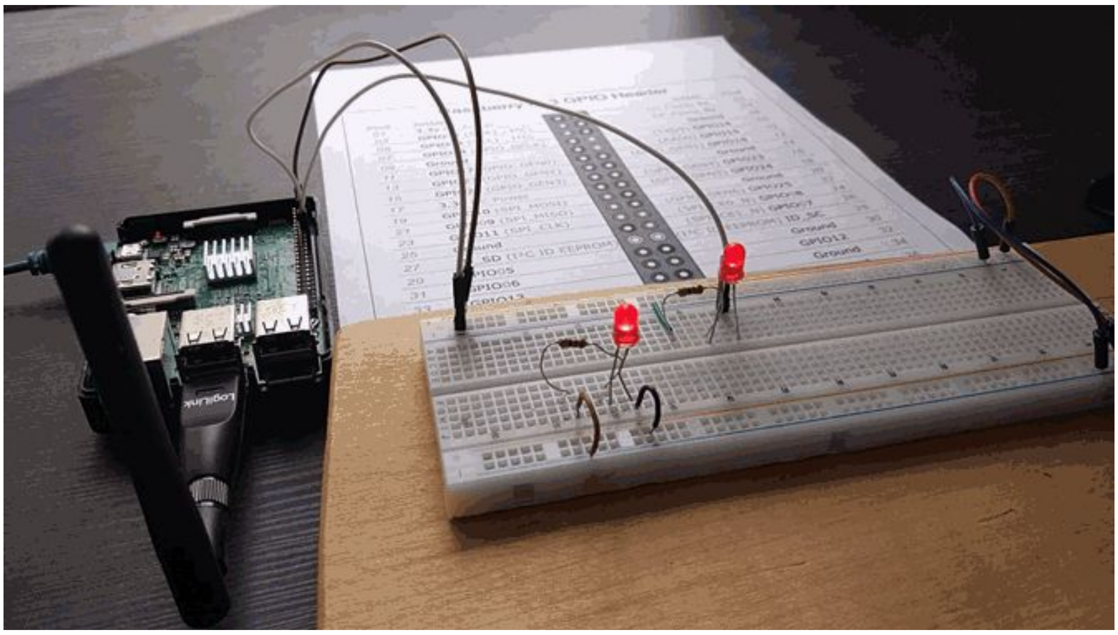
Making the LED Light Flash

By creating a **for** loop, you can control the number of times the LED flashes. Enter the following code, making sure to indent it the same way.

```
for i in range(5):
        print("LED turning on.")
        GPIO.output(ledPin, GPIO.HIGH)
        time.sleep(0.5)
        print("LED turning off.")
        GPIO.output(ledPin, GPIO.LOW)
        time.sleep(0.5)
```

This for loop runs five times, and each time it will **print** to the Python Shell what it is doing, before changing pin 12 to **HIGH**, turning the LED on, then **LOW**, turning the pin off. The program then quits automatically.

Save your program, and then select **Run > Run Module** from the editor menu. Your LED should flash five times!



Congratulations! You have created your first GPIO program!

Method 2: Python via SSH and Nano

If you have connected to your Raspberry Pi via SSH, you can create this program from the command line. Create a new script in **Nano** by typing:

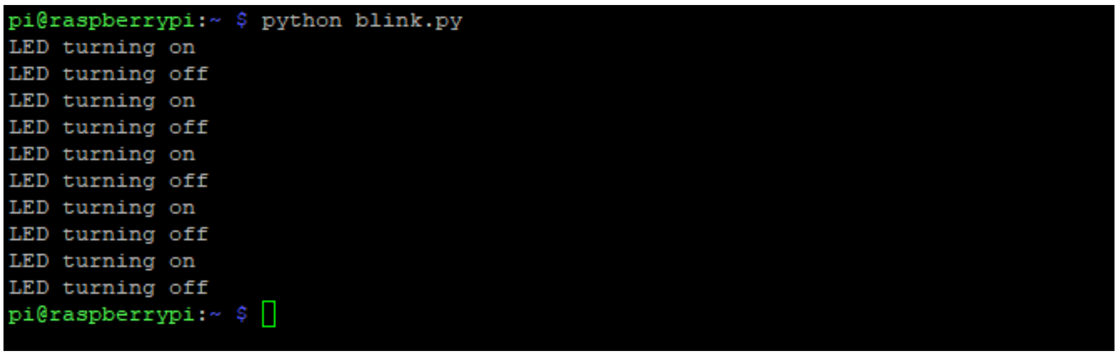
```
sudo nano blink.py
```

This will open up a new file in the Nano editor called blink.py. Enter the same code as above, making sure to indent everything correctly, and save the program by pressing **Ctrl-X**. This triggers a save prompt at the bottom of the screen.

Type **y** to save it, and enter to confirm the filename. This will bring you back to the command line. You can run your program using the Python command:

```
python blink.py
```

You should see the LED flash and the print function on the screen.



```
pi@raspberrypi:~ $ python blink.py
LED turning on
LED turning off
LED turning on
LED turning off
LED turning on
LED turning off
LED turning on
LED turning off
LED turning on
LED turning off
pi@raspberrypi:~ $ 
```

Dive Deeper With More Raspberry Pi Projects

Learning how to control LEDs using code is an important first step in your DIY education. This level of coding is all that you need for many **Raspberry Pi beginner projects**.

As well as being great for homemade electronics, the Raspberry Pi is capable of a vast array of different things, and working through our **awesome Raspberry Pi guide** will help you get to grips with the many uses of these tiny computers.

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Ian Buckley is a freelance journalist, musician, performer and video producer living in Berlin, Germany. When he's not writing or on stage, he's tinkering with DIY electronics or code in the hope of becoming a…

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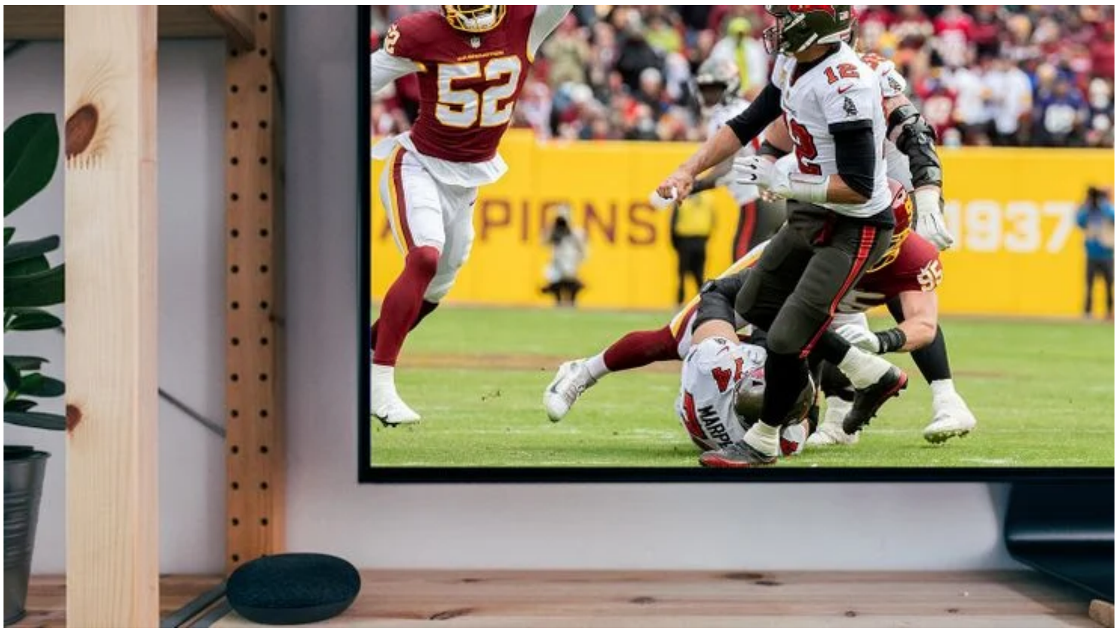

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