diy lofi hip hop raspberry pi radio

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https://learn.adafruit.com/lofi-hip-hop-raspberry-pi-radio-braincraft

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# Table of Contents

**Overview** 3
- Parts 4  

**Configure your Raspberry Pi** 6
- Plug in the BrainCraft HAT 6  
- Install Raspberry Pi OS 6  
- Set up networking 6  
- Update and upgrade 6  
- Install additional software 7  
- Configure the BrainCraft HAT, part 1 7  
- Install the kiosk-mode script 8  
- Configure the BrainCraft HAT, part 2 9  
- Optional: Configure Overlay (read only) mode 9

**Controlling the Radio** 10

**3D Printed Case** 11
- Parts required for the 3D printed case 14  

**Choosing your own videos** 14
Overview

Can't get enough of those sweet lofi hip hop radio beats, but don't want to keep a browser tab open for it? In this guide, you'll set up a Raspberry Pi 4 in Kiosk mode so that it will automatically play any YouTube music stream when it starts, using the high quality digital I2S stereo outputs of the BrainCraft HAT, and showing a suitably low-fi 240x240 version of the video.

We'll use the BrainCraft HAT which has both video display and digital stereo speaker + stereo headphone output for an all-in-one standalone YouTube appliance kit. Plug speakers directly in, or you can use the line/headphone out to connect to an audio system or headphones.

For more information about the BrainCraft HAT, head to its dedicated guide (https://adafru.it/NLE). However, don't actually do the setup steps until this guide instructs you to do so.
Parts

**Raspberry Pi 4 Model B - 4 GB RAM**
The Raspberry Pi 4 Model B is the newest Raspberry Pi computer made, and the Pi Foundation knows you can always make a good thing better! And what could make the Pi 4 better...
https://www.adafruit.com/product/4296

**Adafruit BrainCraft HAT - Machine Learning for Raspberry Pi 4**
The idea behind the BrainCraft HAT is that you'd be able to “craft brains” for Machine Learning on the EDGE, with Microcontrollers & Microcomputers. On ASK...
https://www.adafruit.com/product/4374

**USB Powered Speakers**
Add some extra boom to your audio project with these powered loudspeakers. We sampled half a dozen different models to find ones with a good frequency response, so you'll get...
https://www.adafruit.com/product/1363
Cell-phone TRRS Headset - Earbud Headphones w/ Microphone
These earbud headphones are the perfect accessory for your FONA - they've been tested to work with our modules - but can be used with any iOS or Android device that uses a TRRS...
https://www.adafruit.com/product/1966

16GB Card with NOOBS 3.1 for Raspberry Pi Computers including 4
NOOBS 3.1 is the fastest way to have a variety of operating systems on your Pi. Available on a 16G card, you can now boot multiple OS's such as Raspbian, Pidora, RaspBMC,...
https://www.adafruit.com/product/4266

Micro HDMI to HDMI Cable - 2 meter
Connect an HDMI device with a micro HDMI port to one with a regular size HDMI port together with this basic HDMI cable. It has nice molded grips for easy installation, and is 2 meter...
https://www.adafruit.com/product/1322

Official Raspberry Pi Power Supply 5.1V 3A with USB C
The official Raspberry Pi USB-C power supply is here! And of course, we have ‘em in classic Adafruit black! Superfast with just the right amount of cable length to get your Pi 4...
https://www.adafruit.com/product/4298
Configure your Raspberry Pi

Plug in the BrainCraft HAT

With the power disconnected, simply align the HAT to the pins on the Raspberry Pi 4 and push down firmly until the connector is fully seated. If you like, use M2.5 screws and stand-offs to secure the HAT. This project does not require that the fan be installed, but installing it won't hurt anything either. We skip the step of installing the "fan service", so the fan won't spin even if you plugged it in.

Install Raspberry Pi OS

For this guide, you'll need to download "Raspberry Pi OS with desktop and recommended software", which is a full-featured desktop operating system. Follow the official instructions (https://adafru.it/Pf5) to download the OS and copy it to a Micro SD card. For the next steps, hook your Pi up to a monitor and plug in a mouse and keyboard!

Set up networking

During the first boot, you will be prompted to set up networking. If you skipped that step, you can configure your Pi to connect to a wireless network using these instructions (https://adafru.it/Pf6). A wired network would also work fine, but we know most of you out there prefer the ease of wireless. Next, set up (https://adafru.it/vbC) ssh access (https://adafru.it/vbC) using the command line or raspi-config; you'll need it after configuring the display if you want to access the Pi (there's also a way to configure it using a host computer).

Update and upgrade

During the first boot, you will be prompted to update the software. If you skipped that step, you can do it from a terminal window with these commands:
sudo apt-get update
sudo apt-get -y upgrade

Install additional software

In a terminal window, use the following commands to add some software that is required for the next steps:

sudo apt-get install -y python3-pip
sudo pip3 install --upgrade setuptools

Reboot so that all the updates take effect.

Configure the BrainCraft HAT, part 1

Follow these pages of instructions from the BrainCraft HAT guide:

- Blinka Setup (https://adafru.it/Pf7)
- Audio Setup (https://adafru.it/Pf8)

At this point, you should be able to:

1. Open the Chrome browser on the Raspberry Pi, (you'll need to have an HDMI screen + keyboard + mouse attached to the computer for this step)
2. Visit YouTube in the browser
3. Hear the audio stream on headphones or speakers connected to the BrainCraft HAT's 1/8" jack. If not, make sure the audio on/off switch is set to ON. (Head to the HAT guide for more troubleshooting suggestions)

Remember the card number that you found with `aplay -l` in the Audio Setup steps? You'll need to set it as your default sound output by running a command in the terminal. Change the "2" in this command to the number you found:

```
pacmd set-default-sink 2
```

You will need to restart the browser or the whole system after changing the "default sink" with `pactl`. Remember that later when you unhook the HDMI monitor this number can change, so you may need to repeat these steps later on.

**Install the kiosk-mode script**

Using the browser on the Pi, download the kiosk mode script from GitHub ([https://adafru.it/Za8](https://adafru.it/Za8)). Then, open up a terminal window and run `bash Downloads/kiosk-mode.sh` to set up the Chromium browser in kiosk mode.

(Alternatively, you can run `wget https://github.com/adafruit/Adafruit_Learning_System_Guides/raw/main/Raspberry_Pi_Braincraft_Radio/setup-kiosk.sh` in a Pi terminal to download the script, then `bash setup-kiosk.sh` in the same directory)

Restart the Pi, either via the desktop shutdown menu or `sudo reboot` in a terminal.

When you restart, you should get a full screen YouTube window showing the lofi hip hop radio in the upper left corner, and hear the music streaming on your speakers. However, the display will still be on your HDMI monitor. Check that the controls work
(left/right to change station, up/down to adjust volume) before moving on to the next steps.

If you don't hear anything, make sure you have the audio on/off switch set to "on" and double-check the sound card number for pacmd.

Configure the BrainCraft HAT, part 2

It's time to set up the display. After performing this step, you won't be able to connect your Pi to a HDMI monitor. Don't worry, you can reverse this step if you need to!

Head back to the main guide's Display Module Install page (https://adafru.it/Pfa) and follow the "1.54 inch TFT kernel module" steps.

Before restarting, unplug the HDMI monitor cable.

When you restart, the heroine and her cat should appear on the LCD of the HAT. If the sound stops after this step, use `aplay -l` to check the sound card index again and `pacmd set-default-sink #` (where # is the card number like 1, 2, 3 from the first command) to make the browser use that output. You will need to restart the browser or the whole system after changing the "default sink" with pactl.

At least with some HDMI monitors, having them plugged in when the Pi starts can interfere with showing an image on the BrainCraft HAT's LCD. If your HAT's LCD is blank, make sure nothing is plugged into HDMI and reboot.

To disable the LCD so that you can use a HDMI monitor again, use these commands:

```
cd ~/Raspberry-Pi-Installer-Scripts
sudo python3 adafruit-pitft.py --install-type uninstall --reboot yes
```

Optional: Configure Overlay (read only) mode

We want to be able to turn off the Pi at any time without risk of damaging the operating system files. This read-only mode is called the "overlay". Connect with ssh, run `sudo raspi-config`, choose "performance options" and then "Overlay File System". Choose "Yes" to enable it, and then choose "Yes" again to make the boot filesystem read-only.
If you ever need to make modifications to the Pi, you will need to disable the Overlay File System using raspi-config, or your changes will be lost when you power off.

### Controlling the Radio

For your listening pleasure, you can plug headphones or self-powered speakers into the headphone jack. To quickly mute the device, you can move the on/off switch to the off position.

You can use the 5-way control stick to control the radio:

- **Up/Down**: Adjust volume
- **Left/Right**: Switch among available stations
- **Push stick in**: Reload page, if music stops or gets stuck
- **Button**: Play/pause
- **Slide switch**: Mute/unmute audio
- **Hold button for 5 seconds**: Shut down

If you customized the rotation of your screen during the Display Module Install, the 5-way control stick's direction will match the screen rotation.
Watch kitty swing her tail or get belly-pats on the LCD screen. The video feed is zoomed to remove black bars from the top and bottom. (in this photo, the LCD's image is simulated)

Remember that as long as you enabled Overlay Mode, you can also unplug or turn off the Pi at any time without damaging it. A USB-C power cable with an inline switch is perfect for this purpose. The inexpensive ones tend to work with the official Raspberry Pi power supply but not with PD power supplies or as data cables.

3D Printed Case

If you like lofi radio as much as the author, you'll want to make your project into something more permanent, and that means 3D printing!

Grab the [STL files from prusaprinters.org](https://adafruit.it/PiB) to get started. All files should load in your slicer in the intended orientation for printing. If you want to customize or remove the lettering, you can use the [free software OpenSCAD](https://adafruit.it/aVT) to edit the scad source.
Print with 0.2mm layer height. Default top/bottom layers and infill will work. No supports are required. The author used the "0.20mm Speed" profile in prusaslicer.

If you want to add some color to the lettering, you can switch filament at 0.6mm and again at 1.0mm. Here's how that should look in Layers view when viewed from the Bottom.

Next, it's time to place the heat-set inserts in the raised portion of the print. Begin by pressing the narrow end of the insert into the plastic by hand. Once the bottom of the insert is in place, heat your soldering iron and have a pair of needle nose pliers handy. Put the soldering iron into the heat-set insert and push down SLOWLY as the plastic melts. Once the insert is flush with the plastic surface, place the pliers on top of the insert to keep it from pulling out and withdraw the iron.

Repeat this process for all 4 inserts.

While there are specialty soldering iron tips designed to work with these threaded inserts, the author finds that his "normal" conical soldering iron tip can do in a pinch—just make sure it is clean and will not transfer any solder blobs into the threads!

Next, use M2.5 nylon screws, nuts, and 12mm M-F stand-offs as shown to secure the Pi 4 in the base. Next to the header, just use an M2.5×6 screw. Opposite the header, use a nut plus a 12mm M-F stand-off.
On the BrainCraft HAT, opposite the header, lightly begin screwing a nut onto two more M2.5×6 screws. Don’t tighten them down yet.

Align the headers of the two boards and gently press down. Then tighten down the screws on the braincraft hat. You may need to apply a little force to the side of the nuts to stop them from just spinning. There may still be a slight height difference across the HAT but it should be minimal.

Finally, fit the top of the case over the hat and carefully slide it down. Gently bow the plastic on the headphone jack side so that it can pass over. The case will click shut. In the event that you need to disassemble it, you will have to bend the plastic out so that it can pass over the headphone jack the other direction.

Enjoy your lo-fi radio! This case doesn't protect the Pi or HAT well enough to let you stick it in a bag or pocket, but it will look stylish on a desk or table for sure!
Parts required for the 3D printed case

1 x Tapered Heat-Set Inserts for Plastic
Brass, M2.5 x 0.45 mm Thread Size, 3.4 mm Installed Length (Pack of 100)

Black Nylon Machine Screw and Stand-off Set – M2.5 Thread
Totaling 380 pieces, this M2.5 Screw Set is a must-have for your workstation. You'll have enough screws, nuts, and hex standoffs to fuel your maker...
https://www.adafruit.com/product/3299

White Nylon Machine Screw and Stand-off Set – M2.5 Thread
Totaling 420 pieces, this White Nylon M2.5 Screw Set is a must-have smörgåsbord for your workstation. You'll have more than enough...
https://www.adafruit.com/product/3658

Choosing your own videos

As an example, we'll switch the original videos for two star-wars style lofi streams:

Start by noting the part of the URL that gives the video's ID. You can find this by doing a right-click and choosing "copy video URL". Paste it into any text editor to see the URL. This will get you a URL like https://youtu.be/oNfKzRP8-Q0 -- the video's ID is the part after youtu.be/, so the IDs of our two videos are:

- oNfKzRP8-Q0
- iBUkwL9PJ9o
On a host computer, use ssh to connect to the Raspberry Pi (https://adafruit.it/vbC), use `raspi-config` to disable overlay mode and restart, and use ssh to connect a second time.

Make a backup of the file we're going to edit: `cp kioskvideo.html original-kioskvideo.html`

Next, start the nano editor on the file `kioskvideo.html` in the home directory: `nano kioskvideo.html`
Press the secret key combination Shift+Alt+4 to soft-wrap long lines and then scroll down until you find the <iframe> tag. Replace the ID of the video to embed (5qap5aO4i9A) with the video you want to play first (oNfKzRP8-Q0).

Scroll down a bit further to modify the playlist and the "pan" values, putting both video IDs in the playlist, and then making sure there are the same number of values in the "pan" var as the "playlist" var. Write out the file by pressing Ctrl+O and confirming the name.

You can change the pan values in the range from 0 to -374. A value of 0 will show the left of the video, a value of -187 will show the center, and a value of -374 will show the right.

On the BrainCraft HAT, press in on the joystick to reload the HTML page. If you did everything right, star wars "lofi beats to relax/study to will start playing. If not, carefully review the edits you made and correct them. Each time, press Ctrl+O to save the file and then press in on the joystick to reload in the browser.

(My 3D printed model of Baby Yoda was by Alsamen, but has been removed from Thingiverse. There are other 3D printable Baby Yoda models out there (https://adafru.it/Rid) though)
If you need to start over, you can return to the terminal and use `cp` to replace the edited file with the backup: `cp original-kioskvideo.html kioskvideo.html`

You can also re-run the original installation script if that doesn't clear things up: `bash Downloads/kiosk-mode.sh`

Once you're satisfied with your modification, repeat the raspi-config steps to put the Pi in overlay mode once again and enjoy your customized lofi playlist!