

[Hello Security]

WGUISW

0x01 Say Hello to Security

- AI & Voice Cloning

Krystian Bajno, 2024

_baycode.eu

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[Hello Security]

WGUISW

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0x02 Whoami

Krystian Bajno

Cyber Security Specialist
Penetration Tester

Full-Stack Software Engineer
Backend, Frontend, Mobile



Comp. Sci. I - Cloud Computing Technology

Comp. Sci. II - Cloud Computing Architecture
and Security

0x03 Links section

Useful projects

<https://github.com/voicepaw/so-vits-svc-fork>

<https://github.com/WadRex/RVCompact>

<https://github.com/RVC-Project/Retrieval-based-Voice-Conversion-WebUI>

<https://github.com/litagin02/rvc-tts-webui>

<https://github.com/w-okada/voice-changer>

<https://github.com/facebookresearch/demucs>

<https://github.com/AUTOMATIC1111/stable-diffusion-webui>

<https://github.com/comfyanonymous/ComfyUI>

<https://github.com/Illyasviel/Fooocus>

<https://github.com/s0md3v/roop>

<https://github.com/facebookresearch/llama>

<https://huggingface.co/microsoft/phi-2>

<https://github.com/henrymaas/AudioSlicer>

<https://github.com/flutydeer/audio-slicer>

<https://github.com/coqui-ai/tts>

Model repositories

<https://huggingface.co>

<https://civitai.com>

Useful links

<https://machine-learning.paperspace.com/wiki/machine-learning-models-explained>

<https://www.hardware-corner.net/guides/computer-to-run-llama-ai-model/>

<https://www.microsoft.com/en-us/research/blog/phi-2-the-surprising-power-of-small-language-models/>

<https://colab.google/>

<https://paperswithcode.com/task/speech-synthesis/>

<https://paperswithcode.com/>

Recommended AI YouTube channels

<https://www.youtube.com/@Fireship>

<https://www.youtube.com/@NerdyRodent>

<https://www.youtube.com/@sentdex>

<https://www.youtube.com/@sedetweiler>

<https://www.youtube.com/@houseofdim>

<https://www.youtube.com/@sebastiankamph>

https://www.youtube.com/@enigmatic_e

<https://www.youtube.com/@OlivioSarikas>

<https://www.youtube.com/@EndangeredAI>

Ox04 Exploring online

The 2022/3 rise of Generative AI (GAN, LLM)

★ Selected speech synthesis providers

ElevenLabs

<https://elevenlabs.io>

- Polish company! 🇵🇱
- Text to Speech
- Speech to Speech
- Dubbing (video translator)
- Make custom models (paid)

HeyGen

<https://www.heygen.com>

- Lip sync!
- Creating whole digital avatars
- Translating videos
- Speech to Speech

Pros:

1. **Ease of use, cutting edge**
2. **No tech knowledge** requirement
3. **No hardware** requirement
4. **Support**, big funding
5. **API integrations**

Cons:

1. **Commercial**, limited free plans, pricy tier limitations, credit systems
2. **Potential political correctness** limitations
3. **No real-time voice streaming** (at the current moment, all it takes is WebRTC)
4. **Data collection**

Voice

<https://www.resemble.ai>

<https://www.heygen.com>

<https://elevenlabs.io>

Imagery

<https://www.bing.com/search?q=Bing+AI&showconv=1>

<https://openai.com/dall-e-3>

<https://www.midjourney.com/>

<https://www.krea.ai/home>

LLM

<https://www.bing.com/search?q=Bing+AI&showconv=1>

<https://chat.openai.com/>

<https://bard.google.com/chat>

NVIDIA
Microsoft
Google
Meta
Apple
Open Source Community

The biggest players in **AI** as of 2024.

Ox05 Exploring the world of Self-Hosted

Let's do it offline and open source

Requirements

1. **For training, voice infering, images generation, and smaller LLMs** (such as phi-2 and LLAMA-7B, approx 10B parameters), **8 GB of GPU VRAM** is sufficient (eg. RTX 3060, or Apple M1 will do due to chip mixing RAM and VRAM, but M1 works 9x slower than RTX). For bigger LLM's, such as LLAMA-70B - **52 GB of GPU VRAM** is a a bare minimum.

2. **Lots of free storage.**

Alternatively deploy cloud environment for training

Deploy model training on selected **Cloud Computing Platform**, train it in minutes, download the checkpoints, and kill the instance, just like spinning up and destroying a hash cracking machine. You can also use **Google Colab**. Bigger LLM's however require that much resources to **run**. It does not mean you need bigger LLMs to get good results.

Pros:

1. **Free**
2. **Huge model base**
3. **Huge amount of software**
4. **Full control**
5. **Limitless possibilities**
6. **Cutting edge**

Cons:

1. **Requires a bit of tech knowledge**
2. **Requires good GPU**
3. **Only community support**

Voice

<https://github.com/voicepaw/so-vits-svc-fork>
<https://github.com/RVC-Project/Retrieval-based-Voice-Conversion-WebUI>
<https://github.com/litagin02/rvc-tts-webui>
<https://github.com/w-okada/voice-changer>
<https://github.com/facebookresearch/demucs>
<https://github.com/flutydeer/audio-slicer>
<https://github.com/coqui-ai/tts>

Imagery

<https://github.com/comfyanonymous/ComfyUI> (**strongly recommended**)
<https://github.com/AUTOMATIC1111/stable-diffusion-webui>
<https://github.com/lllyasviel/Fooocus> (**love the simplicity**)
<https://github.com/s0md3v/roop>

LLM

<https://github.com/facebookresearch/llama>
<https://huggingface.co/microsoft/phi-2>

Model repositories

<https://huggingface.co>
<https://civitai.com/>

Useful links

<https://paperswithcode.com/>

0x06 Anatomy of a deepfake

Unsupervised deep-learning nature of Generative Adversarial Networks

Picture:

1. Find **one**, good picture of the impersonated person.
2. Substitute the face on a selected picture with impersonated person face (eg. using **Roop**, **Foocus**, **ComfyUI**), or generate a completely fake image with substituted face.
3. Upscale the picture (for example using **Stable Diffusion**, **R-ESRGAN** upscaler).

Video:

1. Find a picture of the impersonated person (one is all it takes).
2. Substitute the face on all frames of the video.
3. Upscale all frames of the video.
4. Voice clone the impersonated person and substitute your own voice in the video with a clone.

**Mind your ethics. Everything is possible, but what for?
Ask the person you clone for approval.**

Ox07 Practical steps to perform voice cloning

Make me sound like you

1. **Acquire a 10 or more minutes sample** of the impersonated person voice.
2. **Cut the sample into approx. 5 second pieces** and remove noise, silence (using **AudioSlicer, audacity**), this sample will be later used for GAN unsupervised model training and **no data labeling** is needed.
3. **Train the model using RVC or SO-VITS-SVC** for 200 epochs or more. (Can take a few hours). Increasing epochs too much will not improve the quality due to **overfitting**.
4. **Use the created model for inference** or **real-time inference streaming**.

The **RVC** and **SVC** models are not interchangeable and need to be trained separately.

Make sure to create a **loopback interface** or use a **mixer** in order to avoid audio feedback while streaming in **real-time**.

Streaming voice is easier than a complete deepfake video real-time streaming due to resources extensive use.

Expect the voice streaming lag to be 0.3 of a second, whereas processing video takes way more time. In order to stream-infer voice + video, you will need to use cloud computing platform or a powerful computer. It is needed to match the audio/video latencies, yet it is perfectly doable in 2024.



Mind your ethics. Everything is possible, but what for?
Ask the person you clone for approval.

Ox08 SO VITS SVC

Step by step

Activate Python environment

```
.\venv\Scripts\Activate.ps1 - Windows
source ./venv/Scripts/activate - Linux, MacOS
```

1. Place dataset files created with AudioSlicer into

```
dataset_raw/<speaker_id>/**/<files.wav>
```

2. Pre-process the dataset

```
svc pre-resample - converts your audio to mono 44.1khz files
svc pre-config - downloads a few configuration files and puts them in the correct directory.
```

3. Modify number of epochs and batch size

in logs/44k/config.json to match **VRAM** or training will crash.

4. Continue pre-processing to optimize to "crepe" prediction method

```
svc pre-hubert -fm crepe - downloads and runs a speech model pre-training.
```

5. Train the model (this could take a few hours)

Model checkpoints will be available in logs/44k - G_x.pth, D_x.pth

```
svc train -t
```

6. Use the model

```
svc gui
```

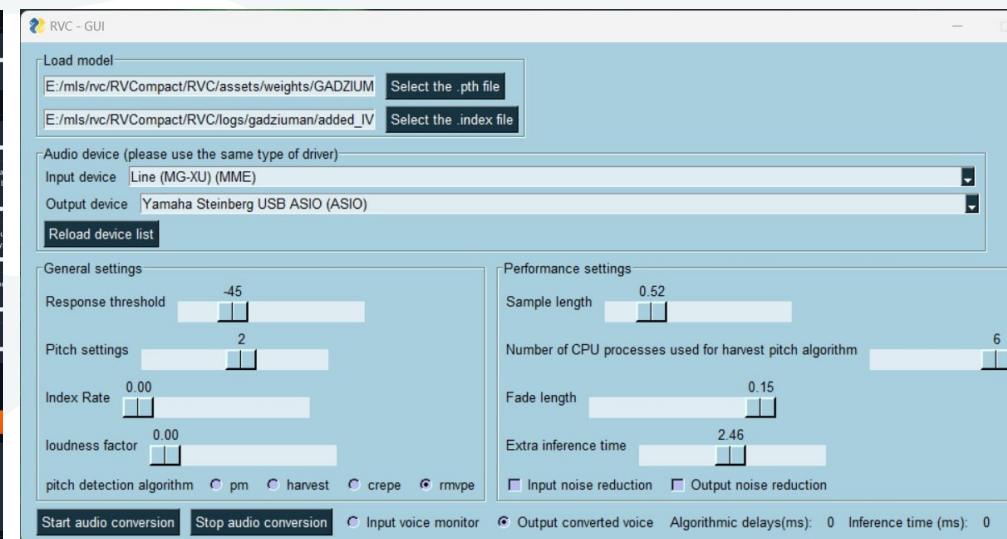
Usage:

Select the **Model path**, **Config path**, and the **Speaker**.

1. To **infer file to file**, select file input audio path, output audio path and press **Infer**.
2. To **change your voice in real-time** - select input and output device, disable auto pitch prediction, adjust Pitch to your voice, press (Re)/Start Voice Changer, and use the output device as input in selected application (eg. Discord, Teams, Telegram). **Make sure to use a loopback interface and a set of headphones to prevent audio feedback.**

The screenshot displays the WGUISW VITS SVC GUI interface, which is divided into several sections for configuring the VITS SVC model.

- Paths:**
 - Model path: E:\m1s\so-vits-svc-fork\logs\44k\G_158.pth (Browse)
 - Config path: E:\m1s\so-vits-svc-fork\configs\44k\config.json (Browse)
 - Cluster model path (Optional): (Browse)
- Common:**
 - Speaker: (Dropdown menu)
 - Silence threshold: -35.0 (Slider)
 - Pitch (12 = 1 octave): 12 (Slider)
 - ADJUST THIS based on your voice when Auto predict F0 is turned off.
 - ☐ Auto predict F0 (Pitch may become unstable when turned on in real-time inference.)
 - F0 prediction method: crepe (Dropdown menu)
 - Cluster infer ratio: 0.00 (Slider)
 - Noise scale: 0.40 (Slider)
 - Pad seconds: 0.10 (Slider)
 - Chunk seconds: 0.50 (Slider)
 - Max chunk seconds (set lower if Out Of Memory, 0 to disable): 40 (Slider)
 - ☒ Absolute threshold (ignored (True) in realtime inference)
- File:**
 - Input audio path: (Browse) (Browse/Folder) (Play)
 - Output audio path: (Save As...)
 - ☒ Auto play
- Realtime:**
 - Crossfade seconds: 0.050 (Slider)
 - Block seconds: 0.350 (Slider)
 - Additional Infer seconds (before): 0.150 (Slider)
 - Additional Infer seconds (after): 0.100 (Slider)
 - Realtime algorithm: 1 (Divide constantly) (Dropdown menu)
 - Input device: Line (MG-XU) (MME) (Dropdown menu)
 - Output device: Line (MG-XU) (MME) (Dropdown menu)
 - ☐ Passthrough original audio (for latency check) (Refresh devices)
- Notes:**
 - In Realtime Inference:
 - Setting F0 prediction method to 'crepe' may cause performance degradation.
 - Auto Predict F0 must be turned off.
 - If the audio sounds mumbly and choppy:
 - Case: The inference has not been made in time (Increase Block seconds)
 - Case: Mic input is low (Decrease Silence threshold)
- Presets:**
 - Presets: Default VC (GPU, GTX 1060) (Dropdown menu) (Delete preset)
 - Preset name: (Add current settings as a preset)
 - ☒ Use GPU
- Buttons:** Infer (Re)Start Voice Changer Stop Voice Changer



Ox0A Threat modelling

! The wide emerging threat of 2024

Due to making AI accessible to wide-public, the new threats have emerged.

What/Who could be the possible target?

- **Anyone** who gets his voice cloned
- **Anyone** who gets his face cloned
- Applications with **bio-authentication** (voice)
- Publicly speaking people
- YouTubers
- Influencers
- Politicians
- The internet

What is the threat?

- AI **phishing, vishing, impersonation, identity theft**
- Bypassing **bio-authentication** (voice)
- **Blackmailing**
- **Disinformation** and increase of **trolling**
- Automated false identity **scamming** bots, **catfishing**
- Fake, bot generated **influencers**
- Increase of AI generated **explicit** pictures
- Abuse of people voice and **copyrights**
- Overreliance on Artificial Intelligence could have potential **negative impact on cognitive abilities** of specialists.
- Flood of LLM generated **spam** content over the internet
- Growing concerns about the **reliability** of digital data due to **AI hallucinations** and **impersonation. Anything digital can be generated.**

Ox0B What are possible AI uses - examples

Do good, not evil

Automation

Creating bots that auto-respond to clients, leveraging LLMs, text-to-speech, and GAN networks for voice inference.

Parsing big sets of data

LLMs can parse big sets of data in order to give useful insights, or even provide code solutions.

Security Assessments

Useful in social-engineering, red-teaming, and comprehensive phishing assessments.

Art creation

Creating art - pictures, animations, songs.

Breaking the language barrier

Translating, dubbing the video/audio into various languages in order to reach wider audience.

Sock Puppets

Creating sock-puppet false identities in order to achieve anonymity and infiltrate criminal communities is easier than ever.

0x0C Let us create a song!

Let's do it now

1. **Clone** the voice of a friend using **RVC** or **SO-VITS**.
2. **Download** the song to exchange the voice in.
3. **Demux** the singer, bass, drums, guitars and pianos on origin using **Demucs**.
4. **Infer** the singer voice using the cloned model.
5. **Reassemble** the song in **audacity** or any other **DAW**.
6. **Enjoy** making your friend a rockstar.

Ox0D Falling into a rabbit hole

Win a bunny

1. **What cipher** is unbreakable provided it is used correctly - and only once, with the key length of plaintext?
2. **What** is steganography?
3. **What web vulnerability** is number one in OWASP 2021?
4. **Imagine** - there is a banking trojan that replaces the addresses during transfers in client browser memory. How can you secure the **client** web application?

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Ox0E Q&A

Ask me anything you want

0x0F Thank you

Presentation in PDF format is available on <https://news.baycode.eu>

Meet me again at <https://wguisw.org>