ITP 115– Programming in Python

EarSketch

EarSketch

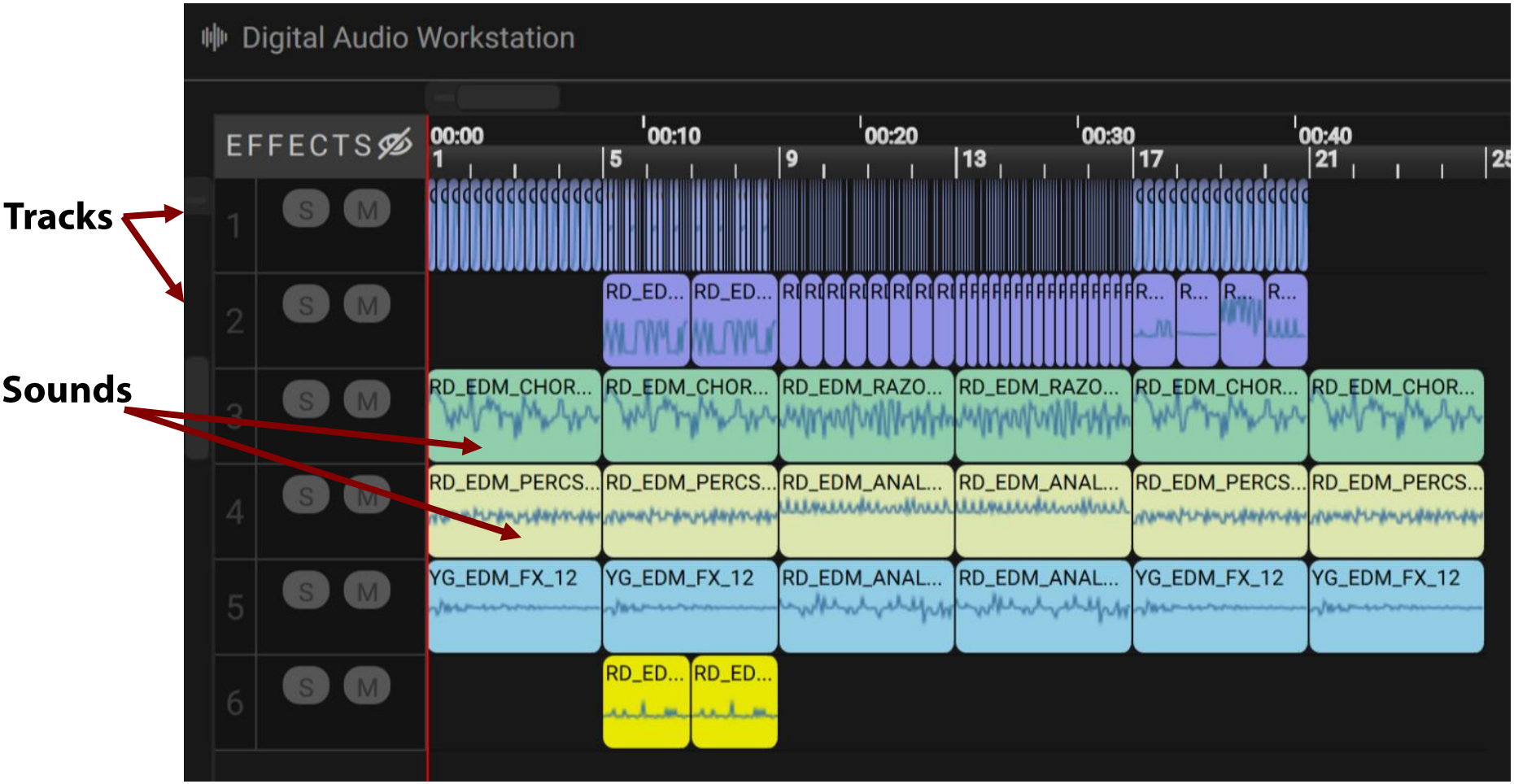
- Learn to code while making music!

- One request
  - You will have time to explore EarSketch shortly
  - When I'm explaining it, please don't play the audio since it is distracting

Background

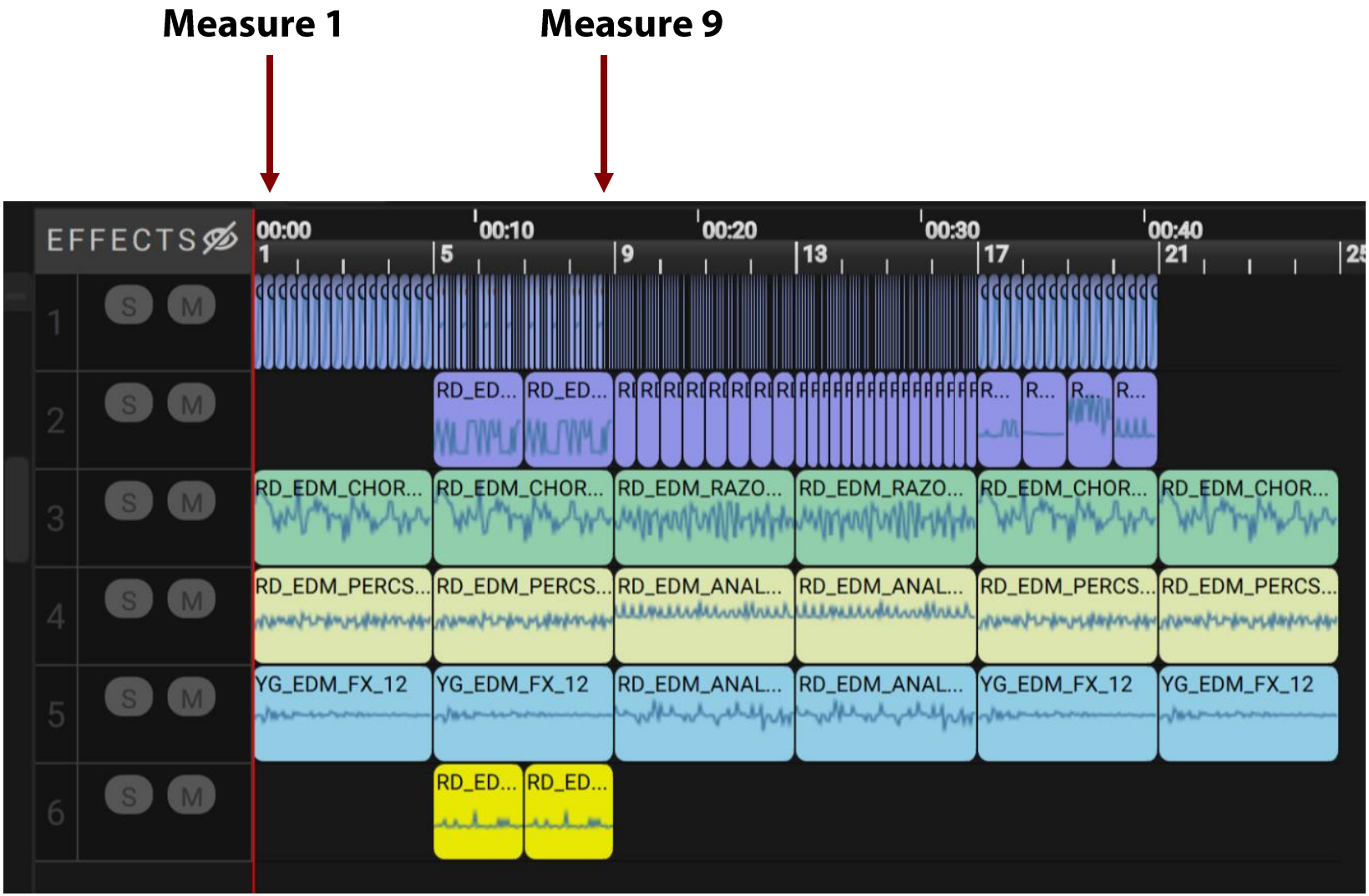
- EarSketch is a Digital Audio Workstation (DAW)
  - Pro Tools, Logic, and GarageBand are other examples
  - DAWs are like PyCharm (IDE) for making music

- In a DAW, different sounds and instruments are arranged in distinct **tracks** that all play together


Tracks
Sounds
Digital Audio Workstation
EFFECTS
00:00
00:10
00:20
00:30
00:40
1
5
9
13
17
21
S
M
RD_ED...
RD_EDM_CHOR...
RD_EDM_RAZO...
RD_EDM_PERCS...
RD_EDM_ANAL...
YG_EDM_FX_12

Background

- A **beat** is the basic unit of time in music
- **Tempo** is the speed of a song in beats per minute (bpm)
  - Higher tempos mean faster songs
- Beats are grouped into **measures** which all have the same number of beats.
  - In EarSketch, **one measure has four beats**


Measure 1
Measure 9
EFFECTS
00:00
00:10
00:20
00:30
00:40
1
5
9
13
17
21
S
M
RD_ED...
RD_EDM_CHOR...
RD_EDM_RAZO...
RD_EDM_PERCS...
RD_EDM_ANAL...
YG_EDM_FX_12

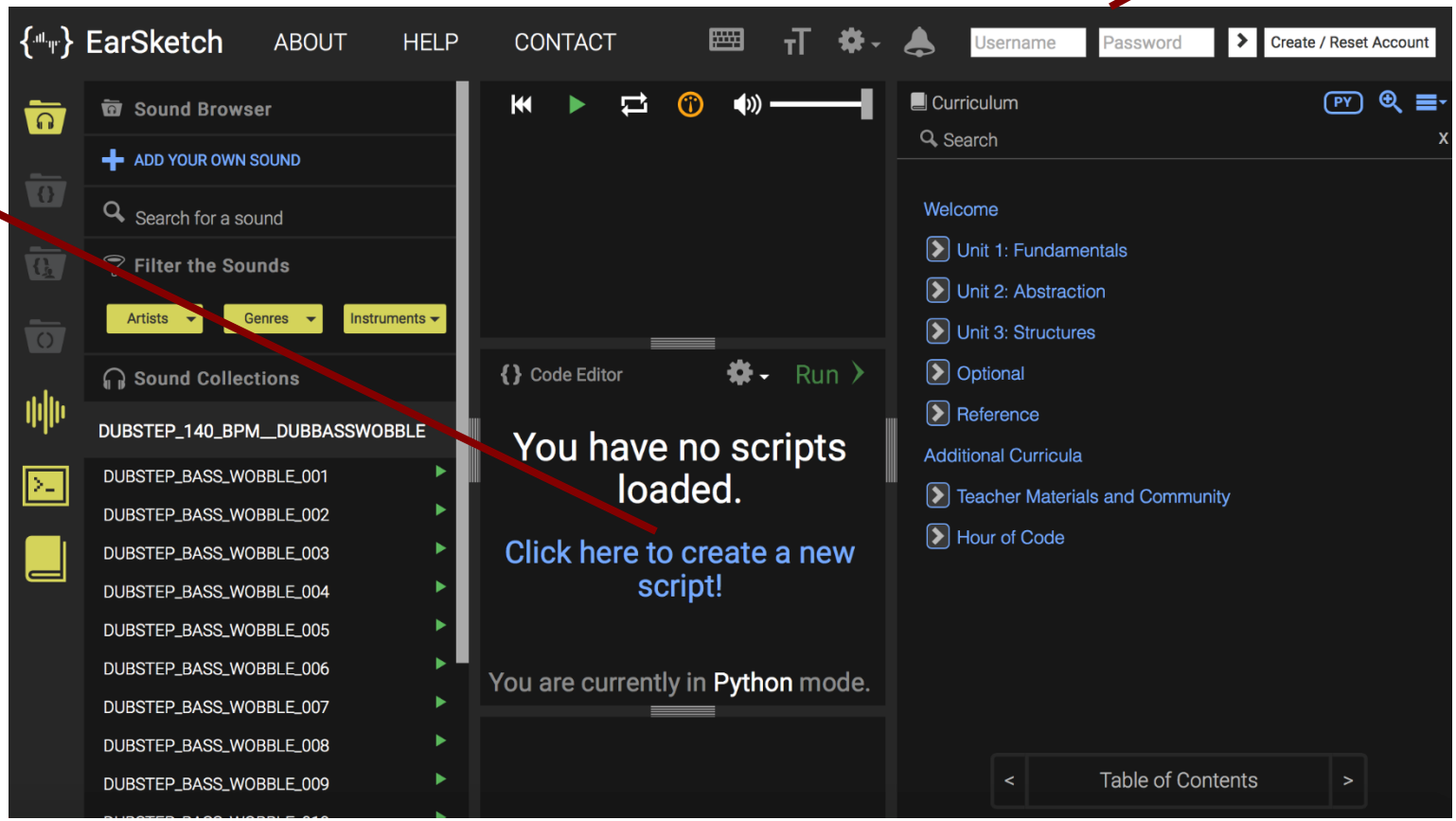
EarSketch Environment

- https://earsketch.gatech.edu/landing/#/
- Click "Get Started"

EarSketch Environment

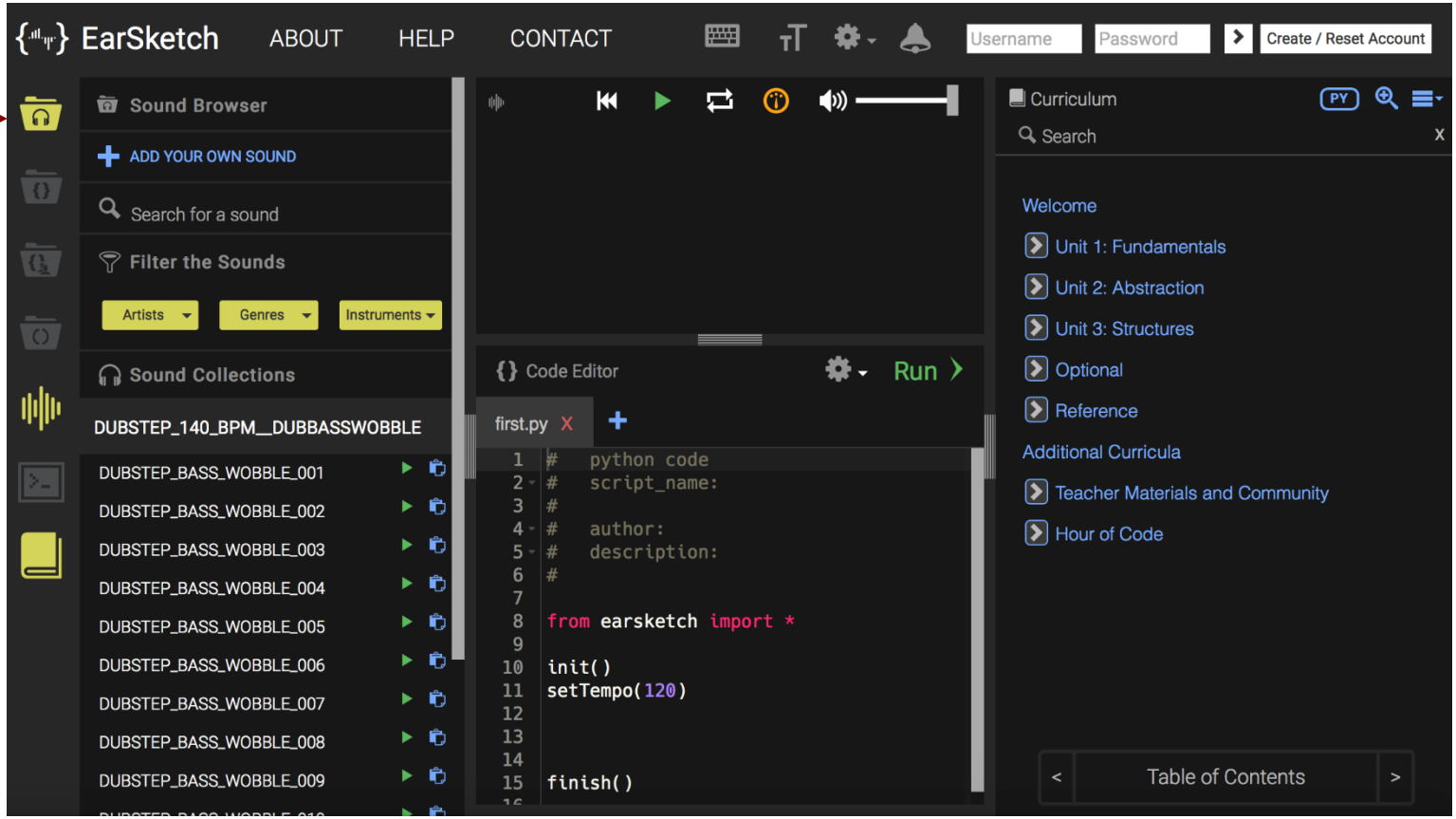
Create an account

Create a song



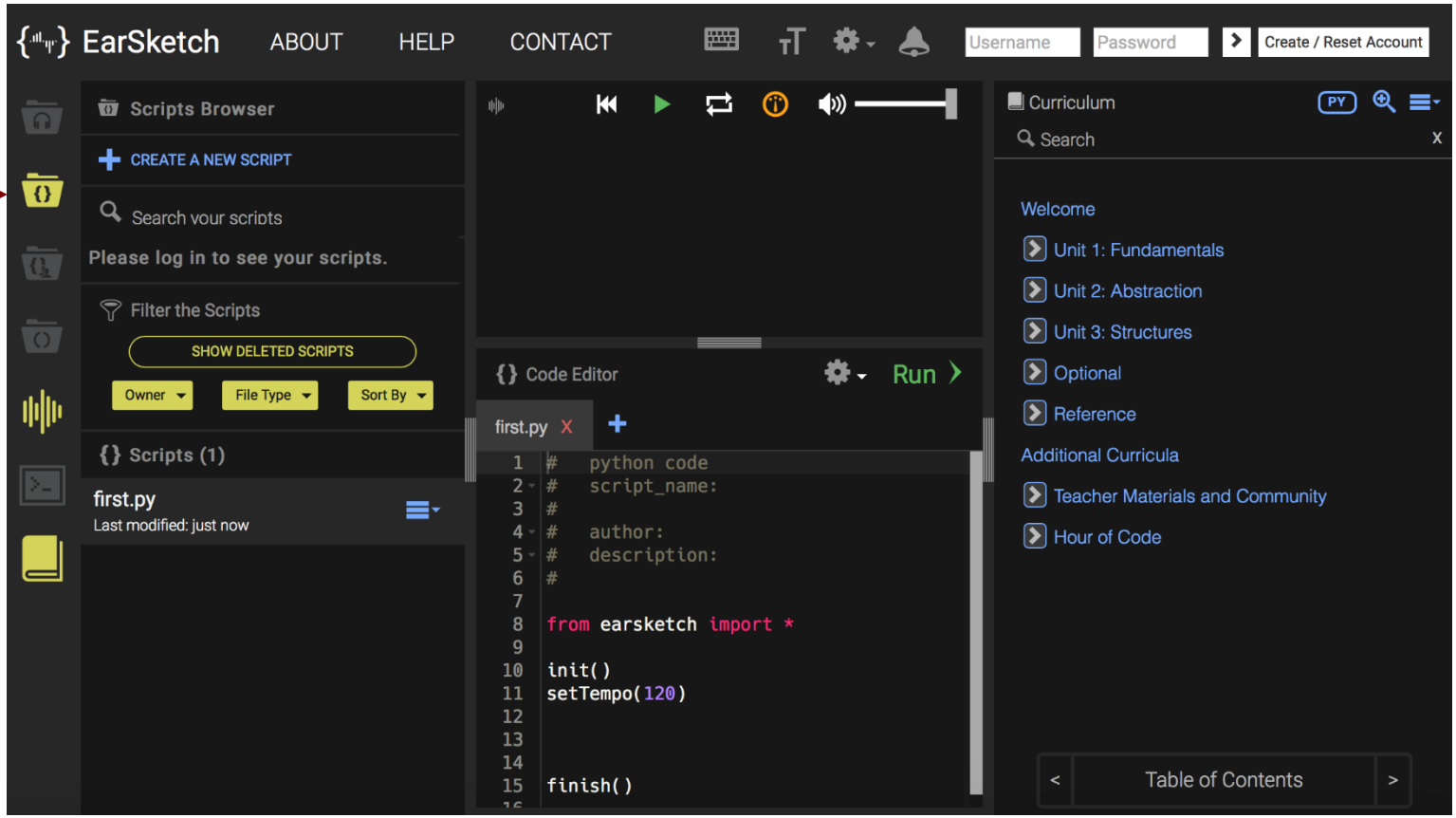
EarSketch Environment

Sounds
Audio for songs



EarSketch Environment

Scripts
Different "songs" you create



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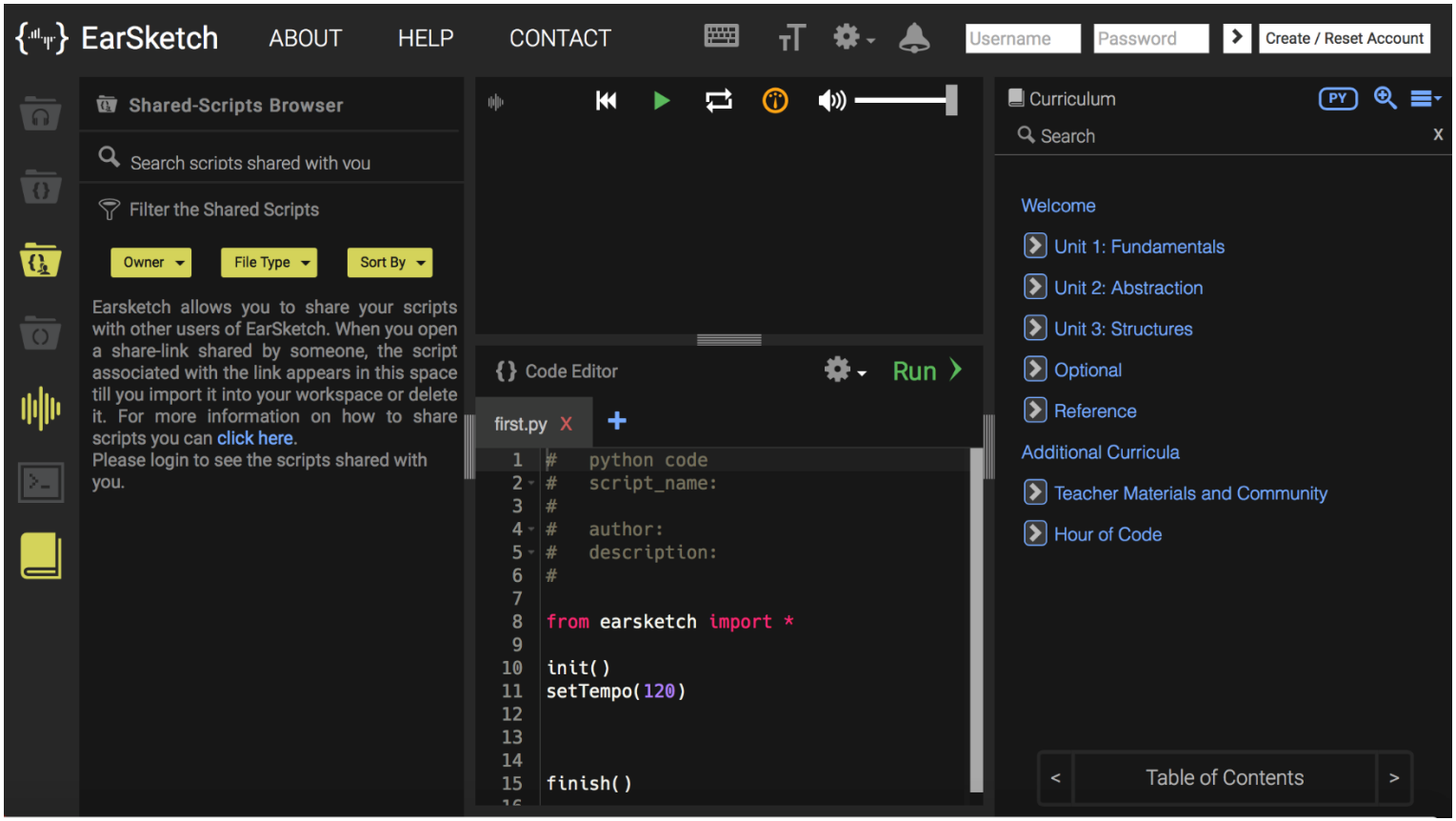
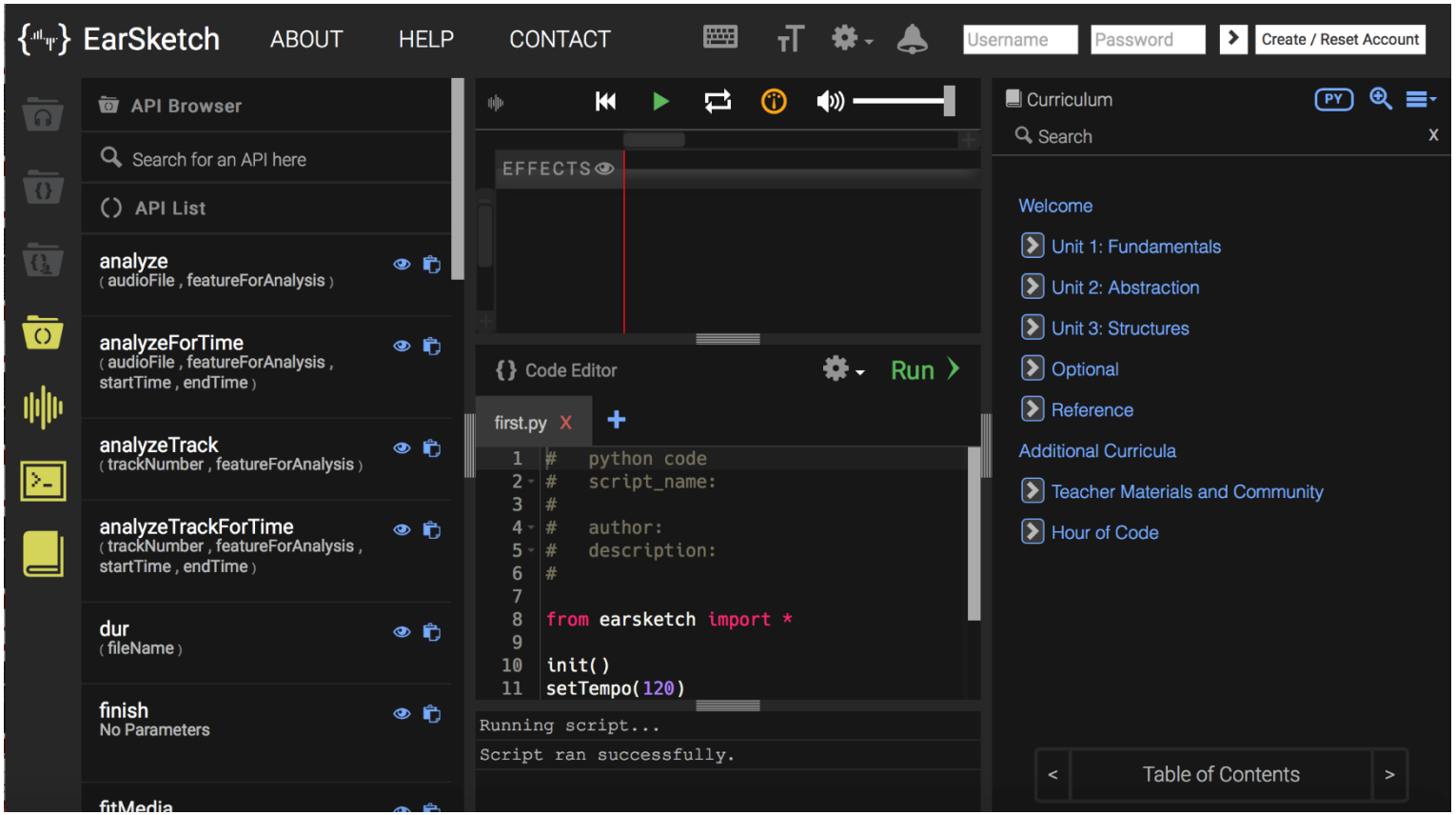
Share →



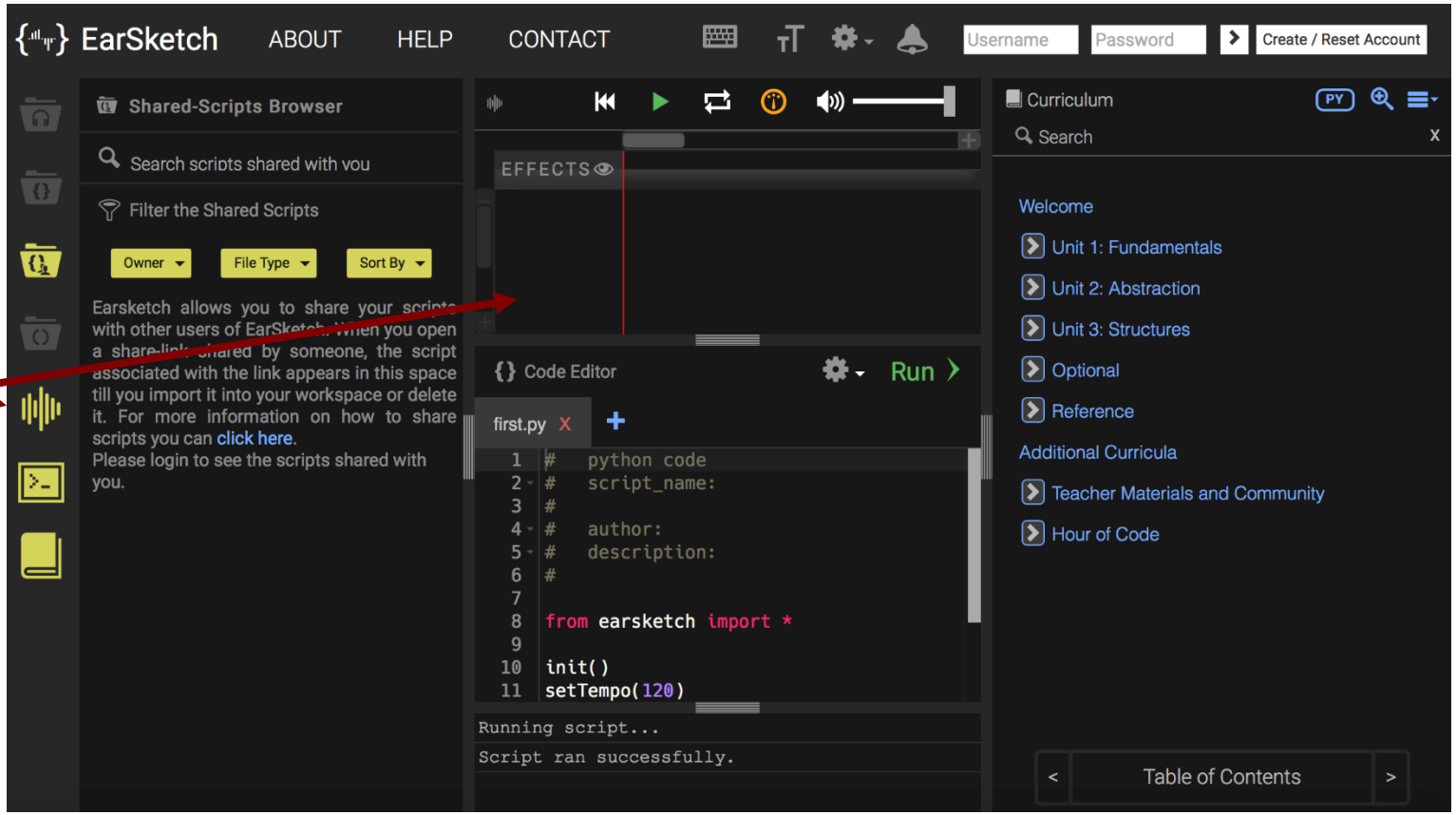
EarSketch Environment

API
How to use different functions

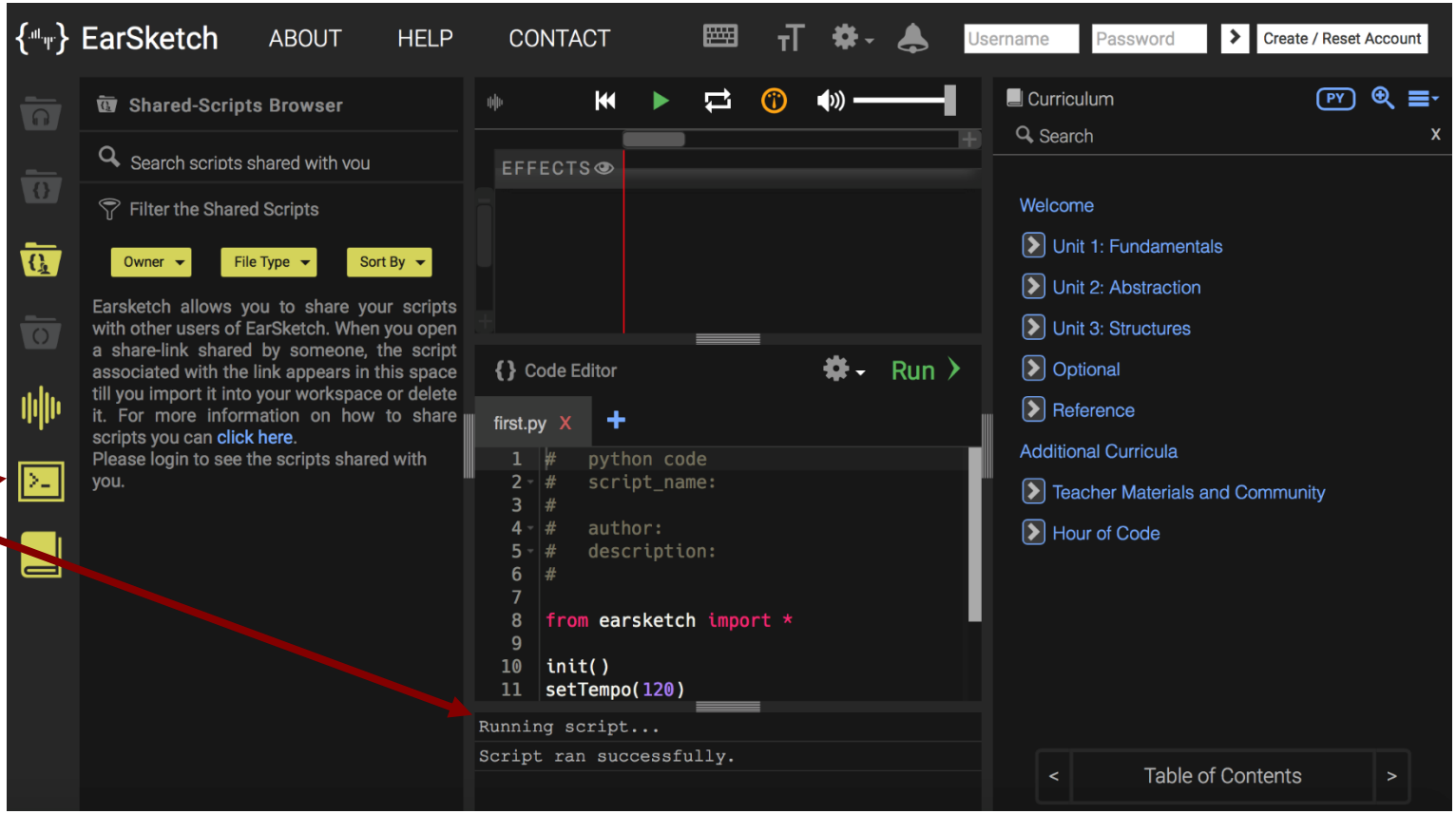


EarSketch Environment

Workstation
The music you create



EarSketch Environment

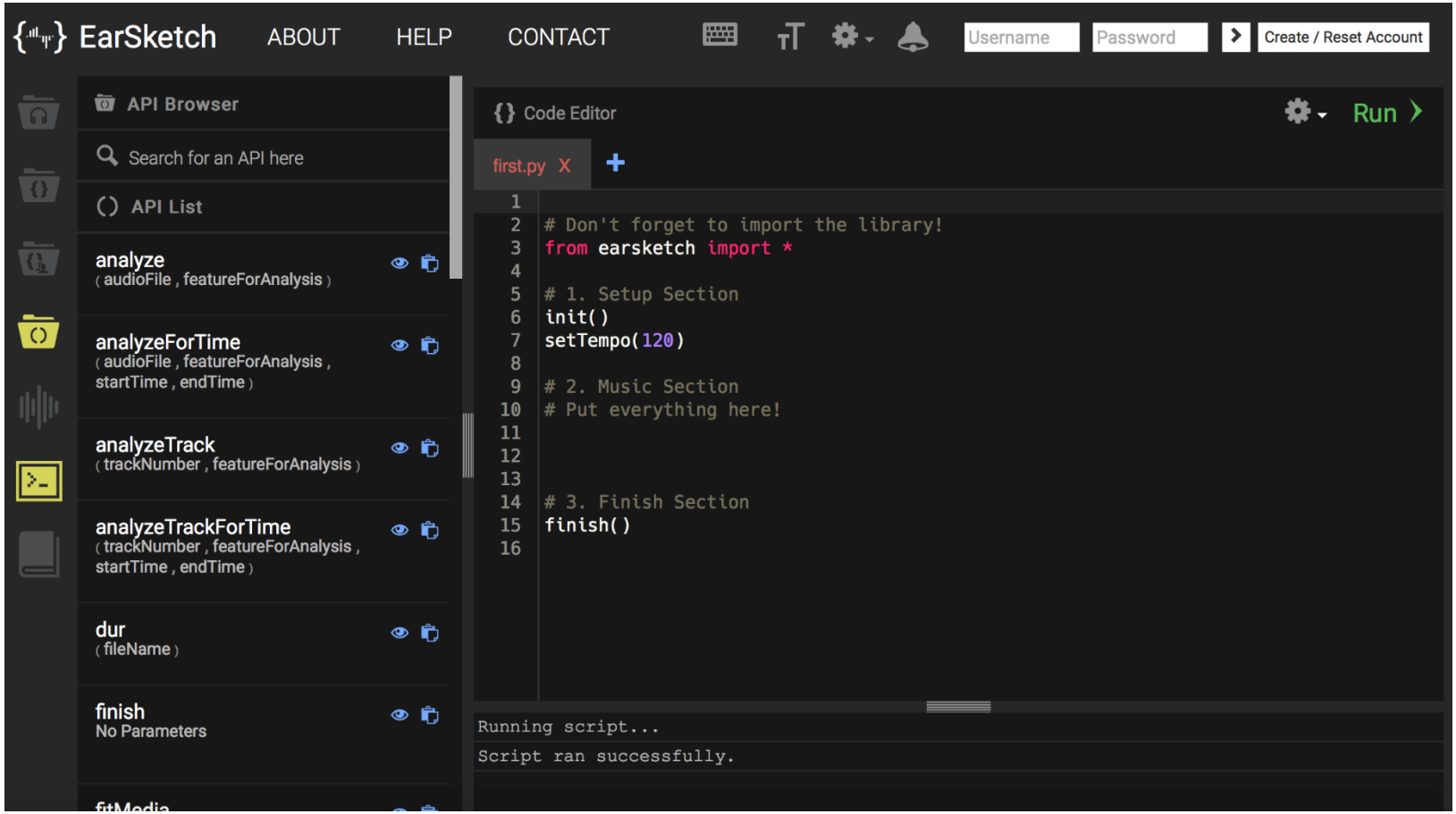


Console
Python
code output

Let's Get Started

- Click to create a new script
  - Make sure you select Python as your language
- Each script has 3 sections:
  1. Setup
     - `init()`
     - `setTempo(int BPM)`
  2. Music you define
  3. Finish
     - `finish()`

Let's Get Started



Adding Sounds

- Add sounds by calling **`fitMedia()`** function, which takes 4 arguments:

  - **`fileName-`** the name of the sound to be played
  - **`trackNumber-`** where the sound goes
  - **`startLocation-`** measure to start sound
  - **`endLocation-`** measure to end sound

Adding Sounds

- Try it!
  - Note: you will have to click "Run" then the play button in the Workstation

- Demo

Adding Sounds

- We added a sound, but it was short

- How can we extend and repeat sounds in the background?

```
12  #Setup
13  from earsketch import *
14  init()
15  setTempo(120)
16
17  #Music
18  for i in range (3):
19    fitMedia(TECHNO_LOOP_PART_002, 1, i+1, i+2)
20
```

- Demo

Effects

- You can add effects to alter a sound
- Some common ones are **VOLUME**, **DELAY**, and **FILTER**
  - A full list of effects can be found in Chapter 30.1 of the EarSketch guide guide
- The syntax for adding an effect is very similar to adding a sound

Adding Effects

- To add an effect, call **`setEffect()`** function, which takes 4 arguments
  - **`trackNumber-`** the number to apply the effect to
  - **`effectName-`** the effect you want to add
  - **`effectParameter-`** how you want to change effect
  - **`effectValue-`** the value for the parameter

- Note: **`trackNumber`** must match an existing sound

Effect Example

- Let's say we wanted to lower the volume of our background beat

```
17  #Music
18  for i in range (3):
19    fitMedia(TECHNO_LOOP_PART_002, 1, i+1, i+2)
20
21  setEffect(1, VOLUME, GAIN, -5.0)
22
```

- Demo

Background

- **Four beats per measure** (aka *quarter notes*)
- Often we divide a measure further into sub-beats e.g. *sixteenth notes*

Making a Beat

- EarSketch allows us to compose our own beats note by note
- Great for drum beats
- To make a beat, though, we need a "**beat string**"

Beat Strings

- The beat string is a string of characters *"to refer to sixteenth note sub-beats of a measure"*
- The characters of use are:

  `"0"` starts playing a clip

  `"-"` is a rest (silence)

  `"+"` extends the sounds into the next sixteenth note sub-beat

Adding a Beat

- The function to add a beat is **`makeBeat()`** and it takes 4 arguments:
  - **`fileName-`** the name of the sound to be played
  - **`trackNumber-`** the number to insert the file onto
  - **`measureNumber-`** the measure of your song you want to start the beat on
  - **`beatString`**

Beat Example

- Let's add a beat to our song

```
17  #Music
18  for i in range (3):
19    fitMedia(TECHNO_LOOP_PART_002, 1, i+1, i+2)
20
21  setEffect(1, VOLUME, GAIN, -5.0)
22
23  #Making a beat
24  beat = "0-00-00-0++0+0"
25  makeBeat(OS_CLAP01, 2, 1, beat)
```

- Demo

Beat Example

- Let's have it repeat over the same measures as our background track!

```
17  #Music
18  for i in range (3):
19    fitMedia(TECHNO_LOOP_PART_002, 1, i+1, i+2)
20
21  setEffect(1, VOLUME, GAIN, -5.0)
22
23  #Making a beat
24  beat = "0-00-00-0++0+0"
25  for measure in range(1, 4):
26    makeBeat(OS_CLAP01, 2, measure, beat)
27
```

So Much More!

- There are so many more features in EarSketch
  - Functions, record custom sounds, draw animations
- For more information
  - https://earsketch.gatech.edu/earsketch2/#?curriculum=4-6-2&language=python

Now That's What I Call Music!