

MSU Game Development Audio Documentation

Table of Contents

Introduction	2
Basics of Audio in Video Games	2
Digital Audio Workspaces (DAW's)	3
Pro Tools First	4
Garageband	11
Audacity	12
Tips and Tricks: Navigating DAW's	15
Tips and Tricks: Writing Music	16
Tips and Tricks: Recording SFX and Voice	17

Introduction

Like many other fields within Games and Interactive Media, Audio encompasses a wide range of disciplines, such as Music Composition, Sound Design, Audio Engineering, and more. While this documentation will not cover every single aspect of audio, the goal of this documentation is two fold: to provide an introduction to how to create the most prominent sound assets found in video games, as well as introduce the industry-standard tools found in most studios.

Basics of Audio in Video Games

Audio Assets can be broken down into three categories:

1. Music
2. Sound Effects (SFX)
3. Voice

For **Music**, living recordings of instruments can be collected via a microphone and then later edited and mixed through a **Digital Audio Workspace** (DAW). However, when you do not have access to live resources, music can be created using **Virtual Studio Technology** (VST), which allows you to implement instruments into your project without the need to hire studio musicians. Your music assets are then later transferred to Unity - or another game engine/audio middleware software - to be implemented into the game.

The process is very similar for **SFX**. SFX can be collected via a microphone and then later edited through a DAW. Sometimes, SFX can be created using VST's, though this requires quite a bit of creativity. SFX assets are implemented the same way as music assets. Sometimes you will encounter a need for abstract sound effects for your project.

There are many royalty-free Sound Effects, and even songs, that can be implemented into your game at no cost. Some widely-used databases include:

- [Freesound](#)
- [BBC Sound Effects](#)
- [Hooksounds](#)
- [Youtube Creator Studio](#)

For **Voice**, voice actors and/or actresses are called into a recording studio - or another quiet environment - in order to record lines of dialogue. From there, their lines are edited through a DAW, then implemented the same way that music and SFX are.

You may think that you need an expensive **microphone** in order to record all of these different sounds, but everyone carries a microphone with them every day: their cell phone. Applications such as Voice Memos are very useful for collecting sounds you may want to use in a project. While it is recommended to invest in a microphone, SFX and Voice can easily be recorded onto your phone with decent quality.

Several resources are linked below if you are interested in investing in a microphone, which help outline what type of microphone to buy, as well as a variety of price ranges:

- [The Best Microphone for Beginners](#)
- [15 Best Microphones 2021](#)
- Personal Recommendation (For SFX and voice):
 - [TASCAM DR-40 4-Track Portable Digital Recorder](#)

***An important note:

- Keep in mind to **ALWAYS, ALWAYS, ALWAYS** give credit to the source(s) you are using!
 - Copyrighted music may be used for educational circumstances without permission of the original composer, but only royalty-free music can be used in commercial projects.
 - It may or may not be necessary to gain permission for the owner of the royalty-free composition, check the notes posted with the track.

Next, we will discuss how to go about creating your sound assets.

Digital Audio Workspaces (DAW's)

A DAW, otherwise known as a **Digital Audio Workspace**, is an application or software that can be used to record, edit, and produce audio files. Some DAW's are better for certain aspects of the audio pipeline, such as recording or composing music itself, though most DAW's are highly flexible with what they are capable of producing.

FL Studio: While FL Studio does have a free trial, users are not able to save their work, only export their sound files, which prevents users from being able to come

back and edit their projects. Students are able to purchase the DAW for \$99, compared to the full priced \$199.

There are plenty of free DAW's available for beginners. For both Mac and Windows OS users, consider installing **Pro Tools First**, which is the free, simplified version of Pro Tools. While Pro Tools' interface may look outdated, it is the ***#1 industry standard found in nearly every professional recording studio***, and therefore is very useful to be familiarized with for professional reasons. Consider learning Pro Tools if you are serious about pursuing Sound Design and music composition professionally.

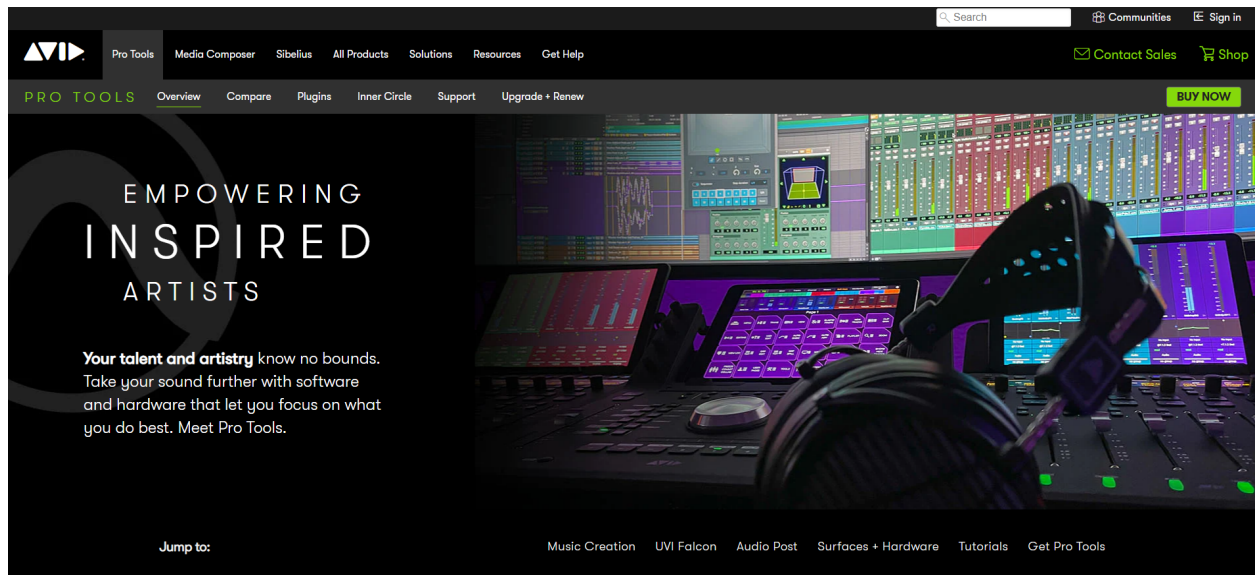
However, Pro Tools First can be overwhelming if you are a student searching to create simple sound assets, and not necessarily become a sound designer. Therefore, if you feel that you fall under this category, consider **Garageband** for Mac users, which is free and comes pre-installed on most Apple devices. For Windows users, consider **Audacity**.

Pro Tools | First

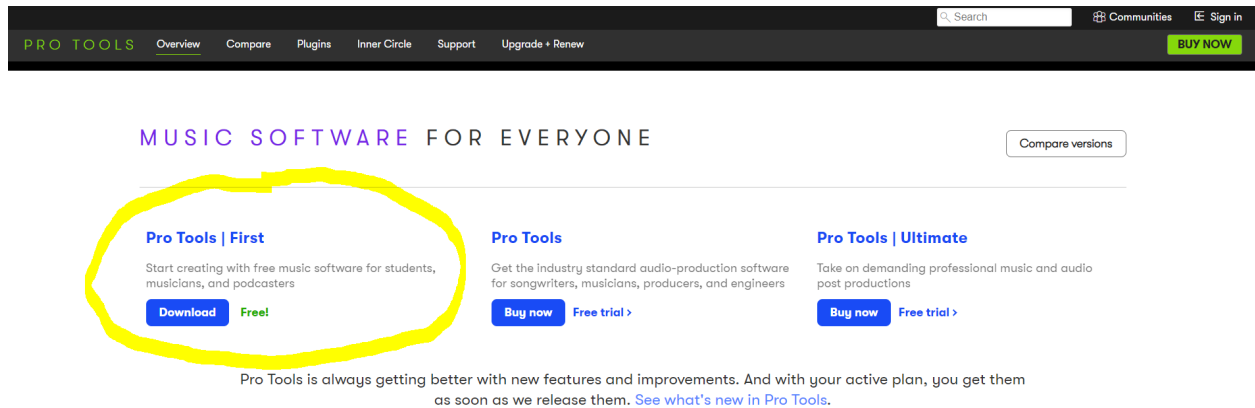
Installation

1. Visit the following link, which should take you to this page:

<https://www.avid.com/pro-tools>



2. Scroll down a little bit and find the “Music Software for Everyone” Tab. There, you are able to download Pro Tools First
 - a. NOTE: While it is possible to download a free trial of the full version of Pro Tools, this trial will expire in 90 days.



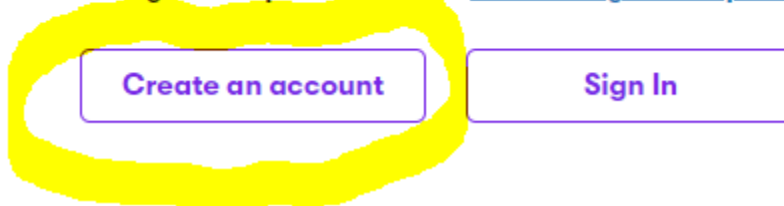
3. Once you click the download button, you will be prompted to “create an account” or “sign in.” Unless you have downloaded anything from Avid before, you will need to press “create an account.” Follow the steps prompting you to create an account, making sure to submit a **valid email address**, as this is where your software will be sent to.
 - a. NOTE: Remember which email you use and the password you select! You will need this in order to use ProTools

Get Your Free Download. Step 1 of 3.

Create or sign in to your accounts: Avid Master Account

Your Avid Master Account gives you access to software downloads, in-app purchases, support, community forums, and more across Avid sites. You must use a valid email address that you own.

Make sure your computer meets the [minimum system requirements](#) before you begin.



4. Next, you will be asked if you have an iLok Account, which can be created using the same email and password as your Avid account. Click the top button that indicates to create a new iLok account, then enter the password you just entered on the previous page.

Get Your Free Download. Step 1 of 3.

Create or sign in to your accounts: iLok Account

To activate Pro Tools | First you need to have an iLok account to manage your software license (it's free). Or if you already have an existing iLok account, we can deposit your Pro Tools | First software license into it.

☒ Create new iLok account using the same email and password as my Avid Master Account.

My Avid Password

Create

OR

Use my existing iLok ID:

We use personal information collected on this page in accordance with our [Privacy Policy](#).

Submit

By allowing Avid to create your [iLok.com](#) account you agree to the [iLok.com Terms of Use](#) and [Privacy Policy](#). If you prefer to create a new account with a different User ID, create a new account on [iLok.com](#), then come back to this page and enter your ID on the right.

5. The next page will ask you what music creation softwares you have previously used, as well as what types of projects you will create. If you have used any previous music softwares before, indicate them in the checkboxes. For the second prompt, indicate you will create the following:
- Audio Post Production
 - Live Sound
 - MIDI Composition
 - Mixing
 - Record live instruments
 - Voice-over / Narration

If you are interested in the other fields listed, feel free to check them off, though the options indicated above are the fields that are necessary for sound design and composition in video games. Finally, make sure to check that "I'm currently a student," then click the button to email your download links to your email.

Get Your Free Download. Step 2 of 3.

Help us provide you with the right resources:

What music creation software have you used?*

What type of projects will you create?*

☐ I'm currently a student


We use personal information collected on this page in accordance with our [Privacy Policy](#).

Email my download links

Email to be sent to: gmbendtsen@gmail.com

*Required answers

6. Your next step will be to check your email inbox, where you should have received an email titled “Your Pro Tools | First Download.” Whether you are a Mac or Windows user, click the appropriate button to start your download. The download process may take a few minutes to complete, depending on your internet speed.


PRO TOOLS | FIRST

Download and install Pro Tools | First

Get ready to start making music! Start your download by clicking the Mac or Windows button below. Make sure to confirm system requirements.

Mac (3.81 GB)
Windows (2.86 GB)

Resources to get you started:

Tutorials

Get started fast and tips + tricks

Tips and Support

Community Forum
Facebook users group

Your Avid Account

Get software updates, product info and more

Check out Avid Link, a free app that installs with Pro Tools | First – Connect with a community of music creators and audio professionals to collaborate and expand your creative opportunities. Plus, get your music heard on Apple Music, Spotify, Pandora, and dozens of other major streaming outlets with AvidPlay.

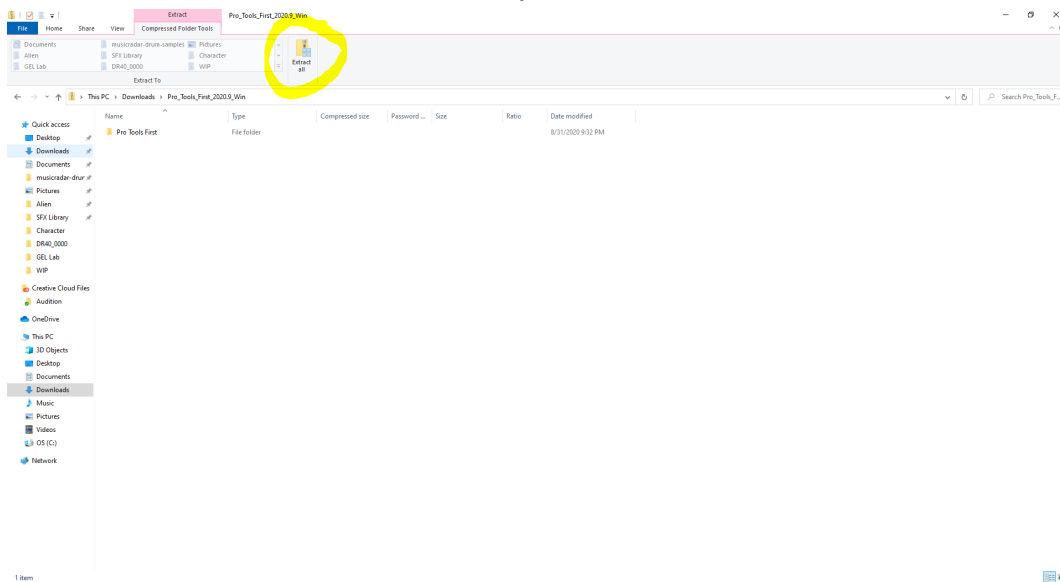
Let your creativity flow!

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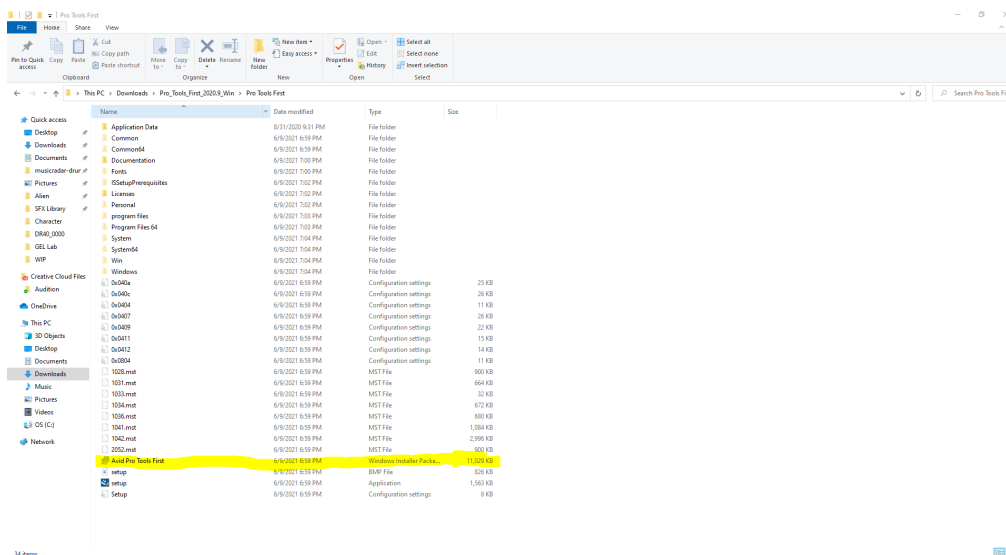
To exercise your rights under the General Data Protection Regulation (GDPR) or the California Consumer Privacy Act

7. The next step will be to extract the files just downloaded to your computer. **For Windows users**, open the compressed folder then, in the context menu, select “Extract all” or right click on the folder and select “Extract all.” **For Mac users**, simply double click the zip folder in order to extract its contents.

By default, the extracted zip folder will be sent to wherever you downloaded your folder initially, though you can select which folder it is extracted to. Make sure to remember where you extracted your folder. The file is relatively large, so the extraction process could take several minutes to complete.



8. Once the extraction is complete, navigate through the folders by selecting “Pro Tools First,” then selecting the “Avid Pro Tools First” Installer package.



9. Next, the InstallShield Wizard will install Pro Tools First onto your computer. Follow the steps outlined by the InstallShield Wizard:
 - a. Select “Next” after you are greeted with the installation window
 - b. Accept the terms in the license agreement, then select “Next”
 - c. Select “Install”
 - d. When asked whether you want to allow the application to make changes to your device, select “Yes”
 - e. Once the installation process is done, select “Finish” and you are all set!

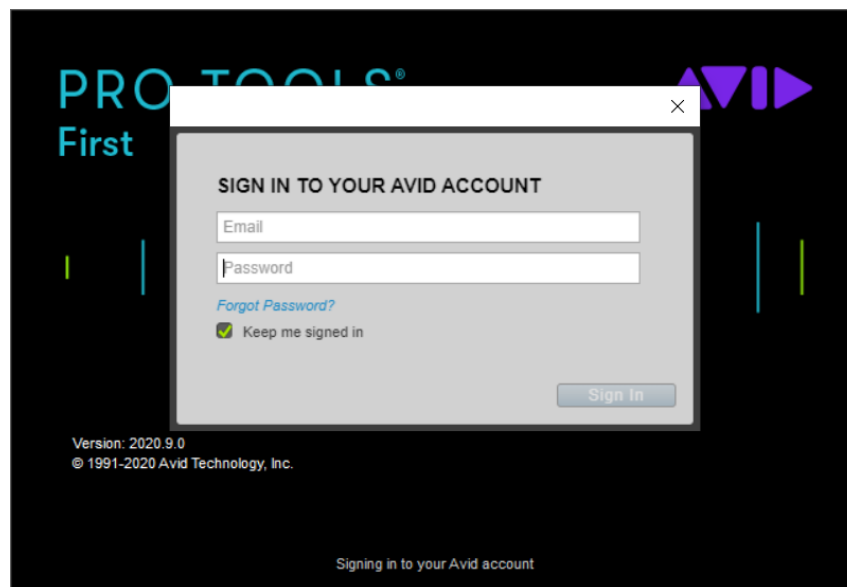
Opening Pro Tools | First for the First Time

1. When opening Pro Tools First for the first time, you may be greeted with a screen that states the following:

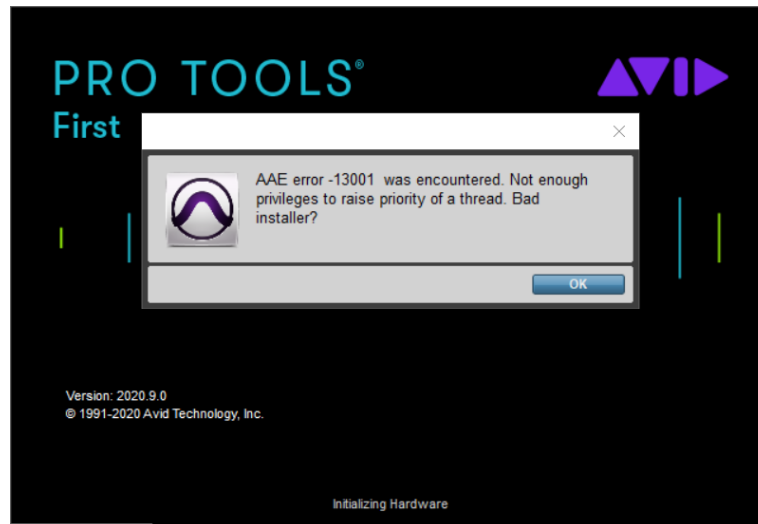
“In order to run this software, License Support components need to be downloaded and installed. Do you want to download and install these components now?”

Similar to the install process for Pro Tools First, follow the steps outlined by the InstallShield Wizard by saying “Yes” to the terms and agreement, and selecting “install” following.

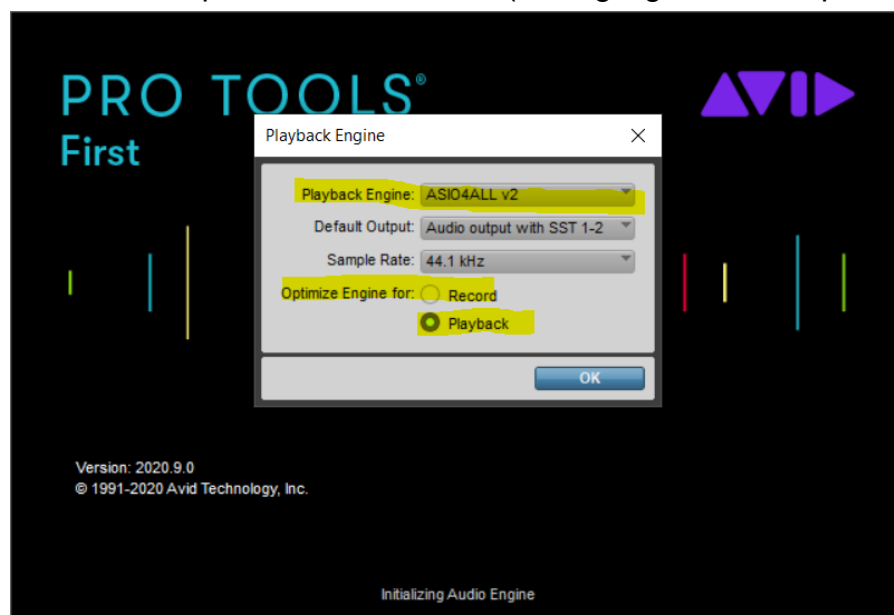
2. Once the License Support components have been downloaded, you will be asked to sign into your Avid account. Use the same log in that you used earlier in order to install the software.



*****NOTE:** you may run into **AAE error -13301**, which may look alarming at first but is an easy fix. Close Pro Tools First, but instead of simply double clicking on the application to open it, right-click on the application and select “Run as Administrator” and select “Yes” when asked if you want to allow this application to make changes to your device.



3. Next, you will need to select the proper audio playback device in order for you to be able to hear your work. An audio playback device is the device that Windows uses to output sound. The playback engine you select will depend on what computer you use, just make sure to:
 - a. Select a playback engine where you will be able to hear sound
 - b. Optimize Engine for playback
 - c. Set the Sample Rate to 44.1 KHz (not highlighted in the picture below)



Using Pro Tools | First

There are many online resources, specifically on YouTube, that offer tutorials on how to use Pro Tools First. Therefore, instead of outlining every single feature that Pro Tools has to offer, there is a 6-part Youtube tutorial linked below that will show you the basics on how to create, edit, and record your very own sounds in Pro Tools | First.

While the tutorial takes around an hour to complete, it is very worth your time and effort if you'd like to take your sound design to the next level!

6-part Youtube Tutorial: [Get Started Fast with Pro Tools | First](#)

Garageband



****If for whatever reason Garageband is no longer installed on your apple device, you can easily reinstall the application on the app store.*

There are many online resources, specifically on YouTube, that offer tutorials on how to use Garageband. Therefore, instead of outlining every single feature that Garageband has to offer, several resources are linked below that will show you the basics on how to create, edit, and record your own sounds in Garageband.

Beginner's Article: [A Simple Beginner's Tutorial For Garageband](#)

Beginner's Youtube Tutorial:

[GarageBand Tutorial - Beginner's Bootcamp \(10 Steps To Make Your First Song\)](#)

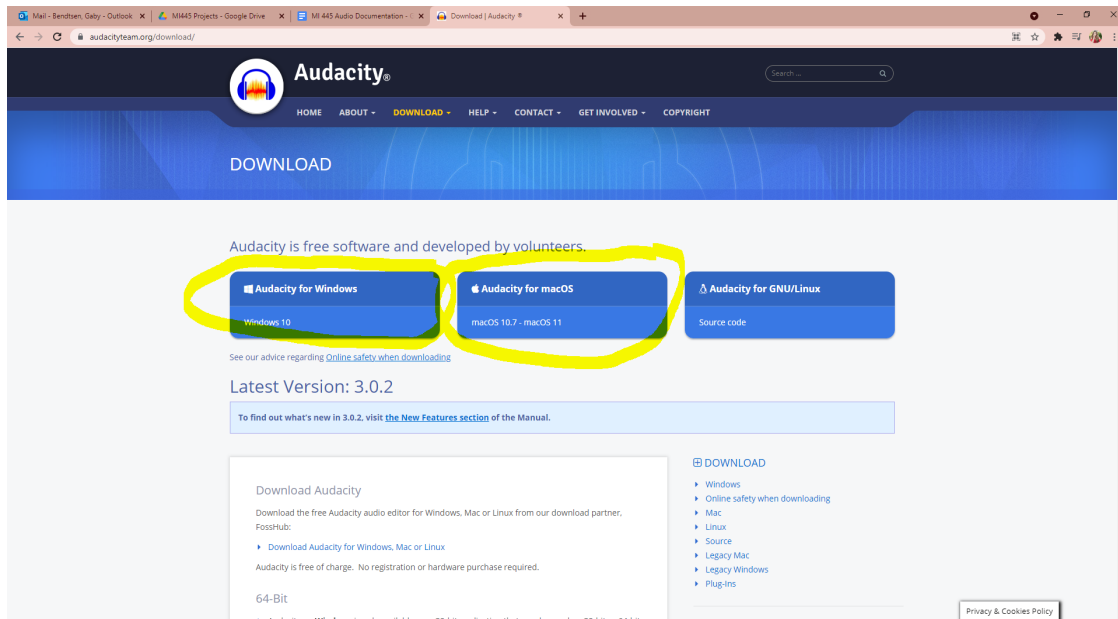
In-Depth Youtube Tutorial:

[THE BEST IN-DEPTH GARAGEBAND TUTORIAL FOR BEGINNERS + Tips and Tricks](#)

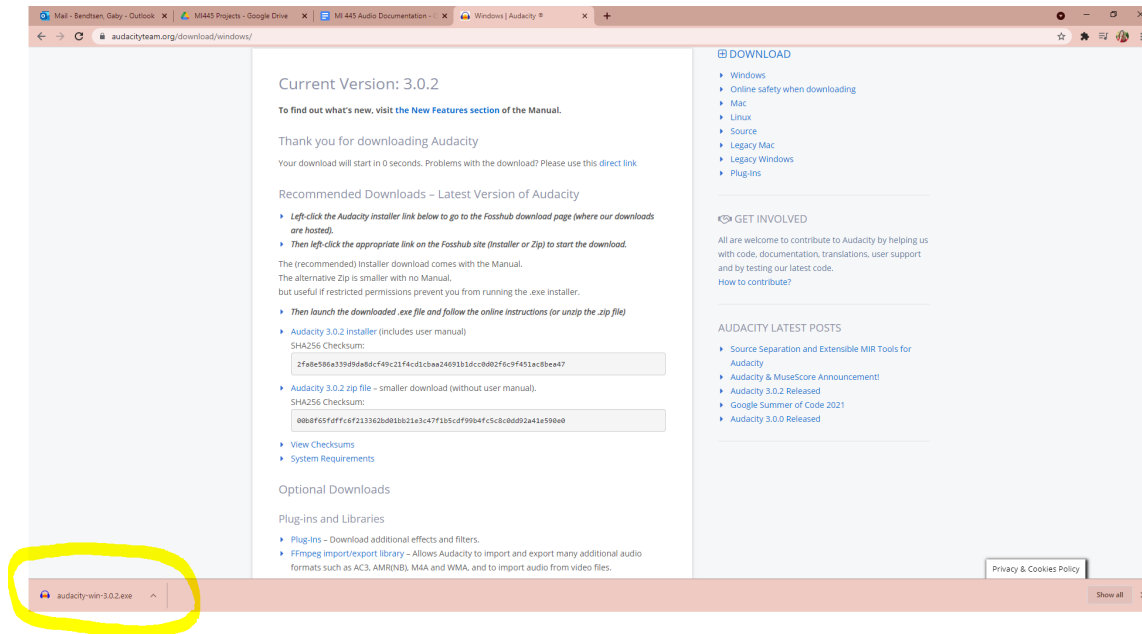
Audacity

Installing Audacity

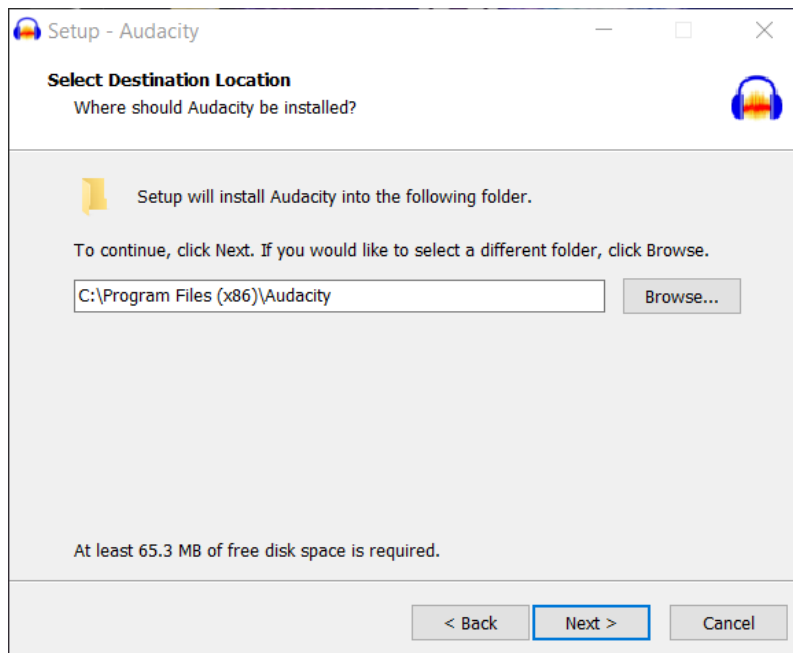
1. Visit the following link, <https://www.audacityteam.org/download/>, which should take you to the page shown below. Click “Windows” if you are a windows user, or click “macOS” if you are a Mac user.



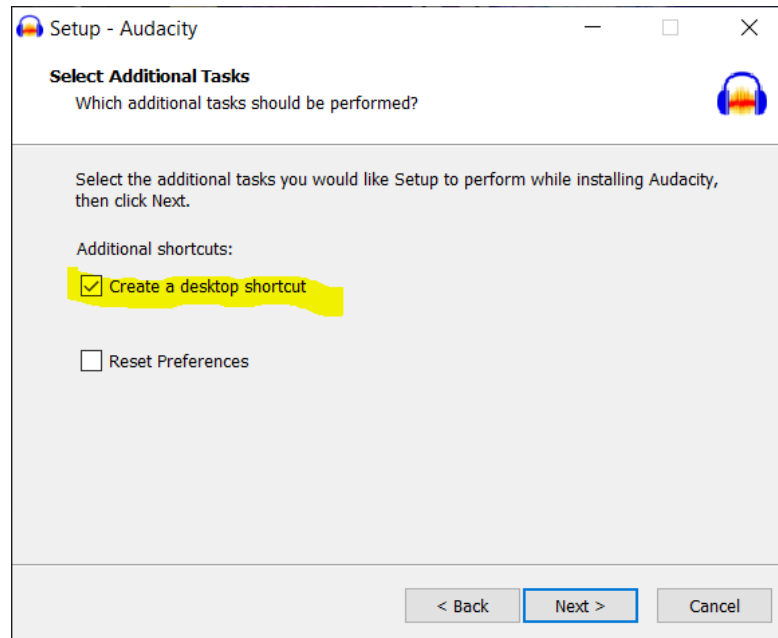
2. The link will put the Audacity installer onto your computer. Once it is done installing, click on the .exe file to begin the download process.
 - a. NOTE: if you are interested in additional plugins, they are linked under “Optional Downloads”



3. Allow Audacity to make changes to your device by selecting “Yes,” then select the language you’d like to use during installation
4. Click “Next” at the Audacity Setup Wizard, “Next” to the information page, then select the folder Audacity will be stored on your computer, though the default should be fine.



5. Select “Create a desktop shortcut,” then select “Next.”



6. Finally, select “Install,” then select “Next” at the second information page, then “Finish” to complete the installation process!

Using Audacity

There are many online resources, specifically on YouTube, that offer tutorials on how to use Audacity. Therefore, instead of outlining every single feature that Audacity has to offer, several resources are linked below that will show you the basics on how to create, edit, and record your own sounds in Audacity.

Beginner’s Youtube Tutorial: [How To Use Audacity for BEGINNERS in 2020! \(Complete Audacity Tutorial\)](#)

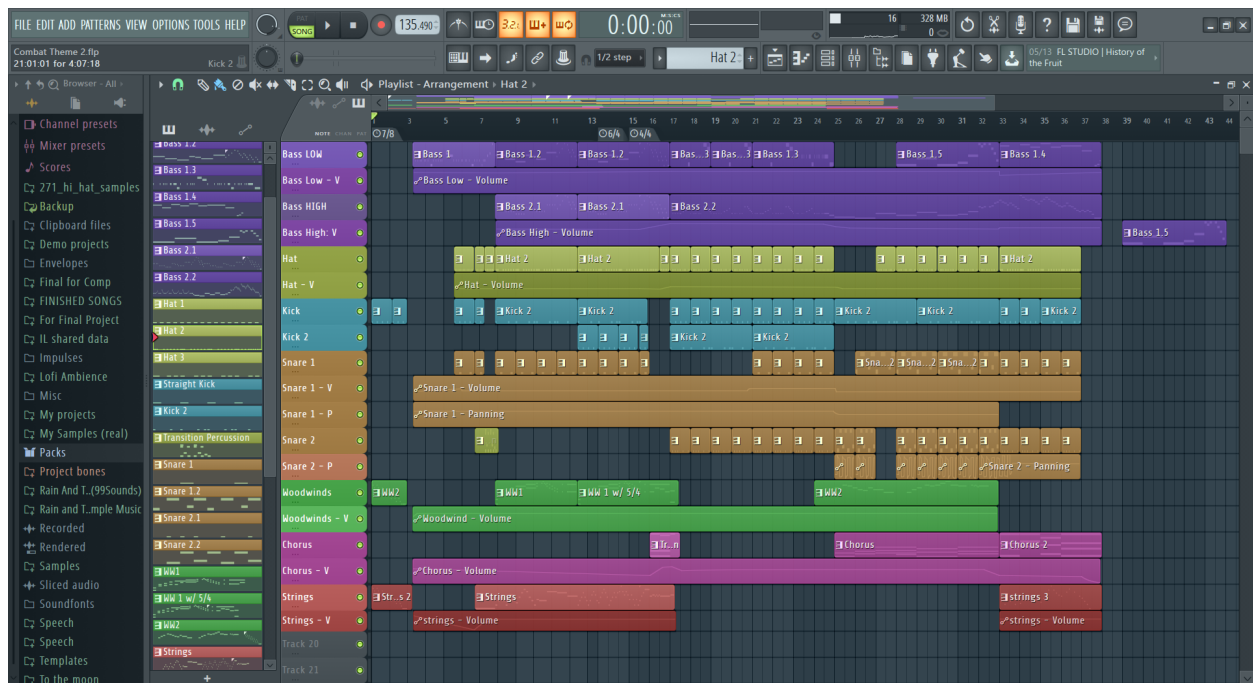
Beginner’s Article: [Getting Started with Audacity - Audacity Tutorial for Beginners](#)

Tips and Tricks: Navigating DAW's

Navigating DAW's can seem like a daunting task. However, once you are familiar with the layout of the DAW of your choice, here are some tips and tricks to make you feel more comfortable navigating through DAW's:

1. **Keep your tracks organized:**

- Projects can quickly get messy whenever the tracks are not labeled and organized. This is an example of tracks organized in FL Studio for the combat music for the MI 445 Game Design and Development tutorial project at Michigan State University:



2. **Use your eyes as much as you use your ears:**

- Use your ears when composing your track, yet when mixing your composing, use your eyes and ears equally.
- Look at the mixer to see how high or low levels are from your instruments to prevent too much or little, yet also use your ears to ensure your mix sounds good

3. **Read, Watch, and Learn from others:**

- There is constantly something new to learn. Even if someone has been producing for years, they are still learning. Constantly push yourself to learn something new!

4. **Look it up!**

- a. Want to do something but don't know how to do it? There are thousands of producers, specifically on YouTube, that have likely already posted a video on how to achieve the effect you desire.

Tips and Tricks: Writing Music

_____ For many professional music composers, they spend years- sometimes their entire lives- studying music theory, performance, compositions, and other fields of music in order to perfect their craft. You may wonder where to start in order to begin creating music. Here are several tips to get you started at writing your own pieces!

1. **Learn the basics of music theory.** There are hundreds of online resources to get you started at learning theory, a quick video that covers the basics, as well as a website where you can practice your skills, are linked below:
 - a. [Learn music theory in half an hour](#)
 - b. [MusicTheory.net](#)
 - i. Navigate to the "exercises" tab in order to get started at practicing your theory skills!
2. When you feel like you have a basic understanding of music theory, it's time to **start writing your own pieces!** Some tips for composing:
 - a. Show your pieces to friends and family- they can offer a different perspective than your own and help gauge if you are successfully conveying the emotions that you are attempting to portray
 - b. Be creative with what types of chords you use! Don't be afraid to stray from "major" and "minor" chords and add notes that you think sound interesting!
 - c. When you feel that you are at a stalemate at where to take your song, step away from the computer for anywhere between 15 minutes to a couple of hours. Sometimes it is necessary to come back to your song with fresh ears so that you can continue to write your piece
3. **Listen to other pieces** that follow the style you wish to achieve.
 - a. This may seem like cheating to some, but every professional composer draws inspiration from other composers.
 - b. Consider spending 1-5 hours just listening to music before you start to write your own melody.
4. **Be creative!**
 - a. Don't be afraid to push the boundaries of sound and music, try new things and you may get something you really like!

Tips and Tricks: Recording SFX and Voice

As mentioned before, it is not necessary to have access to a multi-million dollar recording studio in order to acquire good sounds! Here are the things that are *actually* necessary in order to acquire good sounds:

1. Record everything:

- a. This is how sound designers begin to build their SFX library, you never know what SFX you may need in your future! It is always preferred to use your own SFX versus having to refer to open source sound resources.

2. Record in the “best” space possible.

- a. Record in a place that is quiet and has as little reverb as possible. Artifacts can be difficult to remove post-production, especially for beginners.

3. Put the mic in the right place:

- a. For voice, between 8-12 inches away from the mouth will produce a recording that is clear and present without sounding too far away or close to the microphone.

4. Mind your meters

- a. Decibels are the relative unit of measurement for measuring the intensity of a sound. With most microphones, there should be a meter that indicates how loud the sound you are recording is. Try to record your sounds around -20 to -10db, as this will prevent clipping and distortion in your recording. Levels can be boosted in post-production

5. Use quality headphones while recording

- a. This will help gauge how your recording will sound.

6. Again, be creative!

- a. Especially with SFX, it is necessary to be creative in order to achieve the sound that you desire. For example, many punching sounds are achieved by hitting pieces of meat!