Ensemble Class

Version 1.0
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Introduction and Quick Start

"Ensemble Class" is an application for collaboration. Its primary focus is to help instrumental ensembles to rehearse remotely and to give directors and teachers a means of evaluating progress. This manual will go over the main features and workflow. Feel welcome to explore the app right away without reading ahead, but I'd suggest holding off on using the options in the Repertoire and Collaborate menus until you've read about them here.

[If you are having trouble with audio playback, please go to the end of this manual for trouble shooting suggestions]

The first time you load Ensemble Class, after it has a little time to initialize, press play in the transport controls and you should hear a count in followed by a performance of Chopin's B minor Prelude arranged for three guitars (if you don't hear any sound, just press stop and give it a minute as it runs through the initial configuration process). The recording of this piece was made within Ensemble Class itself, using the included recording features and effects. If you notice that the playhead (the pink line moving across the score) is sometimes a bit out of sync, this is because the performance has a slight bit of expressive rubato (making it a good example of playing slightly out of time with the metronome here and there as part of the phrasing of the piece).

Try selecting one of the parts in the drop down menu. As you select a part, the score will change to show that part, and the volume for that part will automatically be turned down so that you can practice along with the recording.


Select part 1 and try playing along. You can change the tempo if it's a bit too fast at first. Note that the recording is just being stretched, so you will hear some interesting artifacts as a result of that (This functionality will make it so that you can more easily load your own parts later).

Very Slow	Moderately Slow	At Tempo
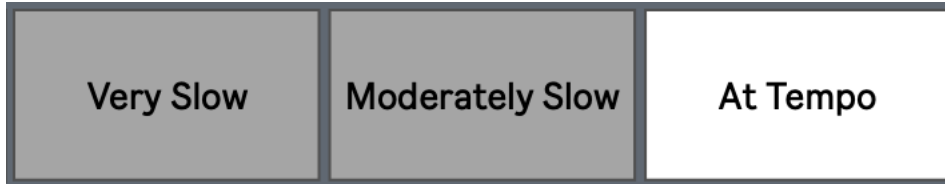
Now try starting the recording from a different point in the score by holding the alt/option key and clicking in the white space above any measure. Instead of using the transport, you can just press the spacebar. Pressing the stop button twice in a row will reset the playhead to the beginning of the score.

In the Studio Menu at the top of the screen, select "scrolling score" to turn off this option. Now select "hide playhead". Sometimes it might be nicer to read along without the playhead guiding the way. Select "metronome" to hear a click throughout the piece (this can be useful when constructing your own project folders)

Studio Window
Metronome
Effects
Input Gain
✓ Scrolling Score
Hide Playhead

Audio Setup
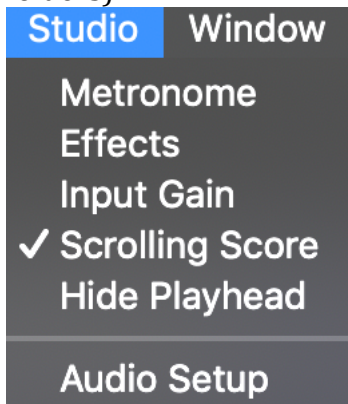
How to Import Scores and Recordings

Importing repertoire is quite easy in Ensemble Class *as long as you follow the naming conventions when creating project folders.* Take a look at the Repertoire drop down menu. Select "Load From Disk" and you will see a pop up menu warning you that folders must be formatted in a specific way (look ahead the "Create Your Own Project Folders" for info on how to do this). After clicking "continue" or "don't show this message again" navigate to the "Espanoleta" folder, which is found within the Ensemble Class application folder. Enter 3/4 when it asks for the meter, and 80 for the bpm (this insures that the score will follow the recording correctly, so it's always important to enter the correct tempo and time signature of the recording). You can select from the drop down menus or type directly into each field, pressing return after you have chosen the bpm will close the window and load the score. After a moment, you will see the score change to part one of Espanoleta and the Title in the top left will now change to indicate the currently selected piece (you can see this change by selecting the chopin prelude again from the drop down menu above the score). Hit the play button or press the spacebar to hear Espanoleta. Make sure to

turn up the volume for part 1 if you'd like to hear that part, rather than perform it yourself with the other two parts accompanying you.
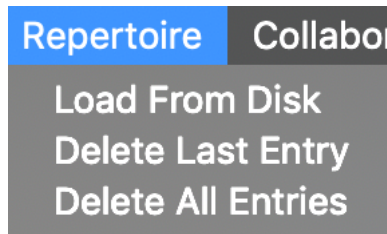

Now try dragging the same Espanoleta folder into the area that says "drop a folder here!". This is another option to perform the same task as "load from disk". This time, enter a mistake or two (maybe choose something odd like 5/16 for the meter). If you do something like this while loading the score, just choose "Delete Last Entry" from the Repertoire menu. If you end up with a bunch of scores that you don't want to view anymore, you can choose "Delete All Entries" to reinitialize the app to having only the Chopin Prelude. Every time you restart the app, it loads with only this Prelude, just to keep it simple. I hope you agree that loading a score and recording is pretty easy though! **important note: the organization of project of folders is important. Don't put any other files in there, unless it is meant to replace one of the files already in the project folder (it would need to have the same name).

Recording a Part

Hit the red Record Button in the transport controls (or press the "r" key). This record button will begin flashing, indicating that you are now ready to record. Hit the play button or press the spacebar to begin recording. If you are recording at the start of the piece, you will hear a count-in before recording begins, otherwise you will hear the piece begin immediately. As you record, notice that a waveform is gradually created, which gives you a visual feedback that the recording is working. After recording a few measures, hit the stop button or press the space bar again. You can listen to your recording, using the Practice volume control to set it at a good level. If you don't like it, you can repeat the process, hitting the record button and the play button to record over your last take. If you want to save it, choose File > Save (or hit Command + S on your keyboard). You will see a popup menu asking you to choose a location and give a name to the recording. Navigate, once again, to the application folder, and select the "student recordings" folder. Name the file something to help you keep track of which recording you've made. Check the location that you chose to make sure that the recording is there. If you forget to save, and choose a different piece of music from the title menu, a window will pop up asking you if you'd like to save your recording.

It's important to remember that Ensemble Class, like any other music recording app, is limited by the hardware that you have available. If you have an audio interface

and a microphone, you will get a much better result than if you record with the microphone included within your computer. Regardless, it is very important to use headphones, while recording, so that you can isolate your individual part in the new audio file that you create. If you need to boost the overall signal, you can go to Studio > Input Gain and either adjust the gain manually or, what is probably better, just select the "normalize" button, which will apply gain to the track overall, while not amplifying anything over a predefined threshold.
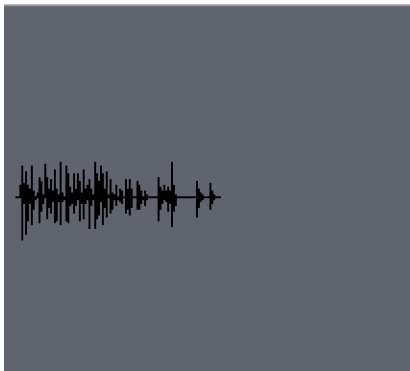

Dealing With Latency

Latency is an unfortunate byproduct when recording with a computer, and there are a few different ways of dealing with it. If you record a part, feeling certain that you are in time with the metronome or other audio tracks, and then find upon listening to your work that it is consistently late, you can use the "Latency Compensation" feature (found within the Studio menu) to deal with this. First off, it is helpful to understand why the latency is occurring: when recording audio, your computer is doing a lot of heavy lifting in order to process the electrical signal from the microphone and convert it into the digital format that is necessary. The amount of latency is dependent upon your computer's processing power and settings, but every computer introduces at least a tiny bit of latency. In the latency compensation window, you can enter a number that will essentially counteract whatever latency amount is introduced by your computer (the latency amount should be consistent throughout your session). You can do this by ear, listening to the part that you just recorded and adjusting the latency until it lines up better. As you raise the latency compensation amount, the other tracks are simply delayed by a small amount so that everything lines up. Once you export your track, it will automatically be

reformatted to adjust this amount of time, so that you or a collaborator can import it without making any latency adjustments for it.

If this seems overly complicated, don't worry! If you like the sound of your recordings and feel like they fit together fine, then you don't need to adjust anything. If you feel like your recording is always late, just push up the latency amount until you feel better about it. Additionally, many audio drivers give a latency amount number for you to use. Go to Studio > Audio Setup to see if your driver gives this info (the driver for my UA Apollo does not, so I just experimented until I settled on 30 milliseconds as the correct latency amount). It takes just a bit of tinkering, but Latency compensation is a very helpful feature, especially when considering that many students will not have fancy audio setups
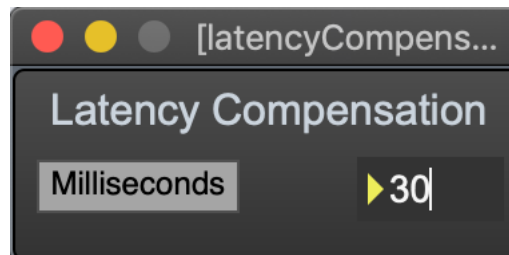
Importing a Part

Now let's load the part that you recorded. Go to the Collaboration menu and select "Import Part". A pop up window will ask you which part you want to replace, and, once you've navigated to the file and loaded it, a button will appear next to the fader for that part in the mixer section. Click on this button to listen to the recording you just loaded. As the part plays, you can switch back and forth to hear how your recording compares to the original. This part of the collaboration menu will allow students to share recordings with each other. Teachers can assign group assignments, asking students to collaborate and create a complete recording of the piece!

Exploring the Studio

The studio menu has a few options for recording parts. There is a metronome, which can also be activated by pressing the ~ key, an effects area that includes EQ and reverb, input gain, in case your microphone is not getting a strong enough signal, and an audio setup option that will allow you to switch your audio interface and change other technical settings if needed (this will probably not be necessary, as Ensemble Class should use whatever audio interface you have connected to your computer).

Open the effects window and turn Preview on. Click the top left square in the Presets section so that it turns pink, and notice the EQ and reverb settings change. These are the settings that I used to record the guitar parts for the Chopin Prelude and Espanoleta, both of which were recorded with the app without using any external processing (I used two Beyer ribbon mics and a Universal Audio Apollo interface). Make another recording and take a listen to it, making sure that the "Practice" volume is turned up in the main mixer section. You should hear a bit of reverb, and a the processing of the EQ. You can experiment and find sounds that you like as you go, and then make another recording after switching the "bypass" button so that it says "Effects ON", which means that your recording will now be recorded to disk with the effects processing. I made these effects so that they can get pretty out there, because I imagined my students would enjoy it, but, for most cases, you'll probably want to keep it pretty mild.

You can create your own presets by Shift+clicking on any square. You can delete a preset by Shift+Option+Clicking a square. Hitting Command (apple key) + E will save the set of presets for the next time you open Ensemble Class. Windows users will see two buttons right beneath the preset block called READ and WRITE. These can be used to store a block of presets that can be loaded at a later date.

Create and Import XML Files

Return to the collaborate menu and choose "import XML". In the selection window, navigate to the folder called "justXML". Enter 4/4 and 60 bpm when prompted. Rather than using a DAW, you can record parts here, apply effects, and add the .wav files to the folder containing the XML files. In this way, you can create new

repertoire for your students to load into the app to practice and record their work with. When doing this, it's important to name the files in a way that conforms with those in Espanoleta. For instance, if you were to make parts for justXML, they would need to be named justXML1.wav, justXML2.wav, and justXML3.wav. This is necessary for the program to be able to automatically parse the files when using the "Load From Disk" command.

Please note that, once you switch to a different piece, or load more repertoire, the XML project will be deleted from the app. This is because it is incomplete, in a sense, since it doesn't have any recordings, so the behavior of the app is to treat it as temporary. You can always load it again and record more files, though!

.XML files can be created with any of the commonly used sheetmusic programs (Sibelius, Finale, Dorico, etc). Make sure that it is .xml and .mxl when exporting, as .mxl files are not supported. If the piece begins with an incomplete measure because of a pickup, change it so that it is a full measure beginning with rests like this:

Making Your Own Project Folders

A project folder is a folder that has the complete number of XML and WAV files for a piece of music. Project folders are meant to be imported by ensemble members for them to practice with and record their own performances. In order to keep the import process running smoothly, which should be as simple as dragging a folder into the app (or selecting Repertoire > Load From Disk), the files should be given the exact same name as the enclosing folder. NO spaces should be used (follow the format of chopin_prelude, chopinPrelude, or chopin-prelude). Each part name should indicate the part number (chopin_prelude1, chopin_prelude2). The file extension, when shown in your finder (look at your system preferences to see if file extensions are shown) should be either .xml or .wav, depending on whether the file is audio or a score. Other file types are NOT supported.

Number of Parts

Ensemble Class is responsive to the number of parts in a project. In the current version, it allows for 1-4 parts. When importing a project with a different number of parts, you will see the mixer section change to reflect this. If you'd like to test this, you can make a copy of the "Espanoleta" folder and rename it to something like "numbersTest". You'll need to rename the files within the folder to match the name, so that they are labeled "numbersTest1.xml" "numbersTest2.xml" . . .

Once you've done this, duplicate "numbersTest3 (both xml and wav) and rename them to "numbersTest4". Import the folder, and you will see the mixer change. You can switch between this and the Chopin Prelude to see the change.

You can go back to "numbersTest" and delete parts 3 and 4 to see the same behavior for a duet. Delete part 2 to see the solo interface.

Using "Zoom Mode"

In addition to giving asynchronous assignments for students to accomplish throughout the week, I use Ensemble Class in concurrence with the Zoom telecommunication platform. One of our common activities in my guitar ensemble is to have everyone muted except for one student, then have that student share her screen, using the "screen sharing" feature and making sure to check the box labeled "share computer sound" within zoom. The result being that we can hear the backing tracks form the student's copy of Ensemble Class, while also hearing the student play as she makes a recording, which is then shared with another student to import, creating a kind of daisy chain of ensemble playing. Unfortunately, there is a strange artifact of the different technologies at play: the sound of the student playing through her microphone tends to be significantly ahead of time in relation to the recording. Zoom mode is not a perfect solution, but it does help with this quite a lot. To use it, the student must first make sure that her speakers are muted so that she can only hear her computer sound through headphones (if this isn't followed, some unpleasant feedback will be heard, which will definitely serve as a good reminder for the next time!). Then, she should mute her microphone within zoom, so that only the audio of the Ensemble Class app can be heard (at the moment that I'm writing this, zoom works in this way, continuing to allow the shared computer sound through while muting the microphone within zoom). Now, the student might need to turn on the effects, maybe add a little input gain (normalization will only affect the sound after it is recorded, so it won't work in this case), and perhaps turn down the volume of the other tracks. The result will be a more synchronized over-all sound, though you should keep in mind that there will likely be some latency, since latency compensation only affects things *after* the recording has been made. In my experience, the input latency of this sort is significantly better than the strange

timing differences between zoom's microphone sound and shared computer sound. Try it out if you run into this issue, as I have.

Some Ideas for Using Ensemble Class

- Using zoom (or any teleccommunication service), choose one ensemble member to be the leader. This person will be heard by you and the rest of the ensemble, and everyone else (including yourself) will be muted.The leader will have Ensemble Class running, and will use the "screen share" feature within zoom to share her computer screen (make sure she checks the "share computer audio" box when screen sharing). All of the volume levels for the piece can be turned down, or the default mode can be used (muting the currently performed part) can be used, depending on the preference of the moment). This student will record while playing, and the other students will play along with their microphones muted. Have the leader drop her part in a file share service (or upload it into the chat feature within zoom). Now, a different student will download the previous leader's performance, import it into the appropriate part, and repeat the process (while having the volume up on the previous part.) This creates a round-robin or "bucket brigade" approach to creating an ensemble performance. While the drawback is that each leader is playing with the last performance rather than the current one, there is a huge difference in the level of collaboration that can occur, as opposed to just using zoom. After doing this a few times, you can load their parts into your copy of the app and have an evaluation sequence, switching between the original recordings you made and their parts, and asking them to evaluate their performance in a respectful and constructive way
- A great homework assignment is to have students send their recordings from the app to you during the week, which you can then compile into little performances in the app
- Assign a "telephone game" group project to your students that begins with one student recording a part that the next student will import from the collaboration menu to evaluate and record with (they would silence any other prerecorded parts in this scenario, making it a fresh recording from scratch). The second student passes it on to the next student who will continue the process of collaboration.
- When recording from scratch, you can turn on the metronome if you wish the recordings to be perfectly in time with the playhead of the score, but, as was the case when I recorded the Chopin prelude, you can also turn off the metronome to have a little bit of rubato. If you don't get too free with it, the score will still be in time with the recording, but it will be more musical.
- Ensemble Class can be used with private students as well! The program responds to the number of XML and WAV files within the project folder. You can make multiple project folders, one for each phrase of a piece of music,

and label them something like juliaPhraseOne1.xml juliaPhraseTwo1.xml, and then just use the title menu (above the score on the right hand side) to switch between the first and second phrase of Augustín Barrios' Julia Florida, for example. Note that I am writing the phrase number as text, which only serves to make it so that the title menu shows the phrase number, since it automatically removes the digit (because it references the part number and is treated as unnecessary in the title menu)

Thank you for being an early adopter of Ensemble Class! I have put a lot of hard work into this app to make it something helpful, and I hope that you find it to be a useful and fun tool. For technical support or customer service, please contact me at tommyecho@gmail.com, and put "ensemble class app" in the subject line. This is a startup project, which I hope to be the first of many, so your feedback is greatly appreciated! I assure you I will get back to every email sent to me, but please don't be alarmed if it takes a day or two in this early stage.

Trouble Shooting Audio

If you are not getting an audio response, go to STUDIO > AUDIO SETUP and try turning the Blue DSP button off and then on again. If this doesn't fix it , go to the "Driver" menu and reselect "Core Audio" (or a different driver, if your audio interface uses something other than Core Audio). Reselect the input and output devices, and, if this doesn't fix it, turn the blue button off and then on one last time. Once the app engages with the audio driver, you should not have to do this again!

About the "Performance and Scheduler" settings . . . first off, I'd suggest not adjusting these until you've exhausted all other possibilities of getting a good audio sound. I tend to set my Sampling Rate at 48000, but I would advise 41000 for a start. Anything below 41000 will lose some frequency content, but, if your computer is challenged by audio processing, you can experiment with the next lower setting available and see if you like the sound (it might improve latency issues). The I/O Vector size is something you can experiment with if you are having crackly audio signal pops (normally called "interrupts"). As you raise this number, you will add latency, but once it is below a certain number (you'd have to experiment), it will begin to be crackly.

It is outside of the scope of this manual and software to give a full tutorial on audio signal processing, but there is lots of information online if you are curious!

CPU   3 %   ●

Driver   **Core Audio**   ▾
Input Device   **Universal Audio Thu...** ▾
Output Device   **Universal Audio Thu...** ▾

Performance and Scheduler

Sampling Rate   **48000**   ▾
I/O Vector Size   **512**   ▾
Signal Vector Size   **512**   ▾
Scheduler in Overdrive ✕   Audio Interrupt ✕
CPU % Limit   ▸**0**

Input   **Output**

Ch 1   **1 MIC/LIN...** ▾   Ch 1   **1 MON L** ▾
Ch 2   **2 MIC/LIN...** ▾   Ch 2   **2 MON R** ▾

Audio Driver Setup   **Open I/O Mappings**