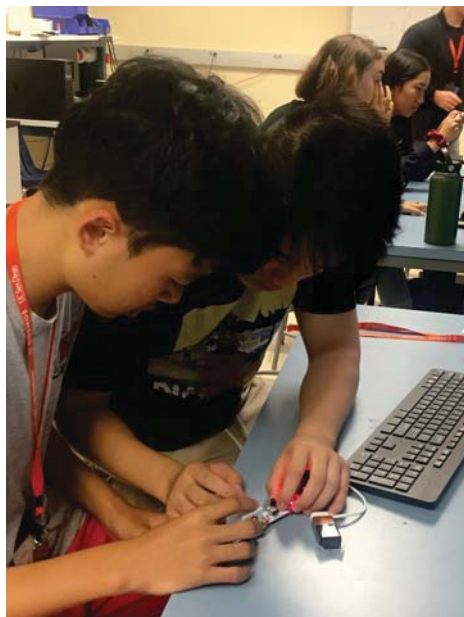


CLUSTER 9: MUSIC AND TECHNOLOGY

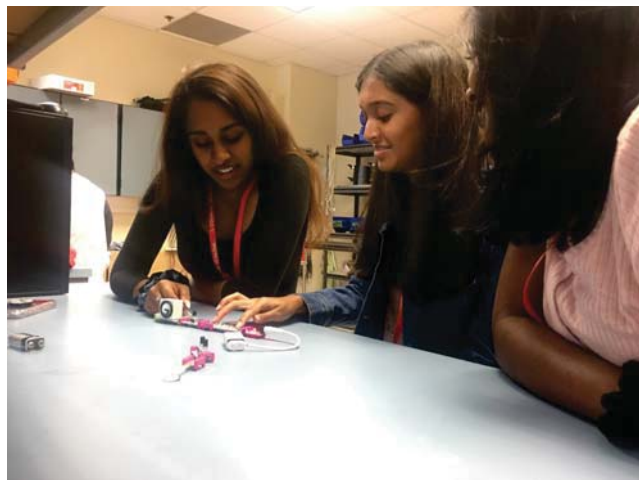
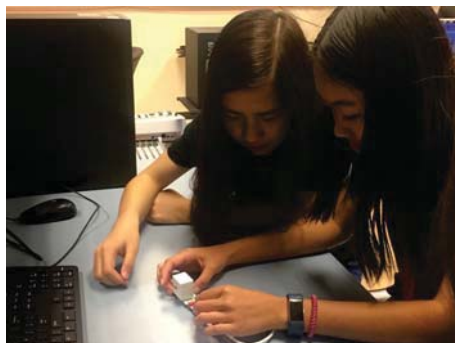


Although it's only the first week of COSMOS, we have already plunged straight into the curriculum for the Music and Technology cluster. After settling into our suites and meeting our roommates, we began learning about the technical aspects of music, starting with an introduction to sound waves using the concept of resonance. We were able to play around in the lab with a few circuits, using oscillators, filters, and delays to create our

own mini instruments. We became familiar with a few electronic platforms that help produce digital music, like Ableton and Impro Visor. Impro Visor uses machine learning technology to help generate certain possibilities for jazz music and music in general based on a few chords. Some interesting features include the ability to mimic a certain artist and generating sheet music while playing your instrument, making this a useful program to aid people in composing. Ableton was the other program we learned about. Ableton is a DAW (Digital Audio Workstation) which allows users to create midi tracks and combine them with synthesizers or samples and layer these tracks.

Outside of the curriculum, all of cluster 9 has been able to enjoy COSMOS. Cosmolympics is a competition between all the clusters, and each group has to create a skit or live performance. Since we are the Music and Technology cluster, we decided to create a medley of 3 songs using our instruments and singers. Working together for the Cosmolympics helped

our cluster bond together, and we all found common ground through our love for music. We are looking forward to what the next three weeks of COSMOS Cluster 9 will bring us.



CLUSTER 9: MUSIC AND TECHNOLOGY

Even though it is only Week 2, we have already been introduced to a plethora of audio tools and resources. For example, we learned the basics of Pure Data, an interactive coding environment with powerful audio capabilities. We used tables in Pure Data to display values in a MIDI-like format and play the corresponding pitches with oscillators. Another program we have been experimenting with is Audacity, a digital audio editor, which can be used to manipulate audio files in a variety of ways.

In addition to learning how to use these programs, we had the opportunity to explore some facilities inside the Conrad Prebys Music Center. Specifically, we visited the Experimental Theater, a room with cutting-edge sound technology that allows the audience to experience different audio effects through the use of recording devices and speakers placed throughout the room. We also visited the Conrad Prebys Concert Hall, which was designed to project sound

throughout the hall without the use of speakers.

Our professors also gave us the opportunity to record our COSMOlympics song in a recording studio. We then created our own samples that we will be able to use in our own productions. We're excited to integrate what we have learned into our projects over the next two weeks!

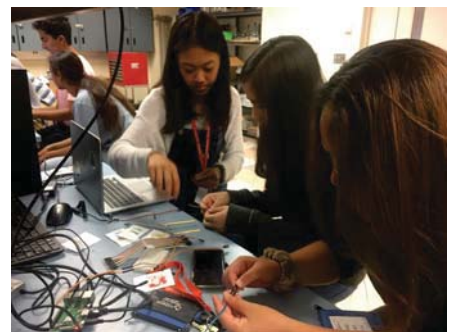
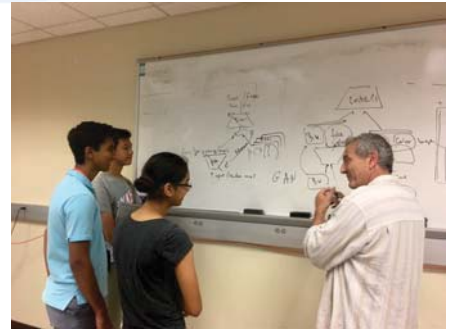


CLUSTER 9: MUSIC AND TECHNOLOGY

This week we had our first experience talking to Python. Thankfully, it was nothing like the snake scene in Harry Potter — our professors gave us a careful introduction to the language/world of Python (or parseltongue) so that we wouldn't get into serious syntax trouble. From writing programs to print out list of numbers and sums to flailing around with Librosa, Pretty-MIDI to play audio files and draw spectrograms, we realized Python's potential to transform the music industry especially with the Raspberry Pi. The Raspberry Pi (not edible) is a small computer that allows us to modify both software and hardware like running Python programs, *playing* Minecraft, and attaching wires. Using a breadboard (not edible), wires, and Python, we programmed a circuit to turn an LED light bulb on/off. Additionally, we got to play with Tensorflow's online playground, which visually modeled artificial intelligence and neural networks, revealing to us that computers can maybe compose the future.

Don't worry; we aren't turning into computer nerds — yet. Remember our trip to the recording studio? We finally received our self-recorded sound effects from the studio. Using Ableton, we attempted to use these effects to compose our own beats. While synthesizing sounds was interesting, Jacob, our TA, displayed his passion for creating unorthodox sounds by stretching real life sounds. We also became more open-minded and listened to airport/museum music. Listening to museum music was intriguing, but taking a tour of the Museum of Making Music was even more exciting. In this field trip, we were accompanied by John, the tour guide who led us around the museum explaining the brief history of music from the time the National Association of Making Music (NAMM) was created, starting from small military bands in the Civil War, to self-playing pianos, to electric guitars. We were able to learn about how famous artists like Benny Goodman influenced music (swing) in their era and play around with unusual instruments such as the theremin, the accordion, and the djembes (African drums).

The knowledge and experiences from this week are going to help us greatly in our final projects! We have already formed our groups and pitched our ideas to our professors — almost like SharkTank except the "I'm out" part. Overall, week 3 was action-packed, and we are all diligently working on our projects. We really hope that everyone will enjoy our presentations!



CLUSTER 9: MUSIC AND TECHNOLOGY

Introduction:

Over the course of these last two weeks, the students of Cluster 9 have formed their own trios for our final project. Learning from the COSMOS curriculum, they have developed the experience, knowledge, and maturity of true intellectuals, innovators, and creators, and this 2-week project is a perfect microcosm of their talent and potential in the STEM field. Our future scientists, engineers, and programmers have been working diligently from Monday morning to Friday evening, setting their intellectual ideas into motion with the end goal of making the world a better place.

Project 1: Visual Audio

Members: Alson Chan, Leo-Yang, Aniketh Prasad

Description:

Our project aims to help deaf people by taking in audio / midi input and comparing it to a midi file. With these comparisons, we can display the audio using objects and colors and can give feedback to the user, detecting wrong notes and other problems with playing. Furthermore, we plan to have a synesthesia type object that displays the current pitch and note that the user is playing in a piano-type interface.



Project 2: GANmidi

Members: Conan Lu, Elena Atluri, Satvik Nagpal

Description:

Our project aims to convert music into a given style using machine learning. We accomplished this using an algorithm known as a generative adversarial network (GAN). A GAN consists of a generator, which creates music based on an input, and a discriminator, which judges if the generated music is real or fake. We fed in pairs of pitch classes and piano rolls to train the algorithm in a given style. Then, the trained generator can be used to interpret other musical pieces into the style it was trained on.



Project 3: piLED

Members: Teresa He, Lia Seo, Sophia Yu

Description:

PILED is a program developed with Pure Data and Python that composes a melody and displays the beat by using LED lights. Through PD, the user will be able to provide a tempo for the program, which will correspond with the lights' actions. In addition, piLED will create the melodies by using markov chains: models that use probability to create sequences.



Project 4: Harmoni-US

Members: Twisha Sundararajan, Megan Wei, Maya Itty

Descriptions:

Our product recognizes chords from a voice or an instrument and generates real-time harmony to the melody presented based on the key. Using PD to detect the pitch, we transpose it a specific amount of semitones in order to create a minor and major chord based off a single pitch.



Project 5: Transform-A-Tune

Members: Natalie Brewer, Rupali Sarathy, Yuhang Chen

Description:

This application allows a user to input a melody of their choice and choose a conversion in order to create a brand new melody. Transform-A-Tune utilizes the process of reflections and mathematical algorithms in order for brand new melodies to be discovered. Some conversions include a negative harmony, a symmetric harmony, reversing the pitches of the melody, randomizing the pitches in the melody, and stretching the relationships between pitches of the melody.



Project 6: Mooderator

Members: Megan Peng, Carol Tu

Description:

The Mooderater will monitor and classify brain waves as either alpha or beta by measuring their frequencies. The user will select whether they would like to focus or relax, and in response, the Mooderater will play customized music that will enhance either alpha or beta waves, which will either improve concentration or reduce stress, based on the dominant wave. Alpha waves have a low frequency, with a range of 8 to 12 Hz, and they elevate levels of serenity; meanwhile, beta wave has a higher frequency ranging from 12 to 32 Hz and heightens attentiveness and problem solving abilities.



Project 7: Musiciser

Members: Tevin Wang, Austin Wang, Doyoon Kim

Description:

Are you an athlete? Do you listen to music while you exercise/workout? Musiciser is the perfect app for you! Musiciser is an app that allows you to not only listen to music while running but also helps you keep a consistent pace. First, you can upload the music of your choice onto the application. Next, you can set the intensity of your exercise from the range of light to vigorous -- we call this the ExerciseTempo. Lastly, you can start musicizing or exercising with the app, but know that if you are running behind your set desired pace, the music will slow down in real time corresponding to how far you are behind your pace and the pitch will also become distorted in real time. If you prefer not to listen to distorted pitches, there is also an option to preserve the pitch of the audio file no matter how slow it becomes in real time. This app is designed to motivate you to move at a constant speed by manipulating your hearing sense to send a warning of your unconscious laziness (if it happens) so you can fully enjoy the music that the wonderful musical stars of today have released. Start exercising at your tempo today!

