IR II Deliverables

Advik Rai

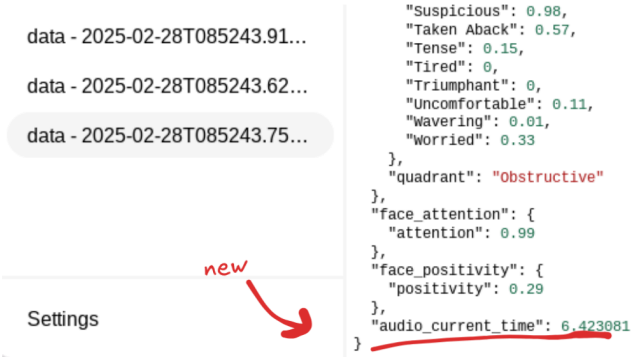
2/28/2025 Weekly Research Deliverable

Tasks:

- Critical component of web app working—timestamp of the currently playing music are added to each frame-by-frame file of emotional data

```
const MusicPlayerSlider = forwardRef((props, ref) => {
  const audioRef = React.useRef(new Audio(Vicissitudes))
  //making audioRef accessible from the parent
  useImperativeHandle(ref, () => ({
    getAudio: () => {
      return audioRef.current;
    }
  }));

  const [paused, setPaused] = React.useState(true);
  const [position, setPosition] = React.useState(0);
  const [volume, setVolume] = React.useState(0.5);

  const duration = Math.floor(audioRef.current?.duration || 0);

  React.useEffect(() => {
    const audio = audioRef.current;
    audio.volume = volume;

    const handleTimeUpdate = () => setPosition(Math.floor(audio.currentTime));
    audio.addEventListener('timeupdate', handleTimeUpdate);

    return () => {
      audio.removeEventListener('timeupdate', handleTimeUpdate);
    };
  }, [volume]);

  const togglePlayPause = () => {
    const audio = audioRef.current;
    if (paused) {
      audio.play();
    } else {
      audio.pause();
    }
    setPaused(!paused);
```

```
21  function App() {
34    const handleBarrierEvent = useCallback((event) => {
43      const currentTime = playerRef.current?.getAudio()?.currentTime || 0;
44      data.audio_current_time = currentTime;
45      const jsonData = JSON.stringify(data, null, 2);
46      const blob = new Blob([jsonData], { type: 'application/json' });
47      const url = URL.createObjectURL(blob);
48      const link = document.createElement('a');
49      link.href = url;
50      link.download = 'data.json';
51
52      if (!isRecording) {
53        link.click();
54      }
55    }, [isRecording]);
56
57
58    useEffect(() => {
59      videoEl.current = document.getElementById("videoEl");
60      let aiSdkLoaded = false
61
62      const loadAiSdk = async () => {
63        if (aiSdkState === "ready" && mphToolsState === "ready") {
64          if (!aiSdkLoaded) {
65            const { source, start } = await getAiSdkControls();
66            await source.useCamera({
67              toVideoElement: document.getElementById("videoEl"),
68            });
69            await start();
70            aiSdkLoaded = true;
71            if (playerRef.current?.getAudio()) {
72              playerRef.current.getAudio().addEventListener("play-status-changed", handlePlayStatusChange);
73              window.addEventListener(CY.modules().EVENT_BARRIER.eventName, handleBarrierEvent);
74            }
```



- Correspondence from Dr. Pantelyat and Dr. Kang on paper draft, advice on publication

Kyurim Kang Fri, Feb 14, 11:02 PM
to Alex, me

Dear Advik,

Apologies for the delay. I've left my comments in the Google Doc—GREAT JOB!

My main suggestions include adding citations for your statements and restructuring the Methods section to ensure all relevant information is organized under the appropriate headings. Once you've made those revisions, I'll review it again.

Please see more detailed comments in the doc.

Have you explored any potential journals for submission?

Best,

Kyu

Kyurim Kang, PhD., LPMT, MT-BC, NMT (She/her)

Advik Rai <advikmrai@gmail.com> Mon, Feb 17, 11:10 PM (11 days ago)
to Kyurim, Alex

Dear Dr. Kang and Dr. Pantelyat,

Thank you very much for your feedback. I will keep editing the draft.
I have compiled a list of possible journals here. Please add your suggestions as well.

Thank you,
Advik.

•••

One attachment • Scanned by Gmail

Kyurim Kang Mon, Feb 17, 11:23 PM (11 days ago)
to me, Alex

Dear Advik,

My pleasure -- let me know if you have any questions.
I will also take a look at the journal list you documented.

- List of journal spreadsheet: https://docs.google.com/spreadsheets/d/1AeR8A8SSF2-tWz-22LzQoS-aBWsDUyWsIStHAXhE7ZU/edit?usp=sharing
- Ongoing revision of paper according to given suggestions: rearrangement of methods section into new headings; new diagrams and images; rewrite of review of literature; supplementary

material section population
https://docs.google.com/document/d/1SrpaZlADLbSvlmbs2Ym0aPC9DZt2gY4VIk_2Y5gv_3c/edit?tab=t.0

Upcoming Milestones:

- Submitting to ArXiv: Early march

Reflection:

I managed to figure out the problem of having the codebase be able to 'communicate' with the embedded frontend mp3 music player, in order to have the timestamp *of the music at the time of data collection* written in the output files. This greatly contributed towards my goal of matching musical components to changes in emotion.

Dr. Kang had a chance to look at my paper and leave me suggestions and edits, including rearranging the Methods section into the standard for journals in this field, which has been a priority.

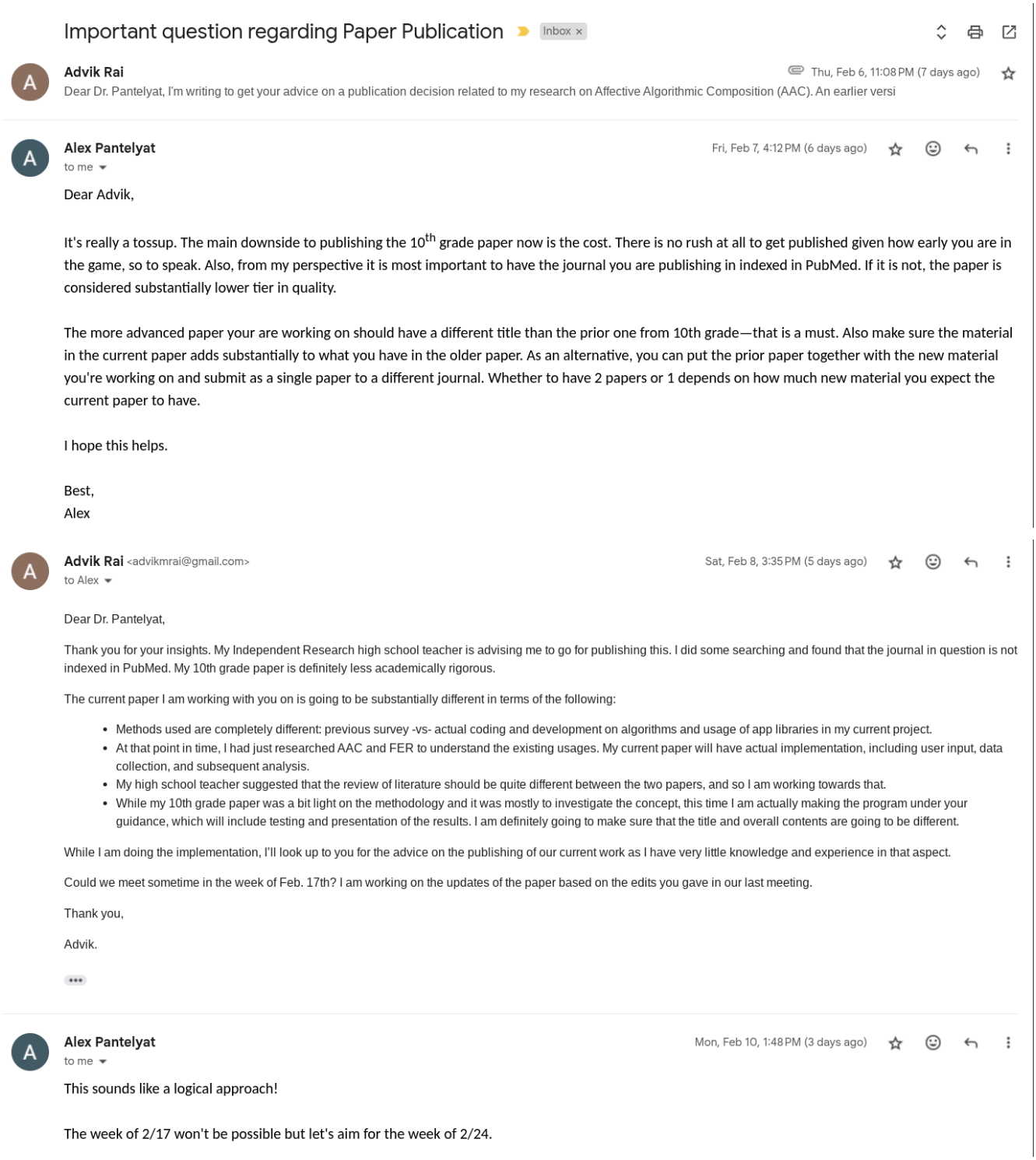
I am looking forward to meeting Dr. Pantelyat and Dr. Kang at 10:00 am on Wednesday, and am thinking about how I will eventually introduce the prospect of the I/M program and its details to him.

I did well using my in-class work time. I am considering using this project as my entry into the regional Science Fair feeding into ISEF on March 15, 2025. My goals for this week are to make considerable strides with the musical component aspect of my application, to keep amending to my paper draft, to continue preparation for SLC, and to get ready for the Science Fair too.

2/13/2025 Weekly Research Deliverable

Tasks:

- Revised and edited paper according to Dr. Pantelyat and Dr. Kang's advice and suggestions https://docs.google.com/document/d/1SrpaZlADLbSvlmbs2Ym0aPC9DZt2gY4VIk_2Y5gv_3c/edit?tab=t.0
- Correspondence from Dr. Pantelyat and Dr. Kang on paper draft, advice on publication



Important question regarding Paper Publication Inbox ×

Advik Rai Thu, Feb 6, 11:08 PM (7 days ago)
Dear Dr. Pantelyat, I'm writing to get your advice on a publication decision related to my research on Affective Algorithmic Composition (AAC). An earlier versi

Alex Pantelyat Fri, Feb 7, 4:12 PM (6 days ago)
to me

Dear Advik,

It's really a tossup. The main downside to publishing the 10th grade paper now is the cost. There is no rush at all to get published given how early you are in the game, so to speak. Also, from my perspective it is most important to have the journal you are publishing in indexed in PubMed. If it is not, the paper is considered substantially lower tier in quality.

The more advanced paper your are working on should have a different title than the prior one from 10th grade—that is a must. Also make sure the material in the current paper adds substantially to what you have in the older paper. As an alternative, you can put the prior paper together with the new material you're working on and submit as a single paper to a different journal. Whether to have 2 papers or 1 depends on how much new material you expect the current paper to have.

I hope this helps.

Best,
Alex

Advik Rai <advikmrai@gmail.com> Sat, Feb 8, 3:35 PM (5 days ago)
to Alex

Dear Dr. Pantelyat,

Thank you for your insights. My Independent Research high school teacher is advising me to go for publishing this. I did some searching and found that the journal in question is not indexed in PubMed. My 10th grade paper is definitely less academically rigorous.

The current paper I am working with you on is going to be substantially different in terms of the following:

- Methods used are completely different: previous survey -vs- actual coding and development on algorithms and usage of app libraries in my current project.
- At that point in time, I had just researched AAC and FER to understand the existing usages. My current paper will have actual implementation, including user input, data collection, and subsequent analysis.
- My high school teacher suggested that the review of literature should be quite different between the two papers, and so I am working towards that.
- While my 10th grade paper was a bit light on the methodology and it was mostly to investigate the concept, this time I am actually making the program under your guidance, which will include testing and presentation of the results. I am definitely going to make sure that the title and overall contents are going to be different.

While I am doing the implementation, I'll look up to you for the advice on the publishing of our current work as I have very little knowledge and experience in that aspect.

Could we meet sometime in the week of Feb. 17th? I am working on the updates of the paper based on the edits you gave in our last meeting.

Thank you,

Advik.

Alex Pantelyat Mon, Feb 10, 1:48 PM (3 days ago)
to me

This sounds like a logical approach!

The week of 2/17 won't be possible but let's aim for the week of 2/24.

- Created instructions for using my Google IDX prototype: https://paagalpan.notion.site/Instructions-for-using-the-idx-google-com-prototype-18bc478bf14380bf8863ee015d6f5bf1?pvs=4

Upcoming Milestones:

Submit preprint to ArXiv: Late February

Reflection: There was a lot of correspondence between Dr. Pantelyat and me this month, especially because it has been conference and publication-accepting season according to him. Dr. Pantelyat left an overwhelming 114 edits on my draft—many of them being minor wording changes—where he located points in the paper to expound upon. He recommended based on a pattern he has been seeing in recent journal publications that I add a supplementary materials section (which is a little bit different from the appendix) and links to shared folders of the data files and sets that I use. In order for other people to use the application in its working state, I wrote instructions in a lightweight webpage on how to use it

I did well using my in-class work time. My goals for this week are now to begin preparation for the SLC conference, and revise my review of literature even more with details and slight rearrangement, distinguishing it even more from the JSR-accepted draft. I am also working on the prototype itself and would like to make it usable without precautions necessary, among other things.

1/10/2025 Weekly Research Deliverable

Tasks:

- Drafted methods paper manuscript Advik Rai 2025 Paper

- Obtained frame-by-frame emotion analysis data in files

  Figure: Code in the app backend that writes and saves facial expression-emotion data to a series of json files

```
    // Add event listener to capture and save data
    window.addEventListener(CY.modules().EVENT_BARRIER.eventName, (event) => {
      const data = event.detail;

      // Exclude the "data" field from the "faces" array within the "face_detector" object
      if (data.face_detector && data.face_detector.faces) {
        data.face_detector.faces.forEach(face => {
          delete face.data;
        });
      }

      // Save data to data.json
      const jsonData = JSON.stringify(data, null, 2);
      const blob = new Blob([jsonData], { type: 'application/json' });
      const url = URL.createObjectURL(blob);
      const link = document.createElement('a');
      link.href = url;
      link.download = 'data.json';
      link.click();
    });
  }
```

Figure: The components of each json file such as .


```
{
  "camera": {
    "frameTimestamp": 1735875860398
  },
  "face_detector": {
    "totalFaces": 1,
    "rects": [
      {
        "y": 53.51083679199219,
        "x": 100.56505279541015,
        "width": 120.04585876464843,
        "height": 152.7856384277344,
        "confidence": 6.008162975311279
      }
    ],
    "faces": [
      {}
    ],
    "status": "INIT",
    "fullFrameDetection": true
  },
  "face_age": {
    "numericAge": 26,
    "age": {
      "_-18": 0,
      "18-35": 1,
      "35-51": 0,
      "51-_": 0
    }
  },
  "face_emotion": {
    "dominantEmotion": "Happy",
    "emotion": {
      "Angry": 0.22,
      "Disgust": 0.06,
      "Fear": 0.01,
      "Happy": 0.59,
      "Neutral": 0.08,
      "Sad": 0.03,
      "Surprise": 0.01
    }
  },
```

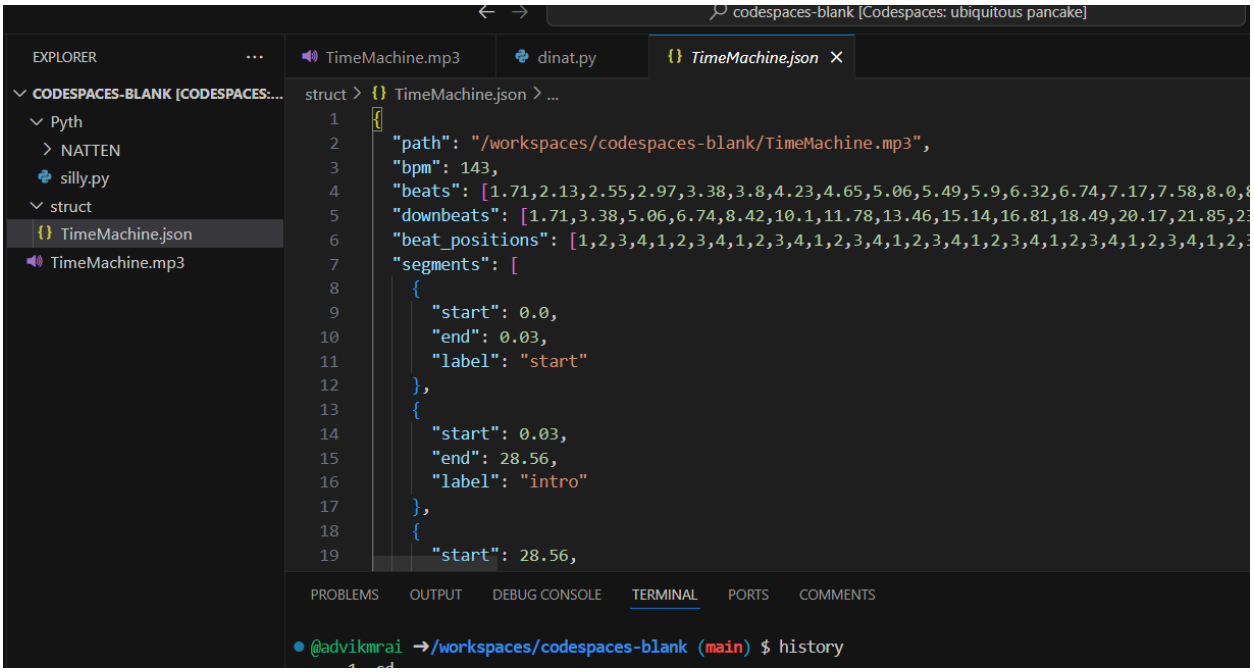
```
  "face_gender": {
    "gender": {
      "Female": 0.05,
      "Male": 0.95
    },
    "mostConfident": "Male"
  },
  "face_features": {
    "features": {
      "Arched Eyebrows": 0.09,
      "Attractive": 0.17,
      "Bald": 0.01,
      "Beard 5 O'Clock Shadow": 0.14,
      "Black Hair": 0.51,
      "Blond Hair": 0.01,
      "Brown Hair": 0.06,
      "Earrings": 0.06,
      "Eyebrows Bushy": 0.2,
      "Eyeglasses": 0.61,
      "Goatee": 0.09,
      "Gray Hair": 0,
      "Hat": 0.08,
      "High Cheekbones": 0.49,
      "Lipstick": 0.03,
      "Mustache": 0.11,
      "Narrow Eyes": 0.14,
      "Necklace": 0.04,
      "Necktie": 0.04,
      "Oval Face": 0.23,
      "Pale Skin": 0.19,
      "Rosy Cheeks": 0,
      "Sideburns": 0.07,
      "Straight Hair": 0.23,
      "Wavy Hair": 0.08
    }
  },
  "face_pose": {
    "pose": {
      "pitch": -0.02,
      "yaw": -0.02,
      "roll": 0.04
    }
  },
```

```
  "face_arousal_valence": {
    "arousal": -0.19,
    "valence": 0.3,
    "affects38": {
      "Afraid": 0,
      "Amused": 0.58,
      "Angry": 0,
      "Annoyed": 0,
      "Anxious": 0,
      "Apathetic": 0.49,
      "Astonished": 0,
      "Bored": 0.02,
      "Calm": 0.17,
      "Conceited": 0.03,
      "Contemplative": 0.52,
      "Content": 0.2,
      "Convinced": 0.21,
      "Delighted": 0.05,
      "Depressed": 0,
      "Determined": 0.21,
      "Disappointed": 0,
      "Discontented": 0,
      "Distressed": 0,
      "Embarrassed": 0.09,
      "Enraged": 0.01,
      "Excited": 0.01,
      "Feel Well": 0.23,
      "Frustrated": 0,
      "Happy": 0.12,
      "Hopeful": 0.84,
      "Impressed": 0.97,
      "Melancholic": 0.32,
      "Peaceful": 0.19,
      "Pensive": 0.55,
      "Pleased": 0.29,
      "Relaxed": 0.23,
      "Sad": 0,
      "Satisfied": 0.2,
      "Sleepy": 0.03,
      "Tired": 0.03,
      "Uncomfortable": 0.01,
      "Worried": 0.72
    },
```

```
"affects98": {
  "Adventurous": 0,
  "Afraid": 0,
  "Alarmed": 0,
  "Ambitious": 0.03,
  "Amorous": 0.37,
  "Amused": 0.58,
  "Angry": 0,
  "Annoyed": 0,
  "Anxious": 0,
  "Apathetic": 0.49,
  "Aroused": 0,
  "Ashamed": 0.05,
  "Astonished": 0,
  "At Ease": 0.23,
  "Attentive": 0.86,
  "Bellicose": 0,
  "Bitter": 0,
  "Bored": 0.02,
  "Calm": 0.17,
  "Compassionate": 0.09,
  "Conceited": 0.03,
  "Confident": 0.95,
  "Conscientious": 0.28,
  "Contemplative": 0.52,
  "Contemptuous": 0,
  "Content": 0.2,
  "Convinced": 0.21,
  "Courageous": 0.01,
  "Defient": 0,
  "Dejected": 0,
  "Delighted": 0.05,
  "Depressed": 0,
  "Desperate": 0,
  "Despondent": 0.02,
  "Determined": 0.21,
  "Disappointed": 0,
  "Discontented": 0,
  "Disgusted": 0,
  "Dissatisfied": 0.02,
  "Distressed": 0,
  "Distrustful": 0.04,
  "Doubtful": 0.01,
  "Droopy": 0.01,
  "Embarrassed": 0.09,
  "Enraged": 0.01,
  "Enthusiastic": 0.37,
  "Envious": 0,
  "Excited": 0.01,
  "Expectant": 0.92,
  "Feel Guilt": 0.08,
  "Feel Well": 0.23,
  "Feeling Superior": 0.07,
  "Friendly": 0.25,
  "Frustrated": 0,
  "Glad": 0.18,
  "Gloomy": 0,
  "Happy": 0.12,
  "Hateful": 0,
  "Hesitant": 0.04,
  "Hopeful": 0.84,
  "Hostile": 0,
  "Impatient": 0.29,
  "Impressed": 0.97,
  "Indignant": 0.03,
  "Insulted": 0,
  "Interested": 0.7,
  "Jealous": 0.03,
  "Joyous": 0.09,
  "Languid": 0.25,
  "Light Hearted": 0.5,
  "Loathing": 0,
  "Longing": 0.92,
  "Lusting": 0,
  "Melancholic": 0.32,
  "Miserable": 0,
  "Passionate": 0.85,
  "Peaceful": 0.19,
  "Pensive": 0.55,
  "Pleased": 0.29,
  "Polite": 0.57,
  "Relaxed": 0.23,
  "Reverent": 0.06,
  "Sad": 0,
  "Satisfied": 0.2,
  "Selfconfident": 0.01,
  "Serene": 0.23,
  "Serious": 0.57,
  "Sleepy": 0.03,
  "Solemn": 0.32,
  "Startled": 0,
  "Suspicious": 0.06,
  "Taken Aback": 0.11,
  "Tense": 0,
  "Tired": 0.03,
  "Triumphant": 0,
  "Uncomfortable": 0.01,
  "Wavering": 0.01,
  "Worried": 0.72
 },
 "quadrant": "Conductive"
},
"face_attention": {
 "attention": 0.93
},
"face_positivity": {
 "positivity": 0.66
}
}
```


- Obtained musical analyses from PyTorch analyzer

Figure: PyTorch automated second-by-second musical analysis of particular mp3, with beats and downbeats charted, song sections (intro, instrumental, chorus, etc.) mapped out



Upcoming milestones:

- Capability to record the exact second currently being played in the MP3 file by the website's music player – 1/13
- Methods paper finished – 1/15

Reflection:

One highlight of my work recently has been obtaining frame-by-frame emotional data in the form of usable .json files. Each of these files includes timestamps in Unix epoch form (the number of milliseconds elapsed since 00:00:00 Jan 1, 1970) as well as detailed data on facial expression analysis, like the dominant emotion and the numeric values for emotions such as anger and disgust. The files have information on gender, age, and physical features, and crucially offer the capability to directly track arousal, valence, and attention levels over time.

An issue I dealt with is the following: Every frame of the facial expression analyzer outputted a data file that was 3 megabytes large, and with over 10 frames a second, the system could get very overwhelmed with hundreds of sizeable files appearing very quickly. The bulk of data was found to be from bitmaps of hundreds of thousands of pixels that were automatically saved with each json file. I addressed this promptly by retaining only the relevant portions, and the file sizes were drastically reduced from 3 MB to only 5 KB each, an improvement of 600x!

I got the PyTorch music analyzer working and it has outputted results for a variety of music files. This is a major step forward in my project, as it allows me to quantifiably analyze the relationship between facial expressions and music.

I have also been working on drafting the methods paper that will incorporate all of this work. I plan to run it by Dr. Pantelyat and his team as they asked me to, and have it published first on arXiv or bioRxiv.

My goals for this week are:

- To synchronize the audio data from music with facial expression data at corresponding timestamps.
- To incorporate more musical components (timbre, chords, melodies) of select songs to refine the system's analysis capabilities.

12/13/2024

Tasks:

- Manuscript submission to Journal of Student Research (https://www.jsr.org), manuscript
- Met with Dr. Pantelyat on 11/19/2024 Transcript
- Hard-coding of musical components is in progress:
    - Download and set-up of PyTorch analyzer used in https://doi.org/10.1109/WASPAA58266.2023.10248148
    - Troubleshooting missing packages, outdated code
    - Two approaches: Usage of pure piano pieces vs. modern songs with multiple tracks, instruments, etc.
- Fixed and expanded mp3 player https://idx.google.com/algoarias-react-8635296

- Arranged for recommendation from Dr. Pantelyat for RSI Summer program
  Pantelyat_Rai_RSI_Letterofsupport_12_9_24.pdf
- Revisions and rehearsals for IR Classroom Presentations this week Slides

Upcoming Milestones:

- Draft methods paper – 12/20/2024

Reflection:

One highlight was submitting the manuscript to the Journal of Student Research, which was a great step forward in sharing my work with wider audiences. Meeting with Dr. Pantelyat on November 19th was invaluable – he suggested some of the avenues the Center uses to publish methods-papers like mine (arXiv and bioRxiv, among others) and offered to look over my finished manuscript in the near future.

I actively pursued the hard-coding of musical components for the project. This involved setting up a PyTorch analyzer based on the methodologies described in the research paper. Crucially, troubleshooting was required and is still ongoing.

Moving forward, I'm excited to continue exploring the two approaches – using pure piano pieces for ease of computation and simplicity vs. jumping into modern songs with their multiple tracks and instrumentations. Analyzing the pros and cons of each approach by trying each out will dictate the direction of the research moving forward. Finally, securing Dr. Pantelyat's recommendation for the RSI Summer program is a big win that motivates me to improve my dedication and focus even more.

I did well using the in-class work time to the fullest extent these past few weeks, but would like to spend a bit more time in the next few days rehearsing my presentations to be given soon.

11/15/2024

Tasks:

- Scheduled meeting with Dr. Pantelyat on 11/19

Advik Rai <advikmrai@gmail.com>
to Alex, Kyurim

Sun, Nov 3, 9:32 AM

Dear Dr. Pantelyat and Dr. Kang,

I wanted to follow up on our meeting on 10/21. I'm excited to continue working on the project and implementing the feedback you provided:
- Having a gradient display of the average emotion and mood changes throughout the duration of a session
- Having EMA in the form of questionnaires for the user displayed periodically throughout a session

I'm available to meet on Mondays, Tuesday, any time after 3:30 pm. Will you be free on November 18 or 19 after 3:30 pm? I hope to make progress and be able to provide updates by that time.

I'm interested in exploring potential publication venues for my research. Could you please provide guidance on suitable journals or conferences for my work?

Best regards,
Advik.

Alex Pantelyat
to me, Kyurim

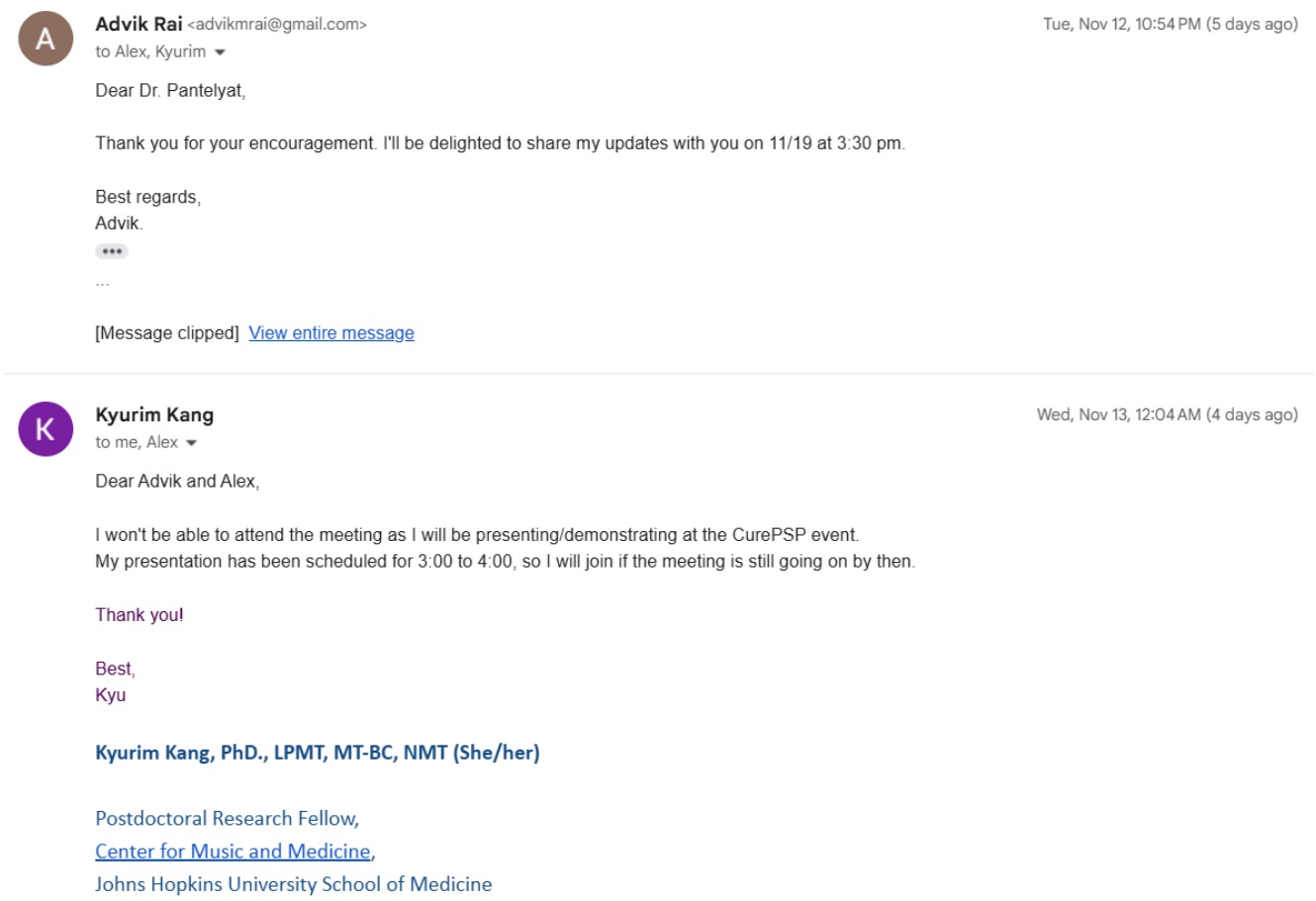
Mon, Nov 11, 9:19 PM (6 days ago)

Dear Advik,

I need to think more about a target journal for this work. I can meet on 11/19 at 3:30 or 4pm.

Best,
Alex

Alexander Pantelyat, M.D., FAAN *Music as Medicine. Medicine for Musicians.*
Associate Professor of Neurology
Johns Hopkins University School of Medicine



Advik Rai <advikmrai@gmail.com> Tue, Nov 12, 10:54 PM (5 days ago)
to Alex, Kyurim

Dear Dr. Pantelyat,

Thank you for your encouragement. I'll be delighted to share my updates with you on 11/19 at 3:30 pm.

Best regards,
Advik.

[Message clipped] View entire message

Kyurim Kang Wed, Nov 13, 12:04 AM (4 days ago)
to me, Alex

Dear Advik and Alex,

I won't be able to attend the meeting as I will be presenting/demonstrating at the CurePSP event.
My presentation has been scheduled for 3:00 to 4:00, so I will join if the meeting is still going on by then.

Thank you!

Best,
Kyu

Kyurim Kang, PhD., LPMT, MT-BC, NMT (She/her)

Postdoctoral Research Fellow,
Center for Music and Medicine,
Johns Hopkins University School of Medicine

- Ported facial recognition / music player website to Project IDX
    - Pro: I can edit it from any device, not just my laptop
    - https://idx.google.com/algoarias-react-8635296

Upcoming milestones:

- Hard-coding musical components of select songs to refine the system's analysis capabilities

    Plan to hard-code the musical components (tempo, melody, instrumentation) of a few select songs to refine the system's analysis capabilities

Reflection:

The primary obstacle this week was finding software capable of accurately quantifying musical components in songs. Exploring 3rd party apps like moises.ai and “mapping tonal harmony pro,” and even the bespoke video game music tool “pocketbard.app” that Mr. McCready suggested I look into for my research. Plan to hard-code the components of a few songs I know well and using those to train the system. If the emotion changes in a person can be tracked over time and matched to musical components of just one song successfully, this will readily set the stage for using any chosen musical sample, so I can hone in on this limited scope of getting just one music piece fully mapped out.

Goals for next week:

- Meeting with Dr. Pantelyat (11/19): Discuss the hard-coding approach, seek feedback on refining the system for accurate analysis, and explore even more potential next steps, particularly regarding journal publication of the work that I have up to this point.
- Continue investigating software solutions for automated music component analysis. The prompt-based approach of the Google AAC machine is not as well-suited, but
- If the hard-coding approach proves successful, begin collecting data on facial expressions and corresponding emotional responses while playing the hard-coded songs.

I did not see this assignment until Sunday night (even though I was looking at my Canvas calendar continually throughout the week), and I understand the importance of adhering to deadlines. I take full responsibility for missing this previous submission and will keep striving to improve my calendar oversight.

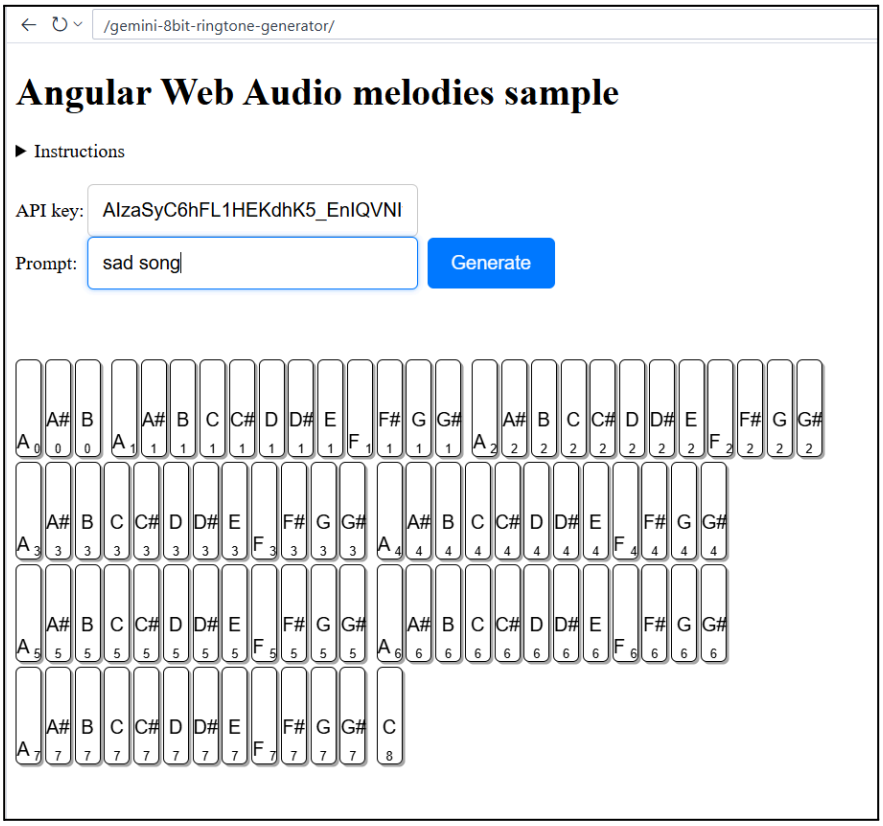
11/01/2024

Tasks:

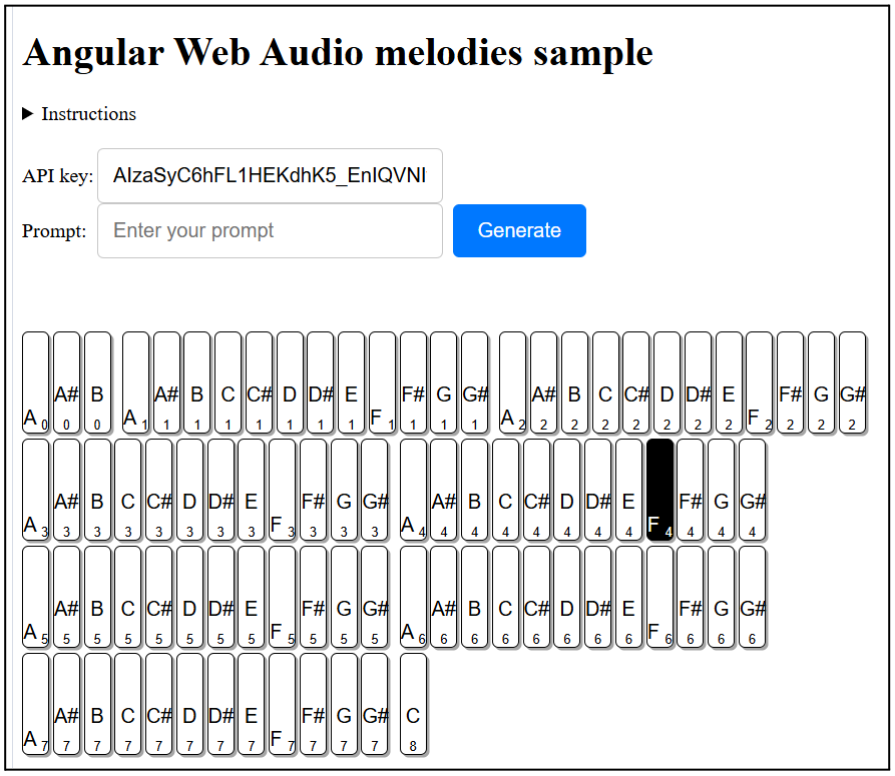
- Met with Dr. Pantelyat and Dr. Kang on 10/21.
    - The link to the slides I had prepared for JHU: https://docs.google.com/presentation/d/1MYuthaBx0G94i15ltGk3nMUB0bz_PBNgNsR1q8ZpYCo/edit?usp=sharing
    - Transcript link: 10-21 in-school meeting.docx

- I got the Google AI Studio 'Affective Algorithmic Composition' software of 8-bit melody working.
    - Software used: AngularJS
    - Package: Google AI Studio
    - Link: https://idx.google.com/angular-webaudio-melodies-sample-8443307 with API key AIzaSyC6hFL1HEKdhK5_EnIQVNIf3eXrkkpU8Mg (google Idx workspace sharing is an experimental feature)

- Prompt entered: *“sad song”*



- Result: Melody is being generated.



Upcoming milestones:

- Begin data generation and collection (11/05/2024)

Reflection:

In their idx.dev website, Google has a demo library using their AI Studio that can be used to generate simple melodies given a text prompt, like “sad song.” One obstacle was finding it in the first place and successfully testing it out as Google has made this software quite obscure to find. I got it working with the API key I generated and am looking to incorporate this type of algorithmic composition into my own website. It’s very rudimentary, but of all the methods detailed in all the papers about Affective Algorithmic Composition, this is the first one I’ve had success generating firsthand with.

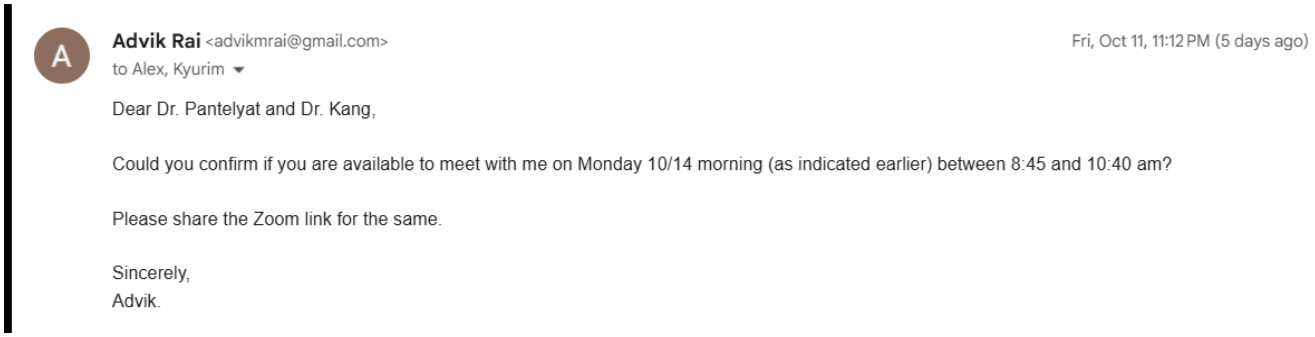
I talked to the doctors about this and showed them how they could run it on their end. We brainstormed potential next steps for the project, including hardcoding musical features and exploring alternative time frames for emotional data analysis. They were interested in having a gradient graphical view as opposed to an x-versus-y-across-time graph because having second-by-second data visualizations is surprisingly rare and less useful in the work they’ve done with patients. That is something to incorporate in the future, though I want to focus on the technological capability of the data collection first before focusing on how to display the data.

I want to focus more on my research outside of class time, this week I have the AMC nat’l math competition that I have been preparing for. My goal next week is to work on data collection capability from pairing the AAC and the music player-facial recognition web app together, as I got them functioning independently.

10/17/2024

Tasks:

- Drafted a compelling presentation for the Center for Music and Medicine (CMM) directors, with research progress, key findings
- Maintained consistent communication with JHU researchers via email to schedule a mutually agreeable meeting time



Advik Rai <advikmrai@gmail.com> Fri, Oct 11, 11:12 PM (5 days ago)
to Alex, Kyurim

Dear Dr. Pantelyat and Dr. Kang,

Could you confirm if you are available to meet with me on Monday 10/14 morning (as indicated earlier) between 8:45 and 10:40 am?

Please share the Zoom link for the same.

Sincerely,
Advik.

Alex Pantelyat
to me, Kyurim

Mon, Oct 14, 8:57 AM (2 days ago)

Dear Advik,

Sorry for the delayed reply! I can meet between 11-12 or 1-2pm today. If that does not work, please let us know other days and times you can meet.

Best,
Alex

Advik Rai <advikmrai@gmail.com>
to Alex, Kyurim

Oct 14, 2024, 3:38 PM (2 days ago)

Dear Dr. Pantelyat and Dr. Kang,

My teachers were not ready to let me excuse myself from class today - I had a History exam in the 11 am-12 pm block and a Physics lab between 1-2 pm.

I am available between 8:50 am and 9:40 am every day, and I can ask my 3rd period teacher to excuse me to extend that time block up to 10:40 am.

Please let me know if you could be available in that time block any day of the week.

Thanks,
Advik.

Alex Pantelyat
to me, Kyurim

Dear Advik,

I can meet at 9am this Wednesday 10/16.
Best,
Alex

Kyurim Kang
to Alex, me

I am also available at that time.
I will send you a calendar invite with a zoom link shortly.

Thank you!

Best,
Kyu

Kyurim Kang, PhD., LPMT, MT-BC, NMT (She/her)

Advik Rai <advikmrai@gmail.com>
to Kyurim, Alex

Oct 15, 2024, 8:04 PM (1 day ago)

Dear Dr. Pantelyat and Dr. Kang,

I have to give the PSAT exam at River Hill High School during this time, so I won't be able to attend our meeting tomorrow, unfortunately. I came to know that it was mandatory only today.

If you're not free Thursday or Friday between 8:45 and 10:00 am, is there a date next week that works for you?

Thanks,
Advik.

Alex Pantelyat
to me, Kyurim

Dear Advik,

Best of luck with the PSATs!!! I can do Monday 10/21 at 9am.
Best,
Alex

- Developed a separate slideshow summarizing research progress for the due on October 21st
- Explored further usage of the the React Material UI library in my website with its documentation, conducted extensive testing and trial-error experimentation in the vscode editor

Upcoming milestones:

- The meeting with Dr. Kang and Dr. Pantelyat is being rescheduled to tentatively next Monday, October 21st. Update: It is.

Reflection:

This week was focused on finalizing preparations for the upcoming meeting with the CMM directors and ensuring key website functionality is working like mp3 playback - this actually doesn't work since I moved to react, it only displays a player now instead of actually playing the music and I am working on fixing that critical point. The scheduling a meeting time with the busy researchers proved to be a challenge, but it took some persistence and we have a date set now.

Looking ahead, I'm eager to meet with the CMM directors to discuss my research progress, receive feedback, explore potential collaborations, etc. They were recently presenting their work at the Berlin conference for the international Association of Music and Medicine and they may have insights from there to share with me, among other things.

In addition to that presentation, I'm developing the separate slideshow summarizing my research progress this month for class. This is good for refining my communication ability and ensuring that my research findings can be presented clearly and concisely. I have been working on that slideshow in class but haven't finalized it to the degree I'd like to have it at right now – I want to accelerate my in-class workrate even more in the future.

10/04/2024

Tasks:

- Found methods to analyze musical samples both qualitatively and quantitatively from a previous Hopkins paper

Acoustic feature extraction and processing

This section focuses on the computational analyses performed on the audio stimulus. We chose acoustic features that broadly capture the timbral, tonal and rhythmic aspects of the stimulus (see Appendix A). The feature set, comprising twenty-five features, can be generally classified into two categories based on the duration of the analysis-window used during the extraction process, that is, short-term features and long-term features. The short-term features, which encapsulate timbral properties of the stimulus, were obtained by employing short-time analysis using a 25 ms window, which is in the order of the commonly used standard window length in the field of Music Information Retrieval (MIR) (Tzanetakis and Cook, 2002). These

Table 2
Pearson's r correlation coefficients between perceptual ratings and respective PC scores.

Perceptual scale	*r*
Fullness	.80***
Brightness	.55**
Timbral complexity	.53**
Rhythmic complexity	.28
Key clarity	.53**
Pulse clarity	.51**
Event synchronicity	.30
Activity	.77***
Dissonance	.30

* $p<.05$. ** $p<.01$. *** $p<.001$.

Snippet from a paper in the sources of a previous Hopkins study that details the methods of audio feature extraction in a musical context.

- Further researched audio processing in the Spotify developers studio and found a relevant API feature that extracts data from any music available on the platform

This code works for any song that is on Spotify, outputting values for the preset audio features that Spotify itself uses to recommend songs tailored best to each of its individual users

- Reviewed new source for literature review recommended by Hopkins team:

to Alex, Kyrana, Kerry, bela_turk@hotmail.com, Nabila, Kevin, aki20109@gmail.com, lee.paul0110@gmail.cc

Dear all,

I hope you are doing well.
During our monthly journal club, I would like to discuss the following paper, "Effect of musical cues on gait in individuals with Parkinson disease with comorbid dementia."
https://www.sciencedirect.com/science/article/pii/S0966636223014704?casa_token=wneRose3yVQAAAAA:S9AcK50ZlYt39FqR8ASMgwyImkX1ol2GCbpbUF1dX17q8vjT43F3qaBPvHgNb60zUiysx-vvRg

We will meet on October 2nd at 12pm: https://JHUBlueJays.zoom.us/j/93925552336
I hope to see many of you.

Have a great weekend!

Best,
Kyu

Assessment of Gait, Balance, and Falls in Individuals with Neurodegenerative Diseases (wustl.edu)

Upcoming milestones:

- Synchronize the audio data from music with facial expression data at those timestamps: 10/8
- Conference with JHU CMM members: 10/14

Reflection:

This week, I felt fairly productive in identifying valuable resources from previous Hopkins research that I hadn't been introduced to earlier. The journal articles that Dr. Kang kindly sends relate highly to my project and keep strengthening my understanding with the latest up-to-date research, in contrast to some of the decades-old papers my previous literature review is built on.

Some obstacles arose when attempting to analyze music myself: the Hopkins study provided methods, but I could not directly implement them as of now. Fortunately, my research into Spotify's developer studio revealed a relevant API feature for extracting audio data from the platform. It greatly simplifies audio signal analysis by giving readily available data points that Spotify itself uses for personalizing recommendations, and I'm working on incorporating this tool into the backend of my tool.

Looking ahead to next week, I would like to spend more time on the functionality of the website, particularly on synchronizing the extracted audio data with facial expression data at corresponding

timestamps (target date: October 8th). This will be a crucial step in establishing the correlation between specific musical elements and the evoked responses.

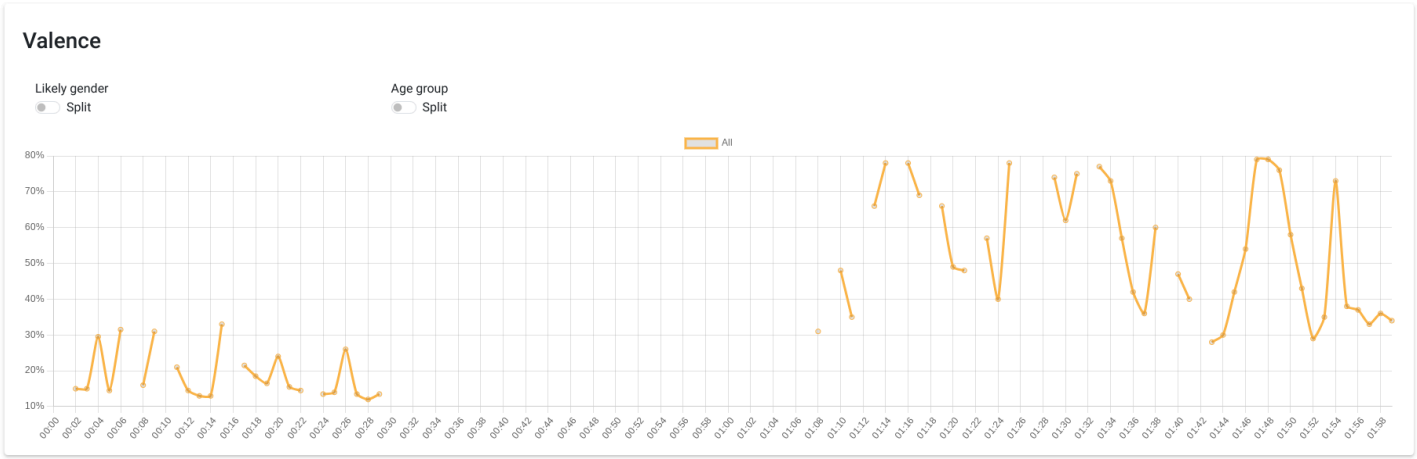
I also want to prepare for the video conference where I present the progress of my project in the morning of October 14th. I think I can ask my 3rd period teacher Mr. McCready to enable me to stay on the call in the morning of school in the case that the call spills over the period demarcation – previous sessions with the CMM have been upwards of one hour, and this one may be the longest one yet as I may have to take and answer more questions in-call.

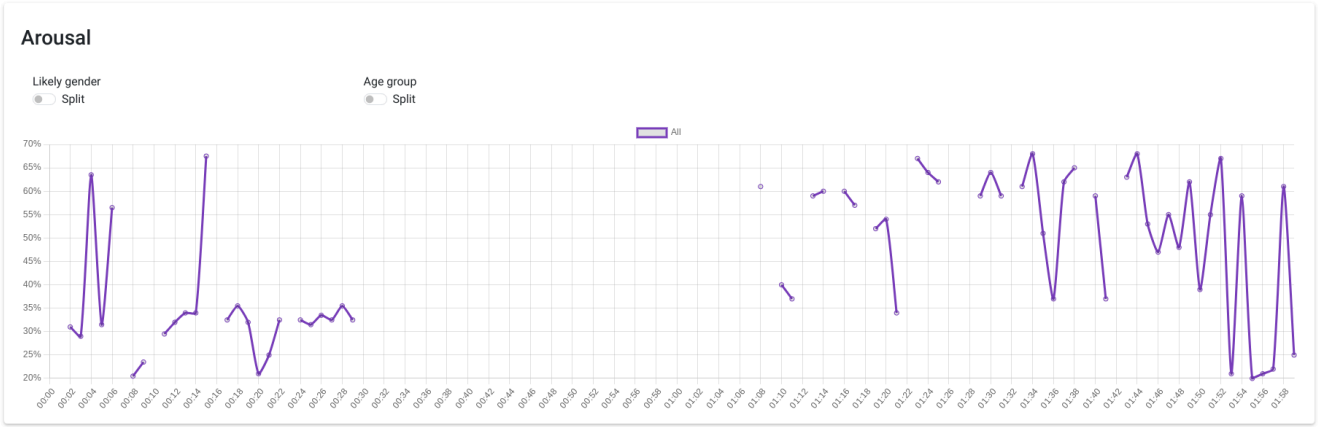
9/27/2024

Tasks:

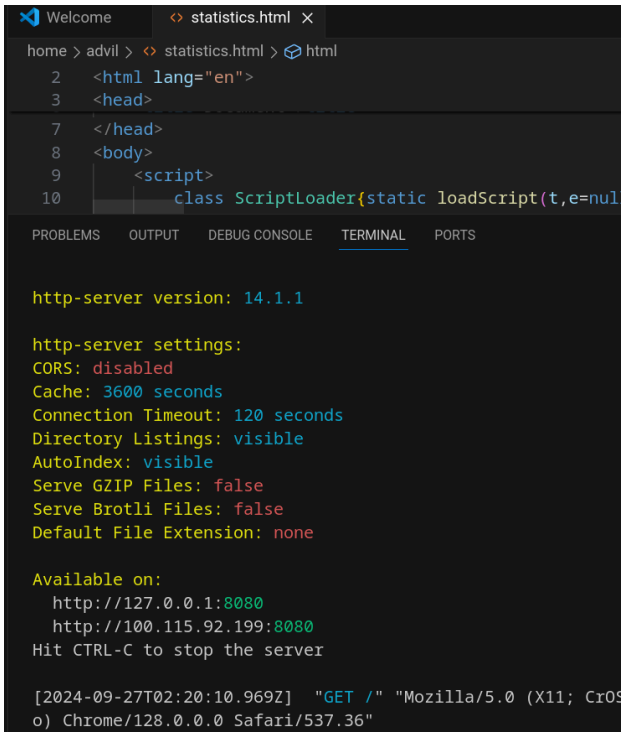
- Working on the real-time data tracking system within the web app to continuously monitor and visualize emotional affectance data that is captured frame by frame. This should operate seamlessly in the background to ensure a smooth user experience without visible interruptions.

- These graphs show my attention, valence, arousal levels during a test session. The long pause is when I close the tab, trying to figure out how to minimize the other intermittent gaps.





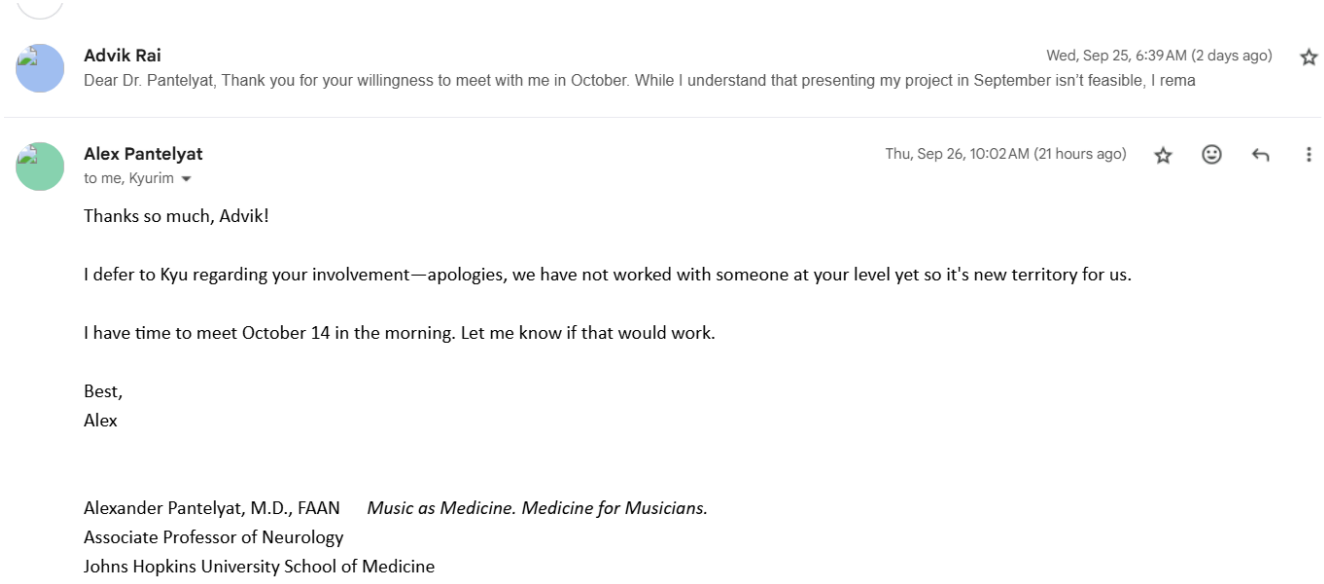
This works on an HTML webpage through a local server I created, which is different from the React app that is online.



Upcoming milestones:

- Synchronize the audio data from music with facial expression data at those timestamps: 10/8
- Conference with JHU CMM members: 10/14

Update: Dr. Pantelyat replied:



Advik Rai Wed, Sep 25, 6:39 AM (2 days ago)

Dear Dr. Pantelyat, Thank you for your willingness to meet with me in October. While I understand that presenting my project in September isn't feasible, I rema

Alex Pantelyat Thu, Sep 26, 10:02 AM (21 hours ago)

to me, Kyurim

Thanks so much, Advik!

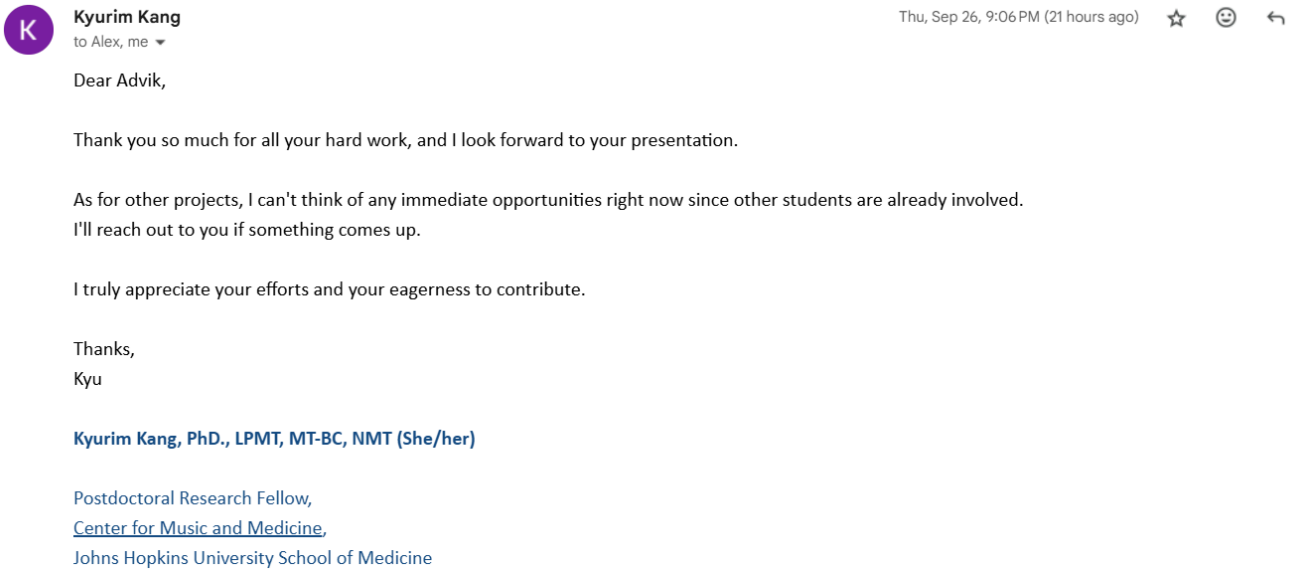
I defer to Kyu regarding your involvement—apologies, we have not worked with someone at your level yet so it's new territory for us.

I have time to meet October 14 in the morning. Let me know if that would work.

Best,
Alex

Alexander Pantelyat, M.D., FAAN *Music as Medicine. Medicine for Musicians.*
Associate Professor of Neurology
Johns Hopkins University School of Medicine

Update update: Dr. Kang replied



Kyurim Kang Thu, Sep 26, 9:06 PM (21 hours ago)

to Alex, me

Dear Advik,

Thank you so much for all your hard work, and I look forward to your presentation.

As for other projects, I can't think of any immediate opportunities right now since other students are already involved.
I'll reach out to you if something comes up.

I truly appreciate your efforts and your eagerness to contribute.

Thanks,
Kyu

Kyurim Kang, PhD., LPMT, MT-BC, NMT (She/her)

Postdoctoral Research Fellow,
Center for Music and Medicine,
Johns Hopkins University School of Medicine

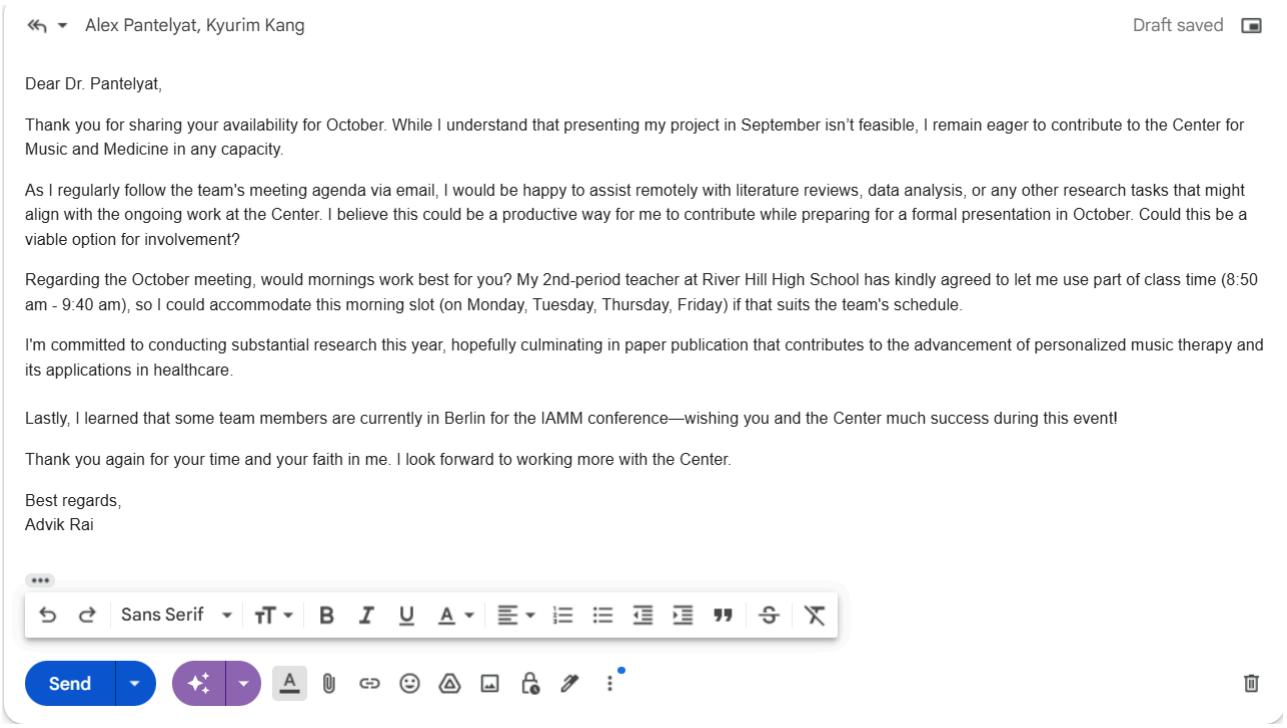
I'll email back possibly confirming that I may meet them in the morning at school. I could ask my and perhaps some of the individual members of the CMM who know me best regarding next steps.
An obstacle right now is getting the emotional readings to work on the main site instead of a local webpage, they use different code and the documentation seems not to include the details for the

implementation I'm using – I'll reach out to them personally for more information. Otherwise, getting emotional readings charted across time at all felt like a major step towards finishing the experimental tool.

9/20/2024 Weekly Research Deliverable

Tasks:

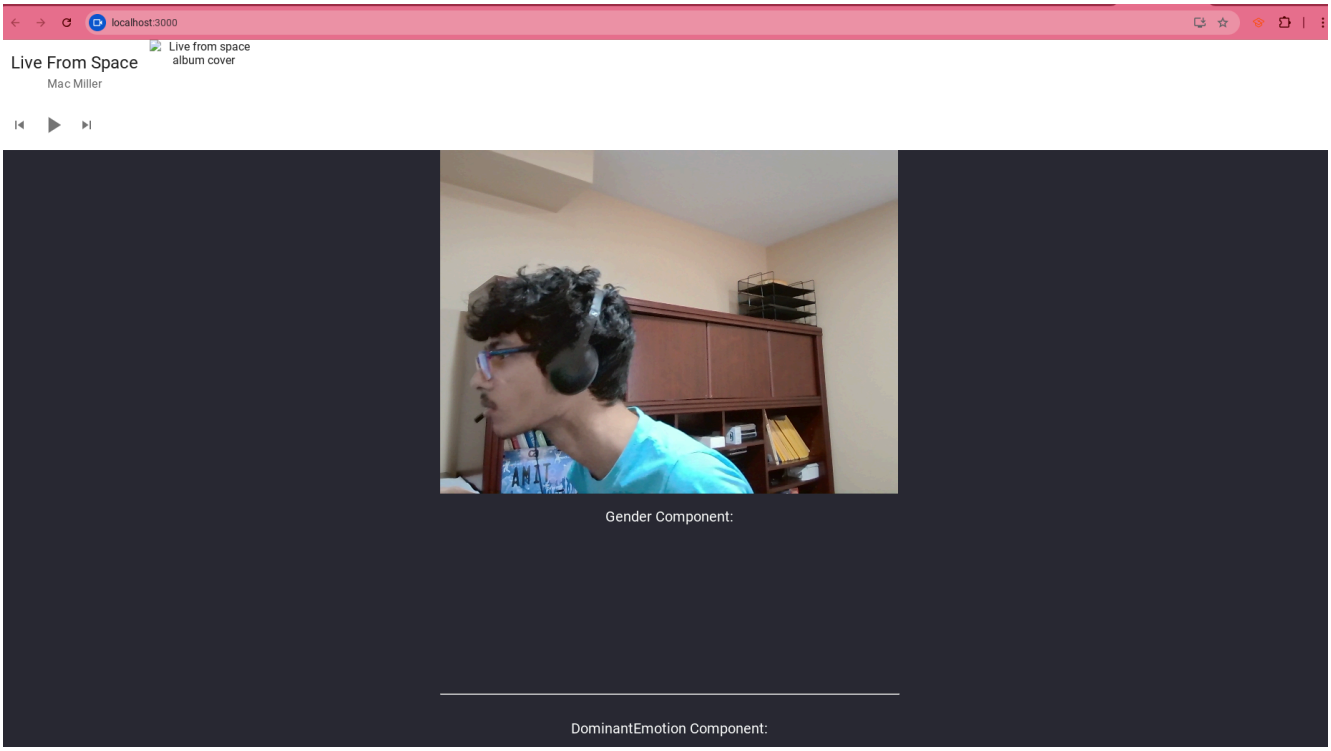
- Drafted an email reply to Dr. Alex Pantelyat at JHU to confirm available times for meetings in October and express interest in contributing to ongoing lab projects.



- Worked on the music functionality on my facial recognition website.
    - Resolved errors in my code related to outdated libraries: overhauled previous Angular code for new React code

```
Failed to compile.

Module not found: Error: Can't resolve '@mui/icons-material/SkipPrevious' in '/home/advil/mph-sdk-integrat
ion-react/src'
WARNING in [eslint]
src/App.js
  Line 16:10:  'Button' is defined but never used  no-unused-vars

ERROR in ./src/App.js 26:0-64
Module not found: Error: Can't resolve '@mui/icons-material/SkipPrevious' in '/home/advil/mph-sdk-integrat
ion-react/src'

ERROR in ./src/App.js 27:0-58
Module not found: Error: Can't resolve '@mui/icons-material/PlayArrow' in '/home/advil/mph-sdk-integration
-react/src'

ERROR in ./src/App.js 28:0-56
Module not found: Error: Can't resolve '@mui/icons-material/SkipNext' in '/home/advil/mph-sdk-integration-
```

- I began preparing the final steps for releasing the music functionality to the public version of the website.



The screenshot above shows the new music player that allows the user to play audio tracks, alongside the facial recognition component.

Upcoming milestone: Confirming meeting times with Dr. Pantelyat and receiving feedback on my involvement in ongoing JHU projects. – 9/25

Reflection:

This week, I felt fairly productive in advancing two key aspects of my research. First, I made progress in my correspondence with Dr. Pantelyat regarding my research pitch and potential involvement in existing projects at the JHU lab. My next step is to send the email and finalize meeting dates, which should open up further opportunities to collaborate.

I worked on refining the system for tracklist capability, and while it's not yet public, I'm close to achieving that goal. This part of the process has been challenging, particularly with troubleshooting some compatibility issues between the interface and the music library, but I've made headway and feel confident about an imminent release for basic music capability.

For next week, my main goals are to finalize my meeting times with Dr. Pantelyat, start pitching my project to the broader lab group, and track emotions of users (time-stamped) as they listen to the music on my website. This precedes gathering initial user feedback and moves closer to real-time data collection.

I'm sort of feeling in a rush because the research work needs to meet the deadlines that are set in the IR II class, but correspondence with the Hopkins researchers may be too slow to keep up with it.