

# Fusing Art and Technology: Evaluating the Impact of an AI-Powered Musical Dashboard on Stress Reduction among College Students

TYLER VERGHO\*, SUPRITHA SHANKAR RAO\*, and MIRANDA JU\*, Dartmouth College, USA



Fig. 1. The Musical Masterpiece Dashboard

We introduce the Musical Masterpiece Dashboard, an innovative Human-Computer Interaction (HCI) tool designed to reduce stress and enhance emotional well-being among college students. This interactive interface allows students to express emotions through drawings, offering a unique fusion of art creation and music generation leveraging advanced AI technologies.

Our research involved a controlled experiment with college students, divided into control and experiment groups, to assess the dashboard's impact on stress levels and emotional states. The results demonstrated a statistically significant decrease in stress and improvement in emotional well-being among participants who interacted with the dashboard, as compared to those in the control group.

This study contributes to the field of HCI by demonstrating the potential of integrating art and music therapy with interactive technology for stress relief. The findings highlight the effectiveness of AI-driven tools in providing personalized and immersive stress-relief experiences. The Musical

Masterpiece Dashboard represents a novel approach to addressing stressors prevalent in academic environments, offering a fun and engaging solution.

**Additional Key Words and Phrases:** Interactive Music Installation, Stress Reduction, Human-Computer Interaction, AI in Music Generation, Student Well-being

## ACM Reference Format:

Tyler Vergho, Supritha Shankar Rao, and Miranda Ju. 2018. Fusing Art and Technology: Evaluating the Impact of an AI-Powered Musical Dashboard on Stress Reduction among College Students. In . ACM, New York, NY, USA, 7 pages. <https://doi.org/XXXXXXX.XXXXXXX>

## 1 INTRODUCTION

In the dynamic and often demanding world of academia, college students navigate a complex maze of academic, social, and professional commitments. These multifaceted responsibilities, while integral to the collegiate experience, often contribute to elevated stress levels, affecting students' mental health and academic performance. Recognizing the need for innovative solutions to ease stress and enhance overall well-being, our research ventured into the realm of Human-Computer Interaction (HCI). The culmination of our efforts is the Musical Masterpiece Dashboard—a creative response to the

\* All authors contributed equally to this research.

HCI COSC 267 'F23, Nov 2023, Hanover, NH

© 2018 Copyright held by the owner/author(s). Publication rights licensed to ACM. This is the author's version of the work. It is posted here for your personal use. Not for redistribution. The definitive Version of Record was published in , <https://doi.org/XXXXXXX.XXXXXXX>.

challenge of harmonizing technology, art, and stress reduction in a college setting. This unique dashboard empowers stressed students to channel their emotions into a musical outlet that translates their drawings into harmonious tunes.

Our project centered around the design and implementation of the Musical Masterpiece Dashboard, an interactive installation that marries the simplicity of drawing with the complexity of music generation. This fusion offers a novel approach to stress relief, allowing students to visually express their emotions and thoughts, which are then transformed into music. By leveraging the power of an AI-driven text-to-music model, the dashboard interprets these drawings and converts them into a unique musical experience.

This experiment, while uniquely focused on the college environment, specifically explored the use of an interactive music installation in the library relaxation room at Dartmouth College. Through user interviews with students, we discovered a widely shared view: music is a powerful tool for alleviating stress. This insight led to the formulation of our research question: How can an interactive music installation in a library relaxation room enhance the mood and well-being of stressed college students? Although our experiment was situated in the library waiting room, the implications of our findings extend beyond this specific context. Theoretically, the approach we have developed could be applied to any setting where individuals experience waiting periods, offering a universally relevant solution to manage stress and improve well-being in various environments.

As we proceed to unpack the design, development, and impact of the Musical Masterpiece Dashboard, we aim to shed light on its potential as a tool for stress management and emotional well-being. In doing so, we hope to contribute valuable insights to the field of HCI and offer a novel perspective on contributing to well-being on college campuses.

## 2 RELATED WORK

### 2.1 Previous Studies on Music and Mood Regulation

The therapeutic potential of music in regulating mood and mitigating stress has been well-documented in various studies. Research in music therapy has consistently shown that music can positively affect emotional states, reducing stress and anxiety levels. A review of literature reveals that listening to music can alter brainwave patterns, promoting relaxation and stress reduction.[9] Moreover, active engagement in music, such as playing an instrument or singing, has been found to be particularly effective in mood regulation, suggesting the multifaceted role of music in mental health management.[5]

### 2.2 Interactive Installations on College Campuses

In recent years, there has been an increasing interest in the use of interactive installations in public spaces, particularly in educational environments. These installations often serve dual purposes: as artistic expressions and as tools for enhancing well-being. For instance, interactive art installations in university campuses have been shown to encourage student engagement and provide stress relief.[4] In fact, Dartmouth has been known to host several interactive art installations in the past, some involving music or sound.[8] The effectiveness of these installations lies in their ability to offer

immersive experiences that diverge from the routine pressures of academic life.

Several studies have underscored the prevalence of mental health challenges among university students,[1] with one in three experiencing such issues during their academic journey. Interactive artificial intelligence (AI)-based tools have been recommended as "potentially scalable solutions to address these problems." [3] We aimed to design a solution that seamlessly integrates these elements into the daily lives of students. Our proposed approach involves the installation of dashboards in high-traffic areas of academic institutions, particularly the library, serving as a retreat for stressed students. Through these dashboards, students can engage in expressive writing and drawing, with the transformative output being a beautiful musical composition.

### 2.3 Enhancing Student Well-being through HCI

Recent advancements in Human-Computer Interaction (HCI) have opened up new avenues for enhancing student well-being. Studies have demonstrated the efficacy of HCI applications in creating environments that support mental health and stress relief. For instance, interactive digital environments have been used to create virtual relaxation spaces, where students can engage in calming activities like meditation or guided breathing exercises.[7] These applications often utilize immersive technologies, such as virtual reality (VR), to provide a more engaging and effective stress-relief experience. Our work aligns with these developments, leveraging HCI principles to create an interactive space where art and music converge, offering students a novel means of relaxation and emotional expression.

### 2.4 AI in Creative Expression and Well-being

The application of Artificial Intelligence (AI) in enhancing well-being and fostering creative expression is a dynamic and rapidly evolving field. One notable area of growth is the use of AI-powered chatbots in mental health interventions. These chatbots, equipped with natural language processing capabilities, can engage users in therapeutic conversations, providing immediate, personalized support for stress and anxiety management.[3][6] Such interactive tools have been shown to effectively simulate empathetic dialogue, offering comfort and guidance akin to a human therapist. In the realm of personalized experiences, AI has also made strides in customizing relaxation techniques to individual preferences. For example, AI algorithms can analyze user data to recommend personalized meditation or mindfulness exercises, creating tailored stress-reduction experiences.[2] The Musical Masterpiece Dashboard integrates these innovative AI approaches, using advanced algorithms and state-of-the-art AI models to transform visual art into personalized musical compositions. This application of AI in art and music therapy represents a novel approach to stress relief, aligning with the broader trend of using AI to create deeply personalized and therapeutically beneficial experiences.

### 2.5 Comparison with Current Work

Our project contributes to this growing body of work by combining the therapeutic aspects of music with expressive writing and drawing, realized through an interactive dashboard. While previous

studies and installations have separately explored the benefits of music and art in stress reduction, our approach synergizes these elements. The Musical Masterpiece Dashboard allows students to transform their drawings into music, providing a unique, immersive experience that not only reduces stress but also fosters creativity. This integration of an interactive art and music experience within an academic setting distinguishes our work from existing research. Furthermore, our focus on user-generated content, where students' own drawings become the basis for music creation, offers a personalized approach to stress relief.

### 3 PROTOTYPE DEVELOPMENT

#### 3.1 Design Process

The genesis of the Musical Masterpiece Dashboard began with an in-depth exploration of the challenges faced by college students, specifically focusing on stress and time management issues. Our journey commenced with a series of user interviews at Dartmouth College, encompassing a diverse group of ten graduate, undergraduate, and PhD students. These conversations provided invaluable insights into the daily lives of students, revealing a common thread of heightened stress levels due to intense course loads and demanding schedules.

Informed by these discussions, our team embarked on brainstorming sessions to identify potential technological solutions that could alleviate this stress. A key consideration was the incorporation of generative AI technology, recognized for its potential in enhancing mood and well-being. We considered a variety of ideas, always anchoring our concepts in the needs and experiences of the students we had interviewed.

It was during these sessions that the idea of leveraging music as a therapeutic tool came to the forefront. Music's role in relaxation and study environments, as highlighted by the students, became a pivotal aspect of our project. This insight was instrumental in steering our prototype towards an interactive musical experience.

The concept of an interactive dashboard emerged as a promising solution. This dashboard was envisioned to be more than just a passive music player; it was designed to actively involve the user in the creation of music. We aimed to create an interface that allowed students to express their creativity while simultaneously providing a relaxing and engaging experience. The idea was to translate visual art, in the form of drawings, into music. This approach sought to harness the therapeutic benefits of both artistic expression and music listening.

In the subsequent stages, our efforts were concentrated on refining this concept. We considered various aspects of user interaction, such as the simplicity of the interface, the responsiveness of the system, and the overall user experience. The goal was to develop a dashboard that was intuitive and inviting, encouraging users to explore their creativity without feeling overwhelmed by the technology.

Throughout the development process, we maintained a strong focus on aligning the dashboard's design with the specific needs and preferences of our target audience – college students. This user-centric approach was critical in ensuring that the final product



Fig. 2. Final generated music screen.

was not only technologically sound but also genuinely effective in reducing stress and enhancing well-being among students.

#### 3.2 Technical Development

The core of our prototype was a 55-inch touchscreen dashboard, designed for interaction via touch or stylus. This setup hosted our main application, which for the prototype was a React web application comprising three distinct screens.

- **Intro/Welcome Screen:** The first screen served as an introductory interface, welcoming users and explaining the dashboard's functionality.
- **Canvas Screen:** On the second screen, users were presented with a canvas where they could create drawings. This screen included tools for selecting pen colors, erasing, and other drawing functionalities. It would also show the full generated text prompt for the user's drawing while music generation was in progress.
- **Generated Music Screen:** The final screen displayed the generated music. It showed the text prompt associated with the user's drawing and allowed users to listen to the audio output, as depicted in Figure 2.

The application's functionality was driven by two generative AI models, each driving a different modality: image-to-text and text-to-music conversion.

- (1) In the first stage, GPT-4V, the vision version of OpenAI's GPT-4, was employed to generate a descriptive text prompt from the user's drawing. For specific examples of these text prompts, see Appendix A.1.
- (2) The generated text was then fed into MusicGen Large (stereo version), a text-to-music transformer-based model developed by Meta. This model produced audio in 10-second segments, using the last 2.5 seconds of each segment as input for the subsequent segment, creating a near-continuous stream of music.

Although the generation time averaged 11-12 seconds per prompt, slightly affecting the listening experience (because the generation was not quite seamless and real-time), the resulting music was of reasonably high fidelity and quality given the constraints of the prototype.

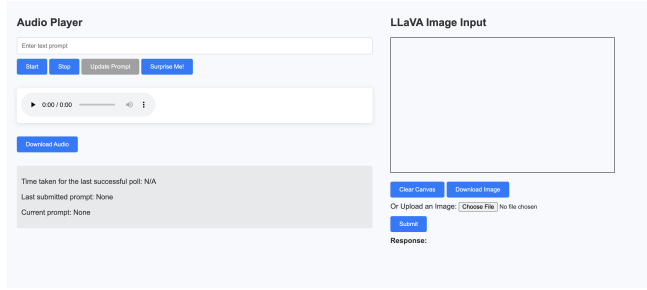


Fig. 3. An early version of the prototype.



Fig. 4. Experiment Procedure

**Technical Specifications.** The frontend was hosted on an M1 MacBook Pro laptop. The music generation model was run off a Linux server with a 24GB NVIDIA RTX 6000 GPU, using the open-source HuggingFace Transformers library. The relatively high compute demands for the music generation model and API costs for the text-to-image model constitute additional considerations for scaling beyond this initial prototype; a single GPU can only support one person interacting with the dashboard at a time. Future work could potentially address some of these technical limitations.

**Prototype Performance.** The dashboard's touchscreen interface, encapsulating the web application, presented some limitations. The drawing functionality occasionally struggled with finer details, affecting the user experience. Additionally, the music translation process, while generally effective, was also imperfect by nature. The image-to-text model adeptly captured detailed aspects of drawings, such as specific words or objects like "BANJO," which influenced the music generation accordingly. However, for more abstract or simplistic drawings, the model sometimes introduced unrelated details. Despite these challenges, the prototype functioned effectively within the scope of our project, demonstrating the potential of this technology in stress reduction applications.

## 4 METHODS AND EXPERIMENT DESIGN

### 4.1 Participant Recruitment and Selection

Our experiment was conducted at Dartmouth College's Feldberg Library. The study participants were randomly selected from students who were working in the library at the time of the experiment. These individuals were approached and asked to spare a few minutes of their time for a research study. To ensure a diverse sample, we did not disclose specific details about the study or its duration to the participants prior to their agreement to participate.

### 4.2 Experiment Procedure

Before the start of the experiment, participants were briefly introduced to the study's purpose—investigating the impact of an interactive musical dashboard on stress and emotional well-being. They were then asked to complete a pre-experiment questionnaire (on paper) consisting of two questions designed to gauge their initial stress level and emotional state:

- (1) On a scale from 1 (not stressed) to 5 (completely stressed), how would you rate your current stress level?
- (2) How would you describe your current emotional state: Very Negative, Somewhat Negative, Neutral, Somewhat Positive, or Very Positive.

Participants were randomly assigned to one of two groups: the control group or the experiment group. We recruited 23 participants into the experiment group and 15 participants into the control group, for a total of 38 participants. Each participant was allocated a strict four-minute session. The control group spent this time in a standard waiting room environment, intended to mimic the waiting experience in typical library settings, such as waiting in line or in a reading room. The experiment group, however, interacted with the Musical Masterpiece Dashboard, exploring its functionalities and experiencing the transformation of their drawings into music.

After the four-minute session, participants were escorted out and asked to complete a post-experiment questionnaire. This questionnaire mirrored the pre-experiment questions to assess any shifts in stress levels and emotional states:

- (3) On a scale from 1 (not stressed) to 5 (completely stressed), how would you rate your current stress level?
- (4) How would you describe your current emotional state?
- (5) How long do you estimate that you stayed in the room during this session?

This structure ensured that both the control and experiment groups underwent a similar process, with the key difference being the interaction with the musical dashboard. The objective was to compare the changes in stress levels and emotional states between the two groups, attributing any significant differences to the effect of the dashboard interaction. All responses were kept anonymous to maintain the integrity and confidentiality of the study.

The question about time spent in the room was intended to gauge whether there was a significant difference between the two groups' perception of passage of time. In theory, if the board was successful at engaging students and reducing their stress levels, they should perceive less time passing as a result.

## 5 RESULTS

### 5.1 Overview

The study aimed to evaluate the impact of an interactive musical dashboard on stress and emotional well-being. Participants were assigned to either a control group or an experiment group, with 23 participants in the experiment group and 15 in the control group. Both groups completed pre- and post-experiment questionnaires designed to measure their stress levels, emotional states, and perception of time spent during the session.

Table 1. Summary of Experiment Results

Metric	Control Group	Experiment Group	p-value
Avg. Stress Level Change	-0.07	-0.48	0.0437
Avg. Emotion State Change	+0.07	+0.57	0.0437
Avg. Time Perception (min.)	4.80	4.13	0.1084

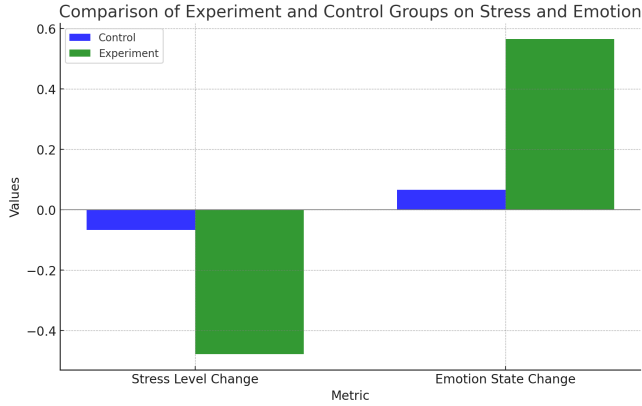


Fig. 5. Comparison of reported stress and emotion levels across control and experiment groups.

## 5.2 Stress Level Changes

Both groups reported changes in stress levels after the session. The experiment group, which interacted with the Musical Masterpiece Dashboard, showed a more pronounced average decrease in stress levels, with a mean reduction of approximately 0.48 points. In contrast, the control group, which spent time in a standard waiting room environment, exhibited a much smaller average decrease in stress levels, with a mean reduction of about 0.07 points.

A t-test comparing the stress changes between the two groups yielded a p-value of 0.0437, indicating that the reduction in stress levels in the experiment group was statistically significant compared to the control group. This suggests that the interactive music dashboard was effective in reducing stress levels among participants.

## 5.3 Emotional State Changes

Similarly, changes in emotional states were observed in both groups, with the experiment group showing a more substantial average improvement. The experiment group experienced an average increase of approximately 0.57 points in positive emotional state, while the control group showed a marginal average increase of about 0.07 points.

The t-test for the emotional state changes also demonstrated statistical significance (p-value = 0.0437), indicating that the improvement in emotional states was significantly greater in the experiment group. This result implies that the interaction with the musical dashboard positively influenced the participants' emotional well-being.

## 5.4 Perception of Time Spent

An interesting aspect of the study was to determine if the interaction with the musical dashboard affected the participants' perception of time. The average time estimate for the duration of the session was 4.13 for the experiment group and 4.80 for the control group. However, the t-test results showed no statistical significance (p-value = 0.1084) in this aspect, indicating that the perception of time spent during the session was not significantly different between the two groups.

# 6 DISCUSSION

## 6.1 Interpretation of Results

The experiment conducted at Dartmouth College provided valuable insights into the efficacy of the Musical Masterpiece Dashboard in reducing stress and improving emotional well-being among college students. The statistically significant decrease in stress levels and improvement in emotional states in the experiment group, as compared to the control group, underscores the potential of interactive musical experiences in stress management.

Anecdotal observations further support these findings. For instance, during the experimental phase, one participant was observed dancing along with the music, indicating high engagement and enjoyment. Similarly, at Technigala, a live project exhibition at Dartmouth, another participant spent an extended period (over 30 minutes) interacting with the dashboard. Such enthusiastic responses suggest that while the dashboard may not universally appeal to all, it profoundly impacts those who engage with it. This is particularly evident in the maximum stress reduction observed in the experiment group being twice that of the control group (+/- 2 points versus 1 point).

## 6.2 Significance of Findings

The results align well with our initial hypothesis that an interactive musical dashboard could effectively reduce stress and improve emotional states among students. The use of generative AI to transform visual art into music provided a unique, engaging experience that not only served as a creative outlet but also as a means of relaxation and stress relief.

The findings of this study are significant in the context of stress management, especially in academic environments. The ability of the Musical Masterpiece Dashboard to engage users and positively impact their emotional well-being highlights the importance of innovative stress-relief tools. Such tools could be particularly beneficial in high-stress environments like colleges and universities, where students often struggle with intense academic pressures.



### 6.3 Implications and Future Directions

The successful implementation and positive reception of the dashboard have several implications. Firstly, it demonstrates the potential of combining art and music therapy with interactive technology to create effective stress-relief tools. Second, it opens up opportunities for further research into more advanced versions of such technology beyond our initial prototype, possibly incorporating real-time music generation and improved touch interface functionalities.

Future studies could explore the long-term effects of regular interaction with such technologies on stress and well-being. Additionally, expanding the user base beyond college students to include other demographics might provide broader insights into its effectiveness across different age groups and backgrounds.

The Musical Masterpiece Dashboard presents a novel approach to stress management, combining technology, music, and art in a harmonious blend that resonates well with its target audience. Its success in the experimental setting at Dartmouth College sets the stage for further development and potential integration into routine stress management practices in academic and other high-stress environments.

## 7 CONCLUSIONS AND FUTURE WORK

### 7.1 Conclusions

This study has successfully demonstrated the potential of the Musical Masterpiece Dashboard in reducing stress and enhancing the emotional well-being of college students. The interactive dashboard, which integrates art creation and music generation through advanced AI technologies, provided a unique and engaging way for students to express their emotions and experience relaxation. Our findings, supported by both quantitative and qualitative data, suggest a statistically significant reduction in stress and improvement in emotional states among participants who interacted with the dashboard.

The design and implementation of the dashboard, driven by user interviews and iterative development, ensured that the final product was tailored to the needs and preferences of the target audience—college students. The integration of music and art, based on the therapeutic principles of these mediums, proved to be an effective approach in creating a relaxing and immersive experience. The project contributes to the field of Human-Computer Interaction (HCI) by offering an innovative solution to stress management, particularly in academic settings.

### 7.2 Future Work

**7.2.1 Longitudinal Studies.** Future research should focus on conducting longitudinal studies to evaluate the long-term effects of regular interaction with the Musical Masterpiece Dashboard on stress and emotional well-being. Such studies could provide insights into the sustained benefits of interactive music installations and inform the development of more permanent solutions in academic environments.

**7.2.2 Technical Enhancements.** The next phase of development for the dashboard should address the technical limitations identified

during the prototype phase. Enhancements such as real-time music generation, improved touchscreen responsiveness, and more accurate AI models for drawing interpretation could significantly enhance user experience. Furthermore, exploring the integration of virtual reality (VR) or augmented reality (AR) could add an additional layer of immersion and interaction.

**7.2.3 Broader User Base and Accessibility.** Expanding the user base beyond college students to include other demographics, such as high school students or working professionals, could provide a broader understanding of the dashboard's effectiveness. Additionally, ensuring accessibility for users with disabilities would make the dashboard a more inclusive stress management tool.

**7.2.4 Integration into Other Settings.** Exploring the potential of integrating the dashboard beyond a tool to reduce boredom during waiting periods. For instance, integration into classrooms or on mobile devices could offer students a readily available tool for stress management. Collaborations with educational institutions to implement the dashboard as part of wellness programs could be beneficial.

**7.2.5 Qualitative Research and Case Studies.** Continuing to combine quantitative with qualitative research methods will provide a more comprehensive understanding of the dashboard's impact. Qualitative data, such as detailed user feedback and case studies, would complement the quantitative findings and offer deeper insights into user experiences.

**7.2.6 Scalability and Commercial Viability.** Finally, assessing the scalability and commercial viability of the dashboard is crucial for its widespread adoption. Understanding the economic and logistical aspects of large-scale production and distribution would be key to bringing the Musical Masterpiece Dashboard to a wider audience.

In conclusion, the Musical Masterpiece Dashboard stands as a testament to the innovative application of HCI principles in addressing real-world challenges such as stress management. Its development and positive reception pave the way for future research and development in this field, with the potential to significantly impact stress management practices in academic and other high-stress environments.

## A APPENDIX

### A.1 Specific Text Prompts for GPT-4V

In our study, the GPT-4V model was used to generate musical descriptions based on the mood and style of images drawn by users. Below are the details of the input prompts provided to GPT-4V and an example of the output generated.

**A.1.1 System Prompt for GPT-4V.** The system prompt used for GPT-4V was as follows:

You translate the style and mood of the image into a musical description. For instance, musical descriptions you could generate include 'An intimate solo piano nocturne, flowing between gentle melodies and introspective harmonies, reminiscent of moonlit romance.' or 'Smooth and sophisticated bossa nova jazz,

spotlighting a sultry saxophone melody, nylon-string guitar comping, and subtle conga rhythms, ideal for a romantic evening.' Emulate the style, length, and descriptive vocabulary of these prompts.

**A.1.2 User Prompt for GPT-4V.** The user prompt given to participants for guiding the GPT-4V input was:

Generate a detailed and descriptive musical description based on the image mood and style. Be creative! Specify the melody, tempo, genre, and style with as many descriptive adjectives as possible. Use text and details in the image to guide the mood. It should be 2-3 sentences.

**A.1.3 Example Output from GPT-4V.** An example output generated by the GPT-4V model (from the input in Figure 6) is provided below:

"The scene suggests a playful and rustic bluegrass ensemble, characterized by the bright twang of a resonator-backed banjo and the warm, earthy tones of a tight-skinned drum. Upbeat and bouncy, the melody bounds forward with a lively tempo, plucked strings dancing over a steady, thumping rhythm, capturing the simple joy and homespun charm suggested by the handwritten words and the smiley face in the image..."



Fig. 6. The input screen for the image-to-text model.

## A.2 Example Text Prompts Generated during the Experimental Phase

A playful and whimsical ukulele ditty, interspersed with light-hearted pizzicato strings that mimic the curious and sprightly steps of a kitten. Each "mew" and "meow" charmingly interpreted by airy flute trills and gentle xylophone taps, set to a cheerful, skipping tempo that captures the essence of feline frolic and carefree simplicity.

A vibrant, whimsical waltz, infused with the bright, playful tones of a glockenspiel and the effervescent bubbles of a pizzicato string section, setting a tempo that dances like sunlight through a prism. Layers of airy flutes mimic the arc of the rainbow, introducing a magical, fairy-tale quality that uplifts and enchants.

The melody weaves through the colors with a sense of wonder and joy, inviting listeners on a journey through a fantasy dreamscape.

A dynamic and energetic electro-synth track, characterized by a pulsating bassline and an uptempo rhythm illustrating a surge of activity and growth, much like the upward arrow in the image. The crisp and punchy electronic melodies mimic the volatility of a financial market, weaving through digital soundscapes that resonate with the motif of economic uprising. This piece would be punctuated with staccato synth leads and FX that audibly denote the sharp angles of the arrow, creating a soundscape of modern ambition and progress.

## REFERENCES

- [1] Mandy D. Bamber and Erin Morpeth. 2018. Effects of Mindfulness Meditation on College Student Anxiety: a Meta-Analysis. *Mindfulness* 10, 2 (June 2018), 203–214. <https://doi.org/10.1007/s12671-018-0965-5>
- [2] Yekta Said Can, Heather Iles-Smith, Niaz Chalanianloo, Deniz Ekiz, Javier Fernández-Álvarez, Claudia Repetto, Giuseppe Riva, and Cem Ersoy. 2020. How to Relax in Stressful Situations: A Smart Stress Reduction System. *Healthcare* 8, 2 (April 2020), 100. <https://doi.org/10.3390/healthcare8020100>
- [3] Izaak Dekker, Elisabeth M. De Jong, Michaëla C. Schippers, Monique De Bruijn-Smolters, Andreas Alexiou, and Bas Giesbers. 2020. Optimizing Students' Mental Health and Academic Performance: AI-Enhanced Life Crafting. *Frontiers in Psychology* 11 (June 2020). <https://doi.org/10.3389/fpsyg.2020.01063>
- [4] Yue Du, Zan Zou, Yaodong He, Yongge Zhou, and Shixian Luo. 2022. Beyond Blue and Green Spaces: Identifying and Characterizing Restorative Environments on Sichuan Technology and Business University Campus. *International Journal of Environmental Research and Public Health* 19, 20 (Oct. 2022), 13500. <https://doi.org/10.3390/ijerph192013500>
- [5] Daniel E. Gustavson, Peyton L. Coleman, John R. Iversen, Hermine H. Maes, Reyna L. Gordon, and Miriam D. Lense. 2021. Mental health and music engagement: review, framework, and guidelines for future studies. *Translational Psychiatry* 11, 1 (June 2021). <https://doi.org/10.1038/s41398-021-01483-8>
- [6] M D Romael Haque and Sabirat Rubya. 2023. An Overview of Chatbot-Based Mobile Mental Health Apps: Insights From App Description and User Reviews. *JMIR mHealth and uHealth* 11 (May 2023), e44838. <https://doi.org/10.2196/44838>
- [7] Regina Kaplan-Rakowski, Karen R. Johnson, and Tomasz Wojdyski. 2021. The impact of virtual reality meditation on college students' exam performance. *Smart Learning Environments* 8, 1 (Oct. 2021). <https://doi.org/10.1186/s40561-021-00166-7>
- [8] Office of Communications. 2017. Resonant Spaces: Sound Art at Dartmouth. News Article. <https://home.dartmouth.edu/news/2017/09/resonant-spaces-sound-art-dartmouth> The show offers visitors a glimpse into the varied and imaginative world of sound art.
- [9] Myriam V. Thoma, Roberto La Marca, Rebecca Brönnimann, Linda Finkel, Ulrike Ehlert, and Urs M. Nater. 2013. The Effect of Music on the Human Stress Response. *PLoS ONE* 8, 8 (Aug. 2013), e70156. <https://doi.org/10.1371/journal.pone.0070156>

Received 21 November 2023