

Active Noise Cancelling

1. Summary in Brief EL

Name of the organization/company - TBD

Team members

Programming Team:

- Mathew LeBlanc
- Eammon Littler
- Jigme Sherpa

Marketing Team:

- John Yish
- Trevor Marques
- Alex Dubrow

Contact information

- Alex Dubrow (dubrow_alex@wheatoncollege.edu)
- Mathew LeBlanc (leblanc_mathew@wheatoncollege.edu)
- Eammon Littler (littler_eammon@wheatoncollege.edu)
- Trevor Marques (marques_trevor@wheatoncollege.edu)
- Jigme Sherpa (sherpa_jigme@wheatoncollege.edu)
- John Yish (yish_john@wheatoncollege.edu)

Organization or business logo - TBD

Due date for the completion of the project

Timeline - See action plan

Brand or brand name - TBD

Budget/financial numbers if available

2. Introduction/Abstract/Opening Statements JS

3. Audience/Target Market ML

The initial target market is the average American home. Every home has noisy appliances that may induce hearing loss over time or are simply annoying. Our device is designed to minimize the noise the user experiences from these appliances. We may be able to expand our market from households to large industry. Workers in factories, for example, experience similar hearing problems due to exposure to loud tools, equipment, and other machines that they use every day. This often allows hearing loss to become an occupational hazard. Many of these machines (saws, mills, welders, engines, ventilation systems, etc.) cannot simply be made quieter on their own. Our noise cancellation device will minimize exposure to the harmful sounds produced by this equipment and thereby reducing the chance of suffering hearing damage.

4. Background/Purpose/Need/Rational ML

The purpose of our product is to reduce long-term hearing damage from everyday ambient sound. Many household appliances are capable of causing hearing loss, especially if exposed for increased lengths of time, including blenders, food processors, lawnmowers, vacuum cleaners, and hair dryers. These common devices are found in practically every American home. People should be able to use them without worrying for their ear health. Our noise cancellation device will minimize the experienced sound output from these items, directly reducing the chance of suffering hearing damage.

Our device may also be adapted for use in industrial complex such as workshops and factories. Relatively small tools such as saws, mills, and drills to larger equipment, like ventilation systems, presses, and engines can cause permanent hearing damage even if only exposed to their sounds

for a moment. The health effects are even worse if exposure is constant and for long time periods.

5. Product or Service Detail/Description

Active noise cancelling technology is a popular way of lowering ambient sound. It is often used in headphones, where microphones pick up incoming sound and speakers cancel it out. Rather than reducing sound right by the ear, we propose a method of reducing sound from the source. A device that attaches to a machine producing harmful sounds will be made and optimised using machine learning. Current techniques involve a mixture of both active and passive noise cancelling, where dense material is added to absorb sound and cancel the rest. This produces a bulky package, sacrificing aesthetic appeal. By using a mixture of programmatic prediction and optimizing, a device with a focus on compactness and minimal design can be achieved.

Our device will be aimed towards reducing sounds from household appliances, such as fans, air conditioners, refrigerators, vacuum cleaners, etc. The user will attach the noise cancelling device to a surface near the sound source to be reduced. Charging will be required to power the device. Users are encouraged to use the device on machines producing constant droning sounds, such as fans at night.

6. Project Activities/Action Plan/Approach/Timeline/Design Plan

Github will be used to organize and view code by team members for this project. Various machine learning and audio manipulation libraries will be explored in the Python programming language. For the prototyping of the device, the Lab 213 Makerspace with their 3D printers and electronics stations will be utilized. A fan owned by a team member will be the subject for the noise cancelling tests. Training for the program will be conducted in

a typical dorm room, where the device will be attached to the fan and a microphone placed where the sound will be received; acting as an analogue for the user's ear. Sound reduction optimization will be done where the microphone is placed. The microphone is temporary, and will only be used when training the program to reduce sound. A Raspberry Pi will be the main processing engine for the machine learning program. If proven to be insufficient in processing power, a laptop will be used as a temporary stand in for processing until further funding for a custom processor is granted.

September 24th:

- **Concept brief rough draft**
- Make a gantt chart?

September 26th:

- **Assign detailed roles to group members for project**
- Figure out strengths of group members
- Determine parts needed for project
 - Electronics
 - Speaker
 - Speaker driver module/sound card
 - Borrow microphone
 - battery?
 - Case for device
 - Connect to laptop or raspi?
- What can each member do?
 - Eammon: 3D printing/electronics and design
 - Jigme: programming and design / 3D modeling
 - Mathew: programming/data collection

October 3rd:

- **Demos to ML class**
 - **What do we want done by then**

- **Python sound visualizer**
- **3d printed case?**
- **3d render of device?**
- **Parts for device?**
- **Finish concept brief for marketing team**
- **Change SM**
- Have background information ready for marketing team

Week of Oct 8th

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- Borrow/buy necessary equipment
- Have initial device design ready
 - Send to marketing team for impressions
- Know machine learning and audio libraries to be used

Week of Oct 15th

- Finish electronics and prototype of device

Week of Oct 22nd

- Have code ready for ML testing
- Test code and train model

Week of Oct 29th

- Test code and train model
- Make changes to device if necessary

Week of Nov 5th

Week of Nov 12th

Week of Nov 19th

- Prepare for presentation
 - Create visuals

- Decide presenters
- Finalize code
- Finalize device design
- Know what we are asking our funders for

Week of Nov 26th

- Practice for presentation

Due Date: Dec 3

7. Summary/Conclusion/Attachments