FM Resynthesis Tool Release Plan, FRT, ARP 2600, Ver 0.1.0, 10/5/2022

High Level Goals

- **Allow User to play backend synthesizer through UI with buttons and keyboard.**
- **Create a genetic algorithm to re-synthesize the user's uploaded sound.**
- **Allow User to record performance on website.**
- **Incorporate AI into a re-synthesis algorithm.**

User Stories

- Sprint 1
  - (1) As a developer I need a repository to share my code.
  - (1) SPIKE: As a developer I need to learn basic Web development tools to help out with more tasks
  - (5) As a frontend developer we should be able to create frt.html with basic heading and keys/buttons to implement user interaction.
  - (3) As a user I need a webpage to access this software tool
  - (2) As a user I need to Perform FM synthesis in python
  - (2) As a developer I need to provide an FM synth in Python for the user to use
  - (2) Design revision 1 user interface (UI) for web page as draft
  - (1) Gain understanding of current webpage to embed page for tool
  - (2) SPIKE: As a frontend developer I need to learn basic JQuery and discover use cases to be able to make the website look great
  - (2) SPIKE: As a team we need to familiarize ourselves with spectral analysis and FM resynthesis to create a better understanding of our project
  - (3) Create statistical holistic fitness function for comparing waveforms
  - (2) Determine genotype to phenotype mapping
  - (3) SPIKE: Consider how to create a parameterized surface for more complex fitness function such as stochastic gradient descent (SGD)
  - (1) VERIFY: As a tester I need to test the python synthesis to ensure it works correctly
  - As a developer I need to acquire web development tools in order to develop the website.
- Sprint 2
  - (1) SPIKE: As a developer I need to be able to use the file a user uploads so then the backend can manipulate it
  - (1) As a frontend developer we should be able to create frt.html with basic heading and keys/buttons to be able to play the re-synthesized sound
  - (3) As a user I need a webpage to access this software tool

- ○ (2) As a user I need to Perform FM synthesis on the webpage
- ○ (2) As a developer I need to provide an FM synth in Python for the user to use
- ○ (3) As a frontend developer I need to learn how to map computer keyboard input (stdin) to MIDI pitches so a user can interact with our python synth.
- ○ (2) SPIKE: As a developer I need to create a union between the front and backend to connect our UI to our Python Synth.
- ○ (2) SPIKE: As a developer I need to research and analyze how to create the genetic algorithm so we can properly
- Sprint 3
  - ○ (5) As a developer I need to Build a Genetic Algorithm using previously built phenotype mapping and fitness function to re-synthesize sounds in the synth
  - ○ (1) As a developer I need to Introduce mutation between generations to generate sounds iteratively to progress towards the user's uploaded sound
  - ○ (3) SPIKE: As a developer I need to Research potential machine learning use cases (CNN, FFNN, etc.) to implement later in our genetic algorithm
  - ○ (2) As a user I need to visualize the waveforms being resynthesized.
  - ○ (1) As a developer I need to determine the average pitch of the target waveform and tune the synthesizer.

- Sprint 4
  - ○ As a developer i need to Implement machine learning use cases (CNN, FFNN, etc.) to increase the re-synthesis algorithm
  - ○ (3) As a developer I need to Use alternative waveforms (Saw, Square, Triangle, etc) for carrier to allow for more complex sounds to be recreated accurately.
  - ○ (1) VERIFY: As a developer I need to ensure input sanitization to keep our site secure
  - ○ (1) As a user I need to visualize the progression of the genetic algorithm

Backlog
- (5) Integrate python backend into webpage front-end
- (5) Build Genetic Algorithm using previously built phenotype mapping and fitness function
- (1) Introduce mutation between generations
- (3) SPIKE: Research potential machine learning use cases (CNN, FFNN, etc.)
- (3) Use alternative waveforms (Saw, Square, Triangle, etc) for carrier
- (1) VERIFY: As a developer I need to ensure input sanitization to keep our site secure