Band Buddy

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Music is part of almost everyone's day to day lives. For guitarists, music goes beyond just a listening experience to a hobby or even a profession. For any guitar player, but especially new players, practice is of utmost importance. It is where the player finds their sound, grows their skillset, and ultimately defines their facility on the instrument and in a band. We propose a guitar looper pedal which can enhance a guitarist's practice routine and help grow this crucial skill set by letting them play in time with uniquely generated drumlines.

Band Buddy is a guitar pedal which can loop a user's input and provide intelligent accompaniment to the musician in the form of a drum backing track that fits the groove of the user's input. The user can select a tempo, a desired genre, a sound profile, and how many bars of music (two or four) they wish to play. When the user presses a button on the pedal, it will start recording what the user is playing for the chosen number of bars, looping it back to them in the meanwhile so they can hear themselves. The recorded segment of music is used as input to a generative machine learning model which constructs a drum track that suits the rhythmic elements of what the user played. The pedal then combines these tracks, the drum track and user track, and outputs it to the user as a repetitive loop.

Our design consists of three main software stages that take place on two main pieces of hardware. A Raspberry Pi 4 runs stages one and three of the software pipeline as well as a local web server which hosts a web application for parameter configuration. Stage one is responsible for playing the metronome, listening to user input, looping it back to them, recording it, and writing it to WAV format. Stage three is responsible for synchronizing the drum backing track with the user input and playing it back to them. Alongside this, a Jetson Nano is used to run stage two of the software pipeline. Stage two is the heart of the generation pipeline and uses a machine learning model to generate the drum backing track. The model uses a GrooVAE architecture based on work by Google's Magenta team. Stage 2 has multiple models, each trained to generate a specific genre of music, which the user can pick from to experiment with different genres and styles. Additional overarching software modules handle data transmission between stages and state management among processes.

There are examples of similar products available on the market such as OneManBand and Spark Amp, but they have some disadvantages compared to our design. Both products have a higher cost and require the user to purchase types of equipment they likely already have. Spark Amp is a specialized amplifier which can provide musical accompaniment with bass and drum backing tracks. OneManBand is a fully customized guitar that provides musical accompaniment to what the user is actively playing. Band Buddy works as just another pedal in a guitarist's already existing arsenal, allowing them to continue using the guitar and amplifier they are already comfortable with. Additionally, Band Buddy would be available for 350$ which is on par with or cheaper than both other products described.