Music Super-Resolution

Şut George-Mihai
3rd-year undergraduate, Computer Science
Babeş-Bolyai University
georgesut@yahoo.com

***Abstract*—Audio super-resolution refers to the task of increasing the sampling rate of an audio signal, usually by training a generative adversarial network to produce outputs whose sampling rate is higher by a specific factor (x2, x4, x6 etc.).**

I. Introduction

In this paper, the goal is to investigate on whether a GAN can be trained with low-resolution audio data given as an input to produce super-resolution audio (i.e a reconstructed high-resolution audio signal). The point of the model is to predict the samples which are missing from the audio signal, which in this case will consist of short, downsampled pieces of music collected from a publicly available API. The project has been inspired by image super-resolution and especially by time-series super-resolution, which in essence operates with the same methods for generating the training dataset by downsampling high-resolution data and making use of a generative model to reconstruct a signal. The original bottleneck-type architecture (Volodymyr Kuleshov and Ermon [1]) will be implemented and possibly compared to SR-GAN (**srgan2017**)

II. Literature review

The process of audio super-resolution using neural nets (also called bandwidth extension) is explained in Volodymyr Kuleshov and Ermon [1] which states that the goal is to reconstruct a low-resolution signal with a sample rate R_1 into a high-resolution signal with a greater sample rate R_2. The paper clarifies the concept by giving a simple example of a 4 KHz signal being upsampled through audio super-resolution to a 16 KHz signal by a factor of 4. The audio signal is encoded into a spectrogram which codifies the frequencies contained in the signal and the sound intensity in decibels with the help of a colorbar situated on the right-side of the image. For the model, a bottleneck-type architecturer has been used, reminiscent of autoencoders which have a similar structure. The first part of the network is responsible for downsampling data, whereas the second part upsamples it.

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Define abbreviations and acronyms the first time they are used in the text, even after they have been defined in the abstract. Abbreviations such as IEEE, SI, MKS, CGS, ac, dc, and rms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.

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Number equations consecutively. To make your equations more compact, you may use the solidus (/), the exp function, or appropriate exponents. Italicize Roman symbols for quantities and variables, but not Greek symbols. Use a long dash rather than a hyphen for a minus sign. Punctuate equations with commas or periods when they are part of a sentence, as in:

$$a + b = \gamma \tag{1}$$

Be sure that the symbols in your equation have been defined before or immediately following the equation. Use "(1)", not "Eq. (1)" or "equation (1)", except at the beginning of a sentence: "Equation (1) is . . ."

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Please don't use the `{eqnarray}` equation environment. Use `{align}` or `{IEEEeqnarray}` instead. The `{eqnarray}` environment leaves unsightly spaces around relation symbols.

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- The word "data" is plural, not singular.
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- In American English, commas, semicolons, periods, question and exclamation marks are located within quotation marks only when a complete thought or name is cited, such as a title or full quotation. When quotation marks are used, instead of a bold or italic typeface, to highlight a word or phrase, punctuation should appear outside of the quotation marks. A parenthetical phrase or statement at the end of a sentence is punctuated outside of the closing parenthesis (like this). (A parenthetical sentence is punctuated within the parentheses.)
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TABLE I
TABLE TYPE STYLES

Table Head	Table Column Head		
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[a]Sample of a Table footnote.

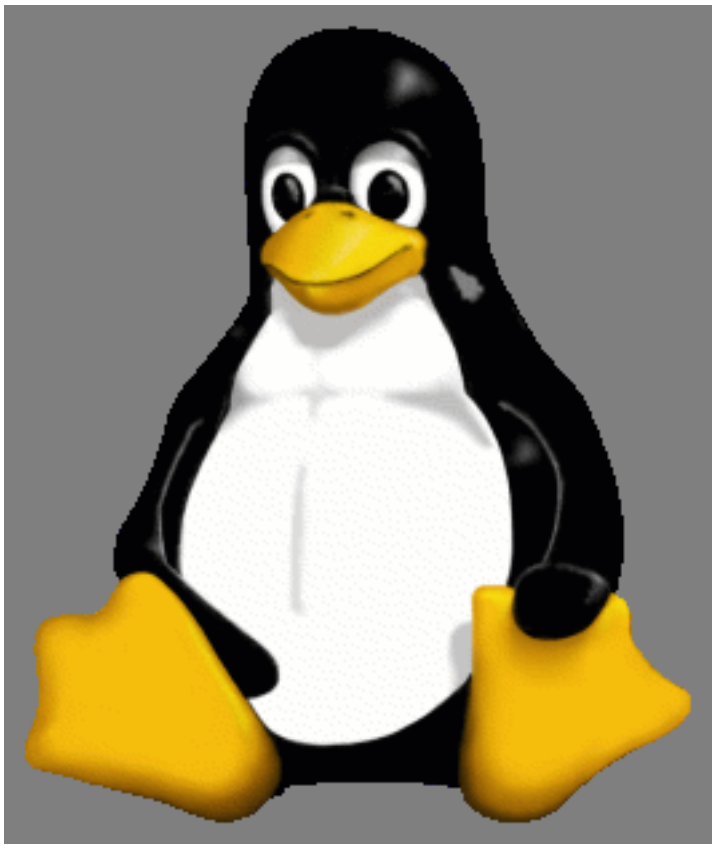

Fig. 1. Example of a figure caption.

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ACKNOWLEDGMENT

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Please number citations consecutively within brackets [**b1**]. The sentence punctuation follows the bracket [**b2**]. Refer simply to the reference number, as in [**b3**]—do not use "Ref. [**b3**]" or "reference [**b3**]" except at the beginning of a sentence: "Reference [**b3**] was the first ..."

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REFERENCES

[1] S. Zayd Enam Volodymyr Kuleshov and Stefano Ermon. *Audio Super-Resolution Using Neural Nets*. 2017.

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