# Few-Shot Speaker Identification Using Meta-Learning

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## Abstract

Speaker identification refers to the task of identifying which speaker is talking from a previously given set of speakers. A similar research area is speaker verification - given a single speaker, identify when that speaker is talking.

## 1 Introduction

Explain the problem and why it is important. Discuss your motivation for pursuing this problem. Give some background if necessary. Clearly state what the input and output is. Be very explicit: "The input to our algorithm is an image, amplitude, patient age, rainfall measurements, grayscale video, etc.. We then use a SVM, neural network, linear regression, etc. to output a predicted age, stock price, cancer type, music genre, etc.." This is very important since different teams have different inputs/outputs spanning different application domains. Being explicit about this makes it easier for readers. If you are using your project for multiple classes, add a paragraph explaining which components of the project were used for each class.

## 2 Related work

You should find existing papers, group them into categories based on their approaches, and discuss their strengths and weaknesses, as well as how they are similar to and differ from your work. In your opinion, which approaches were clever/good? What is the stateof-the-art? Do most people perform the task by hand? You should aim to have at least 5 references in the related work. Include previous attempts by others at your problem, previous technical methods, or previous learning algorithms. Google Scholar is very useful for this: https://scholar.google.com/ (you can click "cite" and it generates MLA, APA, BibTeX, etc.)

## 3 Dataset and Features

Describe your dataset: how many training/validation/test examples do you have? Is there any preprocessing you did? What about normalization or data augmentation? What is the resolution of your images? How is your time-series data discretized? Include a citation on where you obtained your dataset from. Depending on available space, show some examples from your dataset. You should also talk about the features you used. If you extracted features using Fourier transforms, word2vec, PCA, ICA, etc. make sure to talk about it. Try to include examples of your data in the report (e.g. include an image, show a waveform, etc.).

## 4 Methods

Describe your learning algorithms, proposed algorithm(s), or theoretical proof(s). Make sure to include relevant mathematical notation. For example, you can include the loss function you are using.

It is okay to use formulas from the lectures (online or in-class). For each algorithm, give a short description of how it works. Again, we are looking for your understanding of how these deep learning algorithms work. Although the teaching staff probably know the algorithms, future readers may not (reports will be posted on the class website). Additionally, if you are using a niche or cutting-edge algorithm (anything else not covered in the class), you may want to explain your algorithm using 1/2 paragraphs. Note: Theory/algorithms projects may have an appendix showing extended proofs (see Appendix section below).

## 5 Experiments/Results/Discussion

You should also give details about what (hyper)parameters you chose (e.g. why did you use X learning rate for gradient descent, what was your mini-batch size and why) and how you chose them. What your primary metrics are: accuracy, precision, AUC, etc. Provide equations for the metrics if necessary. For results, you want to have a mixture of tables and plots. If you are solving a classification problem, you should include a confusion matrix or AUC/AUPRC curves. Include performance metrics such as precision, recall, and accuracy. For regression problems, state the average error. You should have both quantitative and qualitative results. To reiterate, you must have both quantitative and qualitative results! If it applies: include visualizations of results, heatmaps, examples of where your algorithm failed and a discussion of why certain algorithms failed or succeeded. In addition, explain whether you think you have overfit to your training set and what, if anything, you did to mitigate that. Make sure to discuss the figures/tables in your main text throughout this section. Your plots should include legends, axis labels, and have font sizes that are legible when printed.

## 6 Conclusion/Future Work

Summarize your report and reiterate key points. Which algorithms were the highestperforming? Why do you think that some algorithms worked better than others? For future work, if you had more time, more team members, or more computational resources, what would you explore?

## 7 Contributions

John Boccio was the only member of the team and completely all of the work described in this report.

## References