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Research Article

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"Analysis Of Om (AUM) Chanting Using Machine Learning"

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ABSTRACT

Since ancient times sacred sounds like "OM", Gayatri Mantra and Mrutunjay Mantra have played a significant role not only culturally but also helped in maintaining mental and physical health. According to the manuscripts, it is scientifically verified that these sounds have a remarkable and positive impact on human body and mind. But still extensive research needs to be conducted to prove the impact of sacred sounds, especially "OM", on our significant parts of the body, for example, the heart. This research paper does the frequency analysis of "OM" sound with its chanting performed with the three basic sounds of "A" "U" and "M". There are varied ways of chanting the sound "OM" or "AUM", according to the ancient literature like the Mandukya Upanishda. Therefore, it's typically confusing for a layman to seek out the precise or ideal method of chanting the sound "OM" or "AUM". So, in this research work more focus is on variety of ways of chanting "AUM" which can offer the utmost health benefits. The tools and strategies to be used are; Spectral Analysis, Audio Analysis, computing Techniques. Here sacred sound AUM is recorded and its scientific analysis is carried out. The female subject is chanting AUM for 11 times and the sound file is of 7 minutes duration. The sampling rate is chosen as 44100. The work reviewed is mainly divided into some major steps such as basic understanding, health benefits, and Spectral analysis of sound AUM.

Keywords: OM, AUM, Spectral analysis, sacred sound

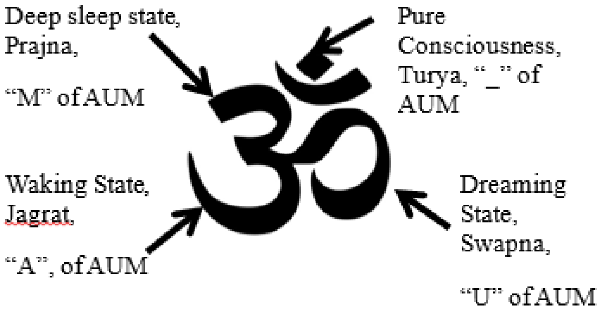
Goals of the study

- To Compare various methods of OM chanting
- To predict the correctness of OM chanting with respect to maximum benefits in terms of physical health
- To Develop an algorithm to decide the degree of correctness of OM chanting
- To do the spectral analysis of sound OM and predict correct parameters in terms of pitch, frequency, power spectral density required for ideal OM sound as per ancient literature of Mandukya Upanishad.

INTRODUCTION

Sacred sounds like "OM", Gayatri Mantra, and Mrutunjay Mantra have promoted mental and physical health since ancient times. Scientific literature reveals its physical and mental benefits. Sacred sounds like "OM" may affect the heart and overall health, but further research is needed. The study analyses how "OM" chanting influences heart rate and blood pressure. Ancient texts like the Mandukya Upanishda describe "OM" chanting. Normal men struggle to find the optimum way to chant "OM". This study will compare "OM" chanting methods for health benefits. Apply AI, Spectral, and Audio Analysis. Consider male and female individuals of various ages. These subjects' sounds will be recorded. Blood pressure and pulse will be taken before and after chanting. These chants will be compared to ideal sound chanting utilizing Spectral Analysis and AI.
Due to translation or history, "a-u-m" has three phonemes.
The mysterious Vedanta Upanishads start with Om.
Spiritual notions are expressed in "cosmic sound" or "mystical syllable" or "affirmation to something divine" in Upanishads.

The Aranyaka and Brahmana Vedic traditions call the syllable "whole of Veda" for its knowledge linkage.
Section 5.32 of the Rig Veda's Aitareya Brahmana states that Om's three phonetic components represent the three stages of cosmic creation and celebrate the universe's creativity when read or chanted.
The Brahmana Vedic word "Om" means "the whole Veda". Om is "the universe beyond the sun" , "mysterious and inexhaustible" , "the infinite language, the infinite knowledge" , "essence of breath, life, everything that exists" , & "with which one is liberated" .
represents various abstract concepts in the Upanishads. Some philosophers argue these texts support Om as a "tool for meditation" and explain its meanings from "artificial and senseless" to "highest concepts such as the cause of the Universe, essence of life, Brahman, Atman, and Self-knowledge".



After explaining the three states of turiya, the Upanishad continues. Om represents this four-part atman. The "a" sound of Om, akara, means waking state and is the source of "apti" (meaning "obtaining"). Whoever knows this is wonderful. Om's "u" sound, ukara, represents the dream state and is the source of "exaltation" (utkarsa). Knowing this enhances and equalizes his understanding. No one in his family is Brahman-illiterate." The Upanishad proceeds after defining these three states and turiya. Om represents this four-part atman.
The "a" sound of Om, akara, means waking state and is the source of "apti" (meaning "obtaining"). Whoever knows this is wonderful.
Om's "u" sound, ukara, represents the dream state and is the source of "exaltation" (utkarsa). Knowing this enhances and equalizes his understanding. No one in his family is Brahman-illiterate."
Awakening includes the universe. Every wish is possible if we understand the universe. Understanding the universe makes one "best of all."
Second part is deeper. Dream state must be known. Dreams and wakings involve cause and effect. Modern psychoanalysis assumes that dream symbolism is necessary to interpret waking behaviour. Jung believed the collective unconscious and archetypal symbols shaped us without our awareness. Thus, to understand the waking condition, we must understand the dream state, "continuity of knowledge. One becomes equal by understanding both. Students who learn from this individual are the "lineage". Since neither condition can adequately describe life, this lineage recognises a higher reality.

Methods of Om Chanting

AUM-chanting meditation is novel. Heavenly phrase soothes and purifies. Monks, sages, and yoga practitioners recite this Sanskrit syllable for benefits. The AUM mantra provides spiritual, physiological, and healing relief from daily stress. Thus, ancient Vedic syllable AUM and modern scientific findings on AUM meditation must be promoted. First, why AUM? AUM's uniqueness as the universe's buzzing sound will be highlighted. AUM's sacred syllable history. Buddhism, Jainism, Sikhism, Mandukya Upanishad, and the Bhagavad Gita will explain AUM's symbolism. Finally, discuss the many benefits of chanting AUM during meditation.
Going through 'Omkara' changes. Sometimes alone, sometimes mantra. Omkara chants "Om Namasivaya". So do penance, sacrifices, etc. All religious chanters say that. No ban. Not everyone can do "Pranavopasana". OM recitation without mantras or ceremonies is Pranavopasana to focus on Brahma. Sri Sankara and other religious leaders believe only Sanyasins can do this. Clear focus is needed for Upasana. Housewives and the mentally sick should avoid Pranavopasana. Other situations do not require purity and concentration like Nirguna Brahma contemplation, hence there is no ban.
Only Pranava's pronunciation is questioned. Why bother with limits? One more issue. Previous paragraph "all" inverted commas. Why? Possibly explained here. "All" means Vedic students and Brahmins. Orthodox Hindus believe shudras and women without upanayana cannot pronounce Pranava. Modernists question conservatism. Do Pranavopasana circumstances influence homeowners? Explain? Take such matters seriously. Why ask about Pranavopasana or advice? Does it hard? All advice confuses and hinders. Your conscience disputes your honesty, but He likes it. If you believe in your actions, the revered Vedic mantra OM or the meaningless "mara" "mara" will work. True devotion pleases God. True love breaks these rules. Great Mahatmas advise loving and adhering to

your mantra. Best wishes. Om Mani Padme Hum is Tibetan Buddhism's Avalokitesvara mantra. Buddhist chants energise with magical frequencies.
The mantra improves deaf animal cognition by assuming cellular and physiological links. Mantra syllable frequency helps holistic healers, meditators, and non-invasive doctors, according to studies. Studies found strong Om Mani Padme Hum vibrations. Constructive word frequency interference may cure the body.

The following components make up the methodology:

The flowchart provides an overview of the approach that was applied to the study. It all begins with selecting the subject matter for the A-U-M chant that comes at the very beginning. The sound is then subjected to a statistical as well as a frequency analysis once it has been recorded on a sound recorder. The conclusion is attainable as a result of carrying out this investigation.

Step 1
- Literature Review
- Problem Statement
- Objectives

Step 2
- Find Gap Of Research
- Primary Data Collection

Step 3
- Preparation of Design Work
- Training of Chanting -A-U-M
- Prepare Chanting -A-U-M

Step 4
- Recording Sound A-U-M
- Statistical Analysis
- Frequency Analysis

Step 5
- Testing and Training

Step 6
- Result & Discussion and Conclusion

Step 7
- Paper Presentation and report writing.

Step 8
- Submission and Approval of Dissertation

Figure: Methodology Flow Work

Machine learning (ML):

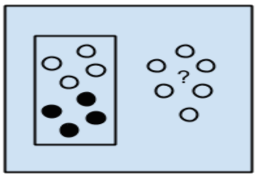
The topic today is “big data.” Before, only corporations had data. Former computer centers stored and processed data. Personal computers and wireless connections make us data generators. Every purchase, movie rental, website visit, blog post, social media post, and even walking or driving generates data. Everyone generates and utilises data. We seek custom items and services. Predict needs and interests. Imagine a grocery chain selling thousands of products to millions of customers at hundreds of sites nationwide or online. Transaction information include date, client ID, products, money, and total cost. Usually, everyday data is big. To increase sales and profit, the grocery store wishes to predict customer purchases. Every customer desire top-notch good.

Uncertain task. Who will buy this ice cream, author's book, movie, city, or connection is unknown. Where and when affect customer behaviour. Not random. Supermarkets aren't random. Beverages, snacks, ice cream, and Gluhwein spices are bought seasonally. The data has trends. In computer issues, we require algorithms. An algorithm converts input to output. Develop a sorting algorithm. This organizes numbers. You can find the most efficient algorithm with few instructions and memory for the same work. No algorithm exists for these occupations. Client behaviour prediction and scam email detection. Email input is usually a character file. Give spam-indicating yes/no output. An unknown I/O converter. Spam varies by time and person. Data bridges knowledge gaps. We can simply "learn" spam from thousands of spams and non-spam messages. This task's algorithm should be extracted automatically by the computer. You don't need to learn to sort numbers because we have algorithms, however many applications have lots of data but no algorithm. We may not understand the process, but we can approximate it. The facts may be explained partially. Despite not knowing the complete process, we can discover tendencies. Machine learning excels at this. Patterns may help us understand or predict the process: Projections will be accurate if the near future matches sample data. Machine learning on big databases is data mining.

There are three machine learning algorithm learning styles:

Supervised Learning

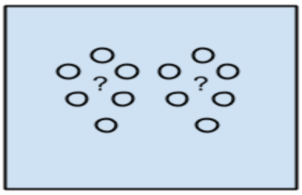
Spam/not spam or stock price are training data labels models are trained by predicting and correcting errors. Training continues until the model matches training data. In supervised learning, classification and regression occur. Logistic regression and BPN are regression algorithms.



Supervised Learning Algorithms

Unsupervised Learning:

Unlabeled inputs yield unknown outputs. Deducing input data structures creates models. Maybe for broad norms. It may minimize duplication mathematically or organise data by similarity. Clustering, DRM, and ARL is IT. K-Means and Apriori algorithms.



Unsupervised Learning Algorithms

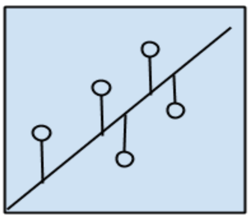
Semi-Supervised Learning

Enter labelled and unlabeled samples. A prediction challenge requires data organisation and prediction structure learning by the model. Both classification and regression are employed.

These algorithms enhance flexible unlabeled data modelling. Each will be explained. Regression models variables and improves predictions with error. Regression dominates statistical machine learning. Confusingly, regression can affect problem and algorithm classes. The regression processes. Best regression algorithms:

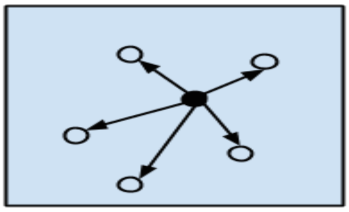
- Ordinary Least Squares Regression (OLSR)
- Linear Regression
- Logistic Regression
- Stepwise Regression
- Multivariate Adaptive Regression Splines (MARS)
- Locally Estimated Scatterplot Smoothing (LOESS)

Algorithms: Instance-based learning models are decision problems with crucial training data. Similarity measurements compare new data to a database of example data to get the best match and forecast. Therefore, instance-based techniques are called winner-take-all and memory-based learning. The representation and similarity of stored instances are stressed.



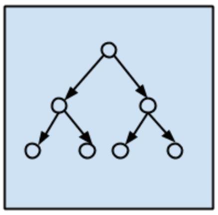
Regression Algorithms

The top instance-based algorithms include: • k-Nearest Neighbour (kNN)
- Learning Vector Quantization (LVQ) • Self-Organizing Map
- Locally Weighted Learning (LWL) and Support Vector Machines (SVM)
- Regularisation Algorithms: Extensions of regression algorithms that penalise models for complexity, favouring simpler, more generalizable models. Regularisation algorithms are popular, powerful, and easy to modify. The most common regularisation procedures are: • Ridge Regression
- LASSO and Elastic Net
- LARS (Least-Angle Regression)



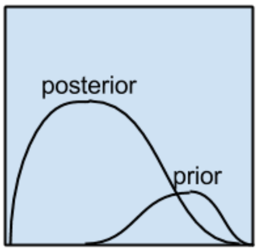
Instance-based Algorithms

Tree Decision Algorithms: Based on data attribute values, decision tree approaches model decisions. In tree architectures, decisions fork until a record is predicted. Decision trees train on data for categorization and regression. Decision trees are popular in machine learning for their speed and accuracy. Classification and Regression Tree are common decision tree techniques.
- ID3 iterative dichotomize
- C4.5 and C5.0 strong approaches
- CHAID: Chi-squared Automatic Interaction Detection
- Decision Stump
- M 5
- Conditional Decision Trees



Decision Tree Algorithms

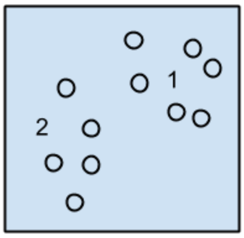
Bayesian Algorithms: Bayesian methods are those that explicitly apply Bayes' Theorem for problems such as classification and regression. The most popular Bayesian algorithms are:
- Naive Bayes
- Gaussian Naive Bayes
- Multinomial Naive Bayes
- Averaged One-Dependence Estimators (AODE)
- Bayesian Belief Network (BBN)



Bayesian Algorithms

Clustering Algorithms: Clustering, like regression, describes the class of problem and the class of methods. Clustering methods are typically organized by the modelling approaches such as centroid-based and hierarchal. All methods are concerned with using the inherent structures in the data to best organize the data into groups of maximum commonalities. The most popular clustering algorithms are:

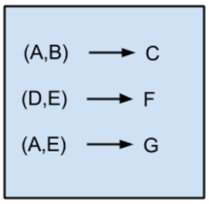
- k-Means
- k-Medians
- Expectation Maximization (EM)
- Hierarchical Clustering



Clustering Algorithms

Association Rule Learning Algorithms: Association rule learning methods extract rules that best explain observed relationships between variables in data. These rules can discover important and commercially useful associations in large multidimensional datasets that can be exploited by an organization. The most popular association rule learning algorithms are:

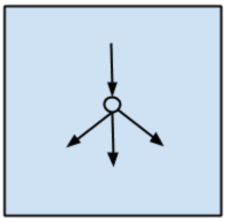
- Apriori algorithm
- Eclat algorithm



Association Rule
Learning Algorithms

Artificial Neural Network: Algorithms Artificial Neural Networks are models that are inspired by the structure and/or function of biological neural networks. They are a class of pattern matching that are commonly used for regression and classification problems but are really an enormous subfield comprised of hundreds of algorithms and variations for all manner of problem types. The most popular artificial neural network algorithms are:

- Perceptron
- Multilayer Perceptron's (MLP)
- Back-Propagation
- Stochastic Gradient Descent
- Hopfield Network
- Radial Basis Function Network (RBFN)



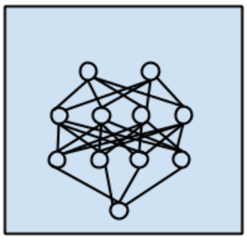
Artificial Neural Network
Algorithms

Deep Learning Algorithms: Note that here Deep Learning algorithms are separated out from neural networks because of the massive growth and popularity in the field. Artificial Neural Networks that exploit abundant cheap computation. Deep learning methods are a modern update to to Artificial Neural Networks that exploit abundant cheap computation. They are concerned with building much larger and more complex neural networks and, as commented on above, many methods are concerned with very large datasets of labelled analog data, such as image, text. Audio and video.

Here we are concerned with the more classical methods. The most popular deep learning algorithms are:

- Convolutional Neural Network (CNN)
- Recurrent Neural Networks (RNNs)

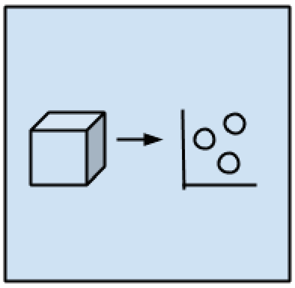
- Long Short-Term Memory Networks (LSTMs)
- Stacked Auto-Encoders
- Deep Boltzmann Machine (DBM)
- Deep Belief Networks (DBN



Deep Learning Algorithms

Dimensionality Reduction Algorithms: Like clustering methods, dimensionality reduction seeks and exploit the inherent structure in the data, but in this case in an unsupervised manner or order to summarize or describe data using less information. This can be useful to visualize dimensional data or to simplify data which can then be used in a supervised learning method. Many of these methods can be adapted for use in classification and regression.

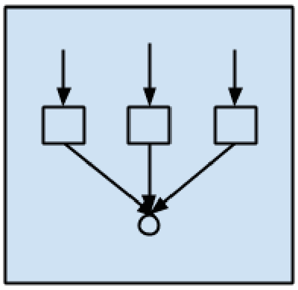
- Principal Component Analysis (PCA)
- Principal Component Regression (PCR)
- Partial Least Squares Regression (PLSR)
- Sammon Mapping
- Multidimensional Scaling (MDS)
- Projection Pursuit
- Linear Discriminant Analysis (LDA)
- Mixture Discriminant Analysis (MDA)
- Quadratic Discriminant Analysis (QDA)
- Flexible Discriminant Analysis (FDA):



Dimensional Reduction Algorithms

Ensemble Algorithms: Ensemble methods are models composed of multiple weaker models that are independently trained and whose predictions are combined in some way to make the overall prediction. Much effort is put into what types of weak learners to combine and the ways in which to combine them. This is a very powerful class of techniques and as such is very popular.

- Boosting
- Bootstrapped Aggregation (Bagging)
- AdaBoost
- Weighted Average (Blending)
- Stacked Generalization (Stacking)
- Gradient Boosting Machines (GBM)
- Gradient Boosted Regression Trees (GBRT)
- Random Forest



Ensemble Algorithms

Audio machine learning applications used to depend on traditional digital signal processing techniques to extract features. For instance, to understand human speech, audio signals could be analyzed using phonetics concepts to extract elements like phonemes. All of this required a lot of domain-specific expertise to solve these problems and tune the system for better performance. However, in recent years, as Deep Learning becomes more and more ubiquitous, it has seen tremendous success in handling audio as well.
The answer, of course, is fairly commonplace and mundane. This is done by generating Spectrograms from the audio. So first let's learn what a Spectrum is, and use that to understand Spectrogram

We select data collection methods.

The AUM chant was adopted by "ISHA YOGA CENTRE". Isha Foundation is based at the Velliangiri foothills Isha Yoga Centre near Coimbatore. Dawn chanting is second. AUM was sung in the morning and recorded. The participant must chant or say A U and M (aa, uu, mm) and record it separately. We collect data separately for men and women. Thus, the same mechanism recorded data continuously. To ensure accurate chanting, I gathered 90 A, U, and M samples. Recordings were converted to wave files. Used Audacity. Audacity was used to trim A, U, M chanting samples and reduce noise before concerting the raw data into wave files. Wave file data is exported to folders. Labelled files.
The audio file for males saying aa, uu, and mm is in Figure 8.
This total file is then splitted into separate files for sound aa, sound uu, and sound mm Figure shows for the sound aa. Figure no 10 and Figure no11 shows for sound uu and sound mm respectively.
Thus, we have collected 90 samples of each sound aa, uu, and mm which is shown in following table no 3

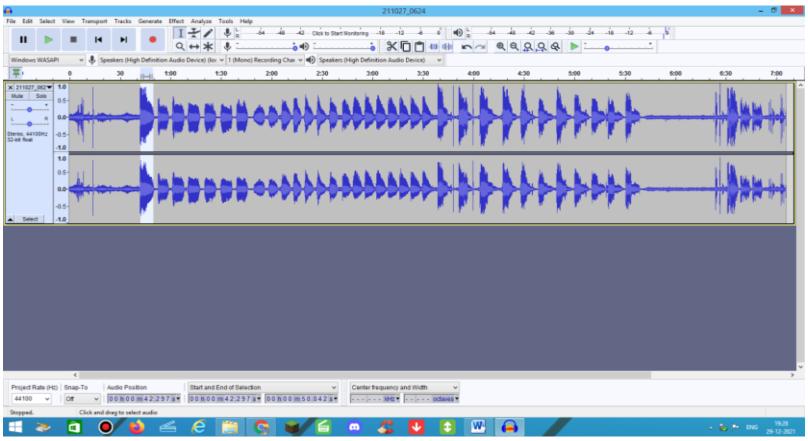


Figure: Audio file sample for uttering aa by male

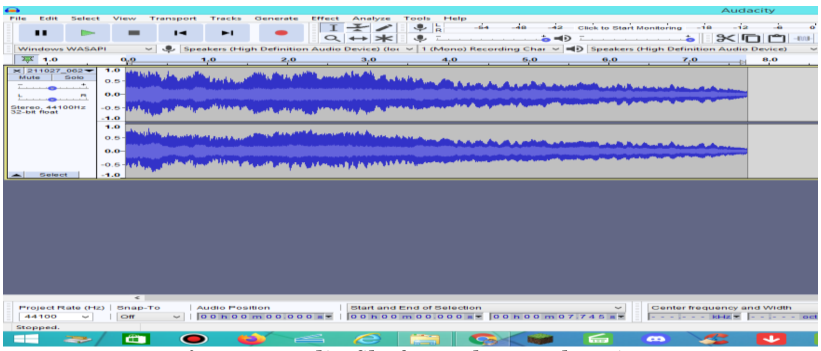


Figure: Audio file for male Om chanting

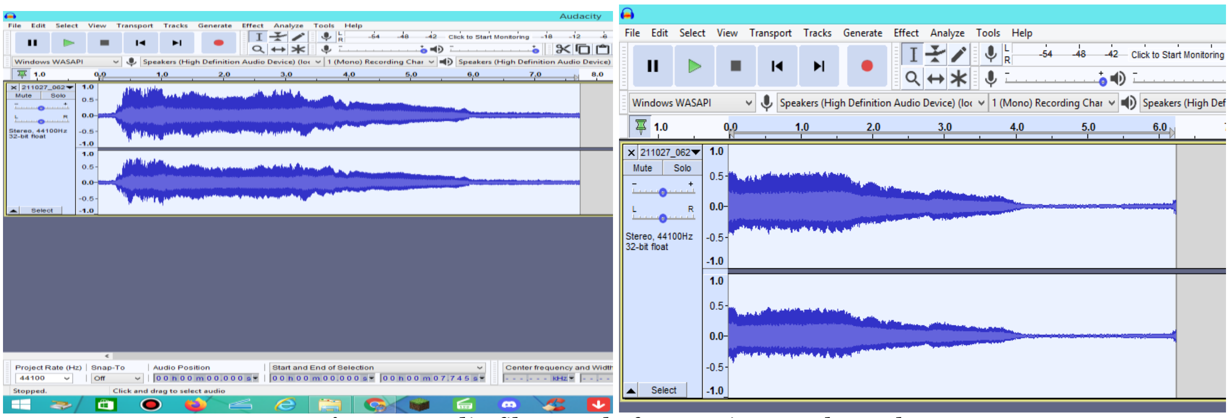


Figure: Audio file sample for uttering mm by male

Following is the sample table shows how 90 samples of each A, U, M, (aa, uu, mm) is converted into files and saved into three different folders.

Data Pre-Processing and Labelling: The data which is collected and recorded using Voice recorder is preprocessed by AUDACITY software. Along with a computer and voice recorder we generate and observe the frequency spectra of all 90samples (audio waveforms), from simple waveforms such as a sine wave to more complex waveforms. Thus, we have converted the recorded data into ".wave file" using Audacity software. Also, we have removed the noise and convert data that is the chanting of the AUM into exact samples of the letters A, U, M. These letters were cut into required sizes by using Audacity software. Then these files were exported in separate folders. Recorded data which is converted into separate files were exported into separate folders and labelled them as Sound aa, Sound uu and Sound mm. We made the folders of equal size and also in each folder we put equal samples. In each folder 90 samples are there.

The following figure shows the data how it is stored in different folders.

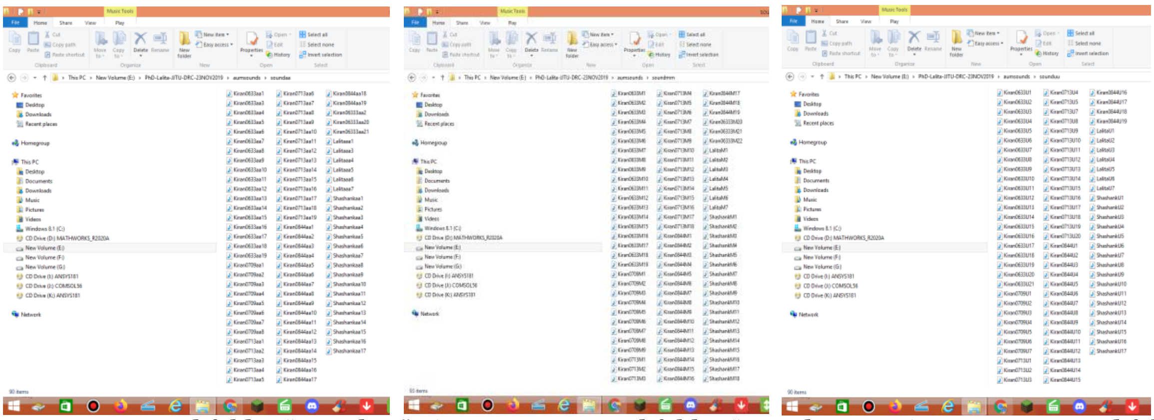


Figure: Data Sound folder "sound aa" Figure: Data Sound folder "sound mm Figure: Data Sound folder "sound uu"

Data Splitting for Training and Testing:

After labelling, the recorded data is kept into separate folder. In every folder of aa, uu, mm each signal represents a fixed duration of 0.5 seconds, assuming a 44.1 kHz sample rate. We create the dataset. Then we separate the Data Set into Train and Validation Sets.80% for Training and 20% for Testing. Same pattern is followed for the data while coding in MATLAB. That is 80% for Testing and 20% for training. Out of 90 files 78 files are allocated for Training and remaining 12 are allocated for Testing. This logic is put into MATLAB code and all the folders are divided accordingly. The main purpose of this activity is to allocate sufficient no of data to provide enough training to the Network

Training

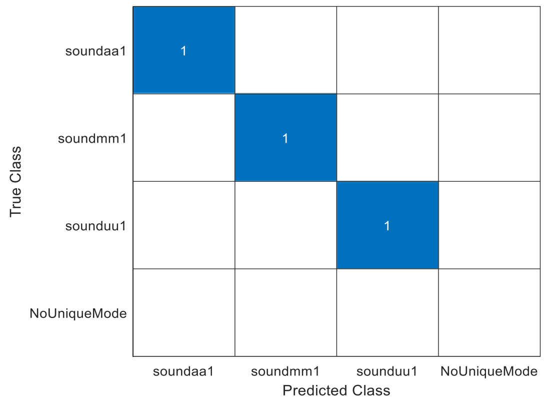
We create a training set that consists of 78 files of the aa signals, 78 files of the uu signals, and 78 of the mm signals. Audio data is highly dimensional and typically contains redundant information. Hence, we have reduced the dimensionality by first extracting features and then training the model using the extracted features. Thus, by using Over time, our "audio Feature Extractor" object harvests the mel spectrum centroid and slope. Use Call

extract to extract audio training data features. Tracking deep learning network training helps. Plotting metrics showed training progress. Network accuracy and overfitting of training data were measured here.
Our AUM data classification research employs genre for wavelet time scattering and audio data storage. Wavelet scattering uses nonlinearities, averaging, and wavelet transforms to represent low-variance data. Low-variance representations are given to classifiers.
The study included 90 AUM data samples (aa, uu, and mm). A 250MB compressed tar bundle contains the data. 500 MB of uncompressed data requires disc space. Extracting the compressed tar file from references creates a ten-subfolder folder. Each subfolder has genre-specific music. Genres: aa, uu, mm. This experiment achieved 61% accuracy using time-domain and frequency-domain information, mel-frequency cepstral (MFC) coefficients from each audio sample, and a Gaussian mixture model (GMM) categorization. Applying deep learning networks to the data. Deep learning approaches typically use CNNs with MFC coefficients or spectrograms. These strategies worked 80%.

Audio Data store: Maintain audio file collections with audio data storage. Audio data is organized from files, folders, labels, and random partitions for machine or deep learning training, validation, and testing. Our project's audio data repository tracks genres. Genre-titled collection subfolders. You can label audio data from subfolders using 'Include Sub Folders' and 'Label Source' to 'folder names'. This test assumes your MATLAB tempter directory's top-level directory is 'genres' Check that location points to top data folder. Three genre-specific subfolders should hold audio files in our main data folder.

Training and Test Sets: Our classifier needs tests and training. Train with 80% data, test with 20%. Randomizes audio store data. Do this before label-splitting to randomize data. This sample seeds RNG reproducibility. Audio data store 80-20 split Each Label. Split Each Label represents classes equally. As expected, training data has 72 records and test 12. Audio Data store supports tall MATLAB arrays. Build towering test and training arrays. System-dependent workers make up MATLAB's parallel pool. Calculate scattering feature natural logarithm for 2^19 audio samples using help erscat features and subsample number of scattering windows by 8. An appendix contains help erscat features code. Calculate training and test wavelet scattering characteristics. Calculate scattering characteristics and generate a matrix from training data. Tall expression evaluation takes many seconds using Parallel Pool 'local':

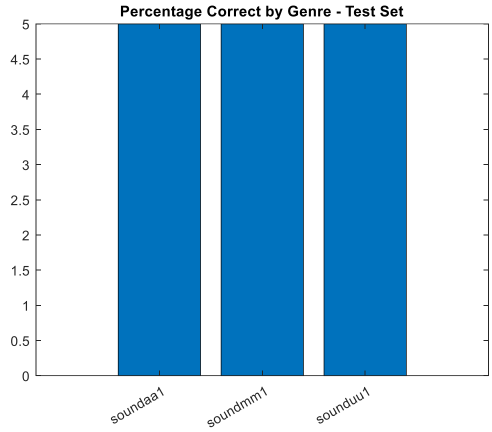
- Pass 1 of 1: Completed in 28 sec
- Evaluation completed in 28 sec
- Repeat this process for the test data.
- Evaluating tall expression using the Parallel Pool 'local':
- Pass 1 of 1: Completed in 9.2 sec
- Evaluation completed in 9.2 sec



Each audio signal's scattering transform has 341 pathways, and each row of Train Features and Test Features represents a scattering time frame. Each data sample has 32 time periods. Thus, the training data feature matrix is 25600-by-341. Rows = 72 training examples multiplied by 32 dispersion windows per example. The test data scattering feature matrix is 6400-by-341. Each of 12 tests has 32 windows. Label each of the 32-training data wavelet scattering feature matrix windows by genre.
This experiment uses a multi-class SVM classifier with a cubic polynomial kernel. Train the SVM on training data. The test accuracy is 88 %. This accuracy is comparable with the state of the art of the GTZAN dataset.

The diagonal of the confusion matrix plot shows that the classification accuracies for the individual genres is quite good in general. Extract these genre accuracies and plot separately.

Display the confusion matrix to inspect the genre-by-genre accuracy rates. Recall there are 12 examples in each class. The diagonal of the confusion matrix plot shows that the classification accuracies for the individual genres is quite good in general. Extract these genre accuracies and plot separately.



Thus, for the analysis of the AUM Dataset we use the wavelet time scattering and the audio datastore in genre classification. In this experiment, wavelet time scattering achieved a classification accuracy comparable to state-of-the-art performance for the audio dataset. As opposed to other approaches requiring the extraction of a number of time-domain and frequency-domain features, wavelet scattering only required the specification of a single parameter, the scale of the time invariant. The audio datastore enabled us to efficiently manage the transfer of a large dataset from disk into MATLAB and permitted us to randomize the data and accurately retain genre membership of the randomized data through the classification workflow.

CONCLUSION

- 4.Based on machine learning implementation for training, classification and prediction of AUM sound and comparing the three pretrained networks namely Google Net, Reset and Efficient b0 it is observed that Google net is giving maximum accuracy of 100 % for 10 no. of epochs.
- 5.We can conclude that for image-based classification Google net is better than other two networks namely ResNet and Efficient b0.
- 6. Based on the audio classification YamNet network has shown 56% accuracy for prediction for random sample of AUM sound.
- As per the frequency analysis done the major components of the frequency are Major frequencies are 185 Hz. 367 Hz. 550 Hz and 737 Hz
- The statistical mean value for the sound OM is 430 Hz. And the standard deviation is 242.34
- The maximum sound energy content is in between the frequency range of 200 Hz to 1400 Hz.

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