# SPECIMEN FORMAT FOR THESES OF MONTH

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| **Faculty** | : | Science |
| **Department** | : | Computer Science |
| **Branch/ Area:** | : | Computer Science/Signal Processing |
| **Sub Subject Heading:** | : | Voice Signals |
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| **Title of the thesis** | : | Acoustic Analysis for Human Voice Disorder Classification Using Optimization and Machine Learning Techniques |
| (i) In Roman Script<br>(ii) In roman Script | | - |
| **Nomenclature of Degree**: | : | Ph. D |
| **Month & Year of Enrolment**: | : | August 2015 |
| **Month & Year of Registration**: | : | August 2015 |
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| **Name of Supervisor** | : | Dr. V. Radha |
| **Designation of Supervisor** | : | Professor |
| **Centre/department/school in which research was conducted** | : | Computer Science / School of Physical Sciences and Computational Sciences |
| **University's Name & Address** | : | Avinashilingam Institute for Home Science and Higher Education for Women, Mettupalayam Road, Coimbatore - 641043 |

**Abstract within 300 words:**

The diagnosis of voice disorders through aggressive medical techniques seems painful for patients. Hence, automatic speech recognition and disorder identification methods have drawn much interest in the recent years and have proved to be successful. In this work, voice recordings are taken from the Saarbruecken Voice Database. The signals are preprocessed to remove silence and de-noised using Hybrid Wiener Filter Discrete Wavelet Transforms (HWFDWT). Features are extracted using Cat Swarm Optimization Mel Frequency Cepstrum Coefficients (CSOMFCC). Finally, the features are classified using Classification using Modified Optimized Back Propagation Network Disorder voice Classification (MOBPNDC). The classification scheme outperforms the existing Support Vector Machine (SVM) and Back Propagation Neural Network (BPNN) methods in terms of Accuracy, Precision, Recall, F-Measure and Time period.

**i) Major objectives** :

To develop an automatic voice pathological identification system based on vocal parameters to make the decision about the speech sample as 'Pathological' or 'Normal' using various speech features and machine learning classifiers.

**ii) Hypothesis**:

The proposed Voice Pathological Identification System that combines the Wiener Filter with Discrete Wavelet Transforms in the preprocessing phase outperforms well in the noise reduction process. The Cat Swarm Optimization technique is implied to Mel Frequency Cepstrum Coefficients so that the relevant features are extracted from the speech signals at high speed in minimal execution time. The classification of normal and pathological voices are efficiently performed by optimizing the SVM and BPNN algorithms as the proposed Modified Optimized Back Propagation Network Disorder Voice Classification (MOBPNDVC) which discriminates the input speech signal as male/female and normal/pathological.

Experiments to evaluate the proposed system are performed with the classification results a ROC curve is plotted for efficient voice pathology disorder classification with higher **Accuracy (ACC) of detection, Sensitivity (SEN) Loss of Voice, Specificity (SPE)** of disease rate and machine Execution Time. **The proposed Modified Optimized Back Propagation Network Disorder Voice Classification (MOBPNDVC) was efficient and produced a maximum average classification accuracy of 97.79% (Saarbruecken Voice Dataset) and 97.5% (Real-Time Dataset) with less Execution Time of 1.6 Sec (Saarbruecken Voice Dataset) and 2.8 Sec (Real-Time Dataset).**

**iii) Methodology** :

- **Phase 1: Preprocessing:** To produce a parametric representation. The First Phase focuses on silence and noise removal steps, here wiener and Discrete wavelet transformation filters are combined and proposed as Hybrid wiener and Discrete wavelet transformation HWFDWT to produce preprocessed speech.
- **Phase 2: Feature Selection and Extraction:** To select a subset of relevant variables and predictors, and to discard redundant and unwanted information. The second phase deals with enhancing feature selection & Extraction process by the proposed method CSOMFCC, by applying Cat Swarm Optimization technique with MFCC coefficients to reduce dimensionality and execution time.
- **Phase 3: Classification:** To classify the mixed voiced data set into normal and pathological voices. The Third phase of the work focuses on algorithms that improve classification accuracy and time with the proposed Modified BPNN algorithm.
- **Phase 4: Performance Analysis:** The ROC Curve plotted to distinguish between Pathological voices classification Accuracy and Pathology Diseases.

**iv) Findings:**

- Proposed the **Hybrid Wiener Filter Discrete Wavelet Transforms (HWFDWT)** for Silence Removal and Noise Removal in Pre-processing techniques.
- Proposed the **Wavelet Thresholding Algorithm** for Silence Removal and Noise Removal.
- Proposed **Cat Swarm Optimization Mel Frequency Cepstrum Coefficients (CSOMFCC)** to extract the best features from the signal in the Feature Extraction process.
- Proposed the **Modified Optimized Back Propagation Network Disorder Voice Classification (MOBPNDVC)** for Voice Pathology Identification System construction.
- Proposed **MOBPNDVC Optimization Algorithm** for Disorder Voice classification accuracy calculation.
- Analyzed the Voice Pathological Identification System to **identify** five types of voice pathology such as Laryngitis, Laryngoceles, Dysphonia, Diplophonia, and Chorditis.

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