# Denoising and Analysis MATLAB App

This MATLAB app allows users to select a .mat file containing 3D data, denoise the data using median filtering, and perform several analyses including calculating the mean square, group velocity, SWS map, and dispersion model.

## Features

- Select and load a .mat file containing 3D data.

- Denoise the selected data using 3D median filtering.

- Calculate and display the group velocity of the denoised data.

- Calculate and display the SWS map of the denoised data.

- Plot the dispersion image of the denoised data.

- Calculate and display the mean square value of the denoised data using the formula \(3qc^2\).

## Requirements

- MATLAB R2020a or later.

- MATLAB App Designer.

## Usage

1. \*\*Select File\*\*: Click the "Select File" button to open a file selection dialog and choose a .mat file containing 3D data. The variables in the .mat file will be loaded into the dropdown menu.

2. \*\*Denoise\*\*: After selecting a variable from the dropdown menu, click the "Denoise" button to denoise the selected 3D data using median filtering. The denoised data will be saved in a new folder with the same name as the original file.

3. \*\*Group Velocity\*\*: Click the "Group Velocity" button to calculate the group velocity of the denoised data. The result will be displayed in the "Group Velocity" text area.

4. \*\*SWS Map\*\*: Click the "SWS Map" button to calculate the SWS map of the denoised data. The result will be displayed in the "SWS Map" text area.

5. \*\*Dispersion Imaging\*\*: Click the "Dispersion Imaging" button to plot the dispersion image of the denoised data on the designated axis.

6. \*\*Mean Square\*\*: Click the "Mean Square" button to calculate the mean square value of the denoised data using the formula \(3qc^2\), where \(c\) is the mean velocity and \(q\) is a constant (1050). The result will be displayed in the "Mean Square" text area.

7. \*\*Mean Score\*\*: Click the "Mean Score" button to calculate the mean value of the denoised data. The result will be displayed in the "Mean Score" text area.

## Installation

1. Clone the repository to your local machine.

2. Open MATLAB and navigate to the directory where the repository is cloned.

3. Open the `app1\_converted.mlapp` file in MATLAB App Designer.

4. Click the "Run" button to launch the app.

## User Interface

The app consists of the following components:

- \*\*Select File Button\*\*: A button to open a file selection dialog to choose a .mat file containing 3D data.

- \*\*Variable DropDown\*\*: A dropdown menu that displays the variables present in the selected .mat file.

- \*\*Denoise Button\*\*: A button to denoise the selected 3D data using median filtering and save the denoised data in a new folder.

- \*\*Group Velocity Button\*\*: A button to calculate the group velocity of the denoised data.

- \*\*Group Velocity Text Area\*\*: A text area to display the calculated group velocity.

- \*\*SWS Button\*\*: A button to calculate the SWS map of the denoised data.

- \*\*SWS Text Area\*\*: A text area to display the calculated SWS map.

- \*\*Dispersion Imaging Button\*\*: A button to plot the dispersion image of the denoised data.

- \*\*Dispersion Axes\*\*: An axis to plot the dispersion image.

- \*\*Mean Square Button\*\*: A button to calculate the mean square value of the denoised data.

- \*\*Mean Square Text Area\*\*: A text area to display the calculated mean square value.

- \*\*Mean Score Button\*\*: A button to calculate the mean score value of the denoised data.

- \*\*Mean Score Text Area\*\*: A text area to display the calculated mean score value.

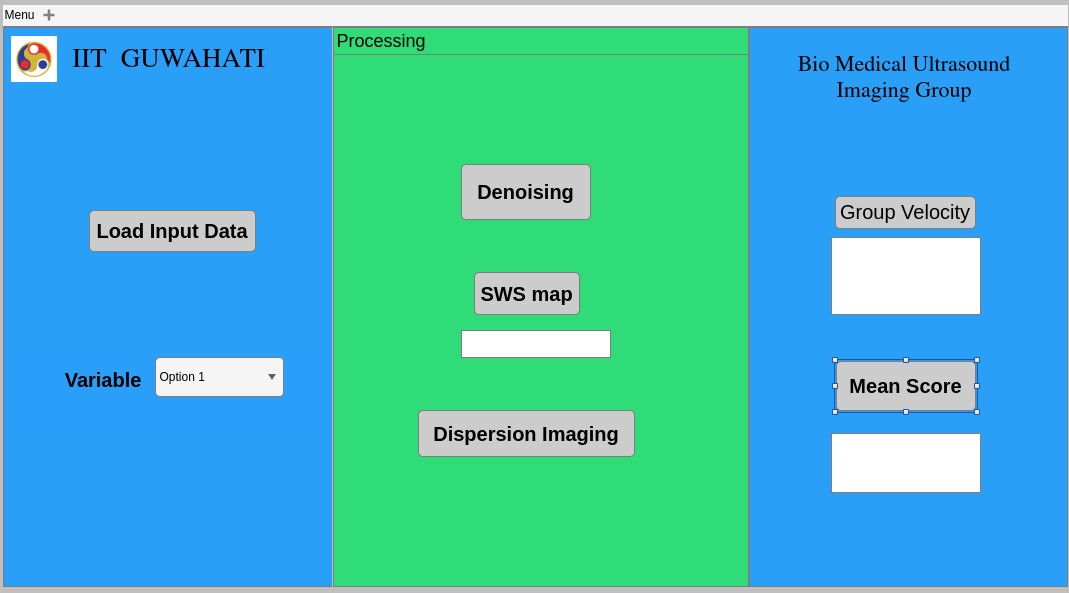


Fig 1. User Interface

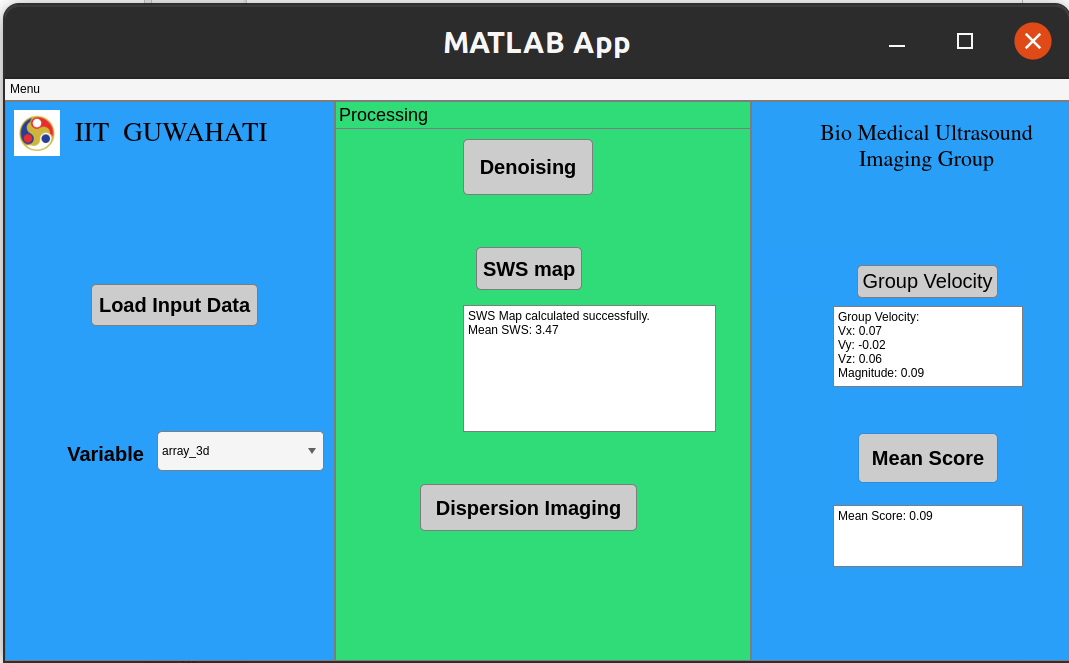


Fig 2. After Processing

## File Structure

- `app1\_coonverted.mlapp`: The main app file created using MATLAB App Designer.

- `README.md`: This file.

## Notes

- Ensure that the .mat file you select contains 3D numeric data.

- The denoised data will be saved in a new folder with the same name as the original file, located in the same directory as the selected file.