Development of Online Machine Learning Software using the HTML5 J-DSP Programming Environment

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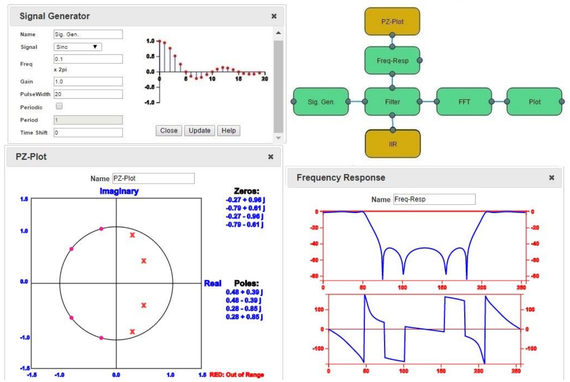
MOTIVATION

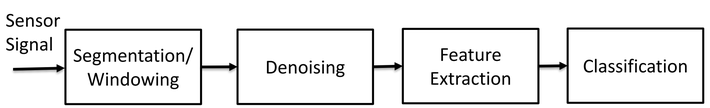
- **Elevated requirements for online content motivated rebuilding online simulation tools in a secure framework.**
- **New online tool based on Web 4.0 HTML5 technologies.**
- **Improved visual and user-friendly environment.**
- **Interactive software for Filter Design, Linear Predictive Coding, FFT, Adaptive Filtering.**



Implementation of Pole-Zero and Frequency response block in HTML5 based J-DSP

INTERFACE WITH SENSOR BOARDS

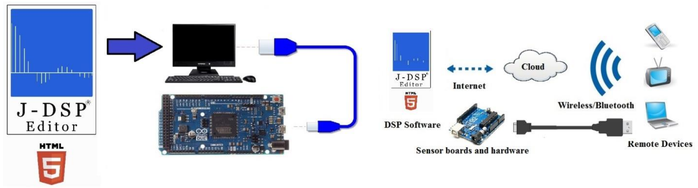
- **New software now has the ability to acquire data from remote devices.**
- **The data acquired can be used to train a model using machine learning algorithms.**



Basic Signal Processing Framework describing feature extraction and classification

INTERFACE WITH MOBILE DEVICES

- **Classification of data acquired to monitor health condition.**
- **Human Activity Detection.**

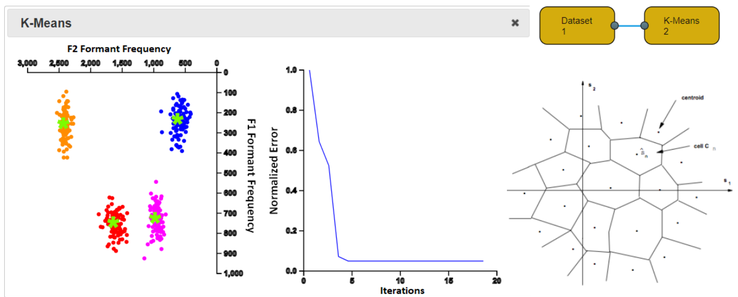


The interaction between DSP software , sensor boards and remote devices using wireless communications (Internet, Cloud, and Bluetooth)

MACHINE LEARNING ALGORITHMS

K-Means

- **Euclidean distance is used as a metric and variance is used as a measure of cluster scatter.**
- **Feature learning in (semi-)supervised or unsupervised training.**



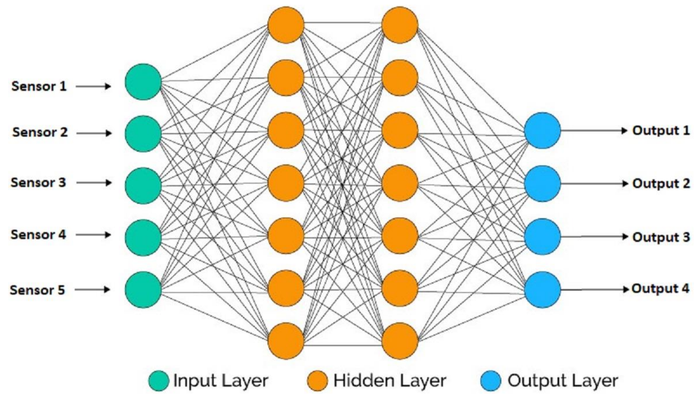
K-means algorithm implemented on formant data in JDSP-HTML5

Voronoi Diagram

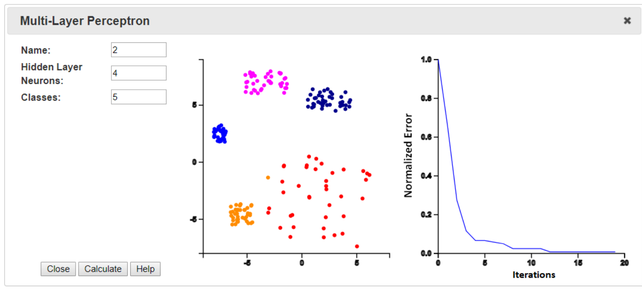
Multilayer Perceptron

- **Learning occurs in the perceptron by changing iteratively connection weights using backpropagation.**
- **MLPs are used in diverse applications including speech and image recognition, and machine translation**.

DEEP LEARNING



Artificial Neural Network with two hidden layers.



Multilayer Perceptron algorithm implemented in JDSP-HTML5

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- U. Shanthamallu, A. Spanias, C. Tepedelenlioglu, M. Stanley, "A Brief Survey of Machine Learning Methods and their Sensor and IoT Applications," *Proceedings 8th IEEE IISA 2017*, Larnaca, August 2017.
- A. Dixit, S. Katoch, P. Spanias, M. Banavar, H. Song, A. Spanias, "Development of Signal Processing Online Labs using HTML5 and Mobile platforms," *IEEE FIE 2017*, Indianapolis, October , 2017.

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