Software Logic

The software process outlined above is largely inspired by the work of Morillo et al in pneumonia classification in patients with COPD[51]. The information content of the three frequency bands mentioned in Figure 1 is outlined in their work. Relative power (RP) in the 200-400 Hz band (of tracheal sounds recorded from the suprasternal notch) contains low-frequency wheezes, rhonchi, and coarse crackles. RP in the 400-800 Hz band contains fine crackles and high-frequency wheezes. Finally, RP in the 800-2000 Hz band contains high-frequency noise mainly originated by airflow turbulences in the trachea. Thus, obtaining the relative power in these bands (Steps 1-3) is the first step in pneumonia classification. The next step is to look at the variability of these signals (Steps 4-6). This is because the wheezes and crackles modulate the power in the given bands over time, leading to a power signal with greater variance. A healthy patient would exhibit fewer or no wheezes and crackles and thus the variance in these bands would be minimized. One method of calculating this variance is the standard deviation. However, a less computationally intensive process involves zero-meaning the signal (Step 4), rectifying it (Step 5), and then taking the mean (Step 6), which gives a “standard deviation-like” measure of signal variability.

The final step involves an LDA classifier which converts the three power variability measures (one for each band) into the pneumonia likelihood percentage. This process is described in the next section.