

# Nonlinear Methods of Analyzing Respiratory Waveform Variability during Oral Feeding in Preterm Infants

## Purpose

This project intends to create a biomedical system that uses respiratory waveform variability to develop clinical algorithms based on respiration that guides clinical care in the feeding of infants in the NICU.



# System Architecture

#### Data Collection System:



#### Signal Processing Flow:



Beiwen Jia, Guanhong Liu, Qing Huang, Tianyu Zhao, Fangyan Dong Professor William C. Tang

Department of Electrical Engineering and Computer Science



### Cardiac Artifact

The cardiac movement can have significant impact on accuracy of ECG signal. Based on Digital Signal Processing method, we designed filters to get rid of those artifact. The results are shown on figures above.

## Approach

This research collects respiratory data from the Intellvue monitor using the respiratory waveform and uses MATLAB, a computer software program, to analyze the waveforms. Data were examined by MATLAB and then the software will determine if the waveform analysis provides relevant data which showing respiratory variability/rigidity of the feeding time of preterm infants.

This program uses the signals obtained by two electrocardiogram electrodes which placed on the surface of an infant's chest to measure the resistance. The impedance will keep going up until a maximum level is reached, and then there is a drop toward negative numbers as exhalation occurs.

Using the signals obtained by electrocardiogram electrodes, we can calculate SampEn, a statistical measure of the change in the complexity of physiological processes. And then certain types of variability may be biomarkers of the healthy physiological system of the infants.

## **Team Organization**

Team Member	Data collection	Hardware	Algorith
Beiwen Jia	$\checkmark$	$\checkmark$	
Fangyan Dong	$\checkmark$		$\checkmark$
Guanhong Liu	$\checkmark$	$\checkmark$	
Qing Huang	$\checkmark$		
Tianyu Zhao	$\checkmark$		$\checkmark$



m	Interface
	$\checkmark$

## Project Timeline & Plans

Fall Quarter Week 2 - Week 4 Literature review, discussion with mentors, setting up the monitor

Week 5 - Week 9 Write the algorithm (data clipping and sample entropy calculation)

#### Winter Break

Test our data extraction system in NICU, UCI Health. Test the algorithm accuracy based on the collected data

#### Winter Quarter

Week 1 - Week 4 Code review, improve the performance; Collecting more data to meet the clinical requirement; Frontend platform development

Week 5 - Week 9 Thesis writing, data visualization

THE HENRY SAMUELI SCHOOL OF ENGINEERING UNIVERSITY of CALIFORNIA - IRVINE