



## S&T Campaign: Analysis & Assessment

### Military Injury Biomechanics

Cameron Good (410) 278 -0835, [cameron.h.good.civ@mail.mil](mailto:cameron.h.good.civ@mail.mil)

Patrick Gillich (410) 278-6332, [patrick.j.gillich.civ@mail.mil](mailto:patrick.j.gillich.civ@mail.mil)

Nitin Moholkar (Altus Engineering)\*

\*Altus Engineering, LLC  
Darlington, MD 21034

## Research Objective

- Develop algorithms to remotely ascertain heart and respiratory rate and local body temperature using both thermal and visible cameras.

### Civilian medical triage



### Military medical triage



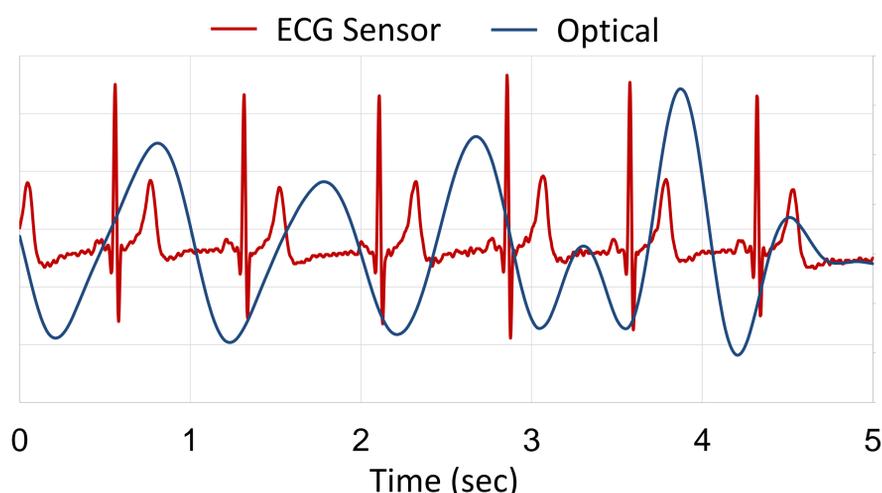
Similar equipment are available to both Civilian and Military medical teams to treat injured individuals. However, new tools for Soldier in-field triage are needed to limit equipment burden while enhancing capabilities.

## ARL Facilities and Capabilities Available to Support Collaborative Research

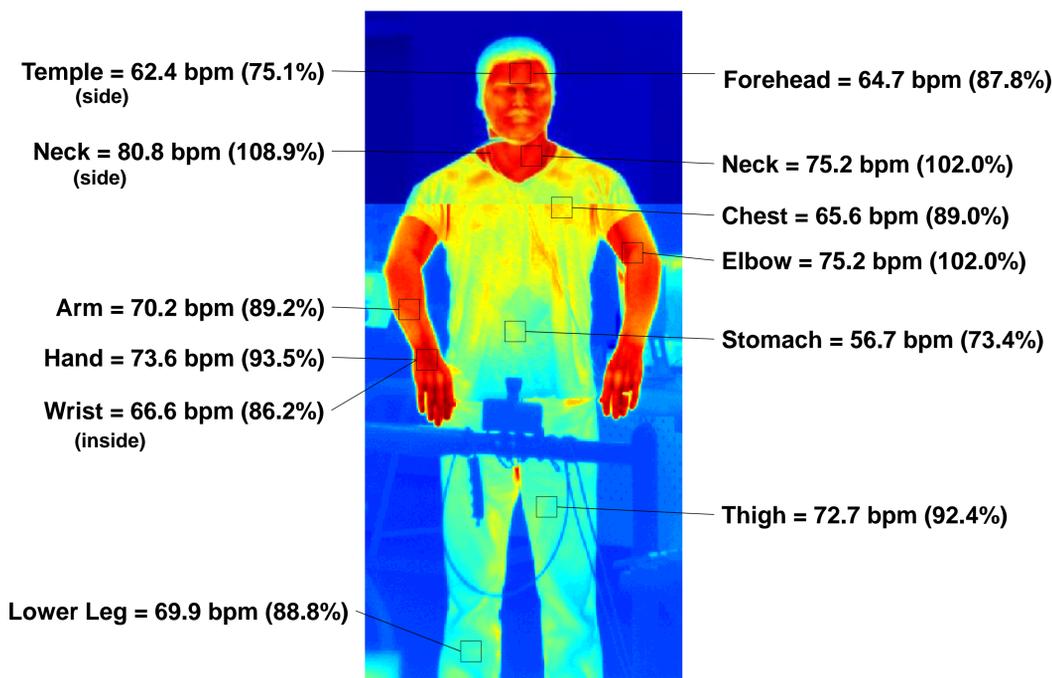
- We have high-definition thermal and optical cameras available for experimentation, along with unique facilities to obtain remote imaging data.
- Custom algorithms and tools to accurately obtain heart and respiratory rate remotely.

## Preliminary Results and Challenges

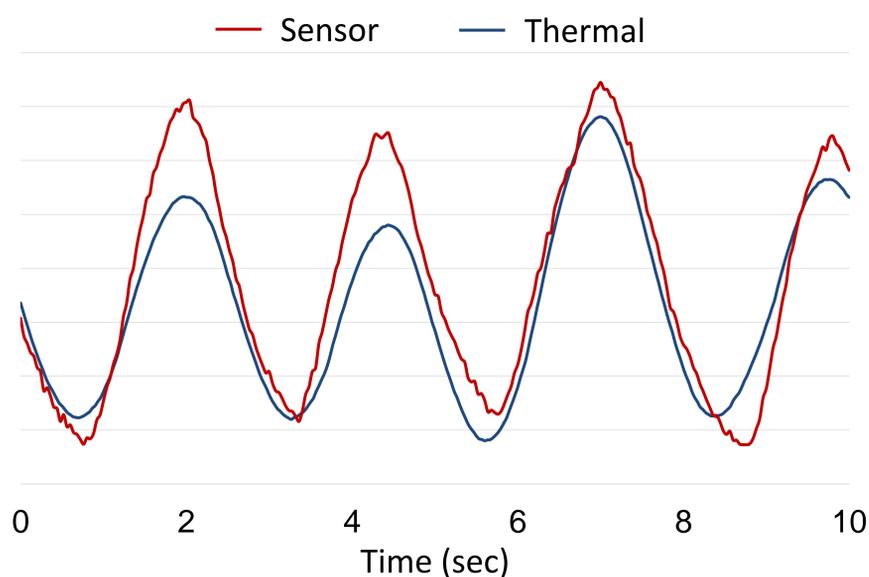
- Using optical imaging with a 12X zoom, we are able to obtain heart rate at a 100ft stand-off distance.
- Using thermal imaging, we are able to obtain heart and respiratory rate at a 25ft stand-off distance.
- Goal is to obtain vital signs at 300ft stand-off.



Determination of heart rate using optical imaging at 100ft.



Determination of heart rate (beats per minute, bpm) using thermal imaging at 25ft. Percent accuracy as compared to an attached electrocardiogram (ECG) monitor is shown in parentheses (average error = 11.5%).



Determination of respiratory rate using thermal imaging at 25ft.

## Complementary Expertise / Facilities / Capabilities Sought in Collaboration

- We are actively seeking collaborators who are interested in advancing remote sensing of vital signs.
- We hope to test our methodology in a hospital trauma setting and compare our results to standard vital sign measurements obtained via attached sensors.
- Advanced expertise in computer vision is needed to automatically identify and analyze regions of interest.