SAND2018-7959C

*Sandia National Laboratories*

# WATCH
## Wearables At The Canyon for Health

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## Problem

Hikers attempting the Grand Canyon R2R Hike undergo significant altitude and temperature change. The extreme environment of the Grand Canyon and the intense physical strain of the hike present an opportunity to measure markers for health as fatigue kicks in.

### Grand Canyon Rim-2-Rim Hike:

- 14.3 miles, 6,000 feet from the North rim to the bottom
- 9.6 miles, 4,500 feet back up to the South Rim

## Objectives

**Markers for Health**
Identify physiological and cognitive markers most related to health and task performance.

**Wearable Devices**
Determine which commercial off-the-shelf (COTS) wearable devices are best for measurement and in rugged environments.
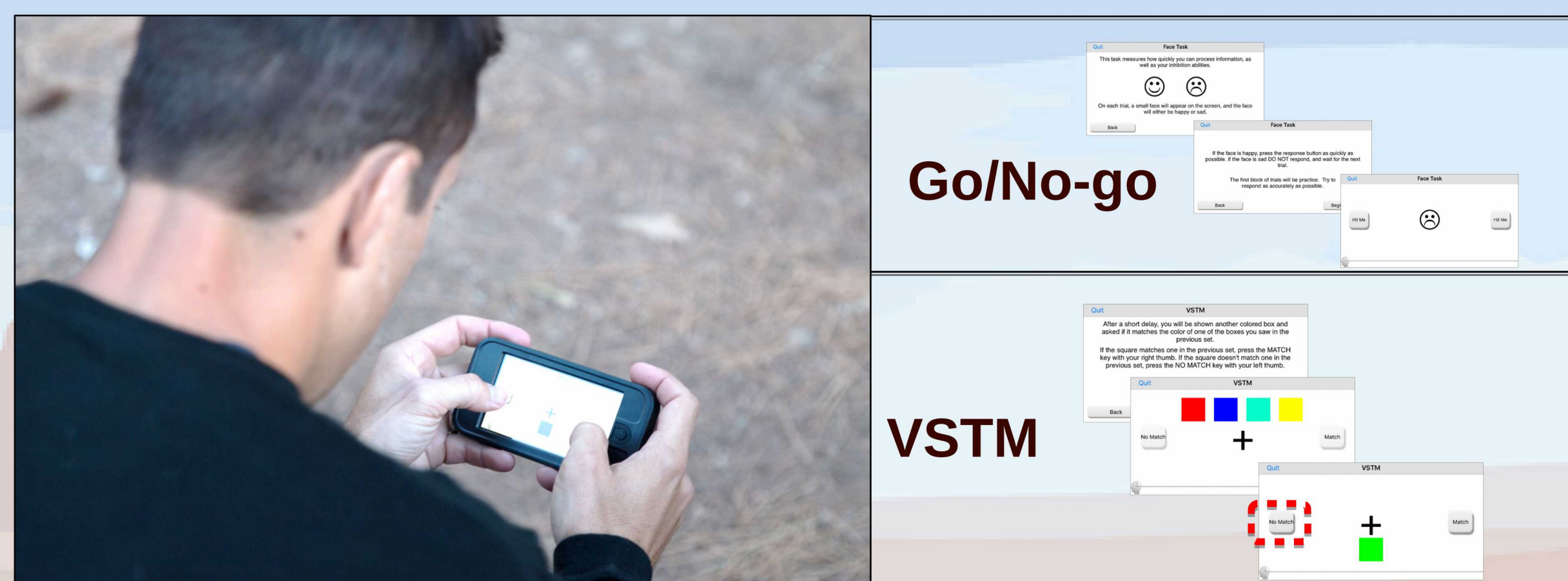
**Health Events**
Identify which markers for health are most predictive of benign vs. traumatic health events.

## Approach

**Data Collection**
During the WATCH data collection event, hikers attempt the R2R hike in a single day. Sandia collects physiological and cognitive data throughout the hike. The WATCH project collaborates with the University of New Mexico to collect survey and blood work data before and after the hike.

Go/No-go

VSTM

Every 5 miles, hikers complete cognitive tests on an iPod touch

iPod Touch

Suunto Smart Sensor

Suunto Spartan Ultra

Wahoo TICKR-X & Garmin Tempe

Garmin Fenix 3 & 5

SensorPush

Garmin or Polar Foot Pod

Hikers are equipped with wearable devices that collect physiological data

## Analysis and Impact

**Data Analysis**
Use statistical and machine learning techniques to identify markers for health and analyze health events.
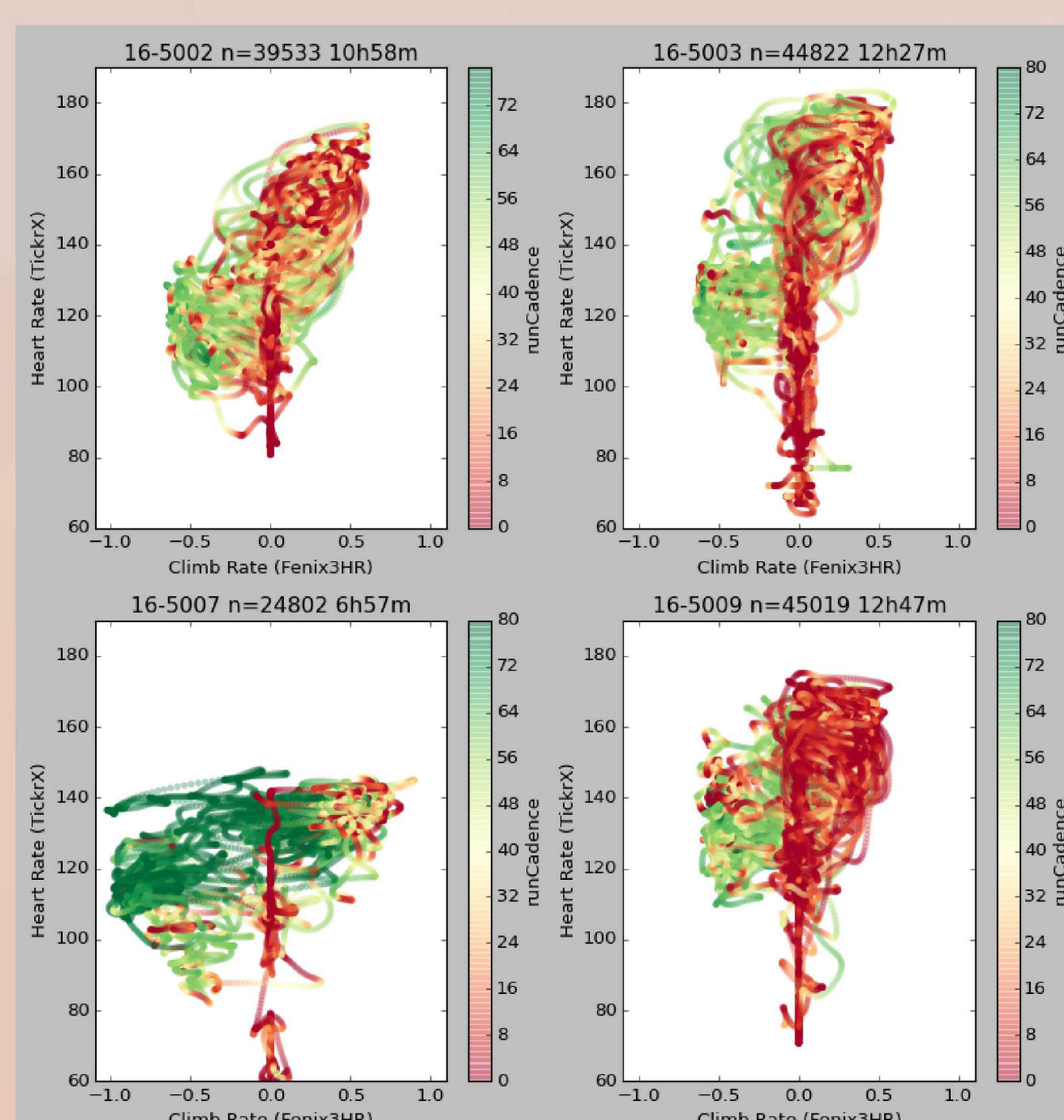
**Cyber Security Implications**
Identify vulnerabilities in the protection of physiological and cognitive data.

**Biosurvelliance Ecosystem (BSVE)**
Integrate data into BSVE to visualize data for real-time analytics.

Individual Profiles:
Heart Rate vs. Climb Rate

Predicting Heart Rate from recent activity