

HIKING THE GRAND CANYON FOR SCIENCE

GLORY EMMANUEL AVIÑA

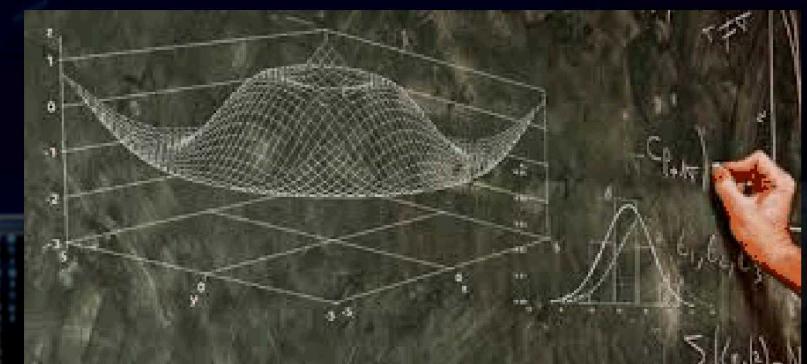
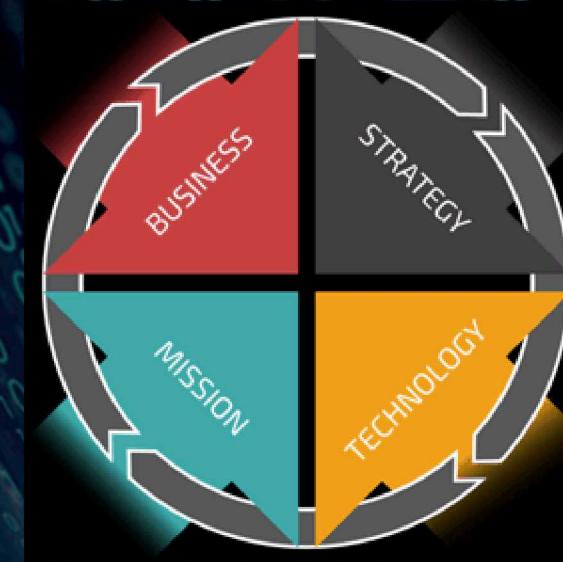
L1 MANAGER, 8766 CYBER SECURITY ASSESSMENTS

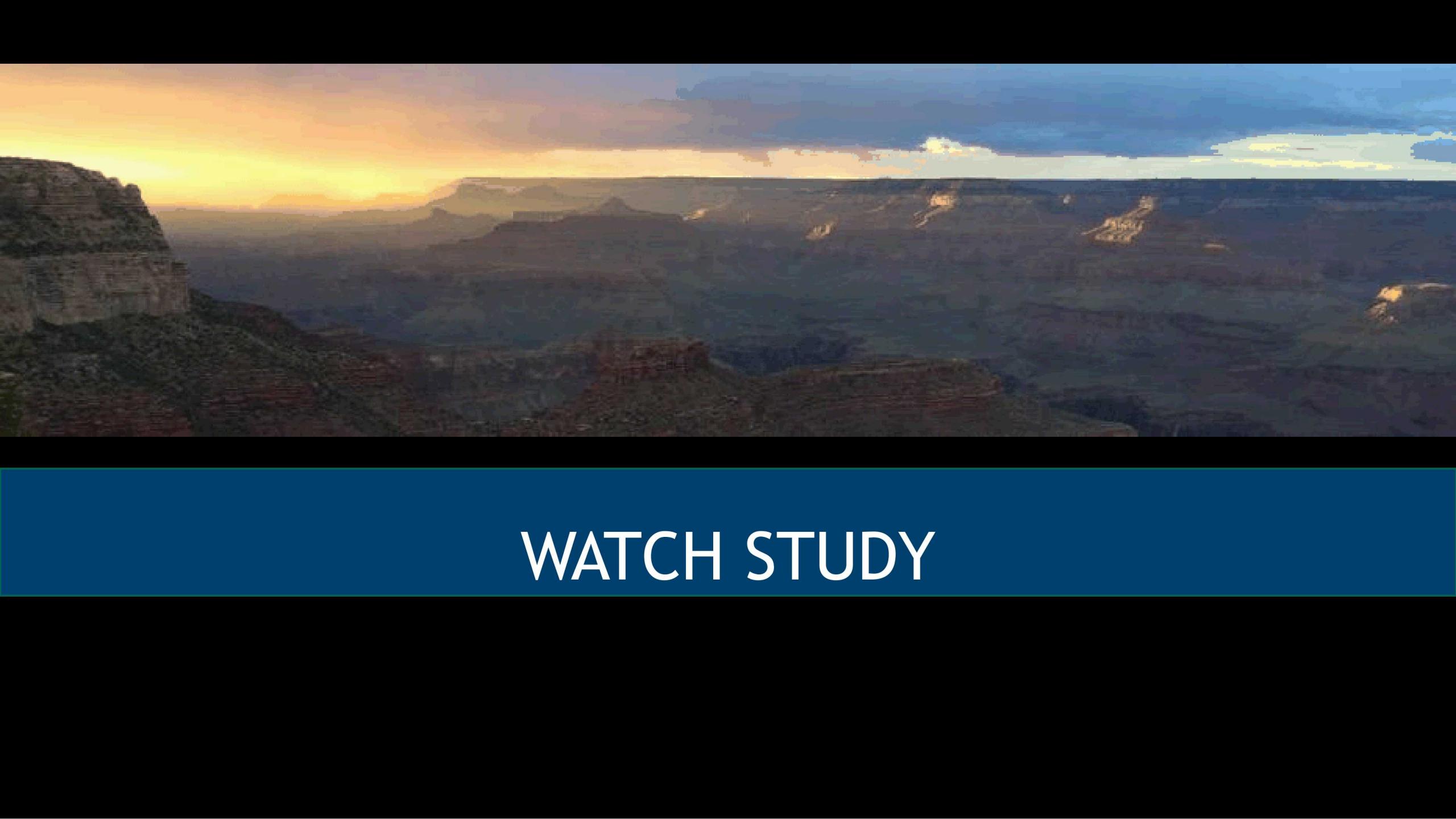
STUDENT TALK -- JUNE 2019

INTRO TO ME

- L1 Manager for Cybersecurity Assessments
- Started in 2006 as student intern
- Worked at SNL-NM for 10 years
- Been a SNL-CA for 4 years

CAREER PATH





WATCH STUDY

WATCH STUDY PURPOSE

1) Markers for Health:

identify physiological, cognitive markers most related to health and task performance

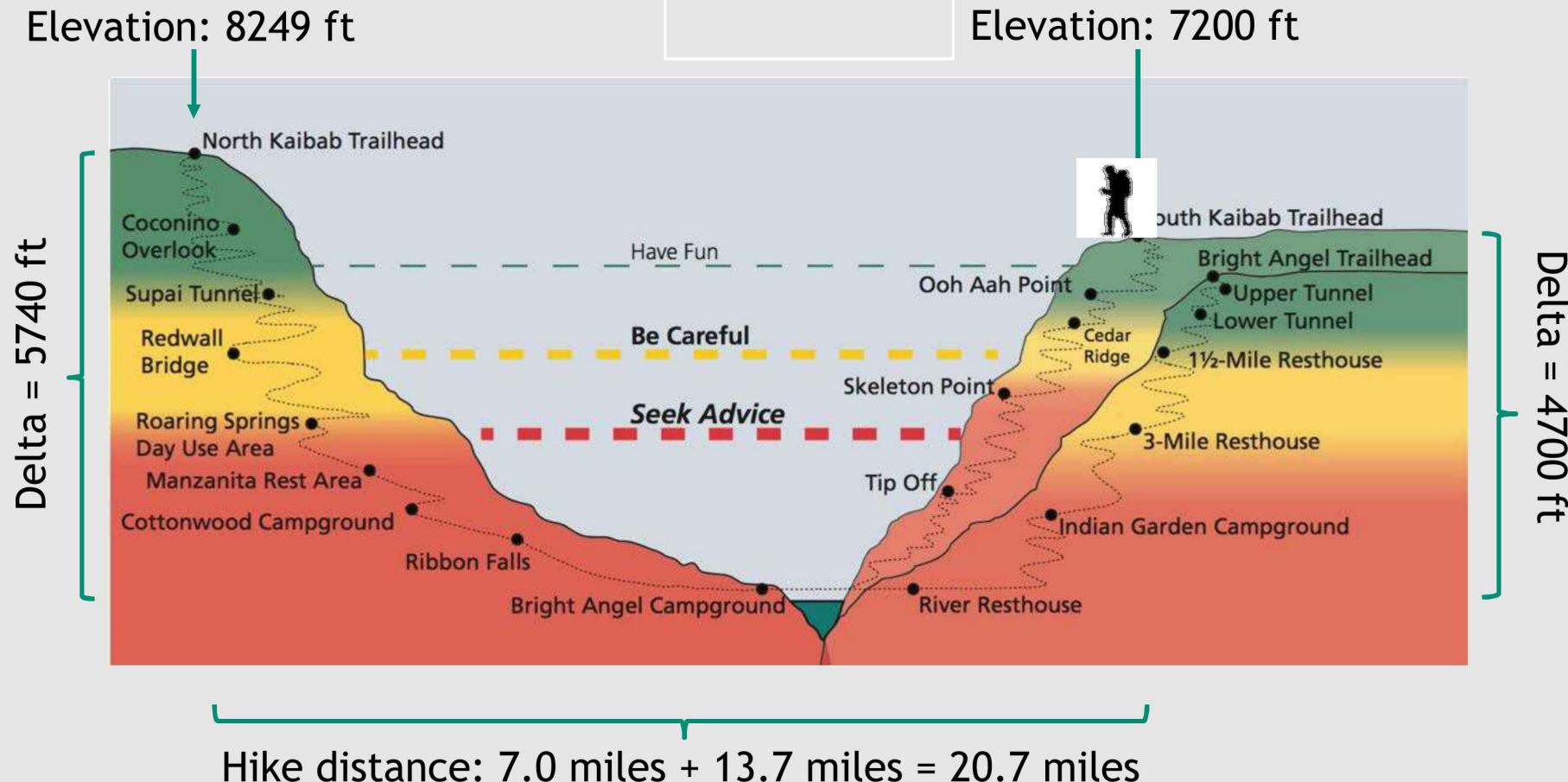
2) Wearable Devices:

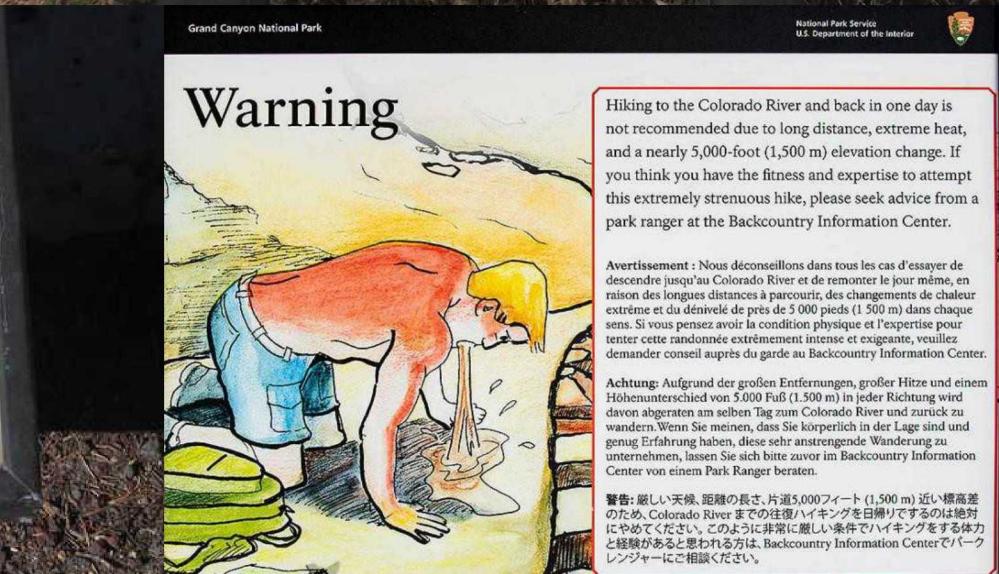
identify which COTS wearable devices are best for measurement and in rugged environments

3) Health Events:

use statistical analyses on collected data to identify which markers are most predictive of benign vs. traumatic health events

THE RIM-TO-RIM HIKE



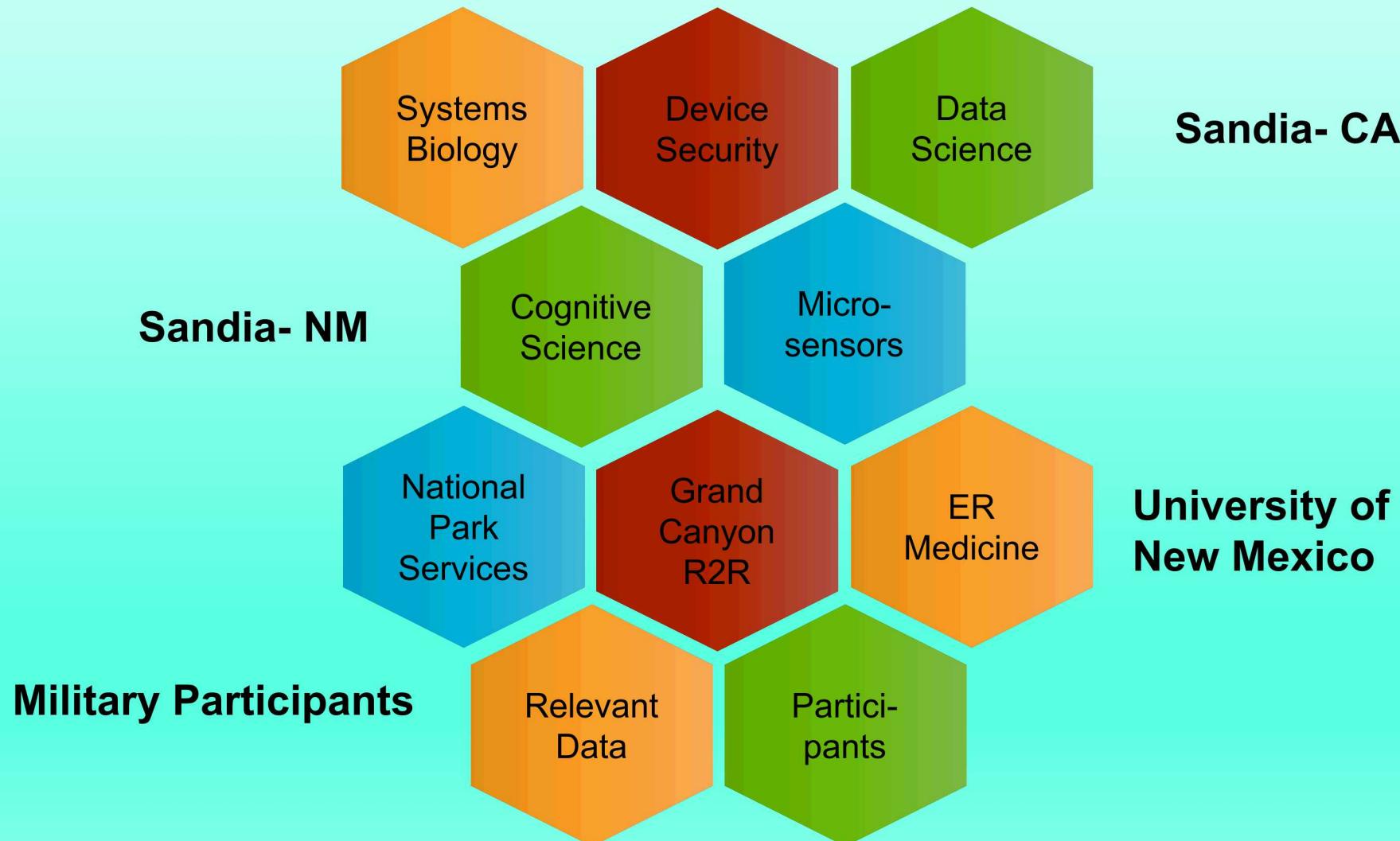


Avertissement : Nous déconseillons dans tous les cas d'essayer de descendre jusqu'au Colorado River et de remonter le jour même, en raison des longues distances à parcourir, des changements de chaleur extrême et du dénivelé de près de 5 000 pieds (1 500 m) dans chaque sens. Si vous pensez avoir la condition physique et l'expertise pour tenter cette randonnée extrêmement intense et exigeante, veuillez demander conseil auprès du garde au Backcountry Information Center.

Achtung: Aufgrund der großen Entfernung, großer Hitze und einem Höhenunterschied von 5.000 Fuß (1.500 m) in jeder Richtung wird davon abgeraten am selben Tag zum Colorado River und zurück zu wandern. Wenn Sie meinen, dass Sie körperlich in der Lage sind und genug Erfahrung haben, diese sehr anstrengende Wanderung zu unternehmen, lassen Sie sich bitte zuvor im Backcountry Information Center von einem Park Ranger beraten.

警告: 繁しい天候、距離の長さ、片道5,000フィート(1,500 m) 近い標高差のため、Colorado River までの往復ハイキングを日帰りでするのは絶対にやめてください。このように非常に厳しい条件でハイキングをする体力と経験があると思われる方は、Backcountry Information Centerでパークレンジャーにご相談ください。

Interdisciplinary Approach



OOH AAH POINT



Photo credit: WATCH team member, Rob Abbott

0.7mi; 790ft Down
20 miles to go!

DEVICES USED

Suunto
Spartan
Ultra



Vivoactive
HR



Fitbit
Charge
HR



LifeBeam
SmartHat



Garmin
eTrex 10



Equivalit



Wahoo TICKR-X



Suunto
Smart
Sensor



Empatica
E4



Garmin
Fenix 3 HR



Garmin
Fenix 5 HR



Pre / Post
Weigh-in
(participant
& pack)



Pre / Post
Blood Draw

Polar Foot
Pod



Garmin Foot
Pod



Myontec Mbody Shorts



Omron
bio-impedance



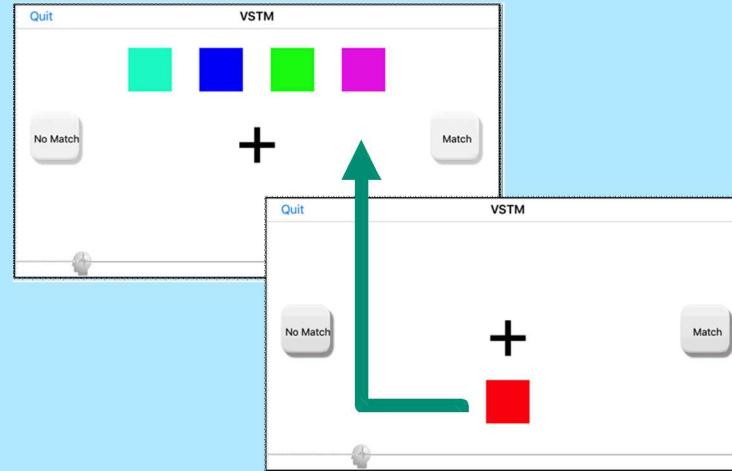
iPod Touch 6
BrainBaseline



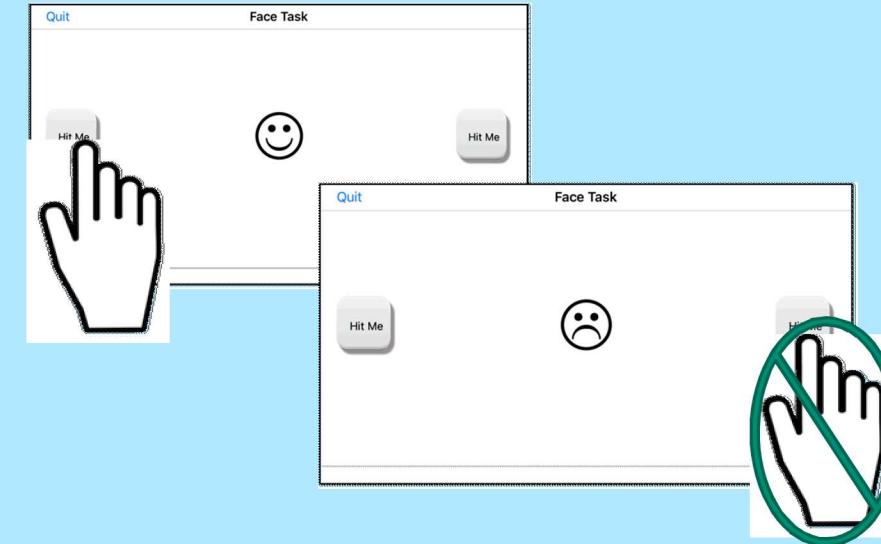
sensorPush

COGNITIVE ASSESSMENTS

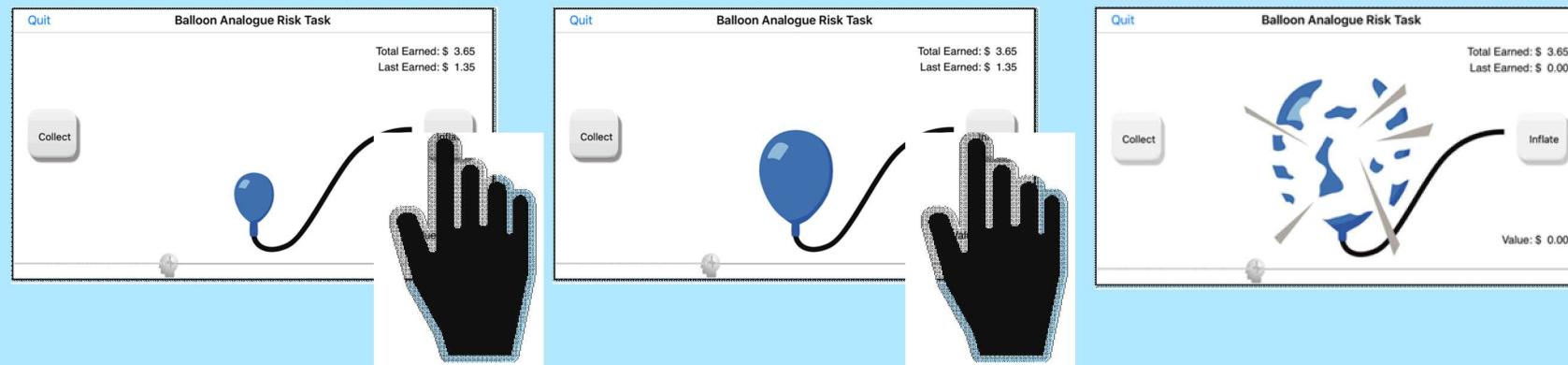
Visual Short-term Memory (VSTM)



Go/No-Go



Balloon Analogue Risk Task (BART)



DATA COLLECTED

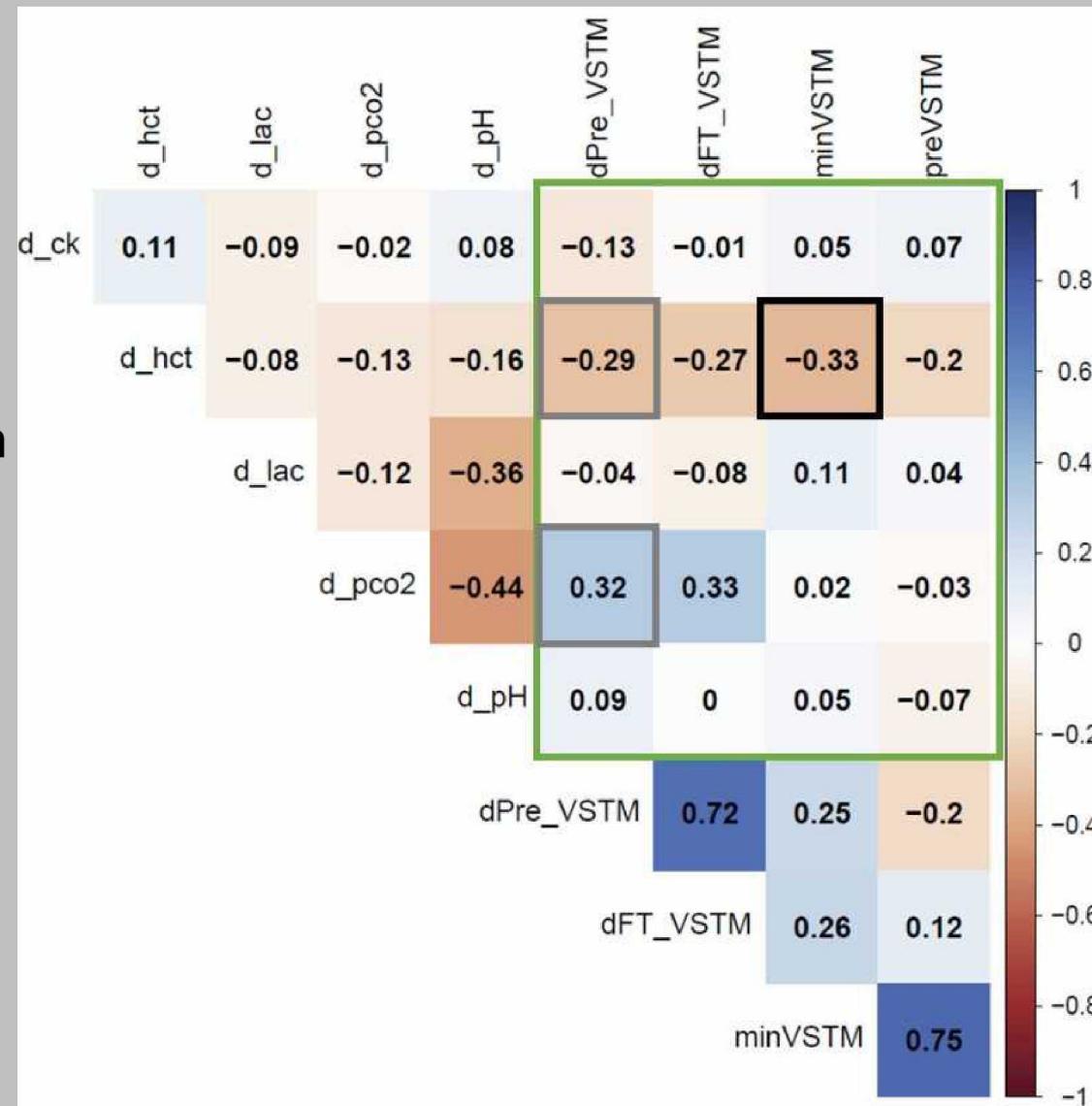
	Wearables	Cognitive	Bloodwork	Surveys
TOTAL	174	162	179	452
Sep 2018	38	38	37	38
Oct 2017	27	27	24	27
May 2017	59	57	67	99
Oct 2016	50	40	51	288



BrainBaseline & Blood



The lower the minimum VSTM accuracy score across the hike, the greater the change in hematocrit across the hike.



Interpreting the Blood & Cognitive Connection



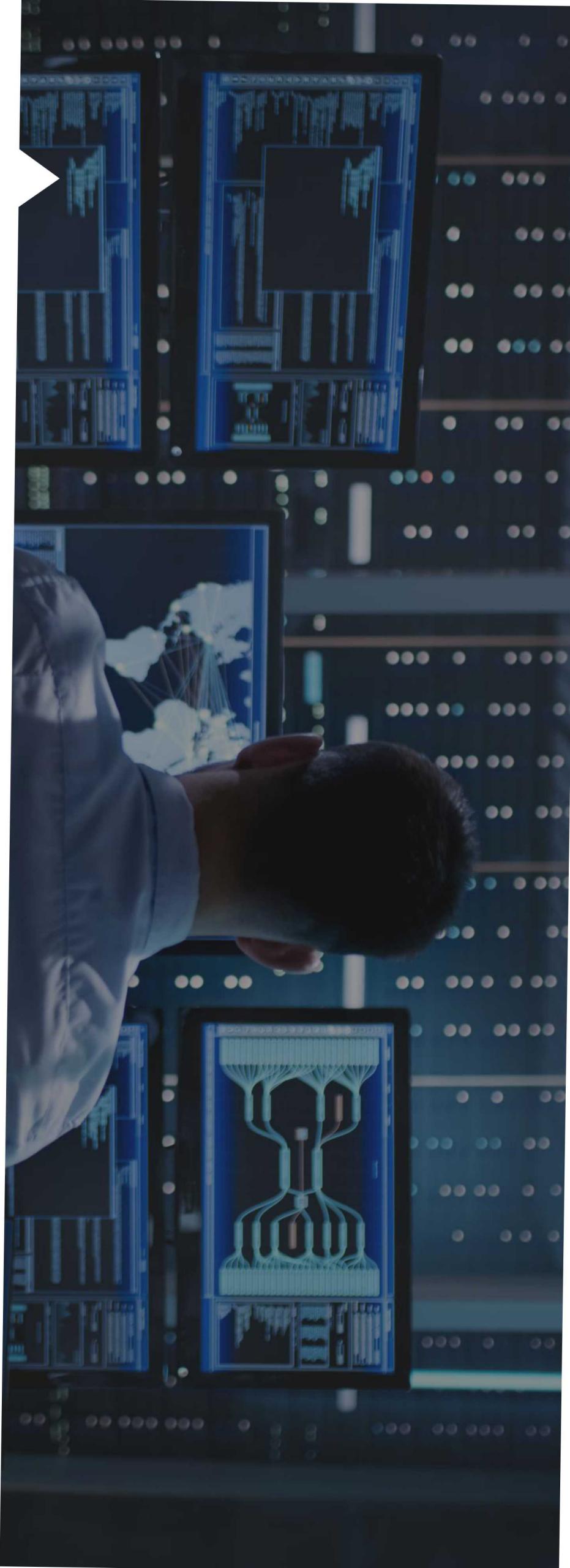
Blood-centric perspective:

- Increased hematocrit associated with...
 - Increased reported fatigue (mental fatigue across hike, max mental fatigue, physical fatigue across hike)
 - Reduced VSTM performance (across hike and min score)
 - Lower minimum BART total value
 - More explosions in BART from final training to end of hike
- Decreased pCO₂ associated with...
 - Lower physical fatigue ratings at start of hike
 - Poorer performance on VSTM at end of hike relative to start
 - Slower response time on VSTM task (across hike and relative to final training)
- Decreased pH levels associated with...
 - Increased reported fatigue (max mental and physical fatigue, mental fatigue across hike, physical fatigue across hike)
 - More explosions in BART from start to end of hike

BrainBaseline-centric perspective:

- Increased fatigue ratings associated with...
 - Increased hematocrit (mental fatigue change, max mental fatigue, physical fatigue change)
 - Increased pCO₂ (physical fatigue at start)
 - Decreased pH levels (max mental and physical fatigue, mental fatigue across hike, physical fatigue across hike)
- Reduced performance on VSTM associated with...
 - Increased hematocrit (VSTM across hike and min score)
 - Decreased percentage CO₂ (VSTM across hike)
- Slower response time on Go/No-Go associated with decreased pCO₂
- Increased explosions in BART associated with...
 - Decreased pH levels (BART across hike)
 - Increased hematocrit (BART from final training to end)
- Lower minimum BART total value associated with increased hematocrit

EMULYTICS



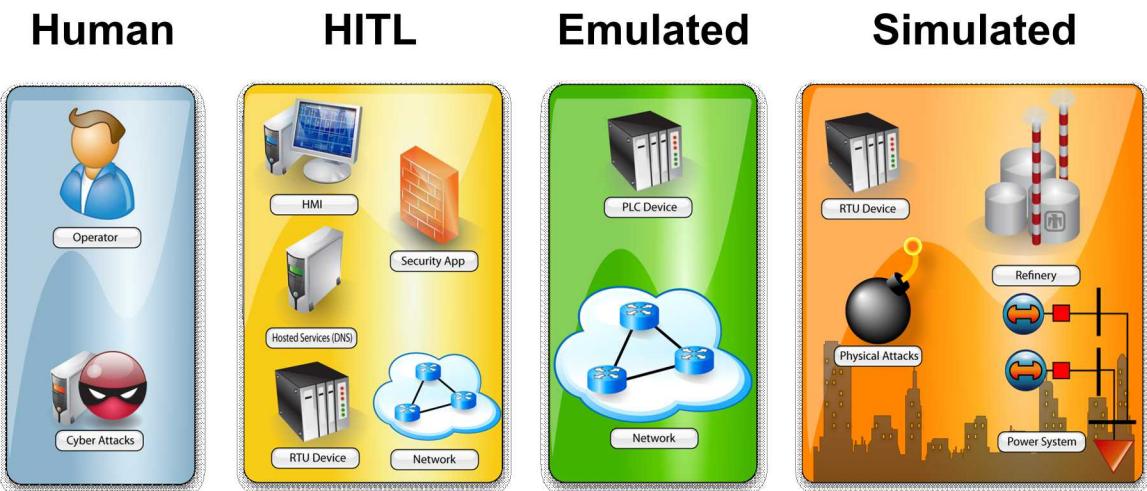
EMULYTICS

Emulytics = Emulation of complex, distributed cyber network systems + analytics of that data

Provides a safe environment at scale to evaluate the parameters and technologies can be evaluated with fidelity and at scale

Delivers solutions for the empirical analysis and design of complex cyber systems in three overarching application areas:

- Human in the Loop
- Predictive Simulation
- Real Time





Questions & Discussion