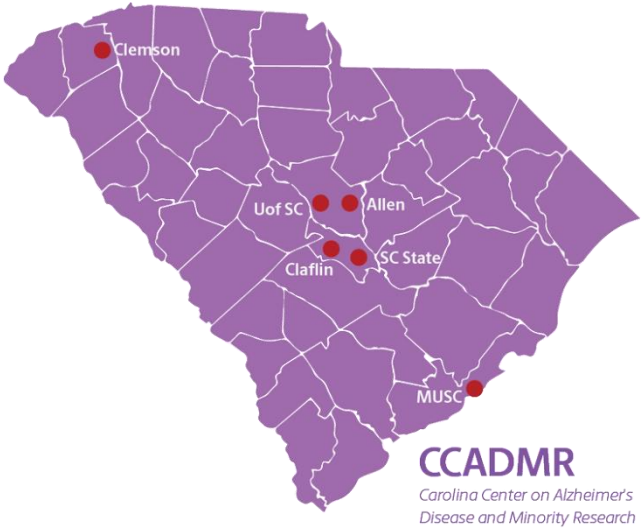


Aging & Technology

presented by

Dr. Winifred E. Newman

March 5, 2021

TODAY'S SPEAKER

Winifred E. Newman, PhD is the Mickel Professor of Architecture at Clemson University and the Associate Dean for Research and Academic Affairs. She concentrates on spatial perception in architecture, ecological psychology, and neuroaesthetics with active research data visualization, mapping, STEM learning environments, and histories of technology and science. Dr. Newman also serves as Director of the Institute for Intelligent Materials, Systems and Environments (CU-iMSE).

Aging and Technology

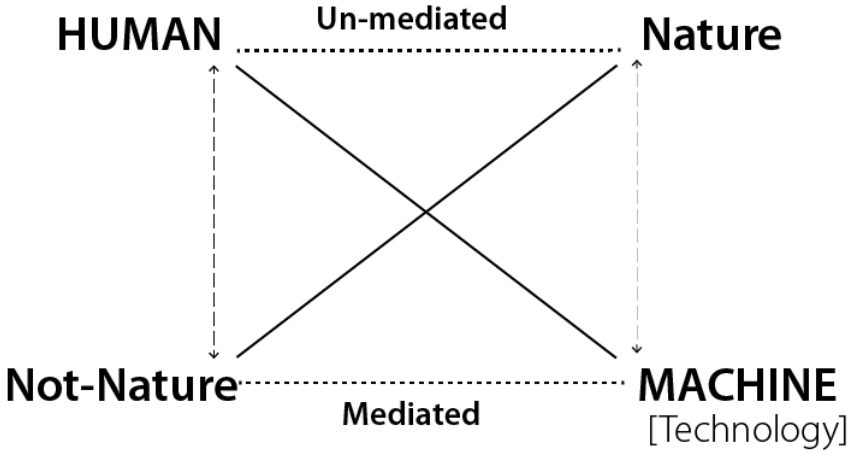
2021 Carolina Center on Alzheimer's Disease and Minority Research (CCADMR)
RESEARCH EDUCATION SEMINAR
March 5, 2021 | Via Live Stream

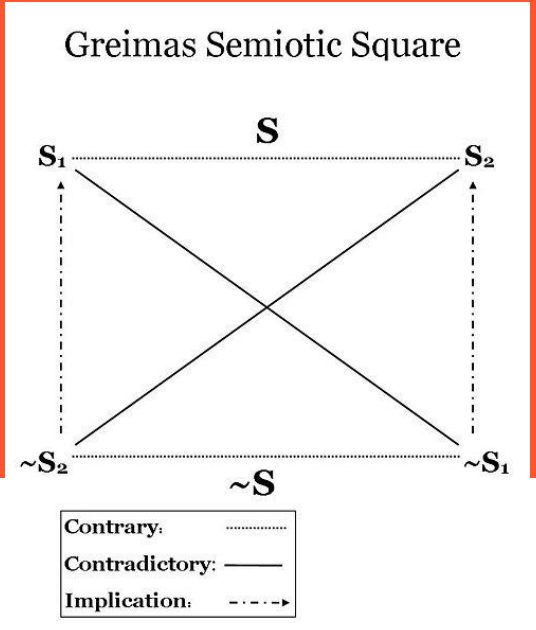
Dr. Winifred E Newman

CLEMSON UNIVERSITY

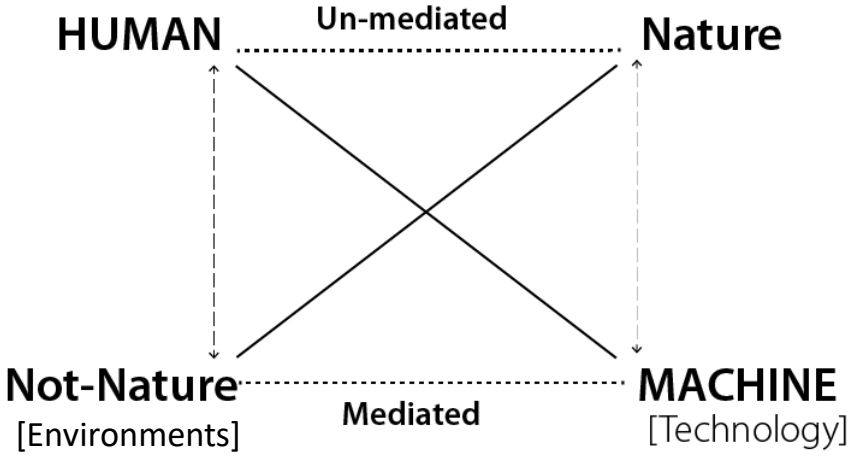
1.0 Technology and Humans

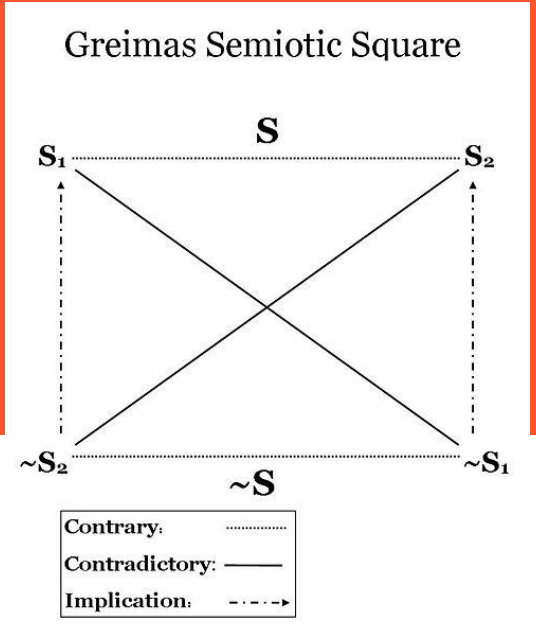
Q1.0 What is the relationship between the us and our environments?
Q1.1 What is the relationship between us and our technologies?
Q1.2 What is the relationship us and Nature?


HUMAN
Un-mediated
Nature
Not-Nature
Mediated
MACHINE
[Technology]


Greimas Semiotic Square
S
S1
S2
~S2
~S1
~S
Contrary:
Contradictory:
Implication:

1.0 Machines/Technology or Humans



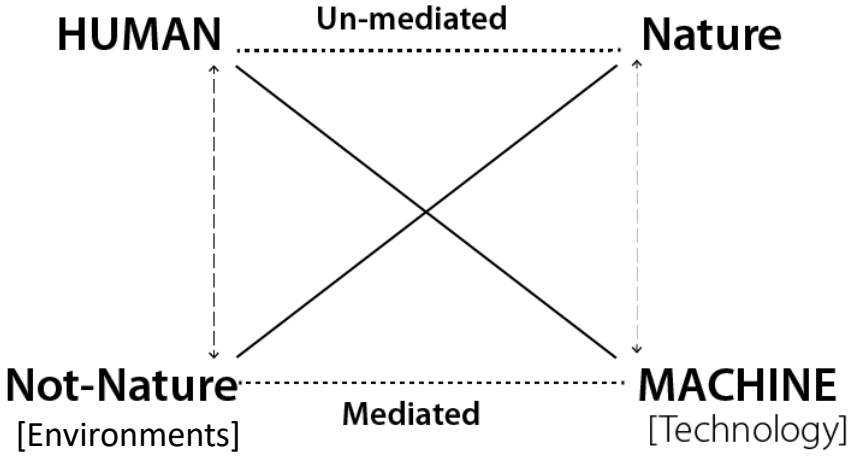


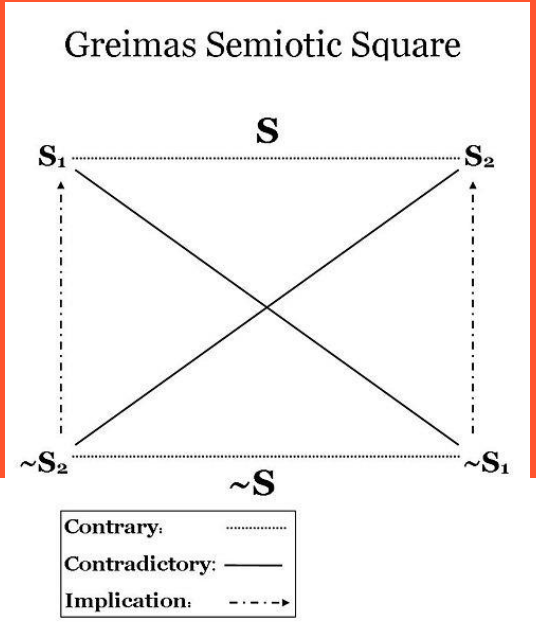
Man/nature or Machine/not-nature

Nature/Man/Machine

Nature/Not-Nature [Man]

1.0 Machines/Technology or Humans





Man/nature or Machine/not-nature

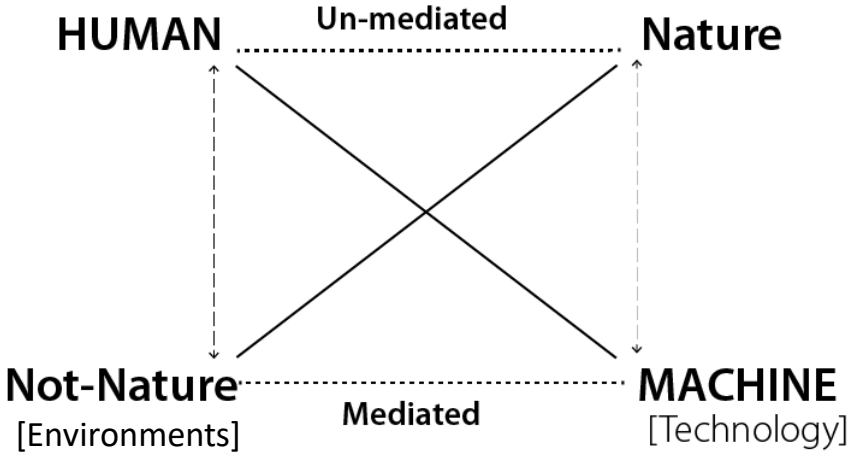
Nature/Man/Machine

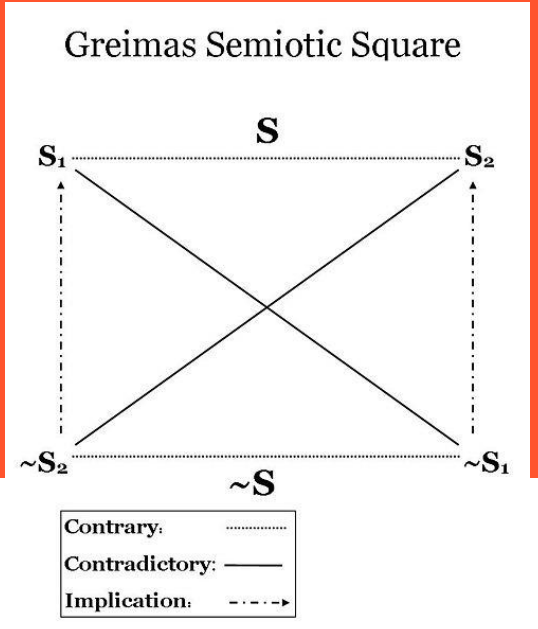
Nature/Not-Nature [Man]

Individual/Society

Perception/Senses

1.0 Machines/Technology or Humans





Man/nature or Machine/not-nature

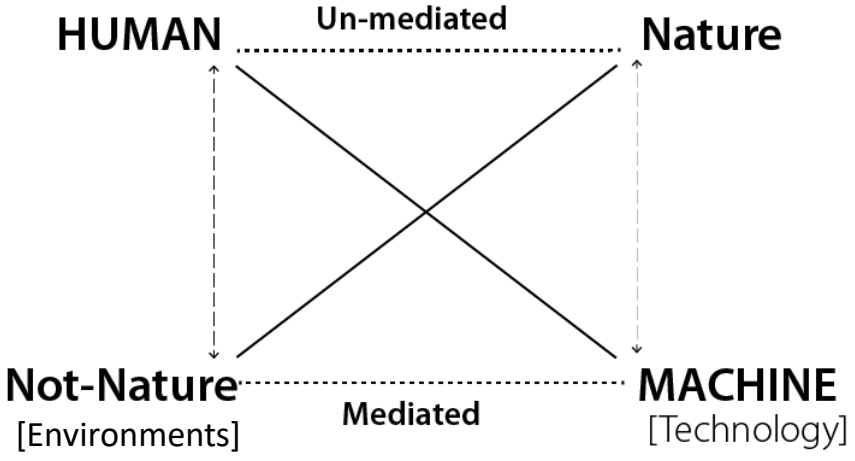
Nature/Man/Machine

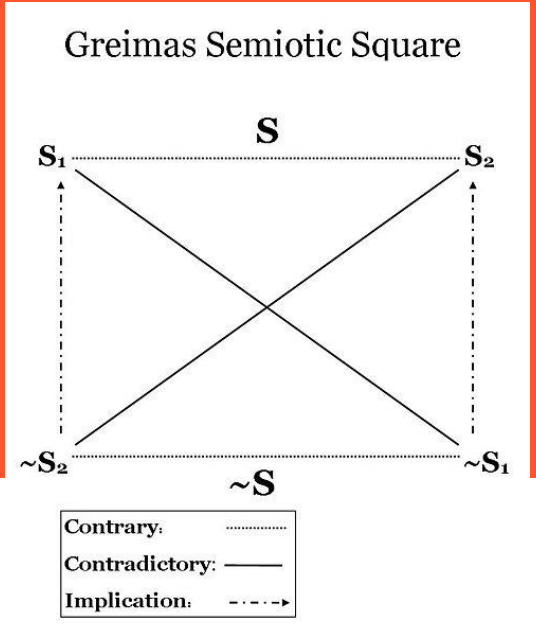
Nature/Not-Nature [Man]

Individual/Society

Perception/Senses

1.0 Machines/Technology or Humans





Man/nature or Machine/not-nature

Nature/Man/Machine

Nature/Not-Nature [Man]

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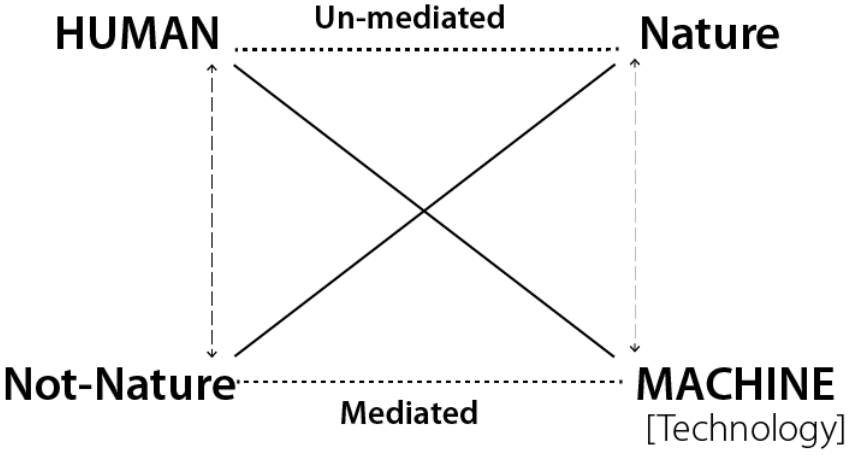
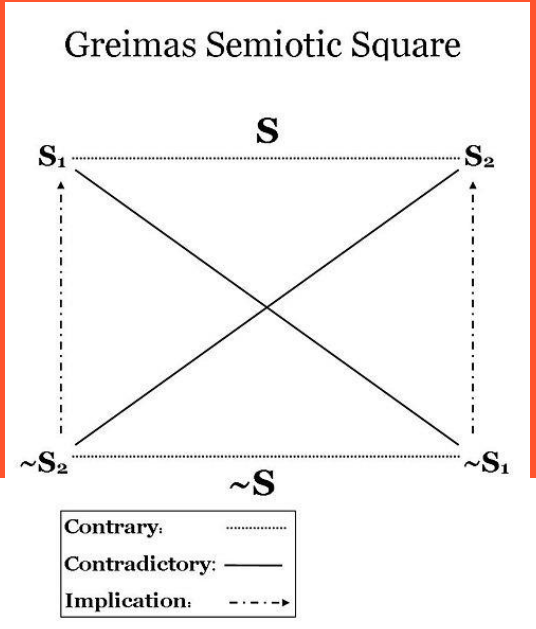
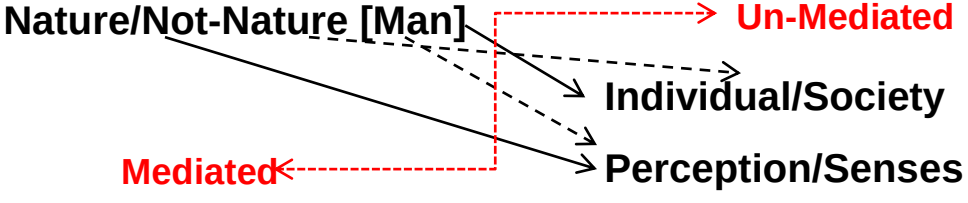
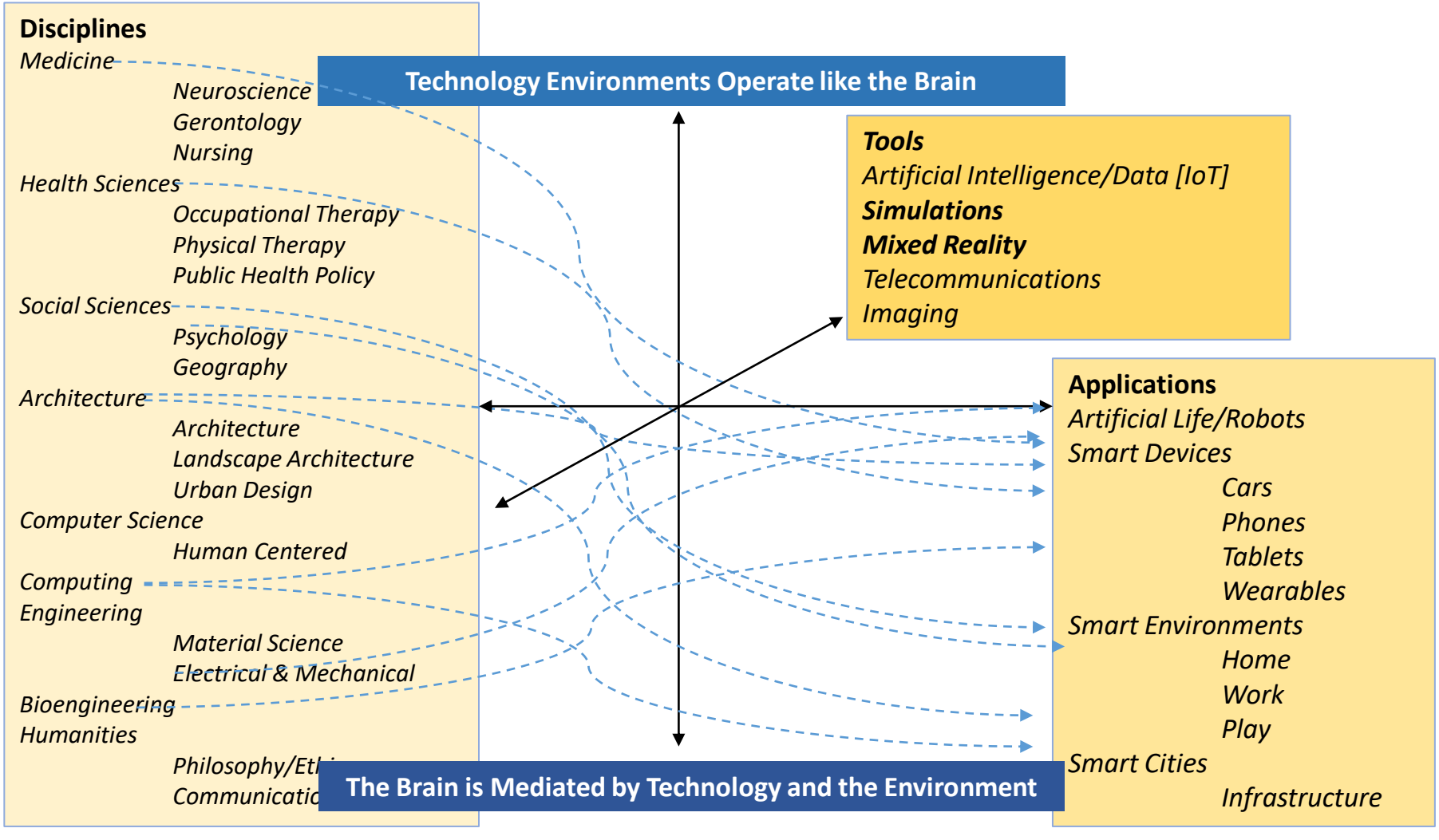




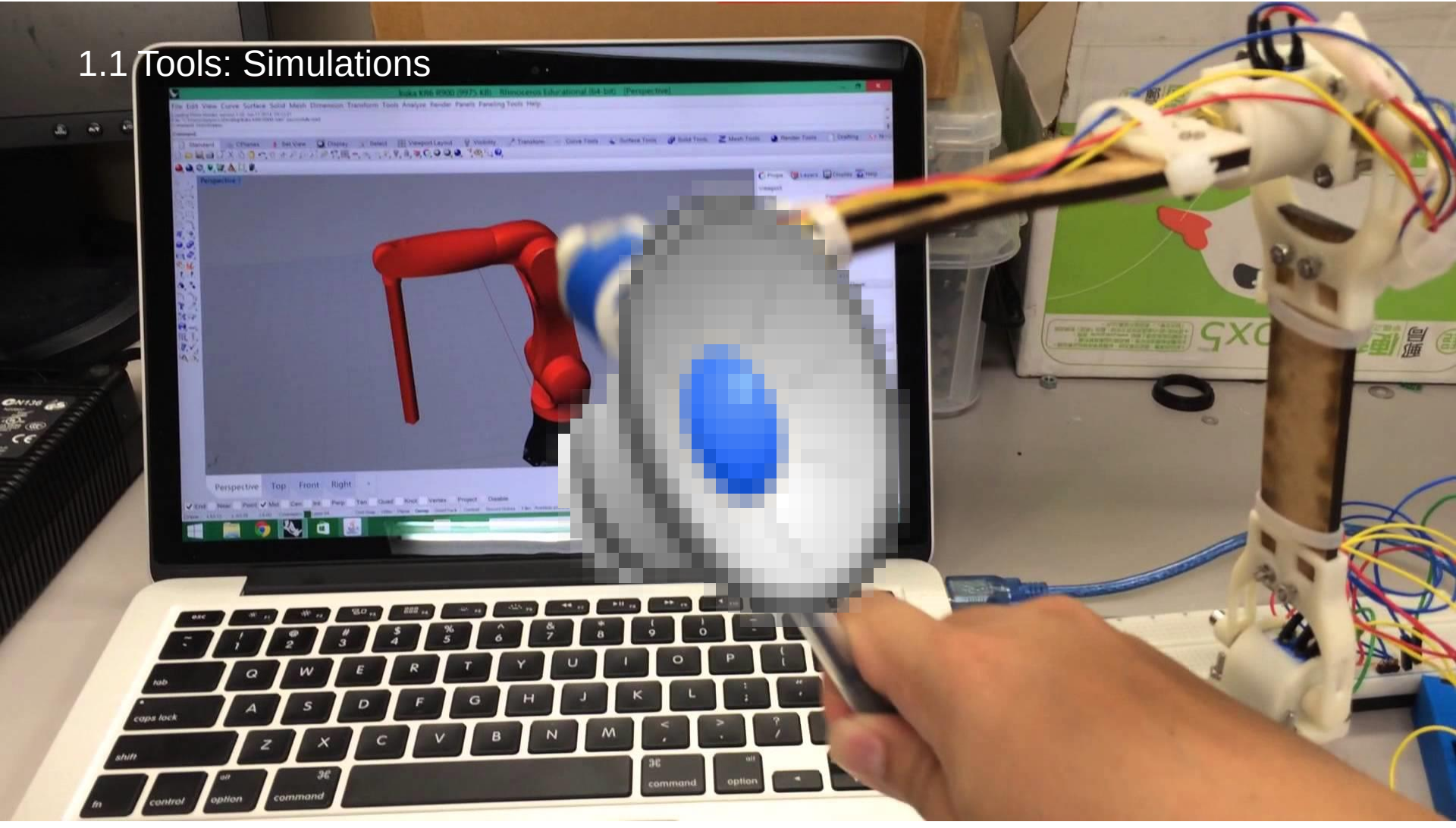
Man/nature or Machine/not-nature

Nature/Man/Machine




Disciplines
Medicine
Neuroscience
Gerontology
Nursing
Health Sciences
Occupational Therapy
Physical Therapy
Public Health Policy
Social Sciences
Psychology
Geography
Architecture
Architecture
Landscape Architecture
Urban Design
Computer Science
Human Centered
Computing
Engineering
Material Science
Electrical & Mechanical
Bioengineering
Humanities
Philosophy/Eth
Communicatio
Technology Environments Operate like the Brain
Tools
Artificial Intelligence/Data [IoT]
Simulations
Mixed Reality
Telecommunications
Imaging
Applications
Artificial Life/Robots
Smart Devices
Cars
Phones
Tablets
Wearables
Smart Environments
Home
Work
Play
Smart Cities
Infrastructure
The Brain is Mediated by Technology and the Environment

1.1 Tools: Simulations



2045 AVATAR PROJECT MILESTONES

STRATEGIC SOCIAL INITIATIVE

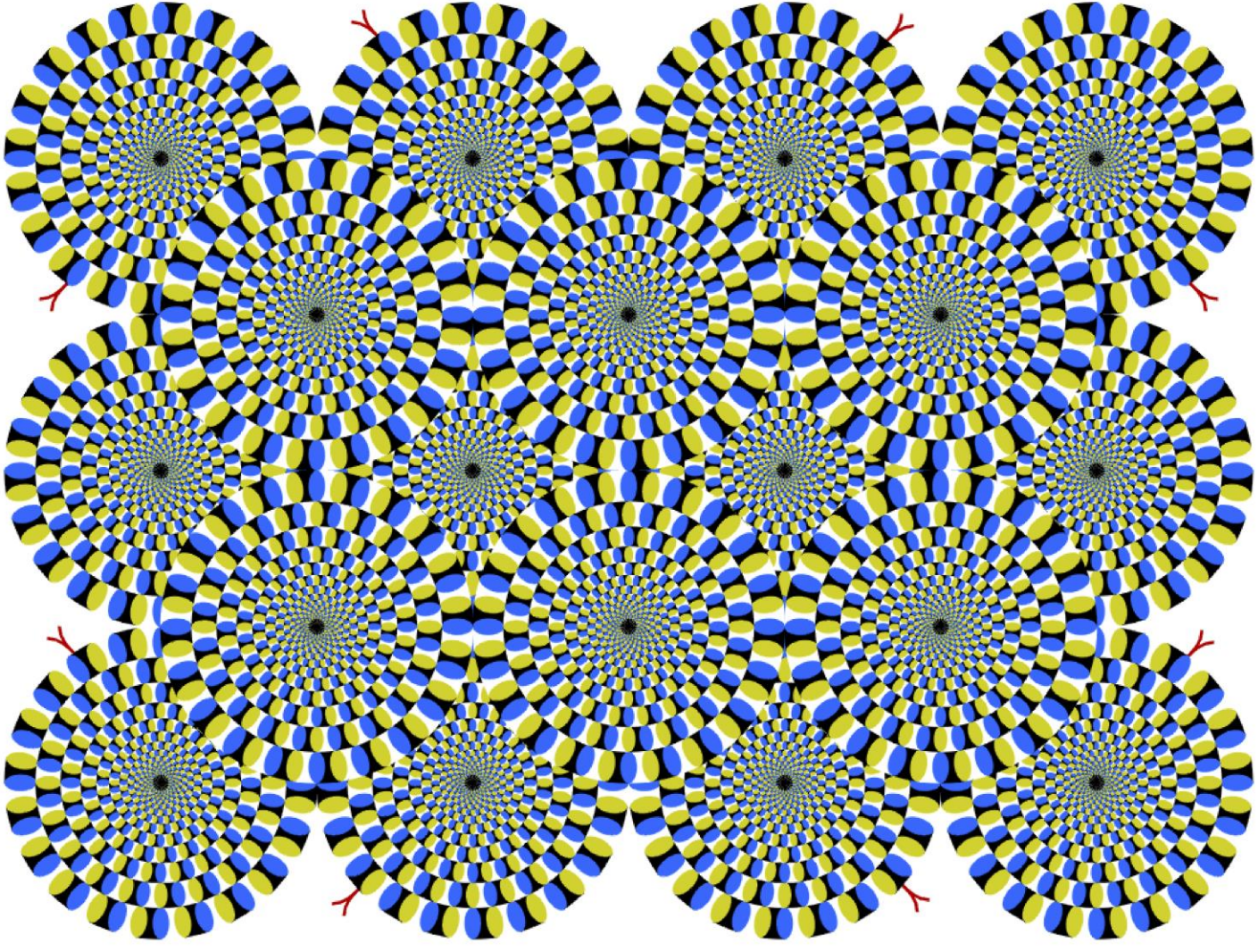
Avatar D 2040 - 2045
A hologram-like avatar

Avatar C 2030 - 2035
An Avatar with an artificial brain in which a human personality is transfered at the end of one's life

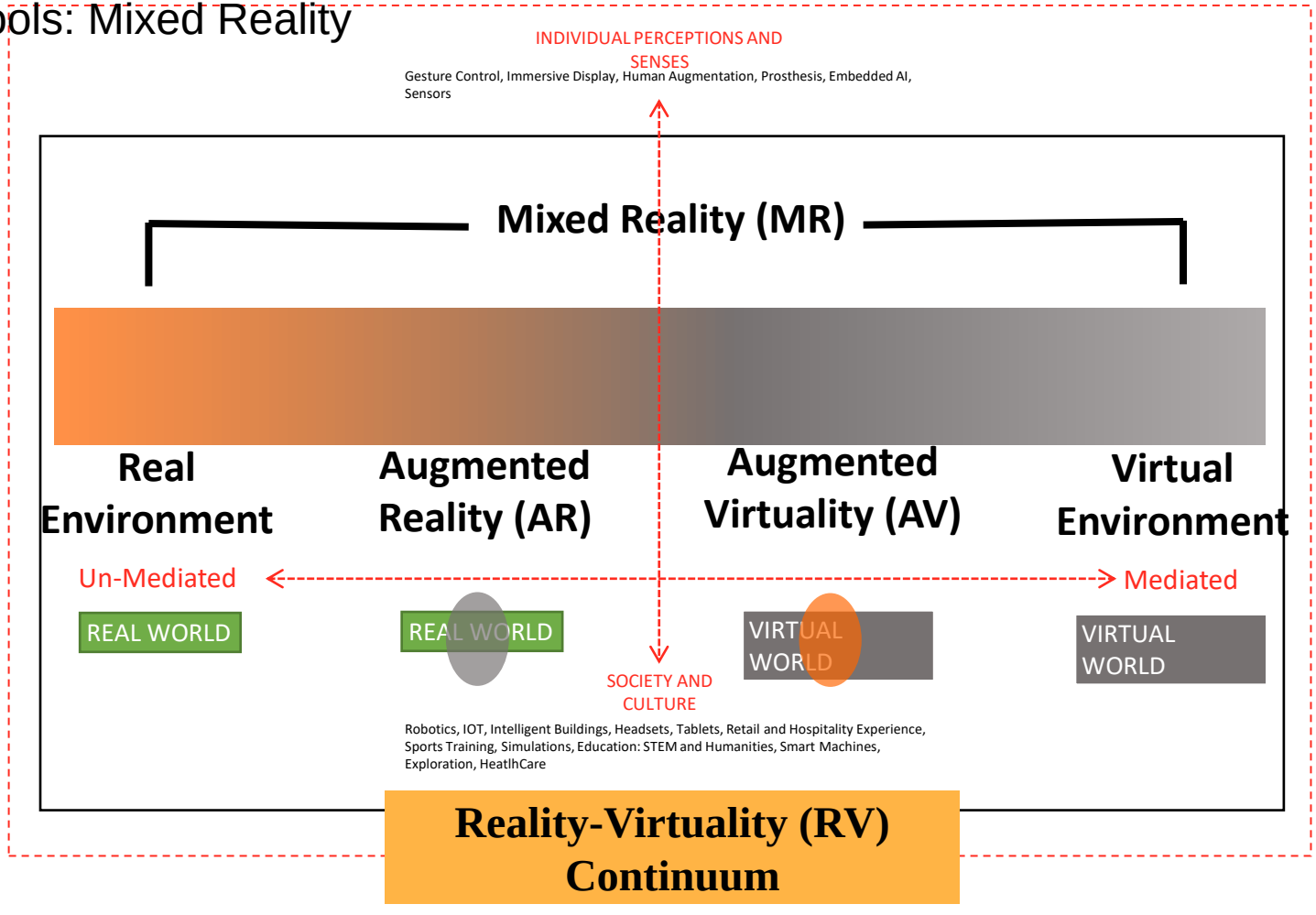
Avatar B 2020 - 2025
An Avatar in which a human brain is transplanted at the end of one's life

Avatar A 2015 - 2020
A robotic copy of a human body remotely controlled via BCI

1.1 Tools: Digital Twin/Human



1.1 Tools: Mixed Reality



2.0 Cases

1. Health STAT-Map (AI/Data/Public Health/Geography)
2. Home as Health Intervention (Architecture/Occupational Therapy)
3. Mapping Visual Stimulus Complexity & Spatial Navigation: Factors that Change with Age (Cognitive Neuroscience/Architecture)

2.1 AIMS

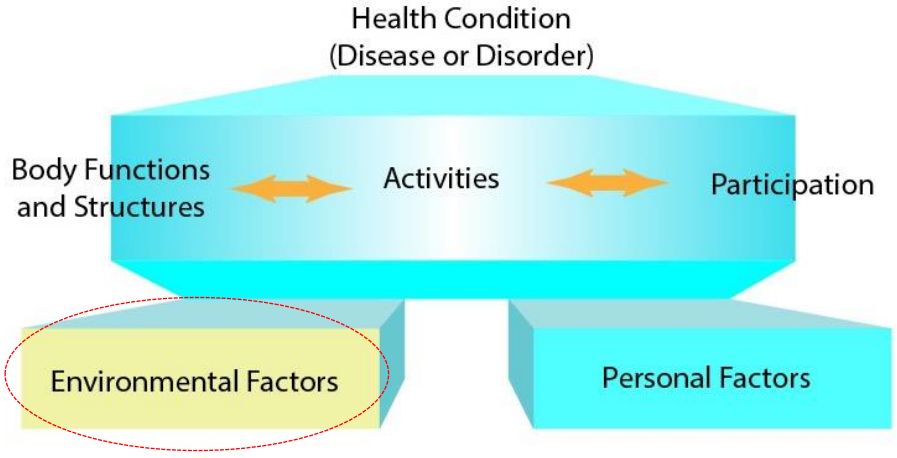


Figure 1: Interaction between components of ICF (WHO 2001: 18)

Aim 1: Examine associations between environment and humans using: a) observation of brain functioning, b) measurements of affect or physical performance and c) data

Aim 2: Examine performance as function of a) mediated environments, b) social engagement, c) cognitive and/or physical health.

Health STAT-Map

Dr. Winifred E Newman

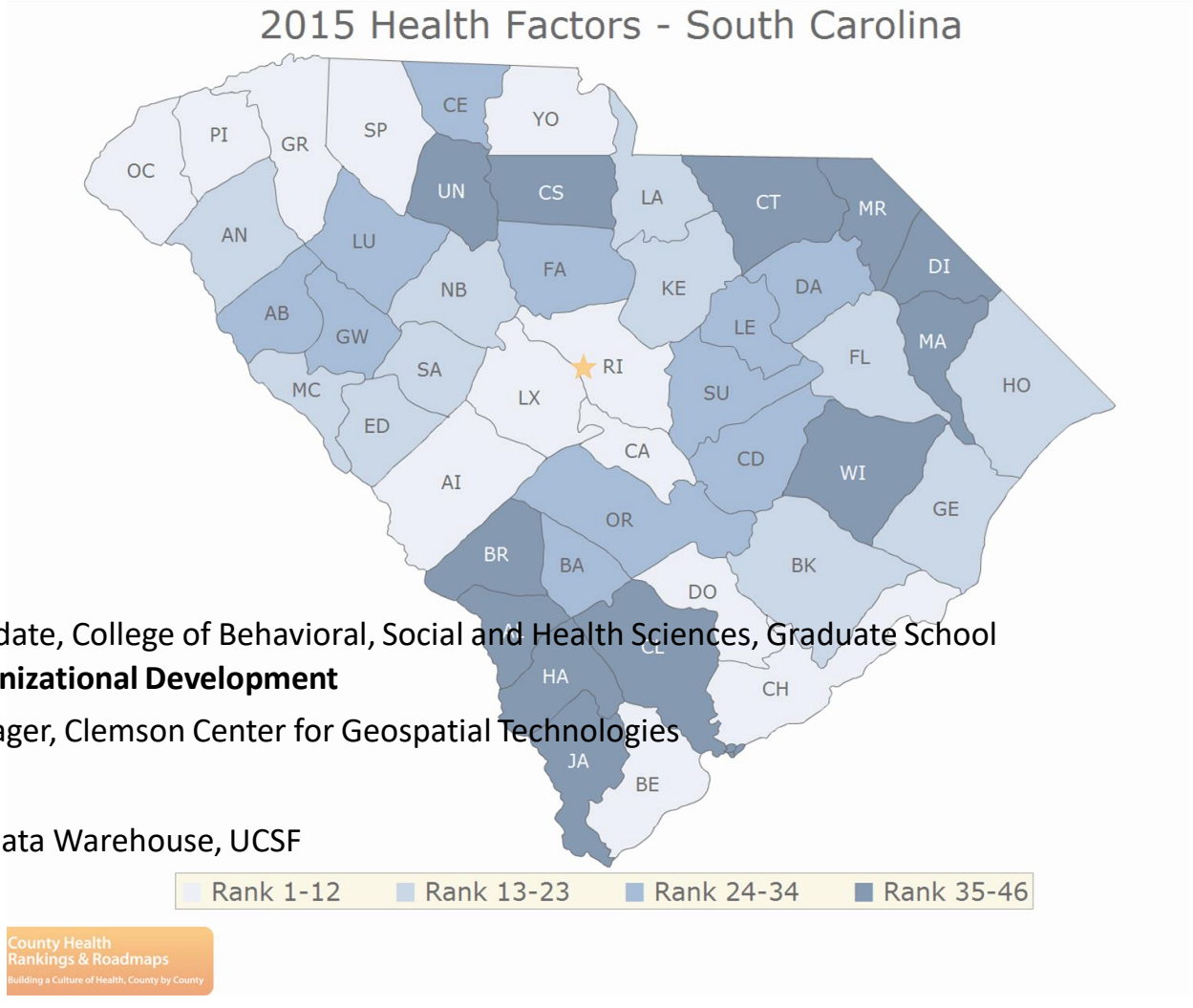
Caitlin Torrence, Doctoral Candidate, College of Behavioral, Social and Health Sciences, Graduate School

Sponsor: **Office of Research and Organizational Development**

Elham Masoomkhah, GIS Manager, Clemson Center for Geospatial Technologies

Tong Liu, PhD Student

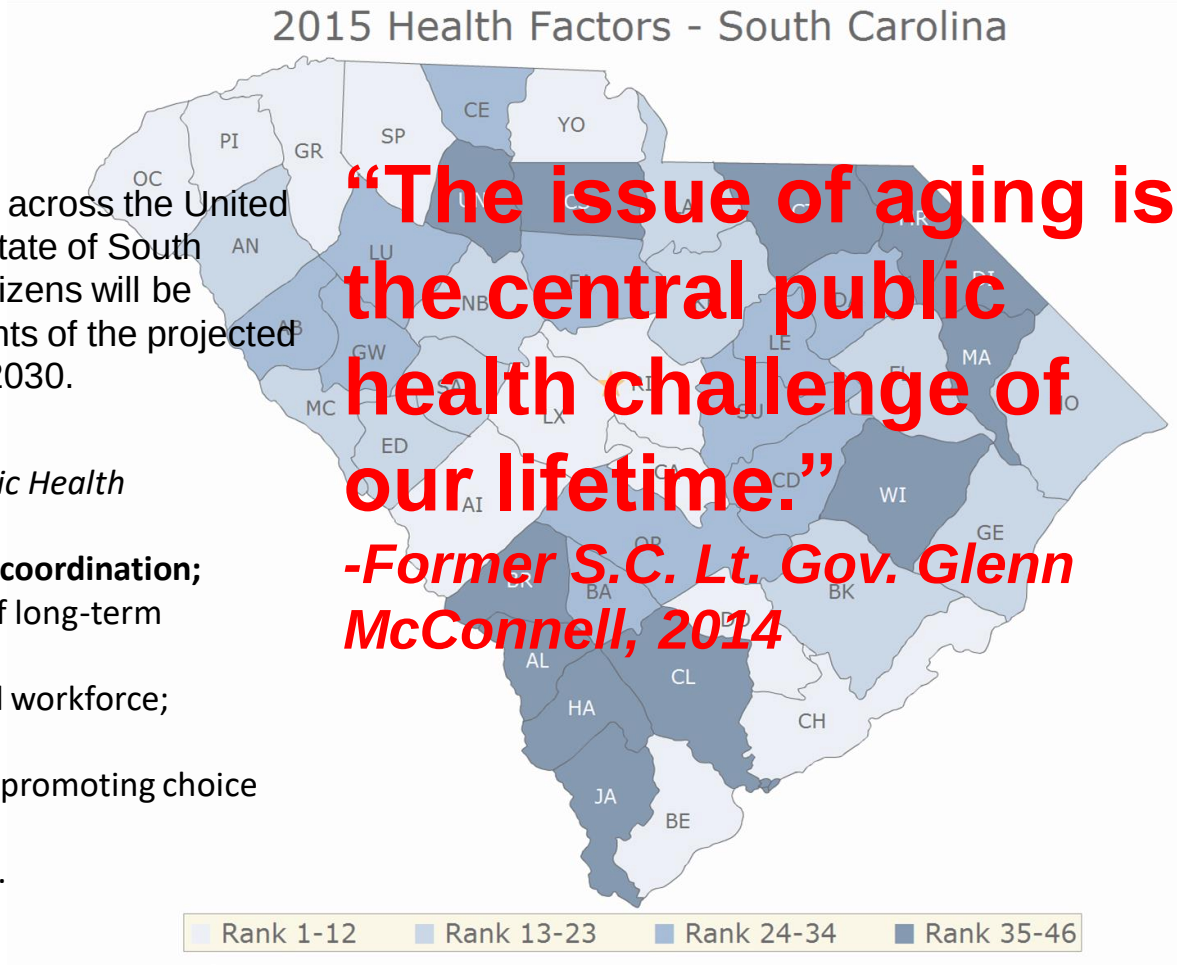
Evan Phelps, Ph.D., SC Clinical Data Warehouse, UCSF



The needs of the aging population across the United States are a critical issue. In the State of South Carolina at one-fifth or 1 million citizens will be affected, almost one in five residents of the projected 5.1 million people in the State by 2030.

The *SC Institute of Medicine and Public Health* identified six crucial areas:

1) **promoting system efficiency and coordination;**
2) strengthening the full spectrum of long-term services and supports;
3) ensuring an adequate and trained workforce;
4) protecting vulnerable adults;
5) supporting family caregivers; and promoting choice and
6) independence through education.



“The issue of aging is the central public health challenge of our lifetime.”

-Former S.C. Lt. Gov. Glenn McConnell, 2014

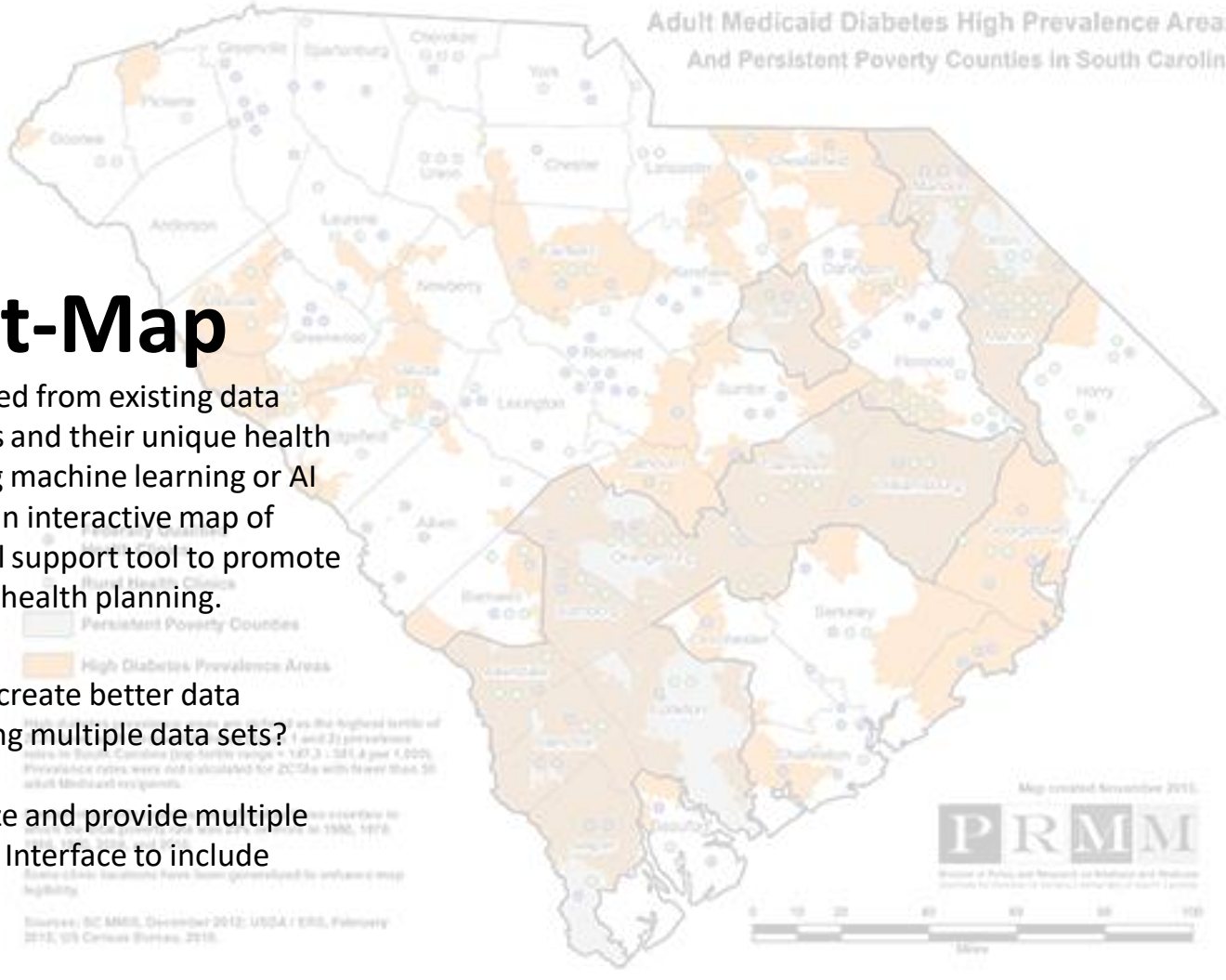
County Health Rankings & Roadmaps
Building a Culture of Health, County by County

Health Stat-Map

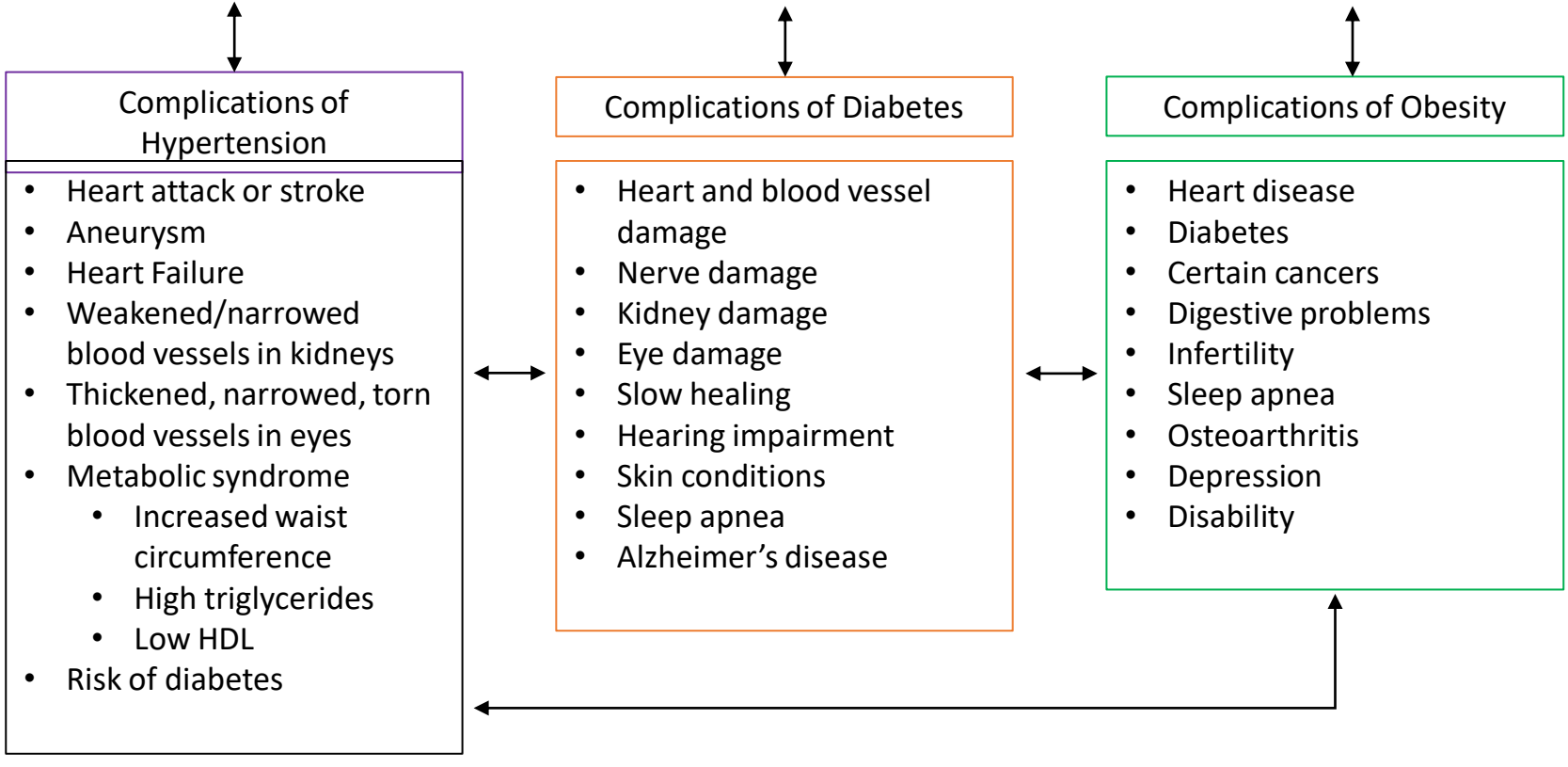
A statistical profile aggregated from existing data describing South Carolinians and their unique health and wellness concerns using machine learning or AI and GIS software to create an interactive map of existing data as an analytical support tool to promote more efficient and effective health planning.

Research question: Can we create better data decision spaces using AI using multiple data sets?

CI team task: Extract, analyze and provide multiple correlations for health data. Interface to include geospatial maps.

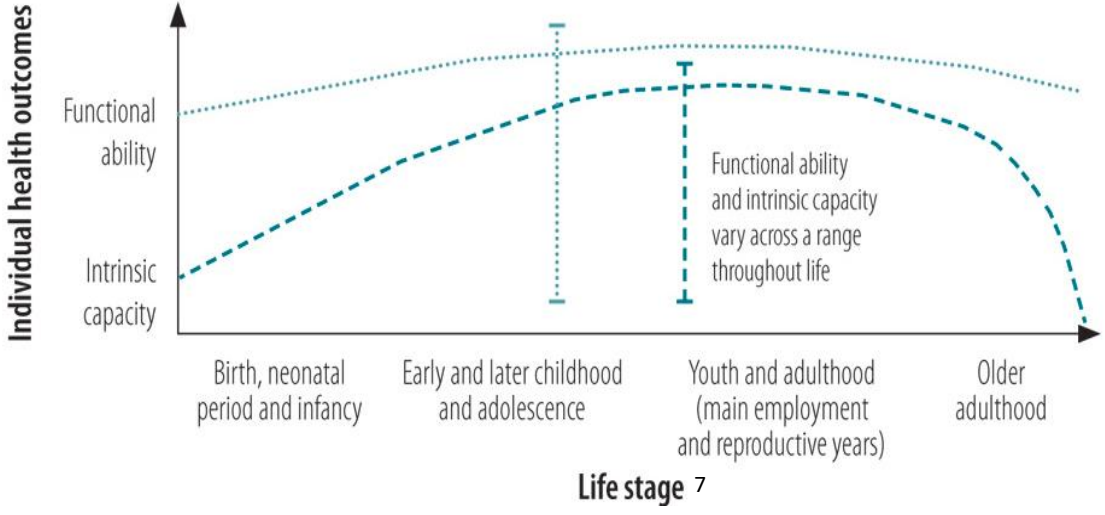


Complications of Aging: Heart disease & Alzheimer's disease



Life Course Approach

- Asserts that “insults” at all stages and ages of life have influence on health and well-being later in life[9]
  - Cumulative risks
  - Critical periods
- Incorporates both social and biological explanations of health outcomes and disease



[7]

“The study of long-term biological, behavioral, and psychosocial processes that link adult health and disease risk to physical or social exposures acting during gestation, childhood, adolescence, earlier in adult life, or across generations.”[8]

Methodological Approach, Research Questions & Data Request

Overarching research question: Can we distinguish aging versus age-related illnesses in a given population?

Age-related illness of focus:
1. Heart disease
2. Alzheimer's disease

Sub-focus areas:
1. Obesity
2. Diabetes
3. Hypertension

Model Specific Research Questions
1. What is the average age of onset of heart disease by zip code?
2. What is the average age of onset of Alzheimer's disease by zip code?
3. What is the average age of onset of obesity by zip code?
4. What is the average age of onset of diabetes by zip code?
5. What is the average age of onset of high blood pressure by zip code?

Statistical Model

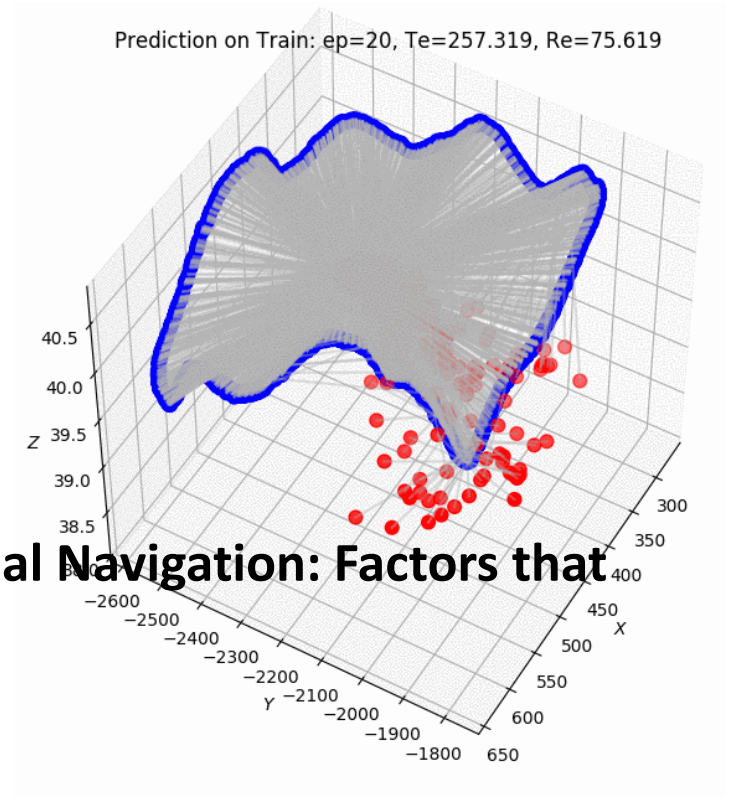
Age at onset of (health condition) = $\mathcal{B}_0$ + $\mathcal{B}_1$(Geographic deprivation) + $\mathcal{B}_2$ (Social environment) + $\mathcal{B}_3$ (Health behaviors) + $\mathcal{B}_4$(Healthcare access*)

*Will depend on the key outcome variable.

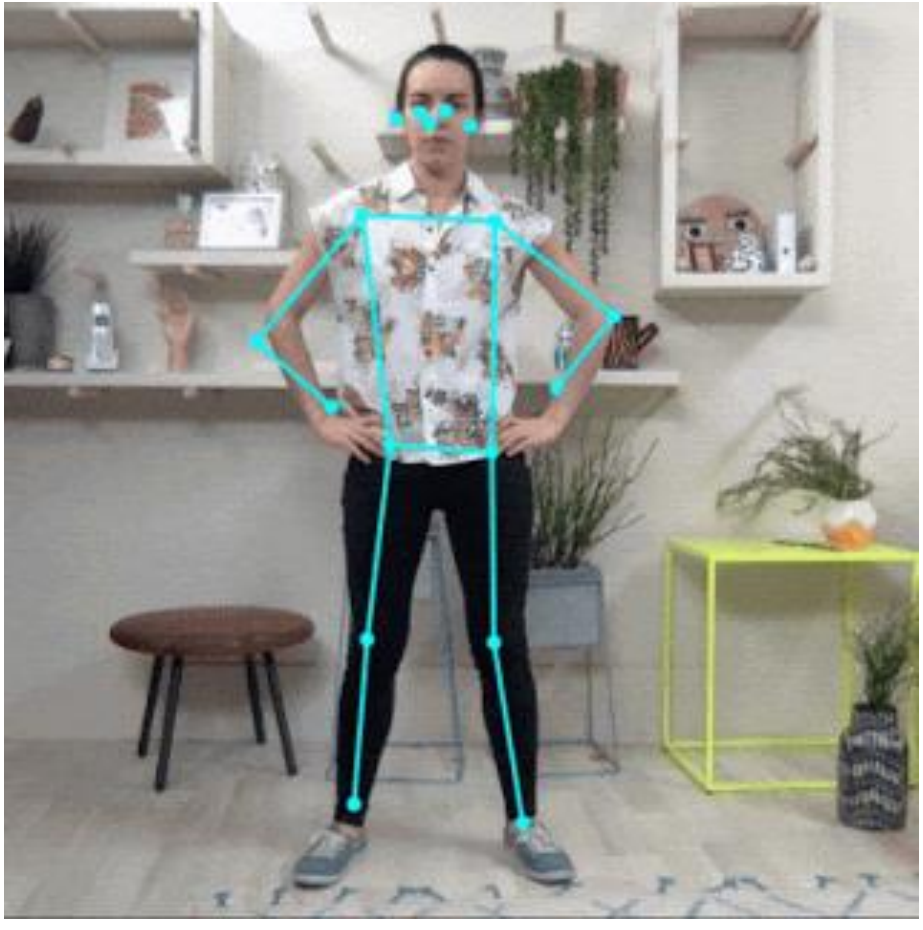
Mapping Visual Stimulus Complexity & Spatial Navigation: Factors that Change with Age

Dr. Winifred E Newman, Architecture
Dr. Kaileigh Bryne, Cognitive Psychology
Dr. Leslie Ross, Cognitive Psychology
Dr. Kapil Mandathil, Engineering
Tong Liu, PhD Student

Sponsor: **Clemson Research Grant**



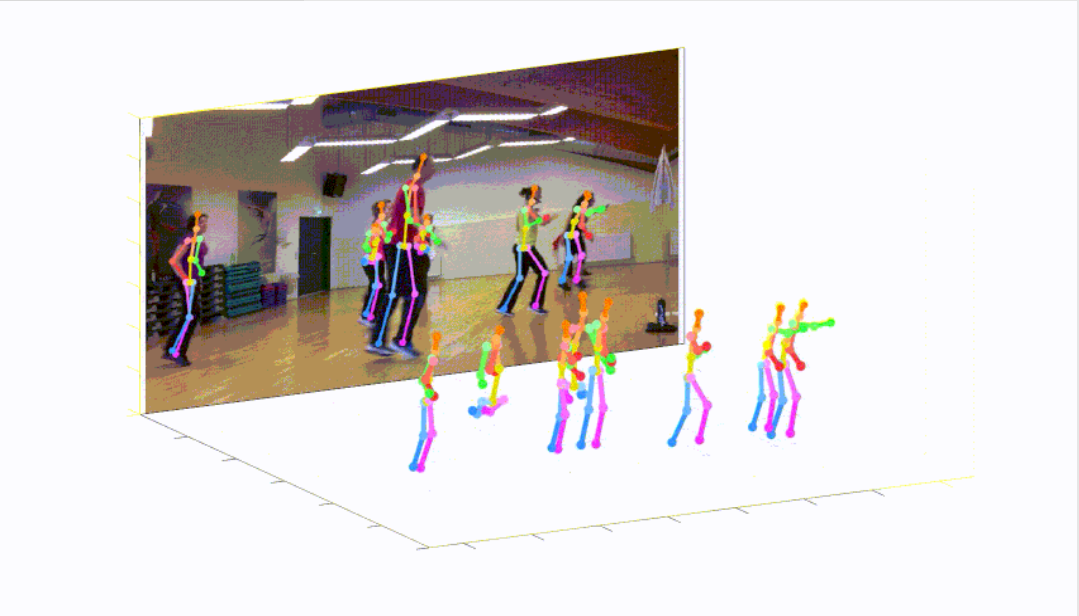
PoseNet implementation for self-driving car localization using Pytorch on Apolloscape dataset.
https://capsulesbot.com/blog/2018/08/24/apolloscape-posenet-pytorch.html

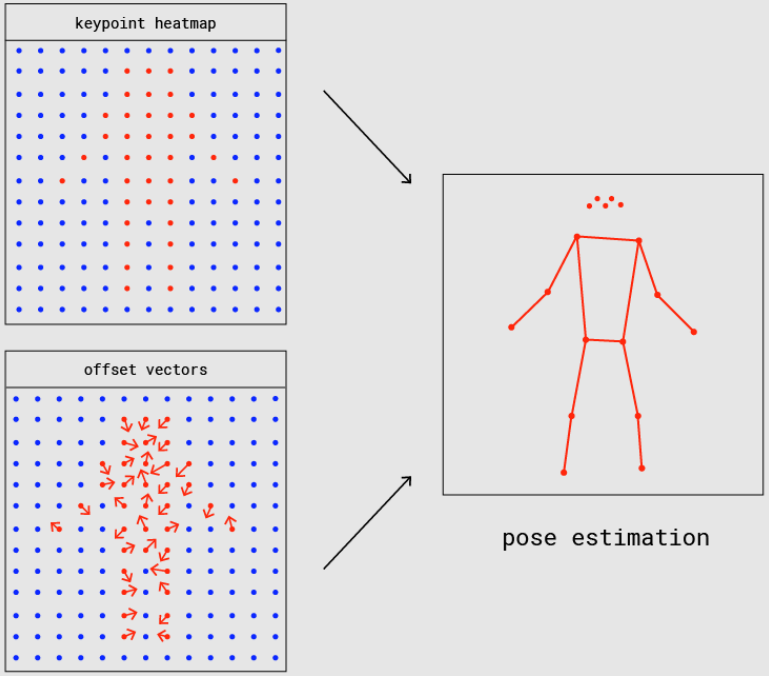


Age-related changes to mobility are a significant factor in longevity and quality of life in older adults. Mobility is directly related to changes in spatial navigation impacted by stimulus complexity in the immediate environment. It is critical to identify changes in spatial navigation due to decline in sensory perception. This study proposes a novel way to assess changes in space navigation based on stimulus complexity and age. It is expected that modeling mobility behavior based on age and stimulus complexity will help us predict a “mobility” age and address potential fall hazards more effectively.

Accounting for body schema therefore lies at the essence of *pre-reflective-architecture-body communication* (Jelic, 2014) as it enables us to engage with the built environment by providing us with access to our bodily-self and the conscious experience of a built environment.

This research proposes looking at body schema through the dynamic interaction between close-to-automatic processes reflected in body posture (pose) allowing us to “see” the state of bodily self-conscious experience as a subject navigates a spatial environment.



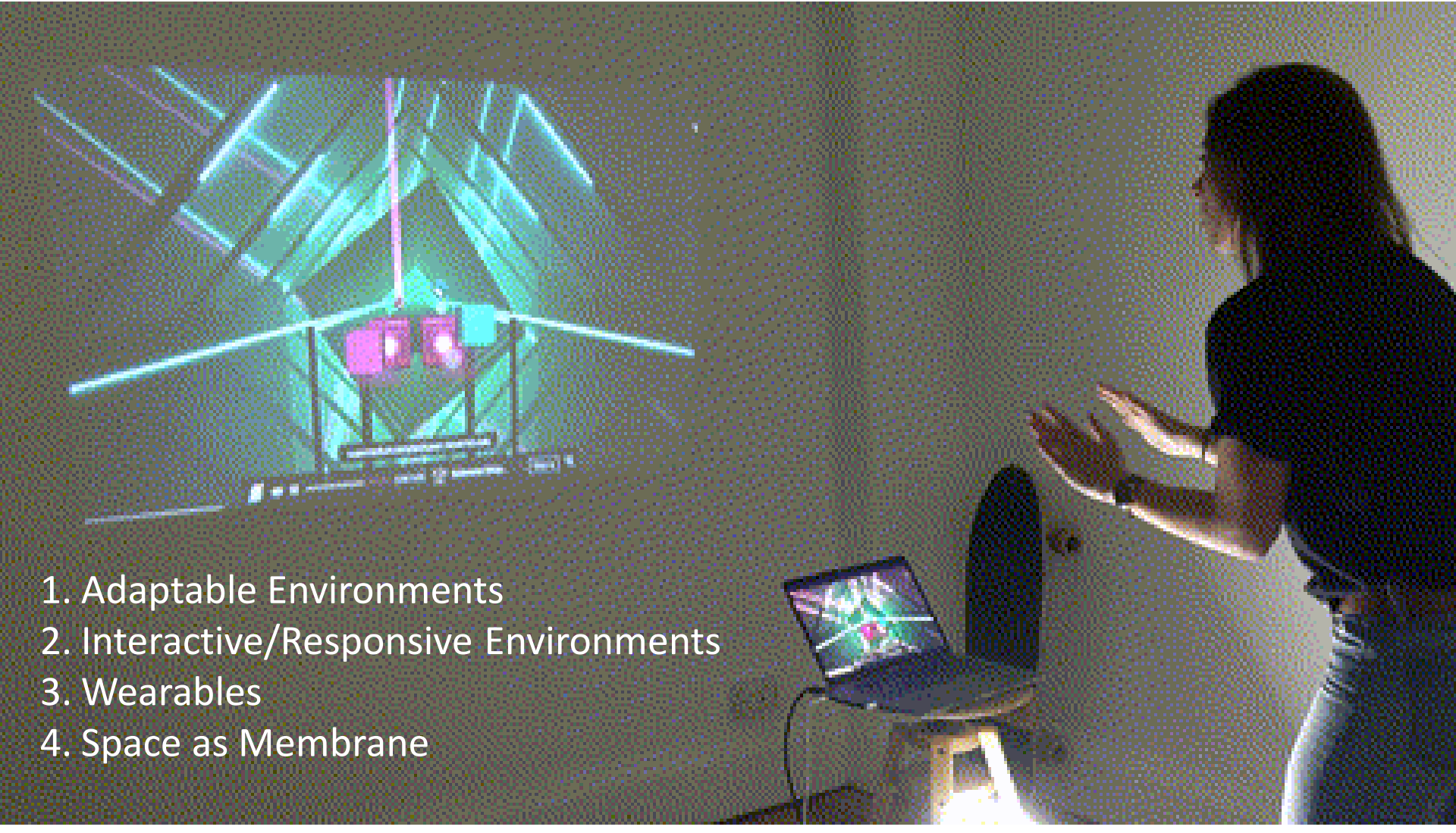


PoseNet model

Fig. 2 Modified configuration of stair to reflect simulation experiment for spatial perception for patient with visual agnosia presenting with limited ability to distinguish objects and limited depth perception.

Fig. 1 Staircase

3.0 Next Steps



1. Adaptable Environments
2. Interactive/Responsive Environments
3. Wearables
4. Space as Membrane

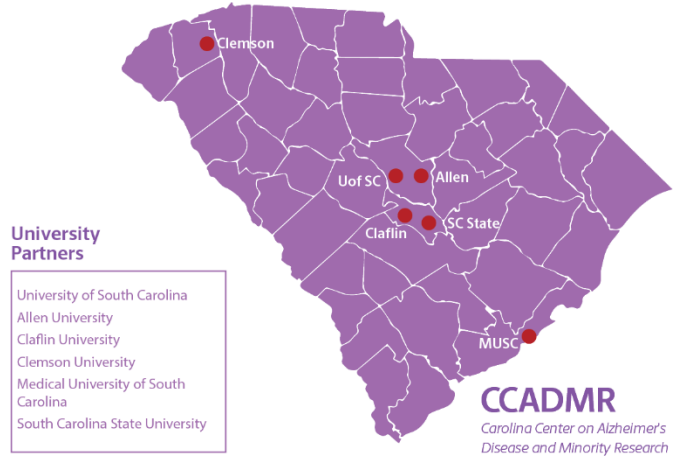
Thank you for participating!

Please give us your feedback about the session by answering a brief survey.

To access the survey:

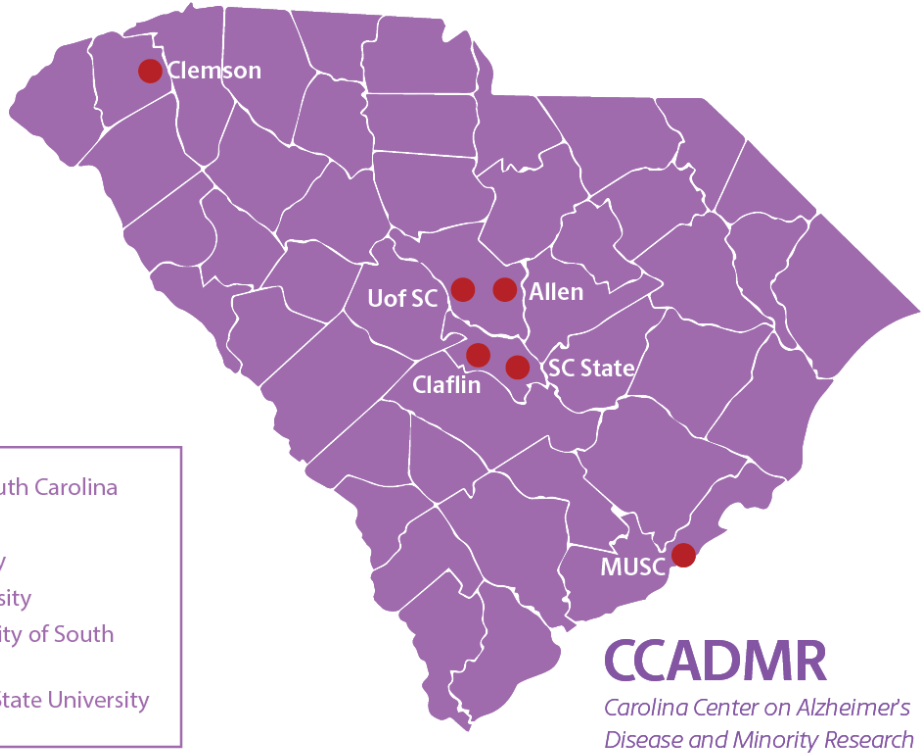
- Scan the QR code here *or*
- Complete the survey once you are emailed a link at the conclusion of the seminar

The QR code appears here or it can be accessed via the Survey Link.



Thank you!

If you have any questions, please contact Quentin McCollum mccolluq@email.sc.edu or Brianna Ashford- Carroll, ashfordb@email.sc.edu.



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- Allen University
- Claflin University
- Clemson University
- Medical University of South Carolina
- South Carolina State University

CCADMR

Carolina Center on Alzheimer's Disease and Minority Research