

# XR in MedTech

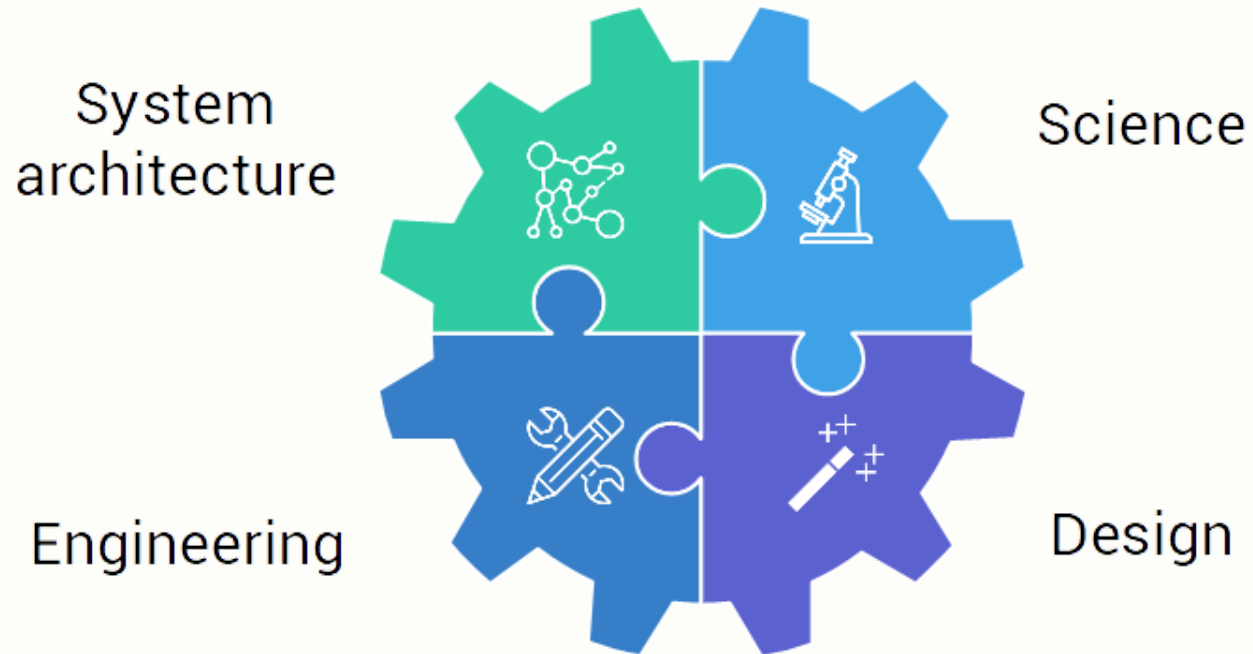
Immersive technology facilitating novel  
medical solutions

ANIMORPH

# About Animorph



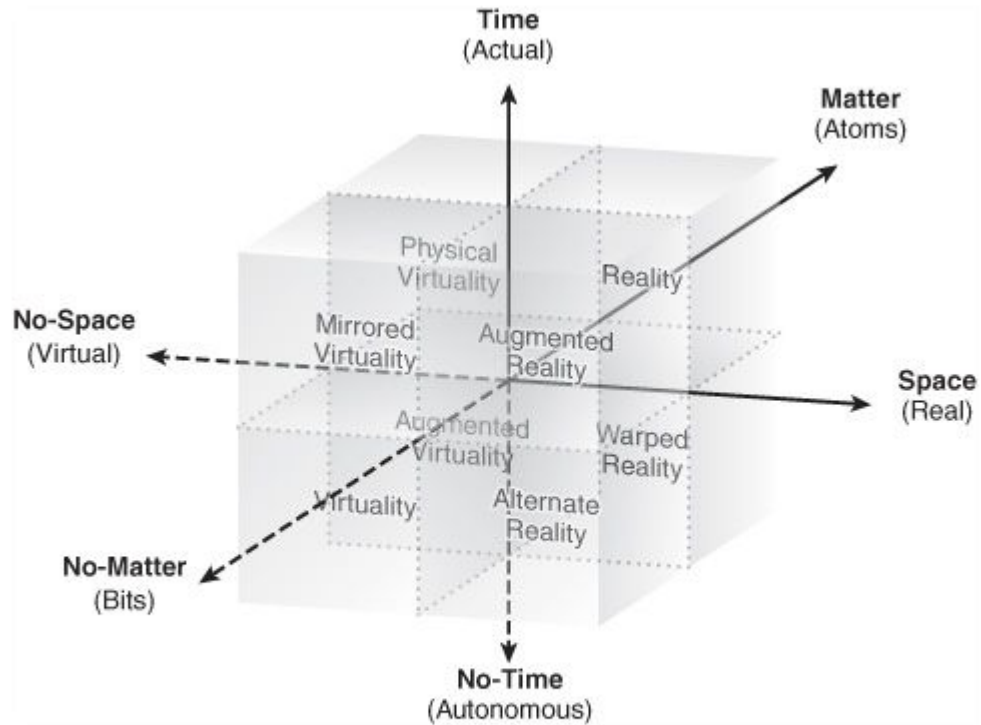
# Pillars





# XR — Extended Reality

# Spectrum of Immersion



**Figure 1.3** The eight Realms of the Multiverse

"Infinite Reality" by Joseph Pine and Kim Korn

# Modern Dawn of XR

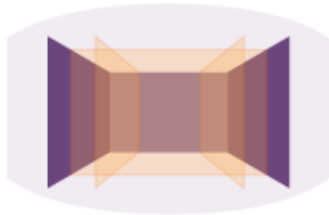


"The Sword of Damocles" by Ivan Sutherland and Bob Sproull (MIT, 1968)

# XR Flavours

## VIRTUAL REALITY (VR)

Fully artificial environment



Full immersion in virtual environment



## AUGMENTED REALITY (AR)

Virtual objects overlaid on real-world environment



The real world enhanced with digital objects



## MIXED REALITY (MR)

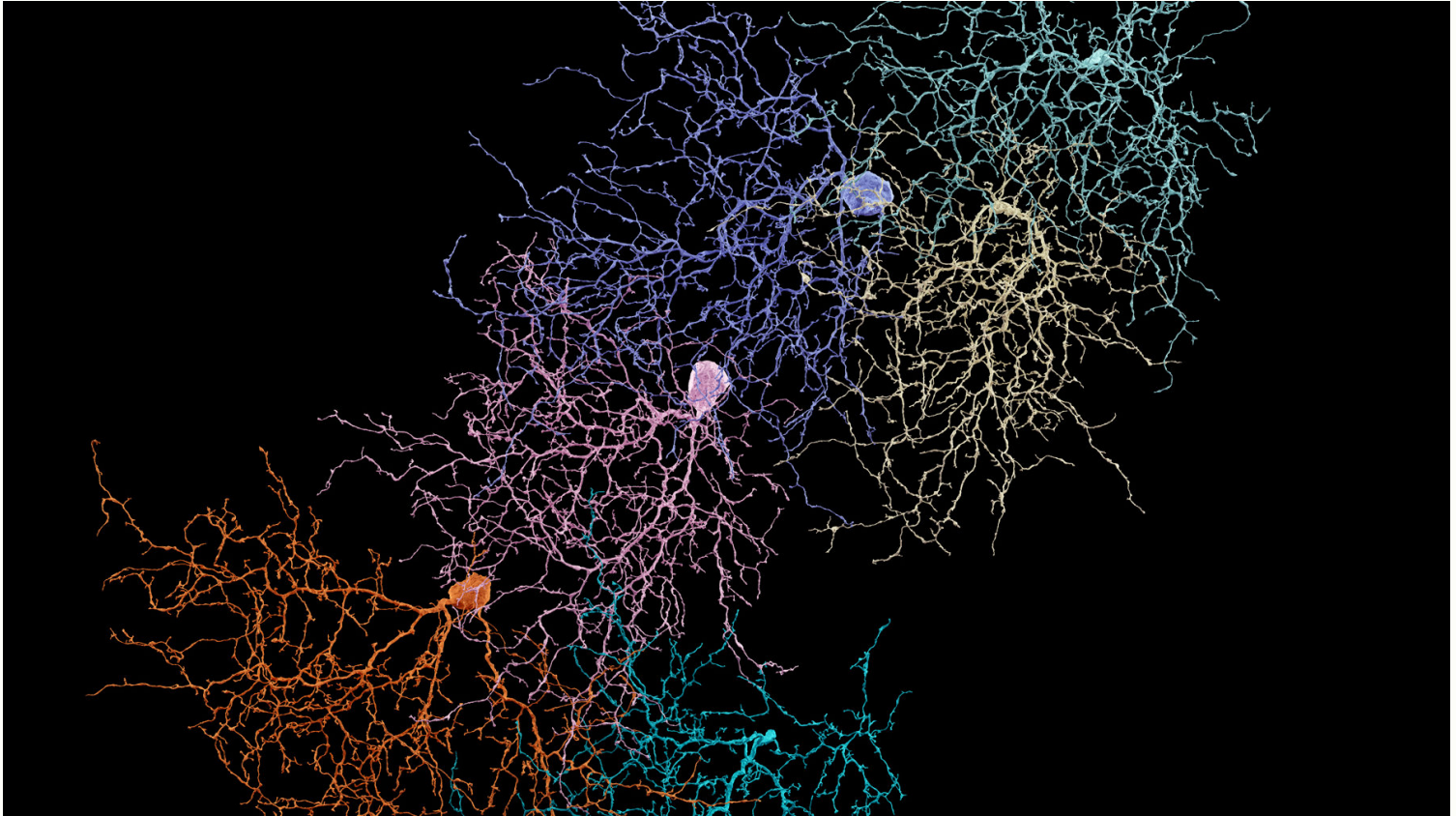
Virtual environment combined with real world



Interact with both the real world and the virtual environment



# Digital Medicines



# Current Degrees of Freedom in VR & AR

# Core VR

# Core VR

## 360 Simulation



## Exposure therapy

360 footage VR applications confronting users with their fears.

Many examples, in the UK pioneered Daniel Freeman, Oxford University.

"Automated psychological therapy using immersive VR for treatment of fear of heights" (The Lancet Psychiatry, 2018)



# Core VR

## 360 Simulation



## Support for medical procedures

"Effectiveness of a virtual reality intervention to minimize pediatric stress and pain intensity during venipuncture"  
(Specialists Pediatric Nursing, 2017)

# Core VR

## 360 Simulation



## Training for medical staff

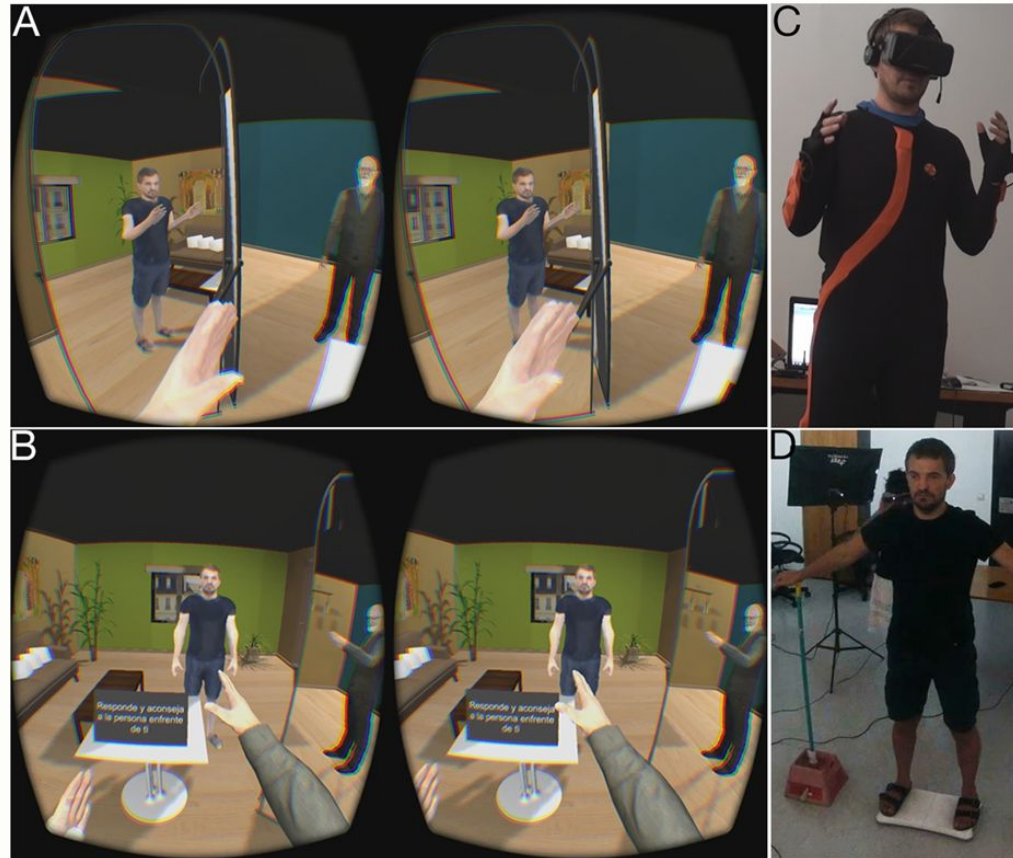
Application for nurses working with teenage cancer patients.

Animorph 2018

# Core VR

## 360 Simulation

## Interactive CGI



## Virtual psychoanalysis

"Conversations between self and self as Sigmund Freud—A virtual body ownership paradigm for self counselling" (Nature, 2015)

Core VR

360  
Simulation

Interactive  
CGI



## Mindfulness

The patients reported pain falling by 60–75 per cent (compared to baseline) during VR session, and by 30–50 per cent immediately afterwards.

Pain Consultants of East Tennessee (PCET) and Parkin Parkin

# Core VR

## 360 Simulation

## Interactive CGI



## Exposure therapy

Health VR: Dirty environments — Obsessive-compulsive disorder.

Mindwave & Mental Health NHS Trust

# Core VR

360  
Simulation

Interactive  
CGI

## Other powerful applications

- Problem solving challenges
- Feedback loops from the system
- Multiplayer experiences



Core VR

360  
Simulation

Interactive  
CGI

Sensory-  
driven



## Haptic feedback

Retrieving motor functions.

"The Efficacy of a Haptic-Enhanced Virtual Reality System for Precision Grasp Acquisition in Stroke Rehabilitation"  
(Journal of Healthcare Engineering, 2017)

# Core AR



# Core AR

## Spatial



## Surface detection

The sensors embedded in glasses paired with GPS enable precise navigation.

[Link](#)

# Core AR

## Spatial



## Interactive holograms

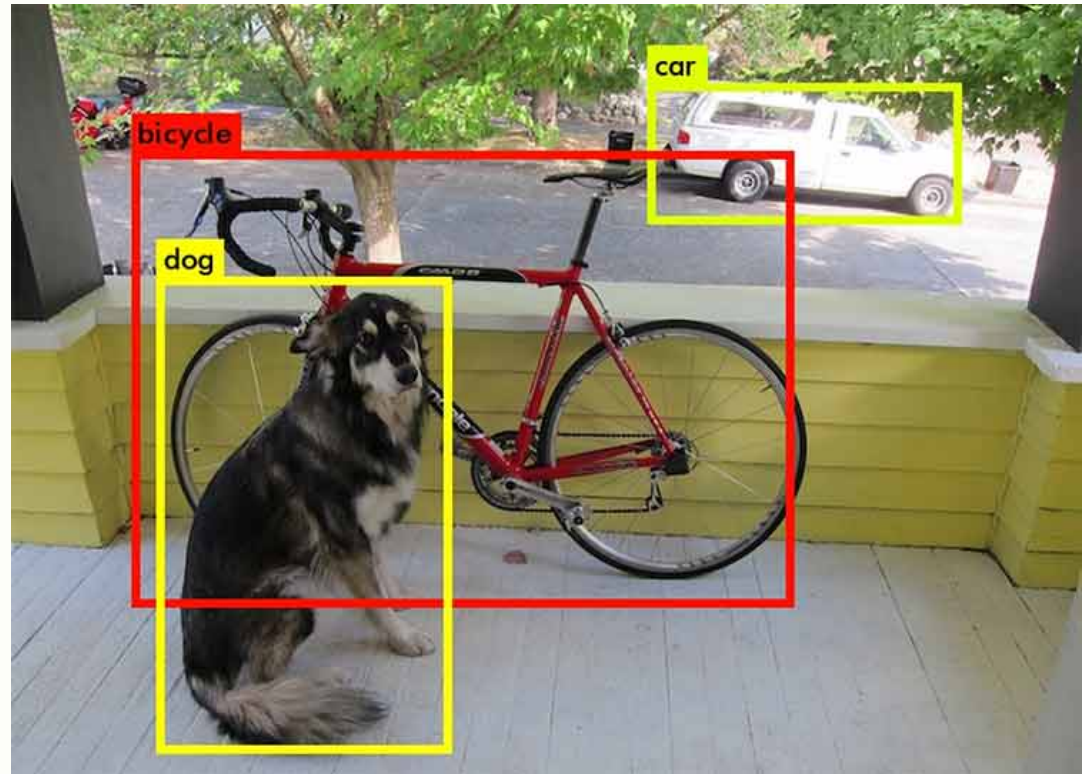
Spatial understanding allows for reliable positioning of the AR objects.

[Link](#)

Core AR

Spatial

Semantic



## Object recognition

Using machine learning to classify and label elements.

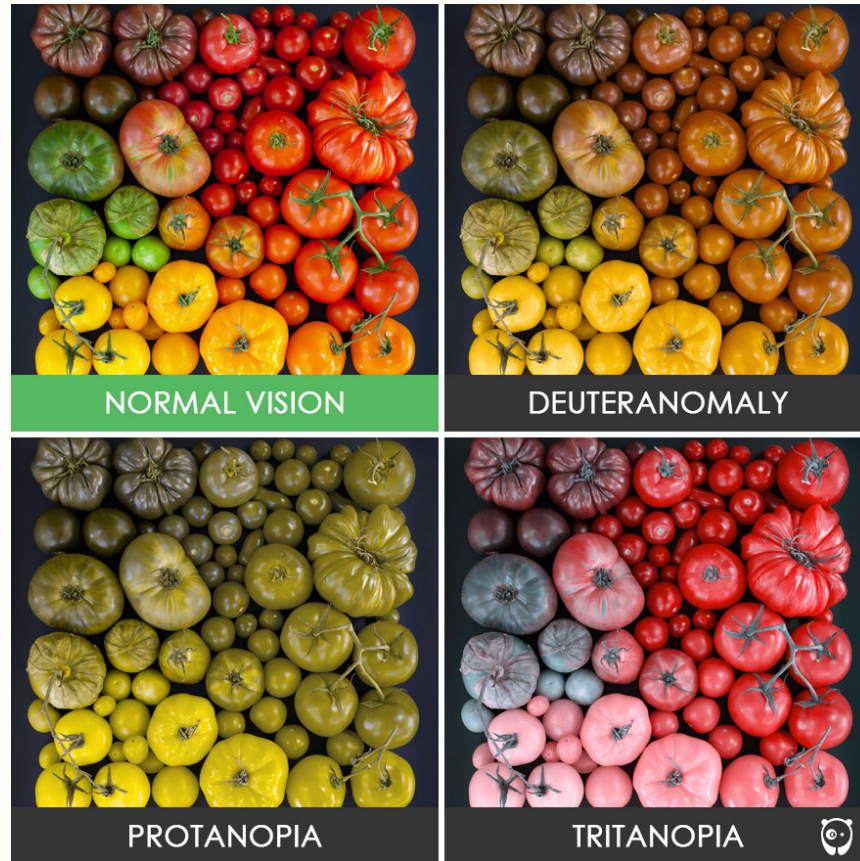
Animorph 2019

Core AR

Spatial

Semantic

Perception  
altering



## Modifying our default perceptions

Applicable to variety of non-normative types of perception



Core AR

Spatial

Semantic

Perception  
altering



## Mirroring phantom limbs

AR is a more flexible approach than pre-rendered VR scenarios

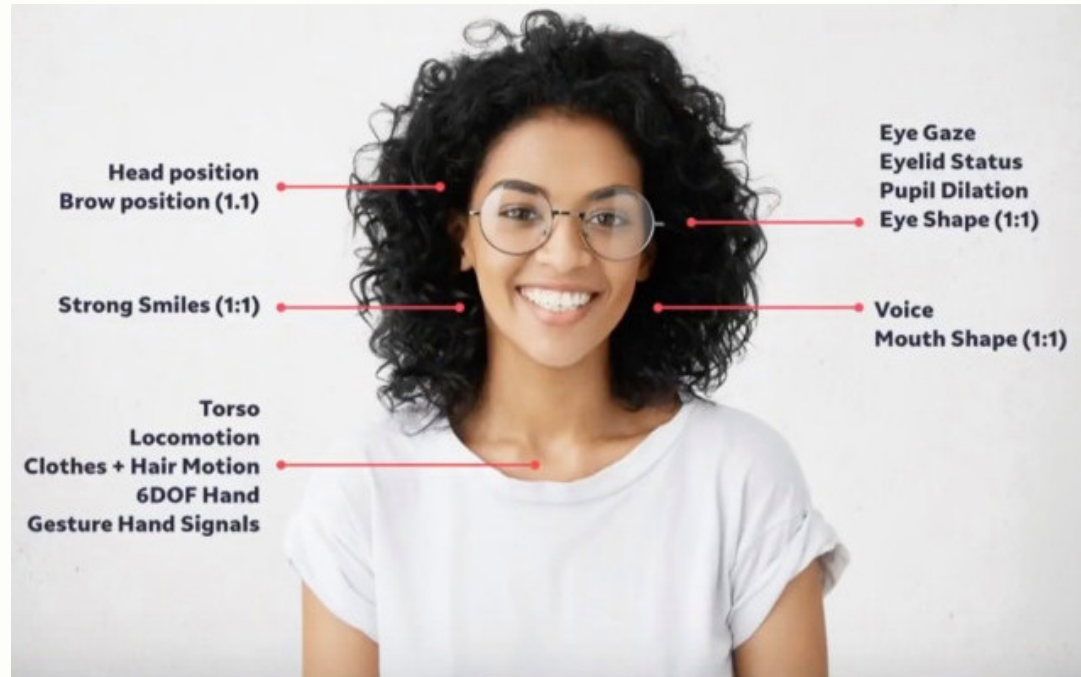
Core AR

Spatial

Semantic

Perception  
altering

Telepresence



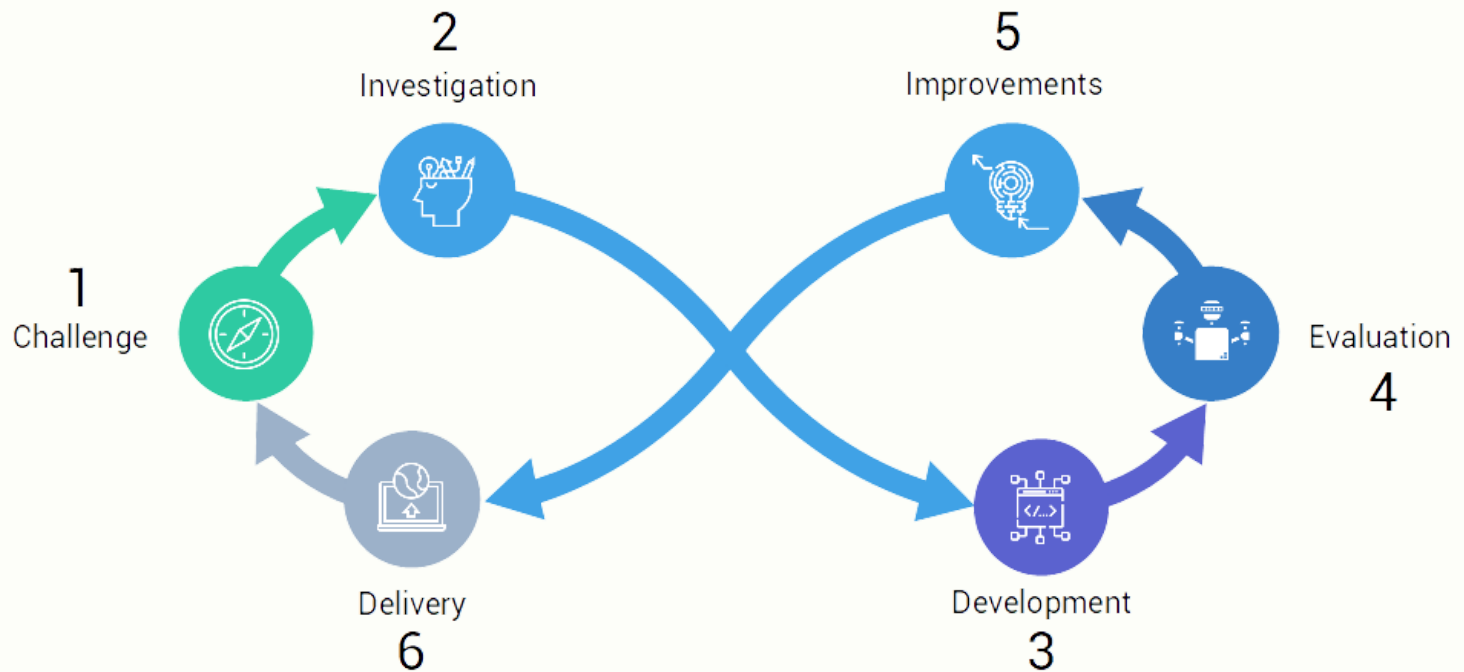
## Avatar chat

Many inputs capture expression for compelling emotional interaction.

Magic Leap

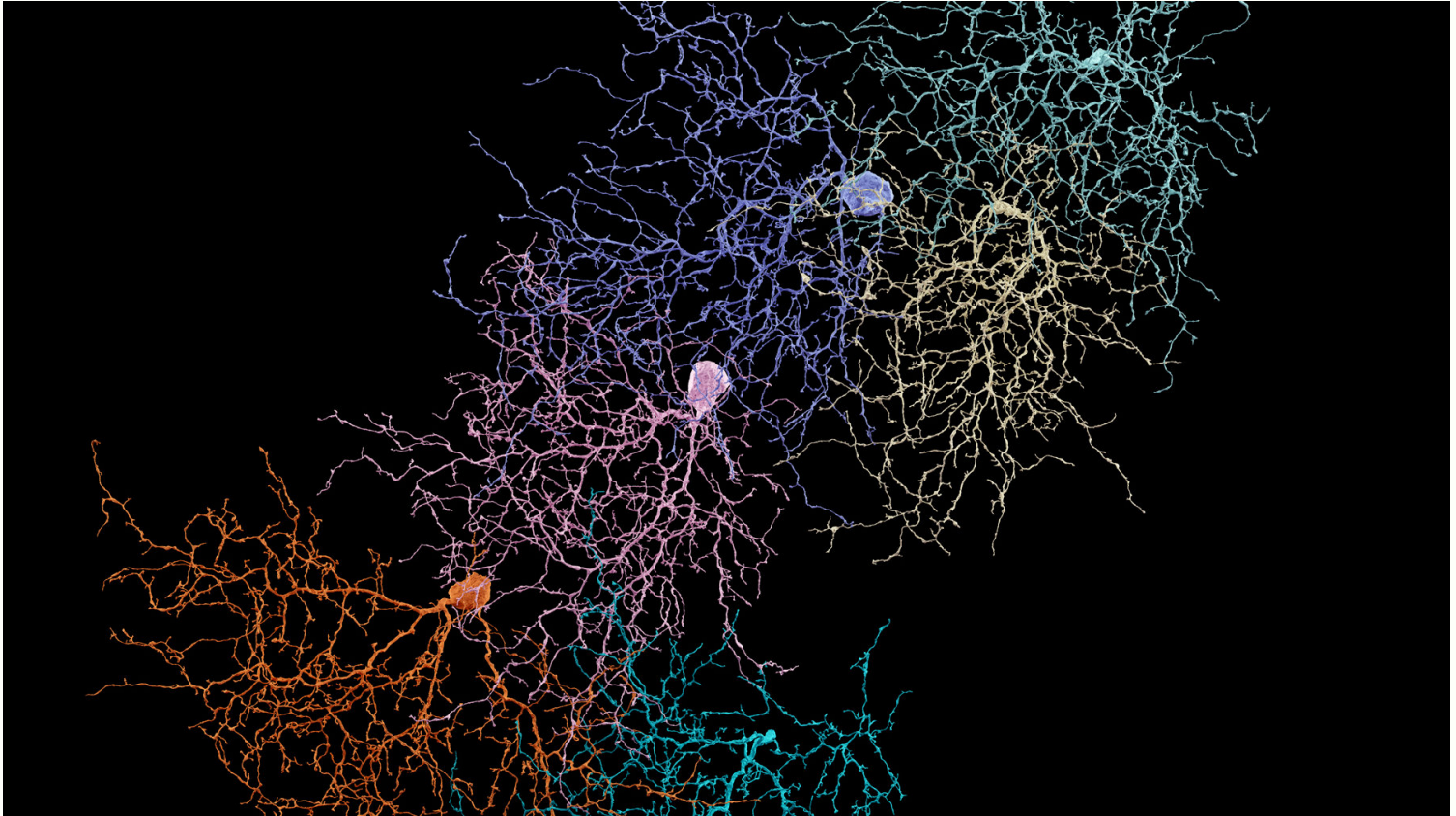
# Final Thoughts

# Agile Workflow





# Inventing New Digital Medicines



# Connect

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