

Computational Medical XR

SIGGRAPH 2023 Frontiers Workshop

Dr. George Papagiannakis, ORamaVR, University of Crete, ICS-FORTH

Dr. Oliver Kannape, MindMaze SA & University Hospital of Geneva

Dr. Walter Greenleaf, Stanford University

Prof. Michael Cole, University of Michigan Medical School

Gabe Jones, Proprio Vision

Dr. Mark Zhang, Brigham and Women's Hospital, Harvard University



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Computational Medical XR

Intro



Computational medical XR is a new interdisciplinary field, bridging life sciences, with mathematics, engineering and computer science.

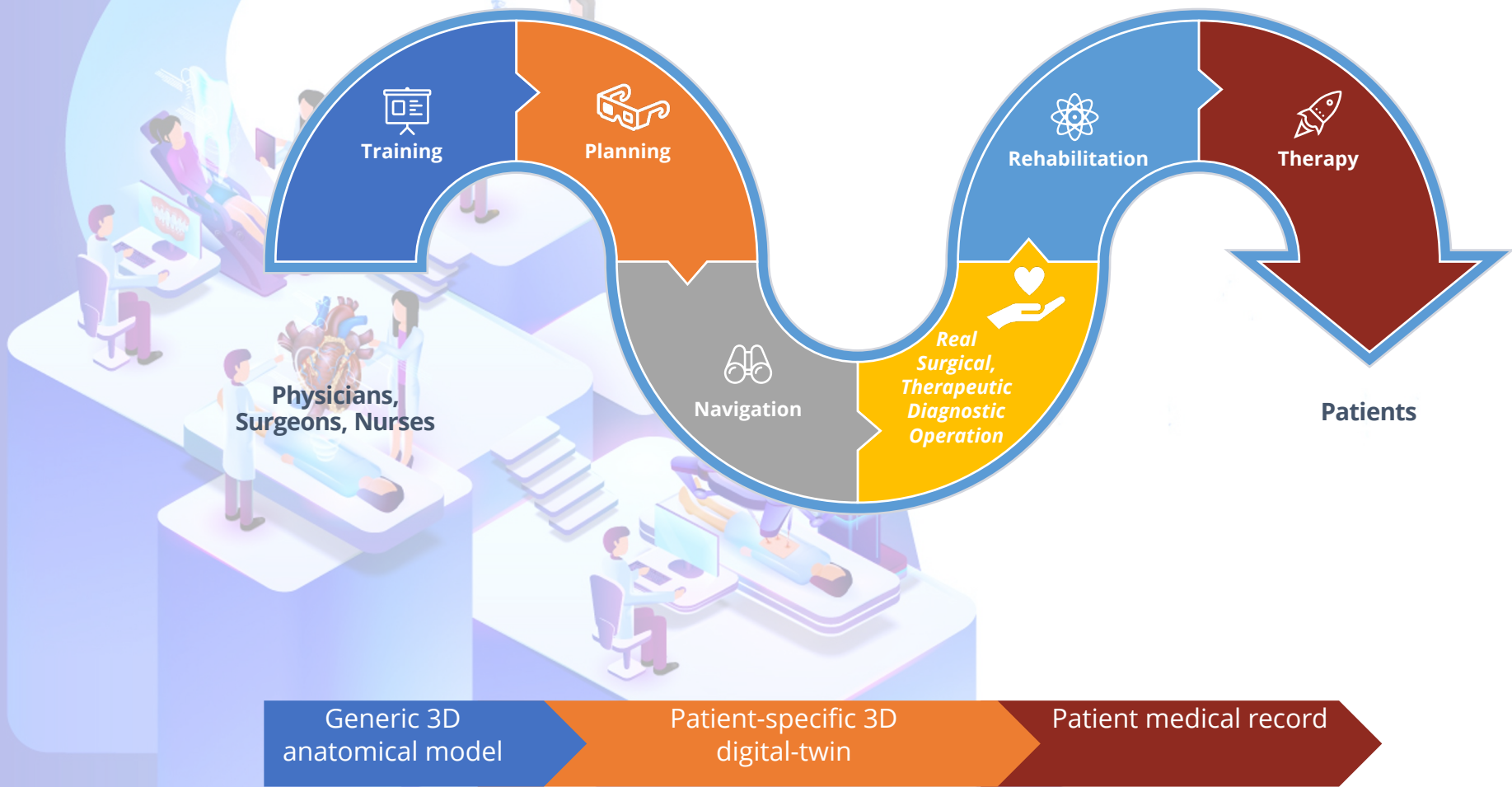
It unifies **computational** science (scientific computing) with intelligent **extended reality** and **spatial computing** for the **medical** field.

It integrates **computational** methods from computer **graphics**, computational **geometry**, **vision** and **deep learning** to solve hard problems in medicine and neuroscience:

- low-code/no-code **authoring** XR platforms
- XR surgical **planning**
- XR operative **navigation**
- Computational systems for **rehabilitation** and **therapeutics**

Computational Medical XR

Overview



Why now for computational medical XR?



Stable Diffusion prompt:
“doctors and nurses with 3D VR and AR glasses in digital and real objects and environments integrated and communicating between each other based on immersive experiences”

“After **years** of **validation** and **use** by early adopters – VR medical technology is poised to move to the **mainstream**; recent changes in **cost** and **access** make VR quite **affordable**”

*Dr. Walter Greenleaf,
Stanford Health Care & Virtual Human Interaction
Lab*

“The biggest **challenges** in **healthcare** are (1) **access**—there aren’t enough enough good doctors to provide timely care to all who need it (and clinicians are leaving the field in droves due to burn out), and (2) **cost**—the cost of healthcare has skyrocketed, largely because of increasing labor costs.

AI will solve both of these issues.”

Daisy Wolf and Vijay Pande,

Computational Medical XR

Workshop Speakers



Prof. Michael Cole,
UMich



Oliver Kannape,
Mindmaze &
University Hospital
of Geneva



Dr. Walter Greenleaf,
StanfordU



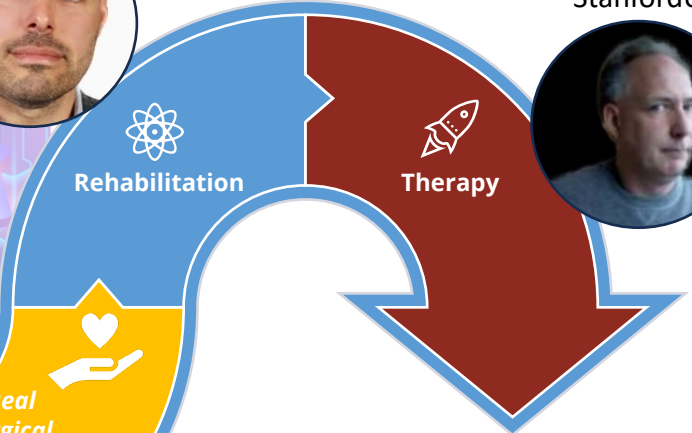
Dr. Mark Zhang,
HarvardU



Dr. George Papagiannakis,
ORamaVR



Gabe Jones,
Proprio Vision





Computational Medical XR

Panels and Outline

Computational XR panel:

(60 minutes talks + 10 minutes Q&A)

1. *"State of the art in Computational Medical XR education, experiential learning, and training"*, Dr. George Papagiannakis
 2. *"Multi-modal imaging systems to enhance surgical performance"*, Gabe Jones
- 10 minutes Q&A panel to all speakers

Neuroscience XR panel:

(60 minutes talks + 10 minutes Q&A)

1. *"Convergence of VR, AR, deep learning and biosensing for medical applications"*, Dr. Walter Greenleaf
 2. *"From embodiment to cognitive neurorehabilitation in medical XR"*, Dr. Oliver Kannape
- 10 minutes Q&A panel to all speakers

Medical XR case studies panel:

(60 minutes talks + 10 minutes Q&A)

1. *"Clinical trials and study protocols for XR-based training"*, Prof. Michael Cole
 2. *"Frameworks for rapid creation of subject matter expertise in extended reality for computational medical XR"*, Dr. Mark Zhang
- 10 minutes Q&A panel to all speakers

Stable Diffusion prompt:
*"physicians in VR displays
experiencing virtual worlds"*

```
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    model = "gpt-3.5-turbo",  
    messages=[  
        {"role":"system", "content": "You are a helpful assistant."},  
        {"role":"user", "content": "Can you say something to inspire the audience of ACM SIGGRAPH 2023 about computational medical extended reality?"},  
    ]  
)  
print(response["choices"][0]["message"]["content"])
```

... Welcome to ACM SIGGRAPH 2023!

Computational medical extended reality merges technology and healthcare, transforming the way we diagnose, treat, and educate.

With XR, doctors visualize complex data in immersive environments, enhancing precision and patient outcomes.

Surgeons practice intricate procedures in virtual spaces, reducing risk.

Patients experience immersive therapies for pain management and rehabilitation.

Researchers collaborate globally, pushing boundaries in medical innovation.

Let us embrace the power of computational medical XR, empowering healthcare professionals, revolutionizing patient care, and opening doors to a future where technology merges seamlessly with humanity's quest for well-being.

Together, we can redefine medicine and shape a healthier world.



Swiss Accelerator innovation project supported by



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Innosuisse – Swiss Innovation Agency



Funded by the
European Union
NextGenerationEU

Greece 2.0
NATIONAL RECOVERY AND RESILIENCE PLAN

fidal
field trials
beyond 5G.



Dr. George Papagiannakis
Prof. University of Crete,
Affiliated Researcher at FORTH
Visiting Prof. University of Geneva
&
ORamaVR co-founder, CEO
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*Let's accelerate world's transition to
computational medical XR!*