# 2019
# Research Experience for Undergraduates

## Remote Interaction with Medical Data Based Holograms

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# Motivation

- Enhance medical data visualization with Augmented Reality (AR)
    - True 3D visualization
    - Fusion of medical data and subject
    - Immerse physician to medical data
- Reduce discrepancies between recorded data and subject's illness
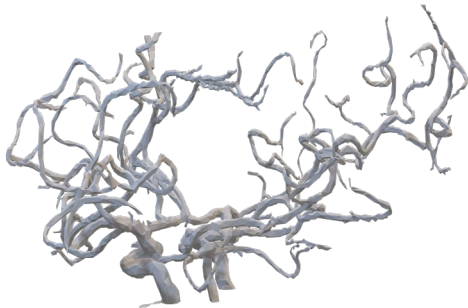- Expand toolset for physicians



https://www.microsoft.com/en-us/hololens



https://spinalnewsinternational.com/world-first-microsoft-hololens-augmented-reality-discectomy-takes-place-in-usa/

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# Goals

- Medical data visualization using AR head mounted displays (HMDs)
  - Commercially accessible



Segmented Vessels-University of Houston MRI Lab



Microsoft.com
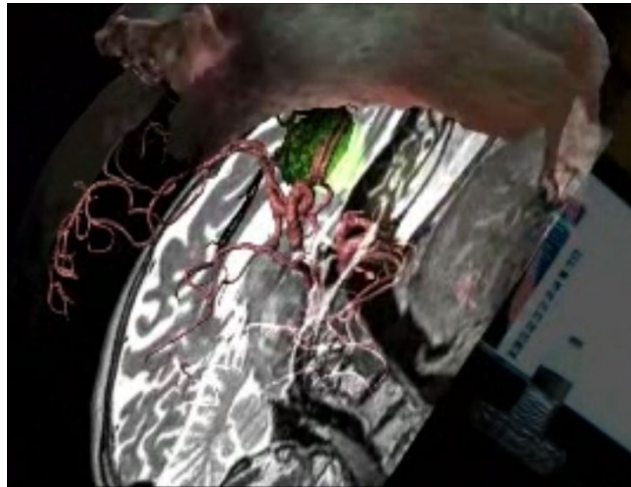
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# Issues with HMDs

- Lack computational power
- Need to offload work to a separate unit
- Proper human interface
  - Are voice commands and hand gestures good enough?

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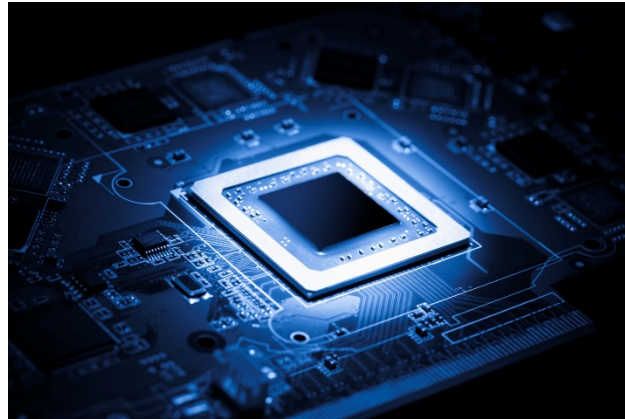
# MRI and Imaging Lab

- Holographic and Imaging Control System
  - Medical data manipulation and analytics
  - Communicates with HMDs on visuals
  - Various medical applications



Brain imaging data, vessels, tumor, and skin
visualization - University of Houston MRI Lab

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# Objectives

- Control HICS remotely through iPad application
    - Indirect control of holographic visuals
- Compare methods for user interaction
    - User studies



https://logicalidea.co/button-design-ux-mistakes/

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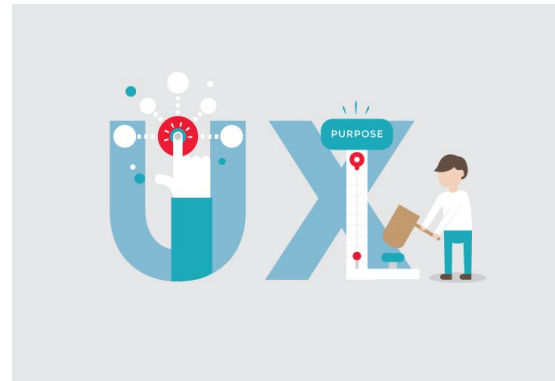
# Remote Control

Transmit MRI data for simulation to HMD based on user input
- Menus on controller GUI shall populate dynamically (not predefined)



https://codeburst.io/role-of-shadows-blur-effects-in-modern-user-interface-design-ec23fac2319

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# User Studies

- Controlling a holographic scene.
- Given a set of tasks, can the user complete them in a timely manner?
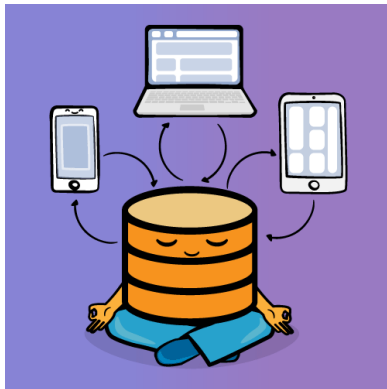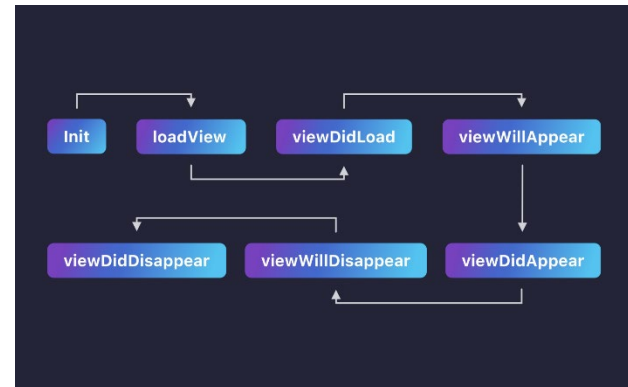
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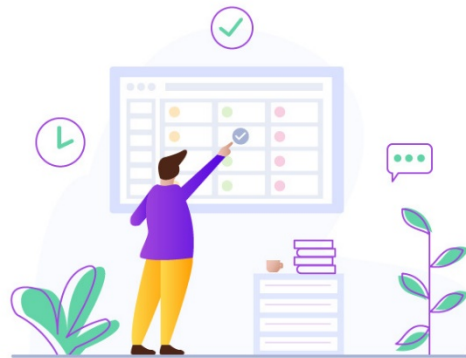
# Progress

Work in progress:

- Network programming using Swift
- Model View Controller architectural pattern
- ViewController Lifecycle
- Asynchronous Programming



https://www.raywenderlich.com/76-tcp-server-with-the-swiftnio-networking-framework



https://medium.com/@ufukatalca/uiviewcontroller-hayat-d%C3%B6ng%C3%BCs%C3%BC-fd7710fb0a8

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# Remaining Work

- Implement mobile application for server interfacing
- Construct task list for defined use cases
- Conduct tests in three different scenarios
  - Mouse and keyboard
  - Pinching gestures with voice commands
  - Mobile controller



https://arstechnica.com/science/2017/11/to-think-critically-you-have-to-be-both-analytical-and-motivated/

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AR and holograms can enhance data visuals



http://www.infometrics.co.nz/new-zealand-research-effects-migration/

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# Acknowledgements

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