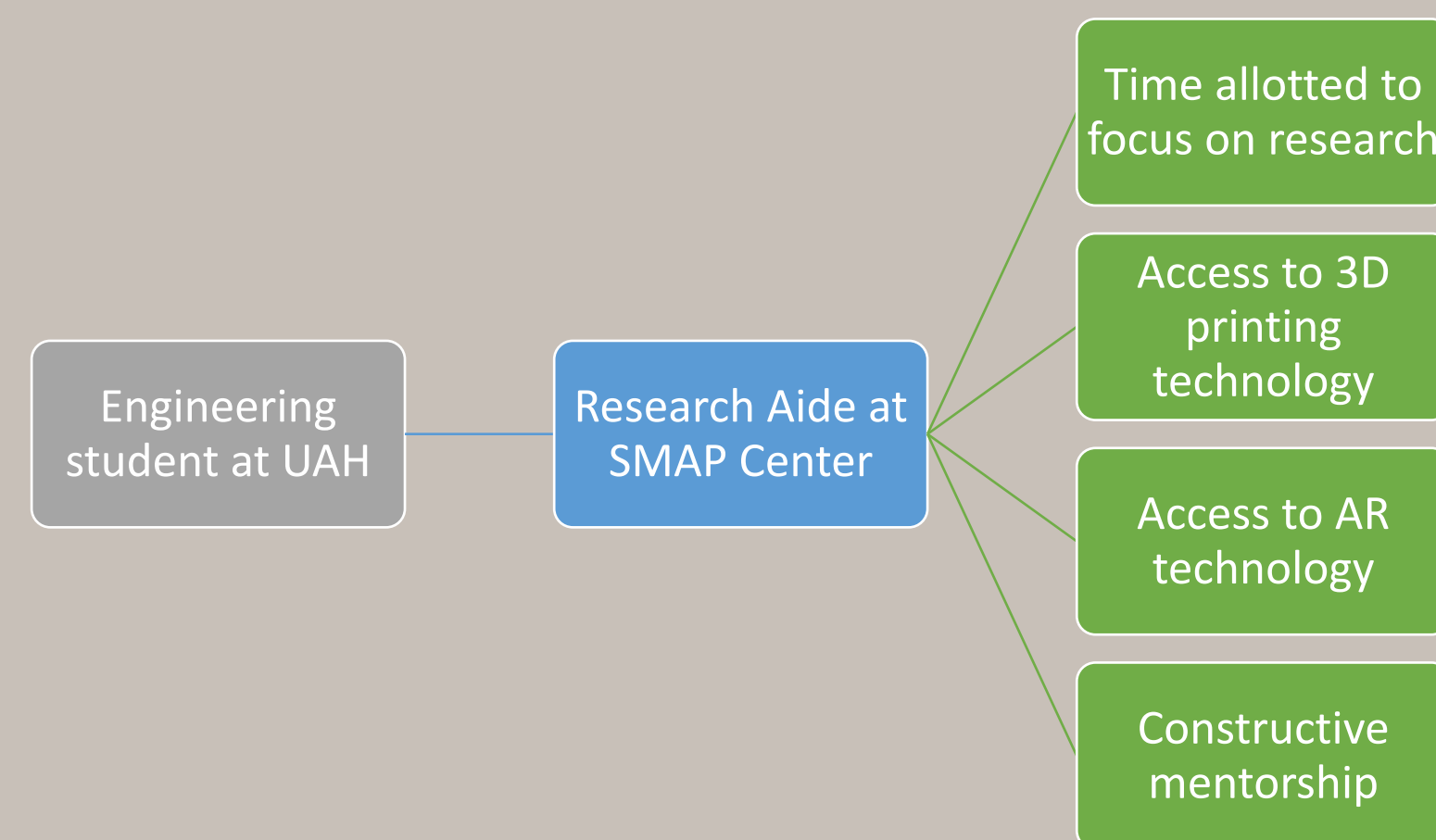


## Introduction

Multiple Sclerosis (MS) is an autoimmune disease where the immune system attacks the protective myelin sheath covering of the central nervous system (CNS). The disease can cause debilitating symptoms such as muscle spasms, fatigue, inability to control movement of appendages, numbness, and cognitive malfunction.

Magnetic Resonance Imaging (MRI) is used to identify brain lesions. To date, there are no tests to specifically diagnose MS because lesions are caused by multiple disease processes. Current diagnosis of MS must include elimination of other testable diseases. The correct lesion count is necessary for final diagnosis to be made.

Research for this project focused on how to model the human brain using MRI data. The team developed a systematic process to identify and visualize brain lesions to increase understanding of lesion location and ratios between brain matter and lesions.



## Objective

Create an interactive personalized diagnostic tool through integrating multiple open-source software platforms to enable better visualization of MS lesions and their effects on the CNS to enhance healthcare consultation and improve understanding during diagnosis and individualized treatment planning.

## Impact

### MS Research

- Brain to lesion matter ratios
- Visualization of lesion locations
- Track progression of lesion development

### Engineering-Nursing Collaboration

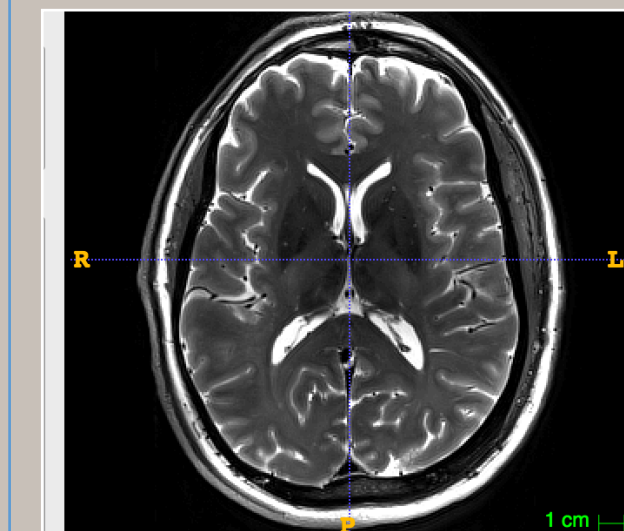
- Integrating/Understanding technologies and systems
- Improved communication skills
- Improved problem solving skills
- Embracing diversity of thoughts

### Process Evaluation

- Need faster processor for Augmented Reality software
- Currently no 3D printing filament that is truly translucent
- A Wacom Intuos Pro tablet improves the efficiency of the process

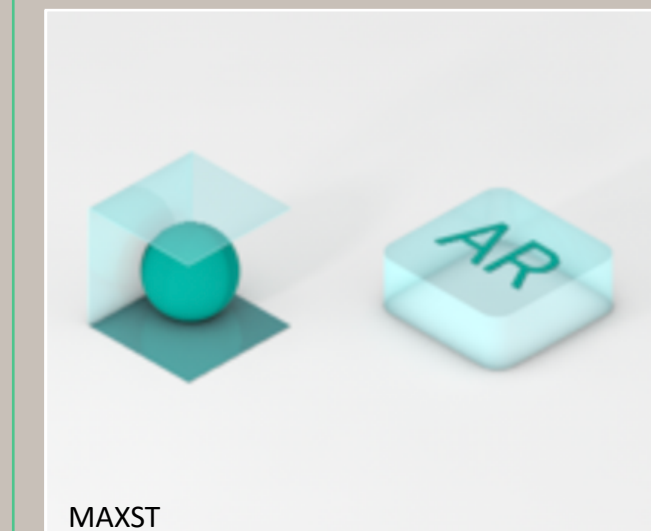
## Future Work

### Phase 2:



- Implement 7 Tesla MRI data into the process from Phase 1
- Outcome: 7 tesla MRI data enables the team to research gray matter lesions which cannot normally be seen on a 3 tesla MRI machine.

### Phase 3:



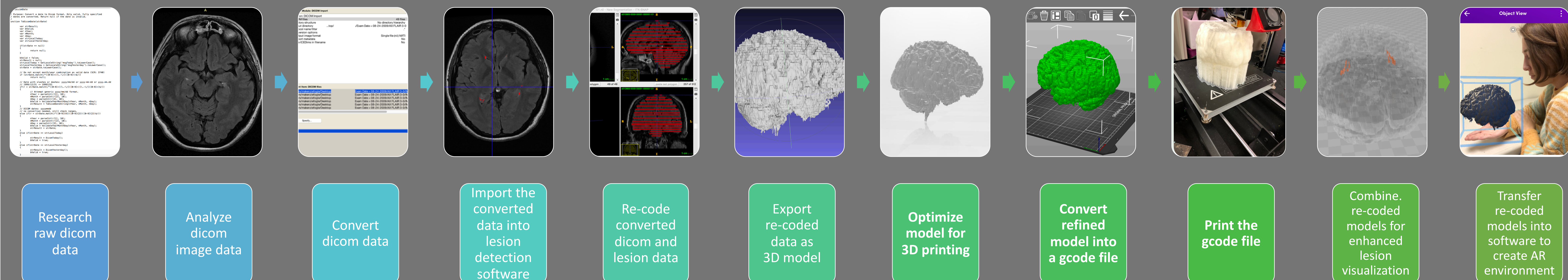
- The development of overlays that will allow visualization of functional areas of the brain
- Outcome: better understand the relationship of lesions to patient symptoms and thus allow more efficient diagnostics and treatment.

### Phase 4:



- Creating an AR object anchoring environment in order to link the overlays created, to the 3D printed model of the brain.
- Outcome: This will enable the patient to hold the model while simultaneously viewing the lesions.

## Phase 1 August 2018-December 2019



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- James Tovar (UAH SMAP employee)
- Thomas Denney (Auburn University 7 Tesla)

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