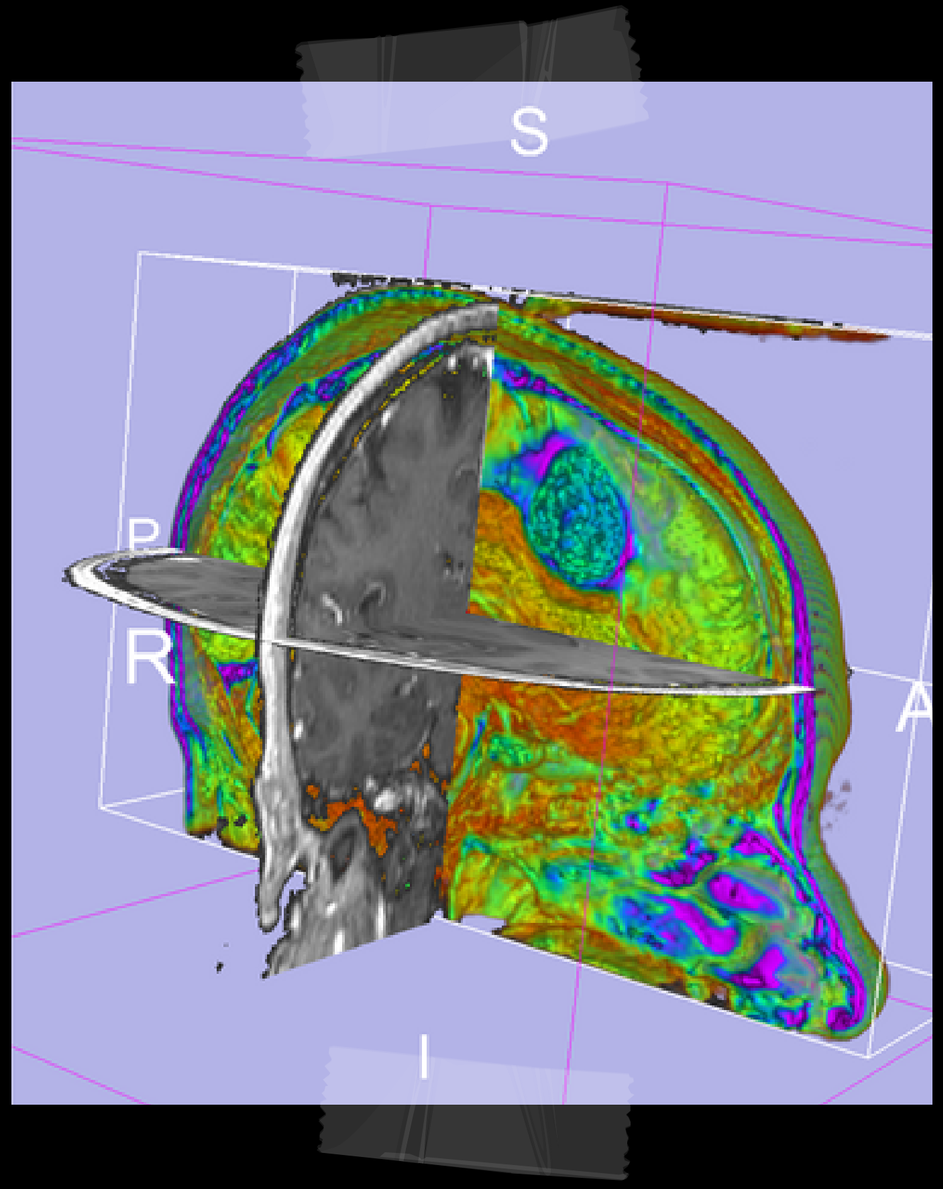
# 3D Slicer Respitch

Kathy Zhang

Research Computing Services,
the University of Melbourne



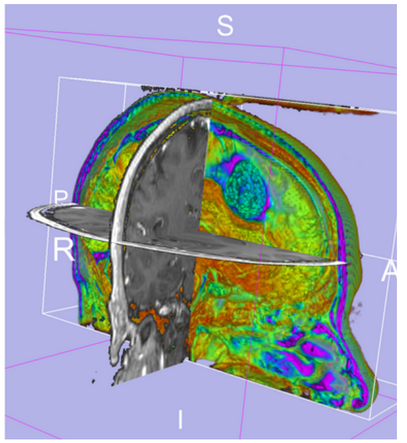
# Learning objectives

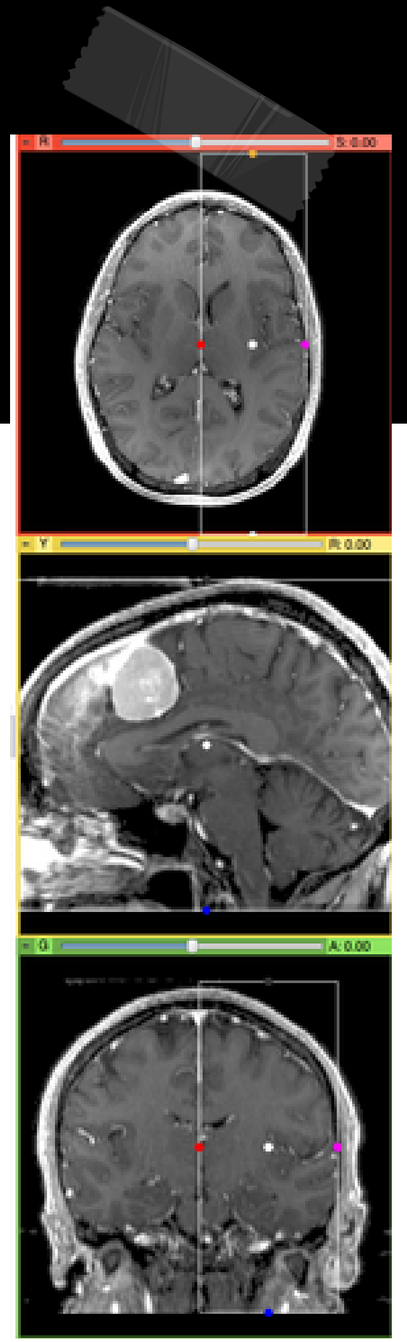
- Understand what 3D Slicer is and what it can be used for
- Learn to navigate the 2D and 3D views in 3D Slicer
- Learn some basic segmentation skills e.g. paint, threshold, grow from seeds

# What is 3D Slicer?

## Free, open-source software for medical image analysis and visualization.

Supports many different data sets, from medical scans to microscopy to astronomy!

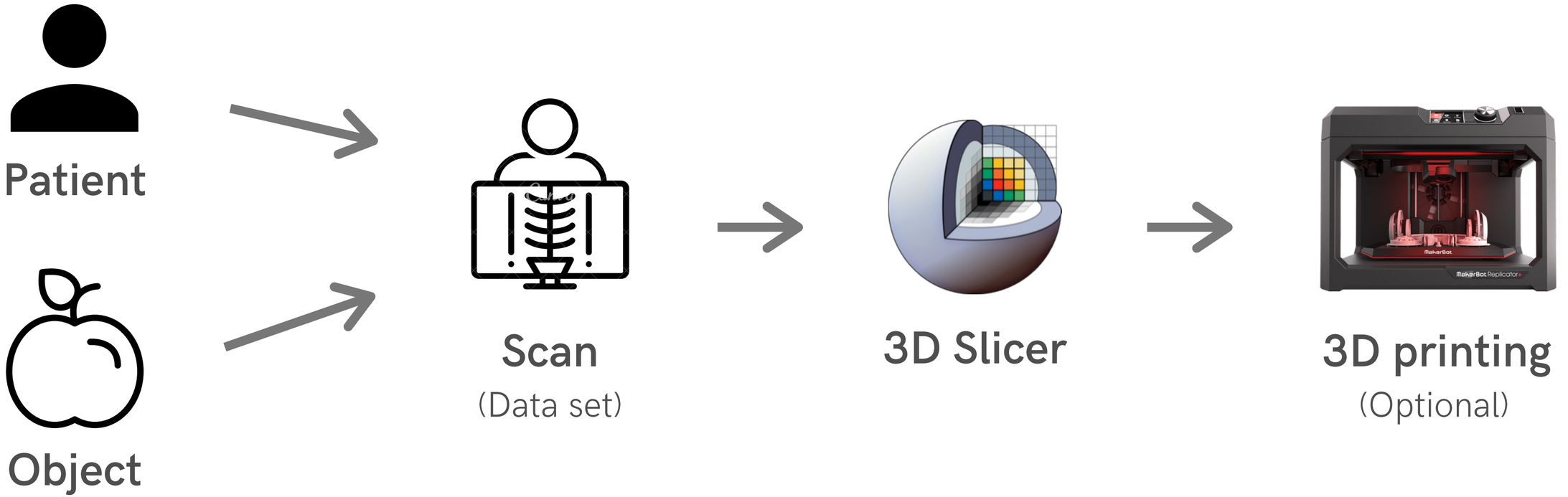


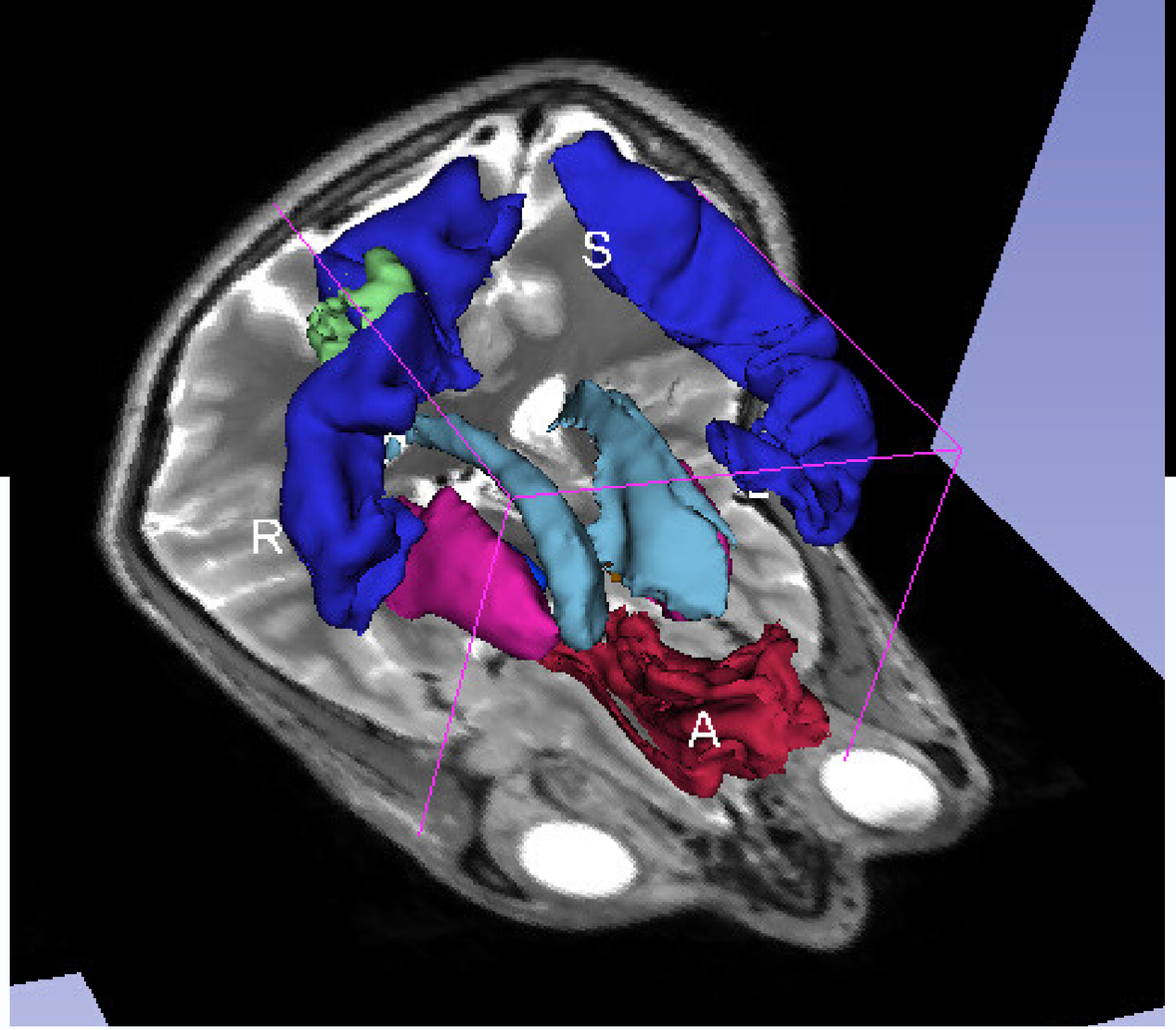
## Commonly used for

visualisating, educating, communicating, sharing, collaborating, prototyping, innovative methods.

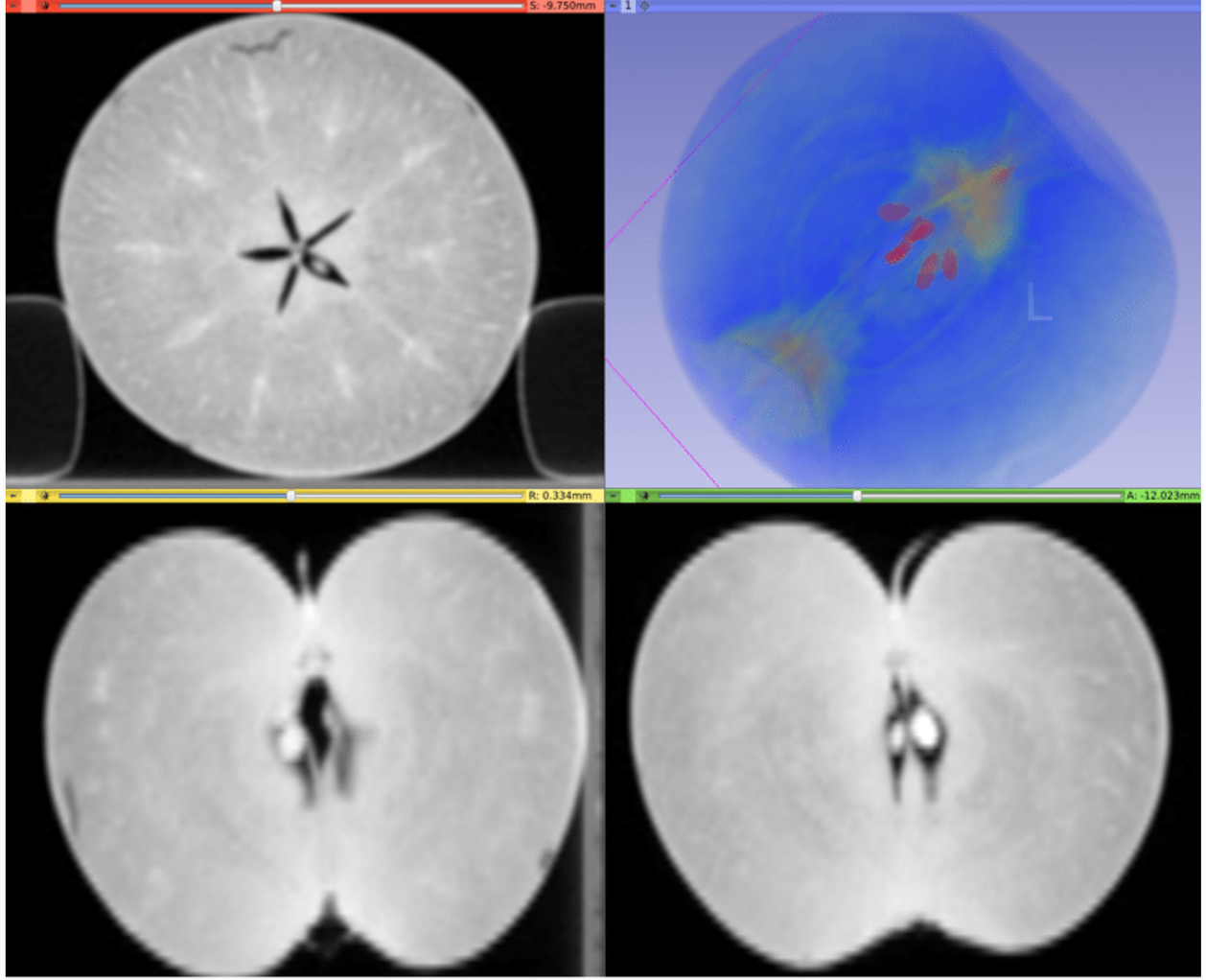
# A typical workflow



# Examples




*Visualisation of the brain's motor system and a mass (green).*




*Volume rendering of a CT scan of a Granny Smith apple.*

*Real-time navigation of breast cancer surgery at Queen's University, Canada*

DOI: 10.1109/TBME.2015.2466591

## TODAY'S TOOLS

laptop / cheat sheet / on-call surgeons

## APPROACHES

anatomy / medical imaging / image processing

## GETTING ORIENTED

2D view / 3D view / navigation

## SEGMENTING

modules / paint / threshold / grow from seeds

Let's learn some basics!

# Today's tools

## COMPUTER

Hopefully you have already downloaded 3D Slicer. You will also need to download the sample CT Chest scan for the challenges.

## CHEAT SHEET

This is full of vocabulary, keyboard shortcuts and pointers for you to refer to throughout today's session.

## ON-CALL SURGEONS

Helpers are stationed around the room in case you get stuck.

## TODAY'S TOOLS

laptop / cheat sheet / on-call surgeons

## APPROACHES

anatomy / medical imaging / image processing

## GETTING ORIENTED

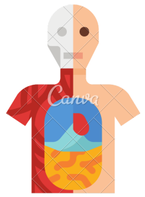
2D view / 3D view / navigation

## SEGMENTING

modules / paint / threshold / grow from seeds

Let's learn some basics!

# Approaches to 3D Slicer



## ANATOMY

What bodily structures am I interested in, and can I identify them on the screen?

## MEDICAL IMAGING

Why do these images look the way they do, and how can I manipulate those qualities in 3D Slicer?

## IMAGE PROCESSING

How can I use my knowledge of MS Paint/ GIMP/ Photoshop to use this program?

## TODAY'S TOOLS

laptop / cheat sheet / on-call surgeons

## APPROACHES

anatomy / medical imaging / image processing

## GETTING ORIENTED

2D view / 3D view / navigation

## SEGMENTING

modules / paint / threshold / grow from seeds

Let's learn some basics!

# Getting oriented

## 2D VIEWS

Special terminology is used to describe anatomy and medical images displayed in 2D. Please refer to your cheat sheet.

## 3D VIEWS

See if you can match up the terminology on your cheatsheet with what is on the computer screen in front of you. This will help you understand how to approach medical scans and the 3D space.

## NAVIGATION

Mouse and keyboard shortcuts have been included on the cheatsheet. Try them out, and get comfortable with navigating the CT chest scan.

# CHALLENGE #1

Bombastic Bill is a keen LARP-er who has run into a spot of bother! During his latest and greatest American Civil War re-enactment, Bill accidentally mixed up his fake musket balls and his real musket balls.

*How many musket balls can you find on Bill's CT chest?*

# CHALLENGE #1

*How many musket balls can you find on Bill's CT chest?*

There were five musket balls in Bill's chest CT scan.
You may have also noticed that Bill has a pacemaker in his chest.

Were you able to find them all?

## TODAY'S TOOLS

laptop / cheat sheet / on-call surgeons

## APPROACHES

anatomy / medical imaging / image processing

## GETTING ORIENTED

2D view / 3D view / navigation

## SEGMENTING

modules / paint / threshold / grow from seeds

Let's learn some basics!

# Segmenting

## MODULES

Look to the tool bar at the top of your screen. Click the "modules" drop down box and select the "segment editor" module. Click "add" to add a segment and get started.

## THRESHOLD

Refer to the section on the Hounsfield scale on your cheat sheet. Using the threshold effect, how can you use these principles when setting a threshold range?

## PAINT AND GROW FROM SEEDS

Using the paint effect, select some voxels that are alike. These might be of bone, lung or heart. Then, on a second segment, paint over everything else that is different to what you selected. What happens when you initialise grow from seeds?

# CHALLENGE #2

As it turns out, musket balls are cast from pure lead. The surgeons need to remove the musket balls from Bill's chest before he dies of lead poisoning.

*Quick! Segment the musket balls you found in Bill's chest.*

# CHALLENGE #2

*Quick! Segment the musket balls you found in Bill's chest.*

What tools and effects did you use to segment the musket balls? There are many different ways to accomplish this. I like to use paint and grow from seeds when doing this particular segmentation.

You may notice that different effects are suited to different tasks. For example, threshold is really effective for segmenting bone and the pacemaker.

# BONUS CHALLENGE

# CHALLENGE #3

Your years of playing Operation have paid off! The surgery is a success and Bill will live to LARP another day. The chief of surgery is so impressed they ask you to present the case at Grand Rounds.

*Present Bill's case to your colleagues using the Grand Rounds checklist taped under your chair.*

# Wrap up

The colours on the checklist have been mapped to the learning outcomes. (The purple ones were just for fun!)

By completing the checklist, you should now feel confident with the basics of 3D Slicer.

Understand what 3D Slicer is and what it can be used for

Learn to navigate the 2D and 3D views
e.g. using Slicer and anatomical planes

Learn some basic 3D Slicer skills
e.g. paint, threshold, grow from seeds

# Thank you!

For more services and workshops, visit us at…

research.unimelb.edu.au/infrastructure/research-computing-services

rescomunimelb.eventbrite.com.au

@ResCom_unimelb
@kathy_zzzz

kathyz@unimelb.edu.au