

# Finding a fETus with UltraSound (FETUS)

## Westminster Enterprise Week #2021

10th November 2021



Tareen Dawood, Guilherme Gomes De Figueiredo,  
Shu Wang, and **Miguel Xochicale**

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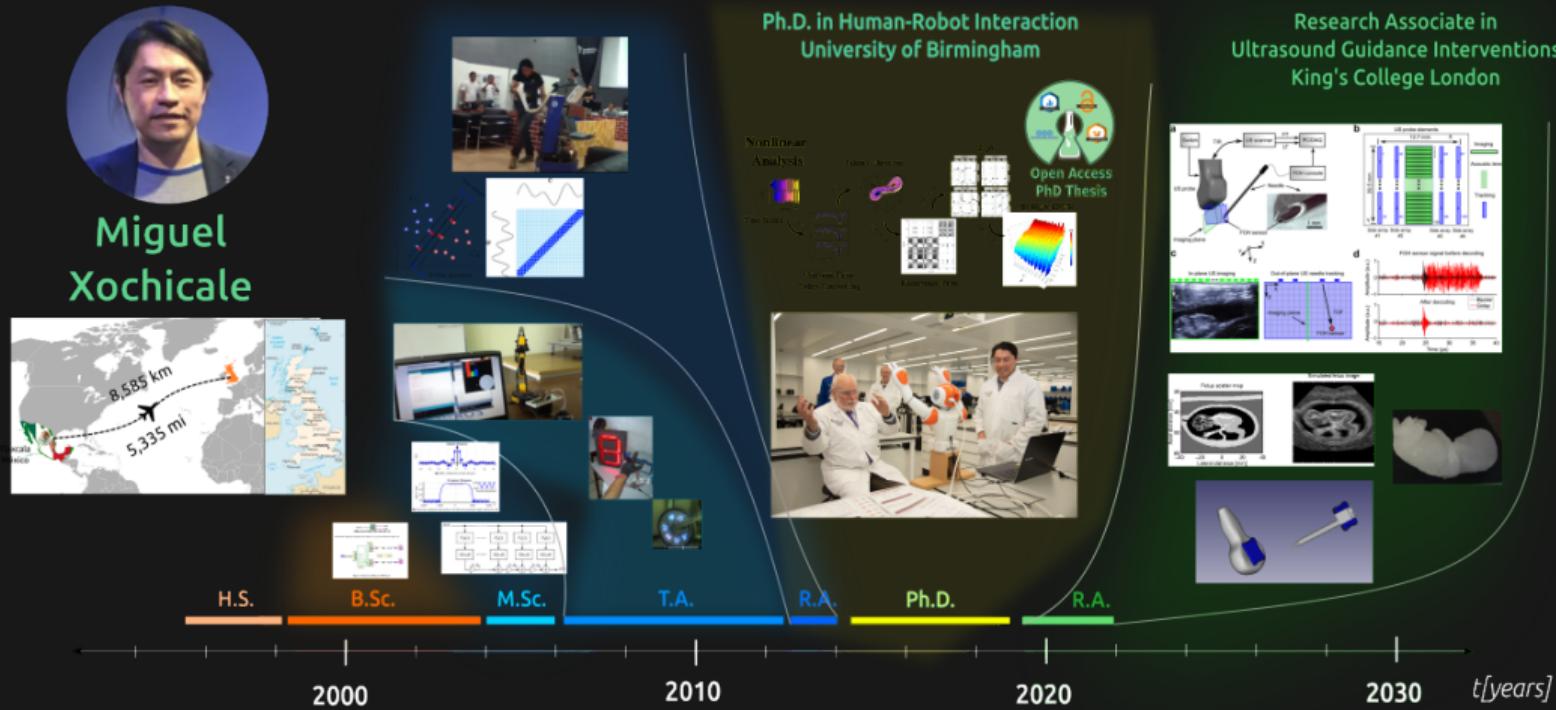
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Get source of this slide and see further references from <https://github.com/xfetus/public-engagement-project/>

# Contents

1. Who?, Why? Where?
2. Guessing Fetal Growth
3. Looking inside the human body
4. Applications of Biomedical Engineering
5. Takeaway messages, pop quiz, and few surprises

# Who are we? / Where we come from? / Do we have hobbies?



# Who are we? / Where we come from? / Do we have hobbies?



## Tareen Dawood



H.S.

B.Sc.

Internship

Working

2000

2010

2030

$t[\text{years}]$

### Defence and Finance



Pay back bursary - Worked

Jobs - scarce = Finance

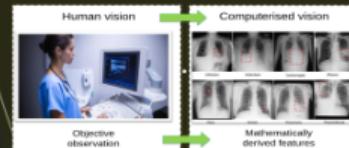
MSc - Mech Eng - Operational



### Masters - Ultrasound Imaging - TB/HIV/Lymphoma Feature Detection

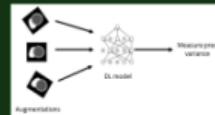


Imaging features from images to earlier detect Lymphomas



### Ph.D. in Cardiac Imaging - Learning to Trust AI

#### Medical Image Analysis - Cardiac Application



#### Predictive Cardiac Models

#### Prevention, Treatment and Decision Support Tool

Who are we? / Where we come from? / Do we have hobbies?

**Shu  
Wang**



**Zhanchong  
Ou**



**Guilherme Gomes  
De Figueiredo**



# Where we are based?

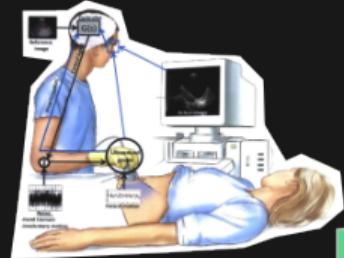


School of Biomedical and Imaging Science



KING'S  
College  
LONDON

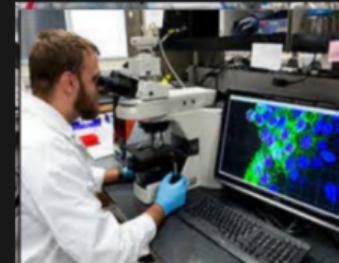
**Ultrasound Imaging**



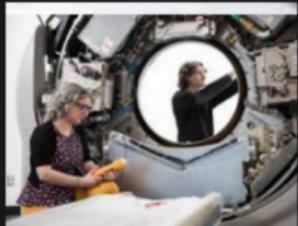
**Machine Learning and Deep Learning with Medical Imaging**



**Biomedical Imaging**



# Biomedical Engineering



**PET and MR Acquisition and Reconstruction**

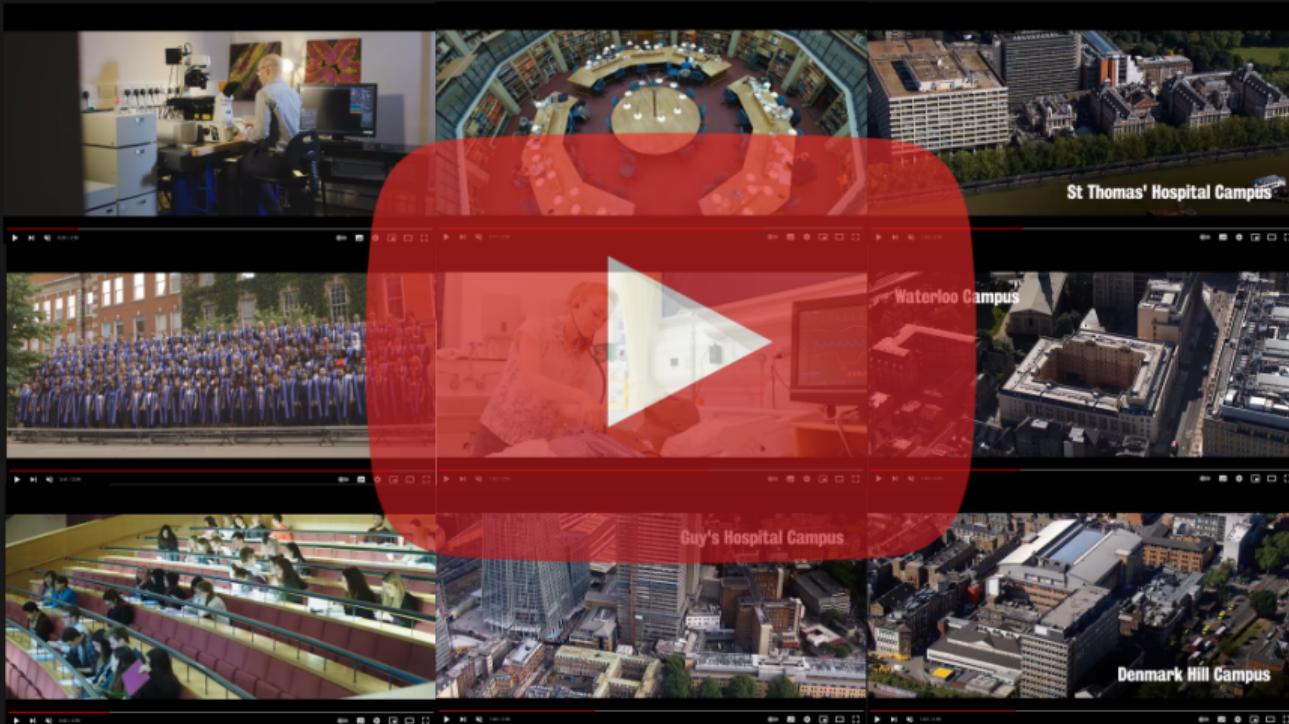


**Image Computing, Analysis and Robotics**



**Image-guided navigation**

# Faculty of Life Sciences & Medicine: video



School of Biomedical Engineering & Imaging Sciences

School of Immunology & Microbial Sciences



School of Basic & Medical Biosciences



## Faculty of Life Sciences & Medicine



School of Cancer & Pharmaceutical Sciences

School of Cardiovascular Medicine & Sciences

School of Life Course Sciences

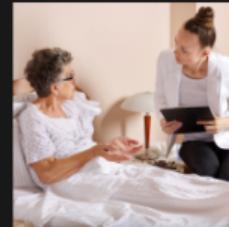
Sonographers



Radiologists



Social workers



## Healthcare Professions



General Doctor  
and Surgeons



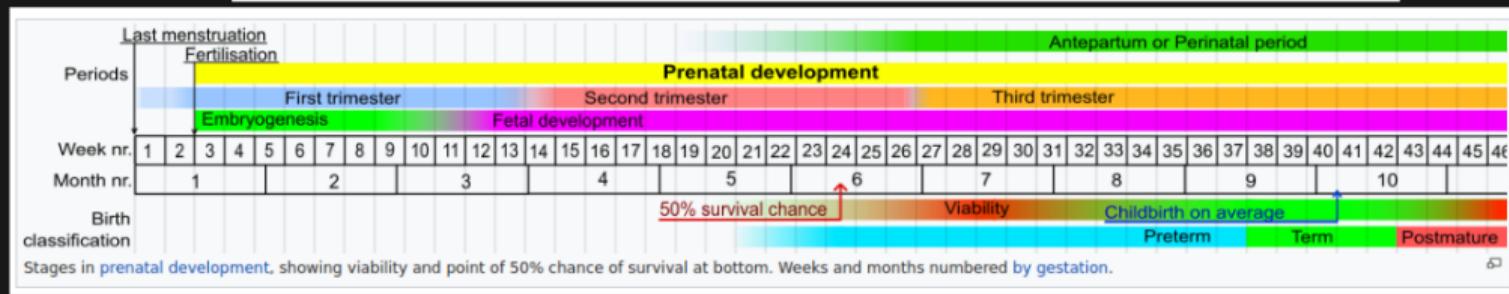
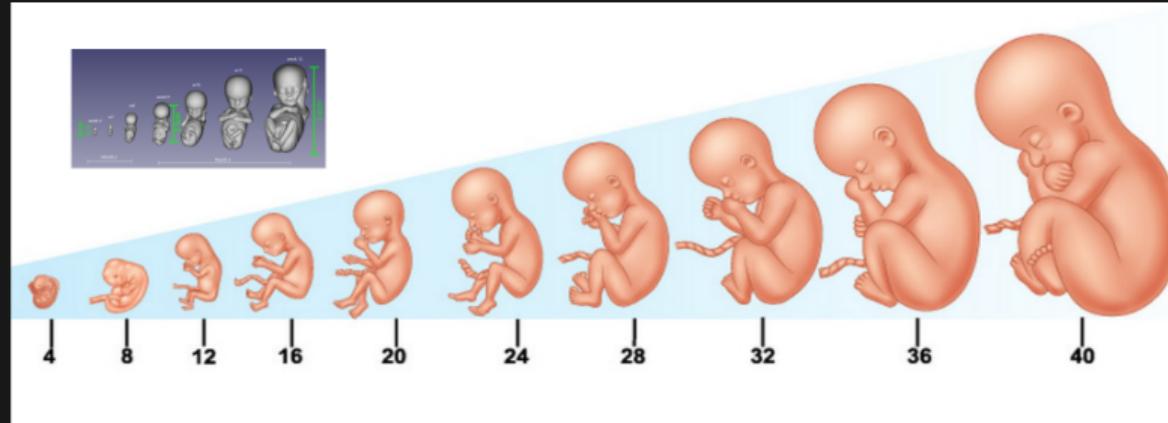
Nurses and Midwives



Physiotherapists

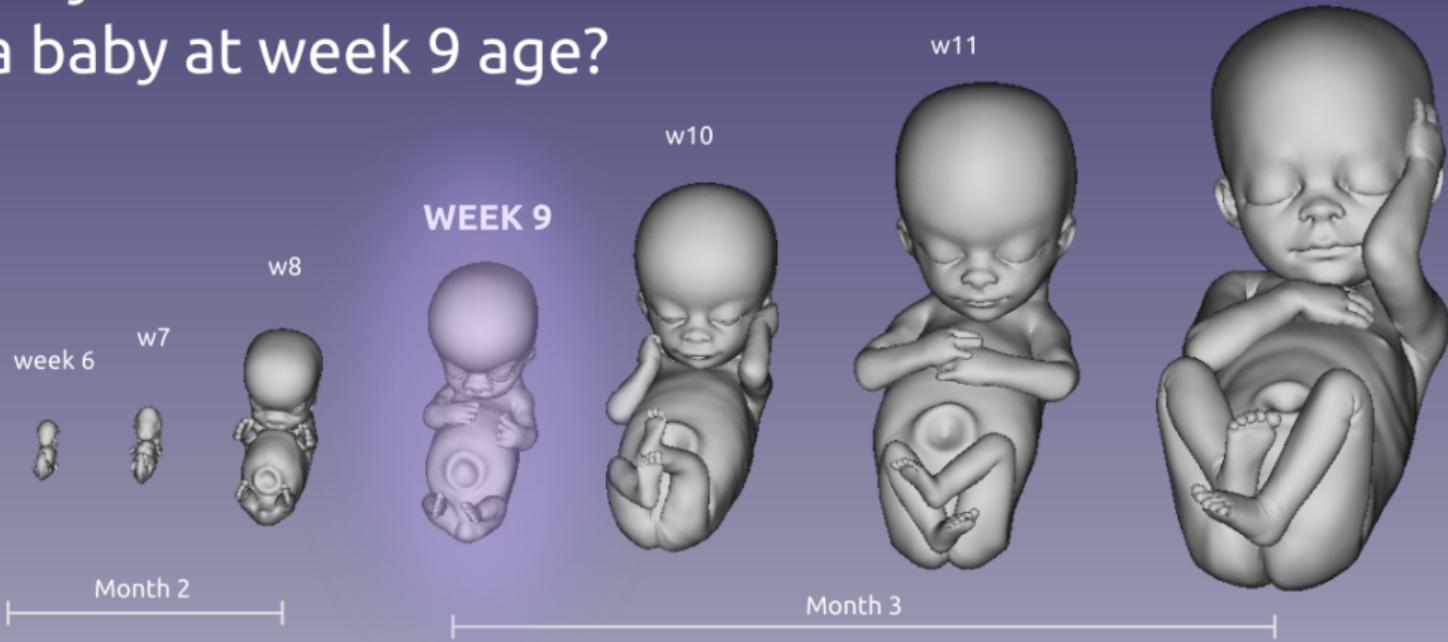
# Understanding Fetal Growth

## Understanding Fetal Growth



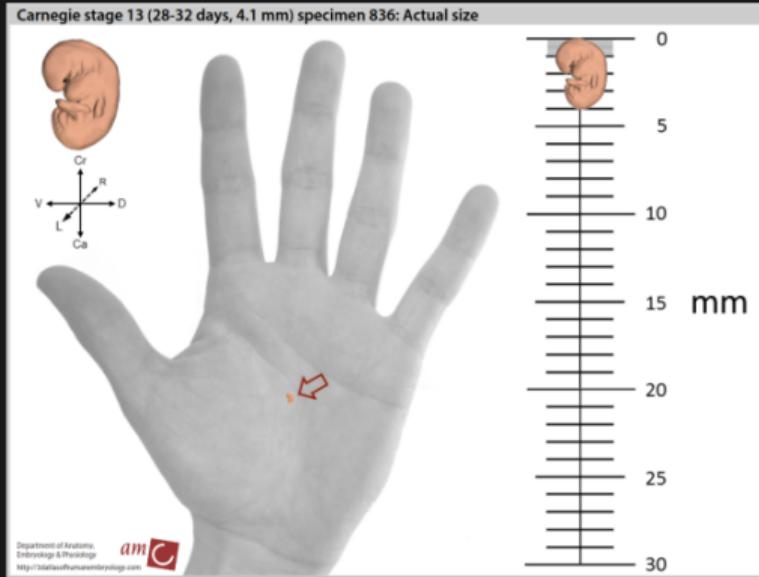
# [ACTIVITY]: Guessing Fetal Growth

Can you draw the size of  
a baby at week 9 age?

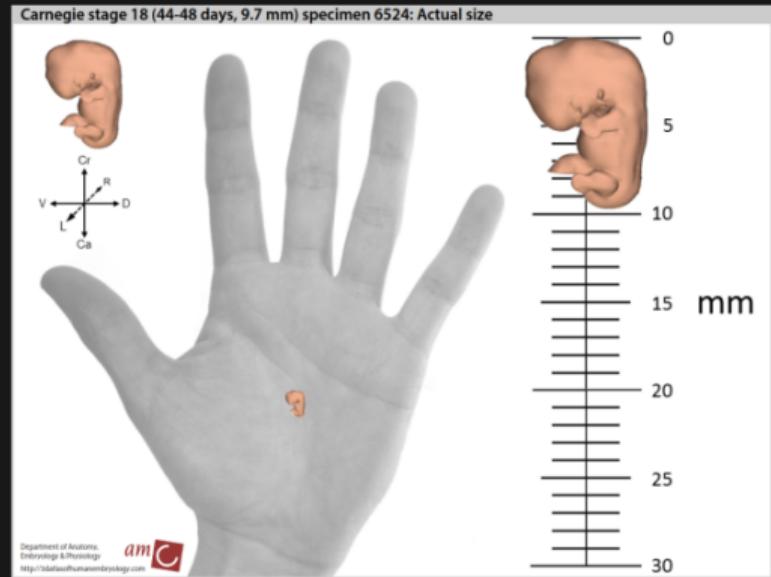


# [ACTIVITY]: Understanding Fetal Growth

week 5

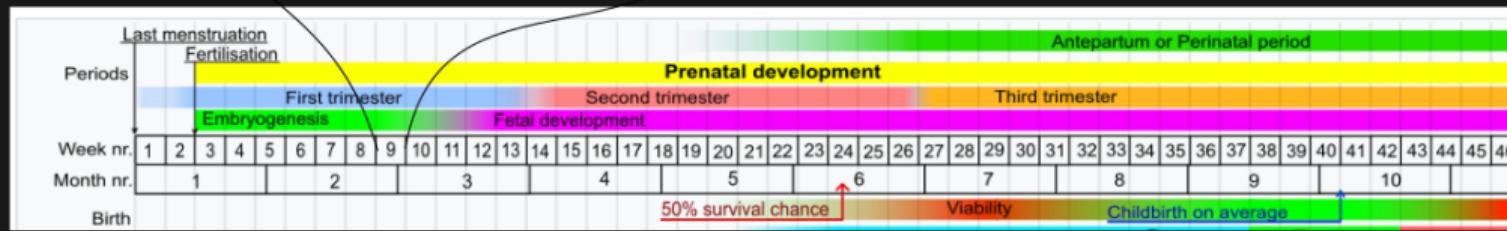
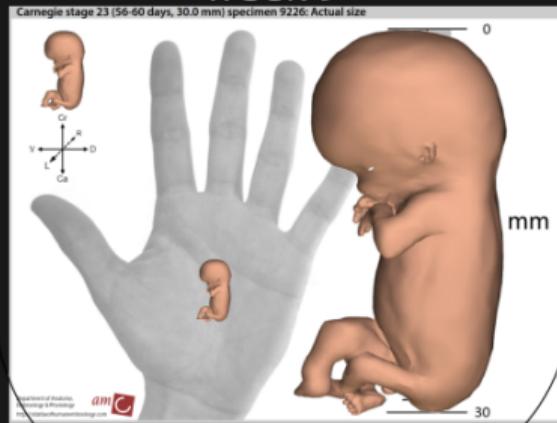


week 6



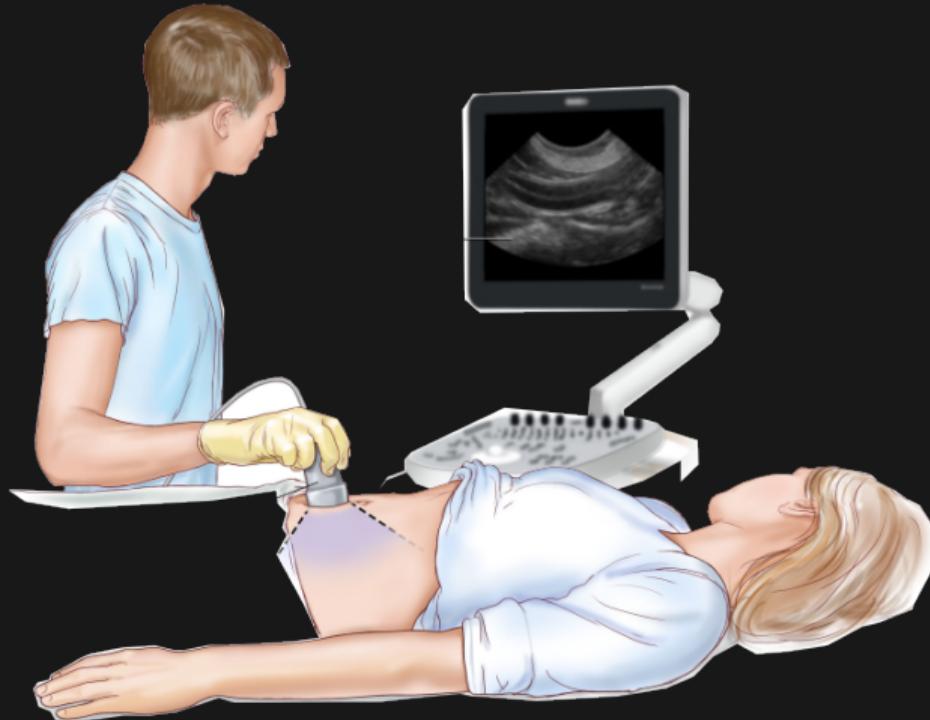
# [ACTIVITY]: Understanding Fetal Growth

week 9



Do you know what type of healthcare professional helps to monitor fetal development?

# The role of a Sonographer



Prepare Exam Room & Equipment



Use Sonography Equipment



Friendly Disposition & Good Patient Care



Maintain Confidence

Do you know  
how clinicians can actually see fetal  
development?

# Computational Tomography

CT

+ high image quality



- non-real-time

## Computational Tomography



# Magnetic Resonance Imaging

# MRI

+ high image quality



- non-real-time

## Magnetic Resonance Imaging



# US

# Ultrasound

+real-time  - poor-image quality



# Medical Imaging in Pregnancy

## CT



## MRI



## US



+ high image quality - non-real-time

+ high image quality - non-real-time

+ real-time - poor-image quality

How a Biomedical Engineer would help  
Sonographers?

What skills do you think a Biomedical  
Engineer needs to have?

# Modelling US imaging

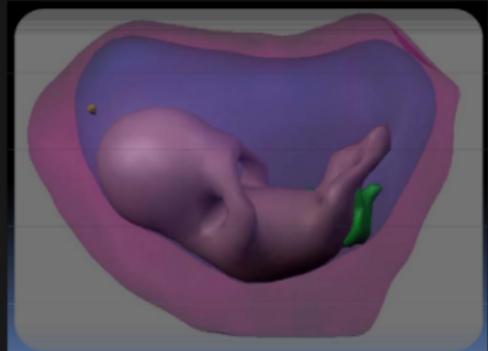
## Segmentation on 3D US data



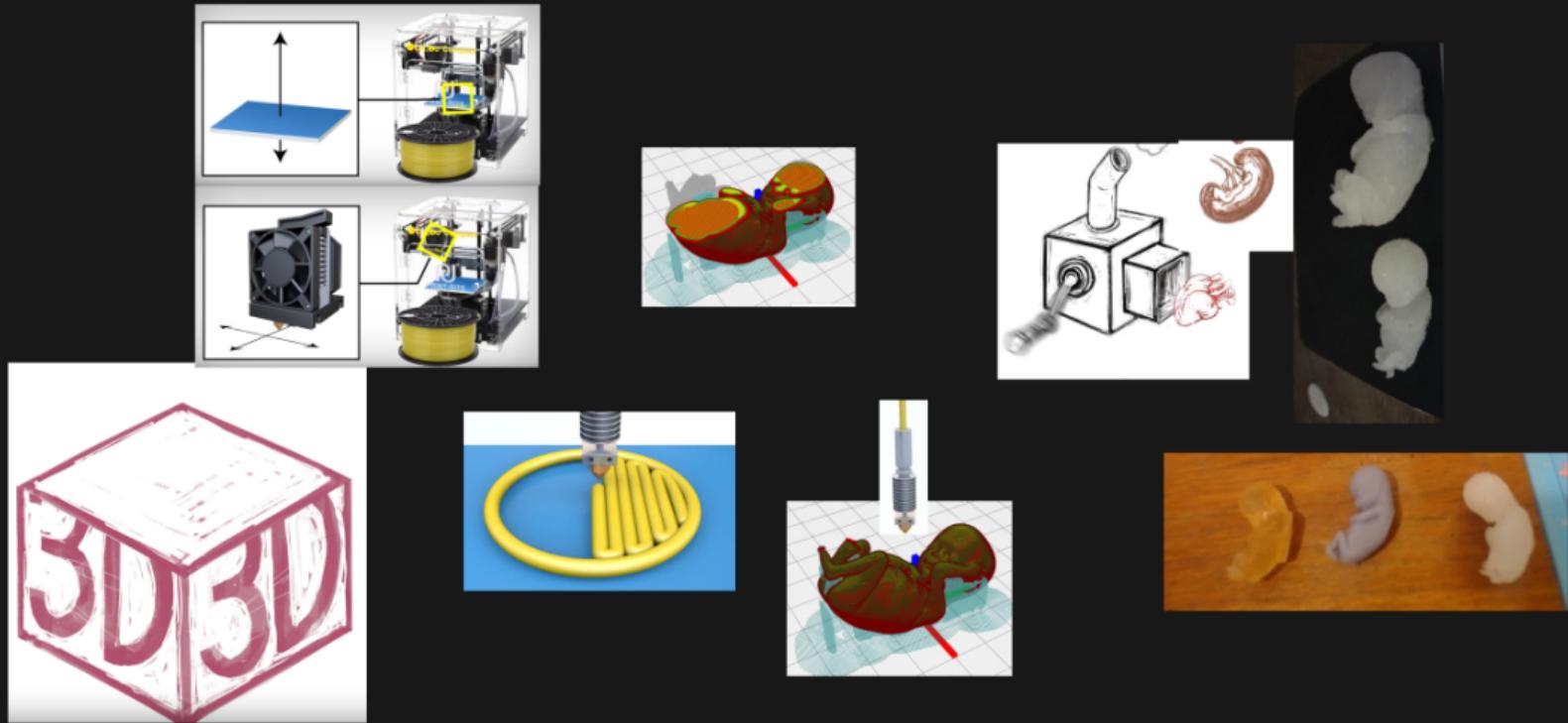
## Tissue Labelling



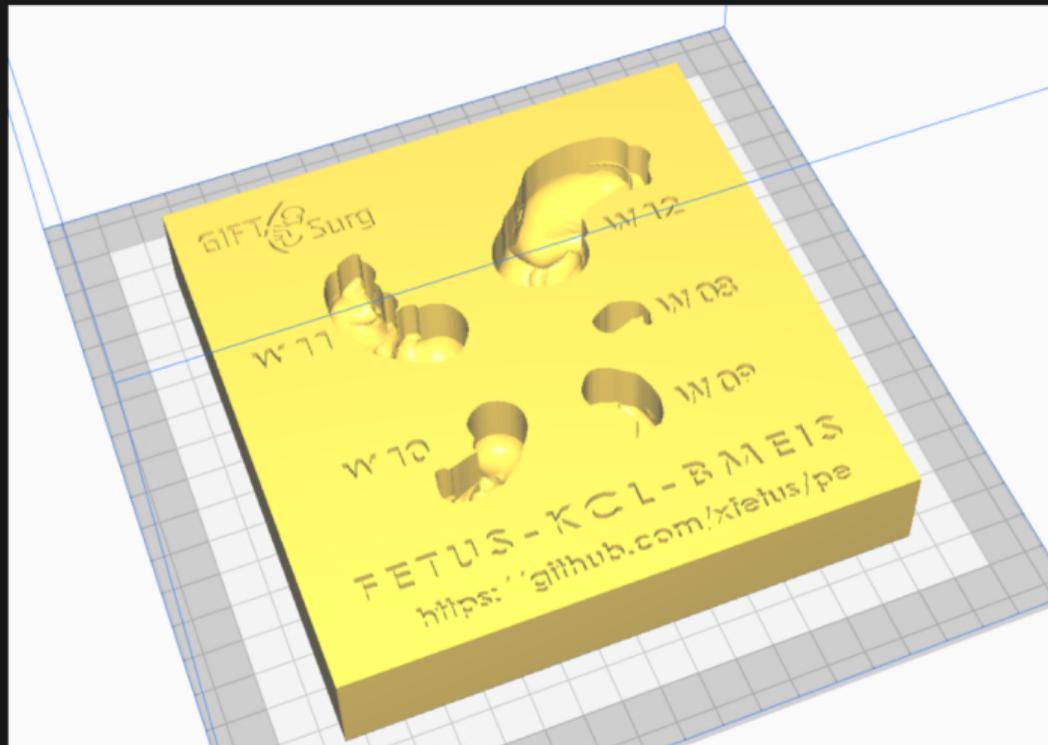
## Surface Reconstruction



# 3D printing Fetuses

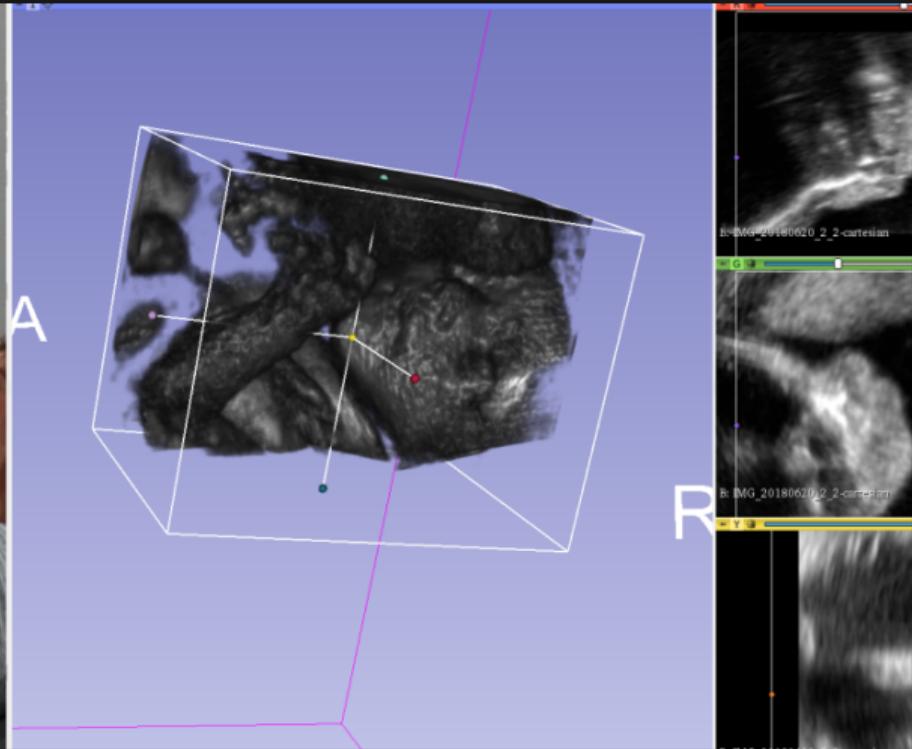


# [ACTIVITY]: Fetal growth of 3D printed fetuses

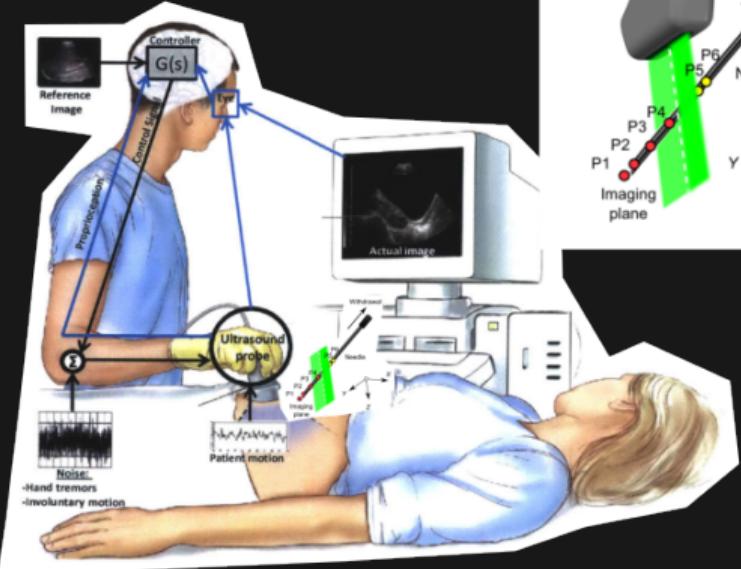


Can you identify body parts of a fetus  
with Ultrasound?

# [ACTIVITY]: Interactive Ultrasound Imaging



# Ultrasound-guided intervention



**Challenges:**

- Skillfullness of sonographers
- Anatomical view changes
- Tracking needles

# Takeaway messages

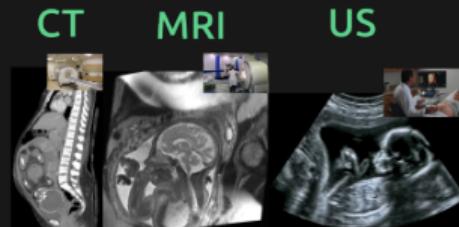
## - Biomedical Engineers

- Maths and Physics
- Biology and Chemistry
- Computer Science



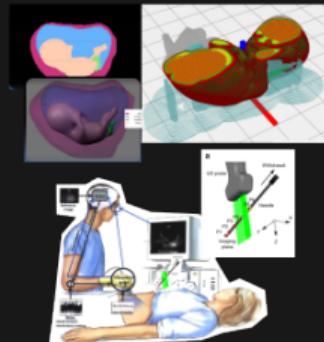
## - Medical Imaging

- Computational Tomography
- Magnetide Resonance
- Ultrasound imaging



## - Applications of US

- Modelling US
- 3D printing
- US-guided Interventions



# [人群] ACTIVITY]: Pop Quiz and Souvenirs

## Souvenirs



## [ACTIVITY]: Pop Quiz and Souvenirs

- \* Q1. What is the most common imaging technique to see a fetus in a mother's womb?
- \* Q2. Can you name the person's job who performs the imaging of fetus?
- \* Q3. Can you name one of the other imaging techniques to diagnose and to monitor fetus in a mother's womb?

## Extra Questions

- \* Share an emoji that reflects how you feel about this workshop
- \* What was your favourite part of the workshop?
- \* What was your least favourite part of the workshop?
- \* What would you change about today's workshop?

# Acknowledgements

## Research Students

Shu Wang	Ou Zhanhong	Tareen Dawood	Guilherme Gomes De Figueiredo	Amal Hussein	Miguel Xochicale	Christian Baker	Francois Joubert	Sunish Mathews	Fang-Yu Lin	Richard Miles	Dzhoshkun Shakir

## Public Engagement Officers

Bella Spencer	Melissa Bovis

## Clinical Fellows

Yada Kunpalin	Brian Dromey

## Quality Management

Jacqueline Beddoe-Rosendo	Clare Heaysman

## Operations Managers

Alima Rahman	Valentina Vitiello

## Investigators

Anna David Vercauteren	Tom Xia	Wenfeng Xia	Sebastien Ourselin

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