

# Finding a fETus with UltraSound (FETUS)

Westminster STEAM Week #WSW2022

15th March 2022



Thea Bautista, Goosie Leung and  
**Miguel Xochicale**

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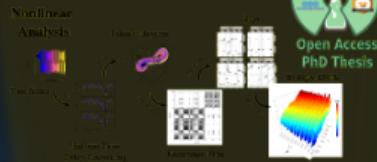
# Contents

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

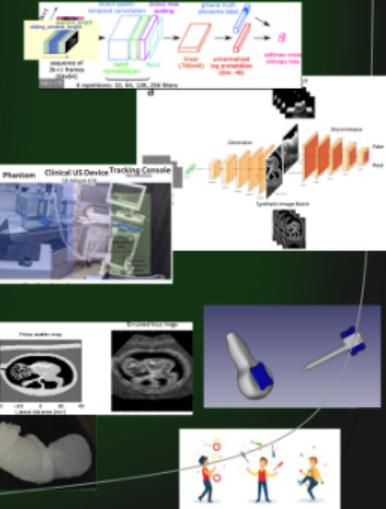
# Miguel Xochicale



Ph.D. in Human-Robot Interaction  
University of Birmingham



Research Associate in  
real-time AI-based Ultrasound Imaging  
King's College London



H.S.

B.Sc.

M.Sc.

T.A.

Ph.D.

R.A.

2000

2010

2020

2030

$t[\text{years}]$

## Thea Bautista



## Goosie Leung



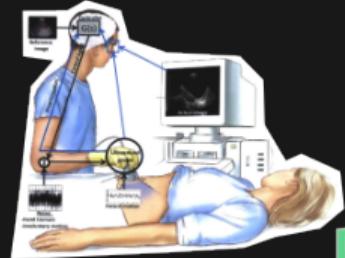
# Where we are based?



School of Biomedical and Imaging Science



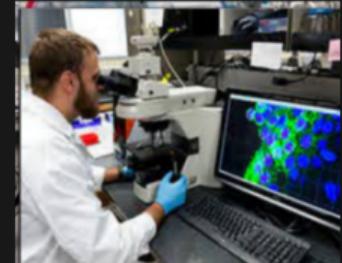
**Ultrasound Imaging**



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



**Biomedical Imaging**



# Biomedical Engineering



**PET and MR Acquisition  
and Reconstruction**

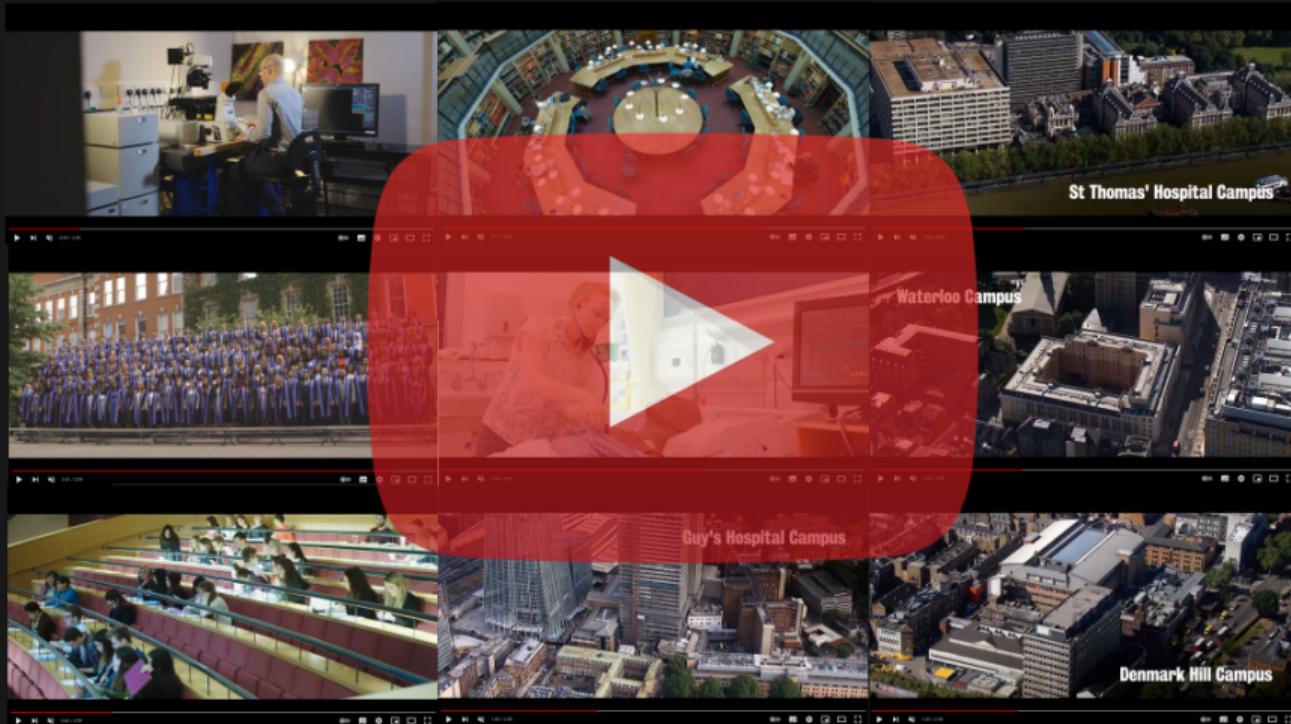


**Image Computing, Analysis and Robotics**



**Image-guided navigation**

# Faculty of Life Sciences & Medicine: video



School of Biomedical Engineering & Imaging Sciences

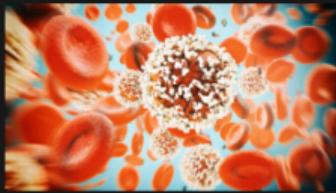
School of Immunology & Microbial Sciences



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 Professionals



General Doctor  
and Surgeons



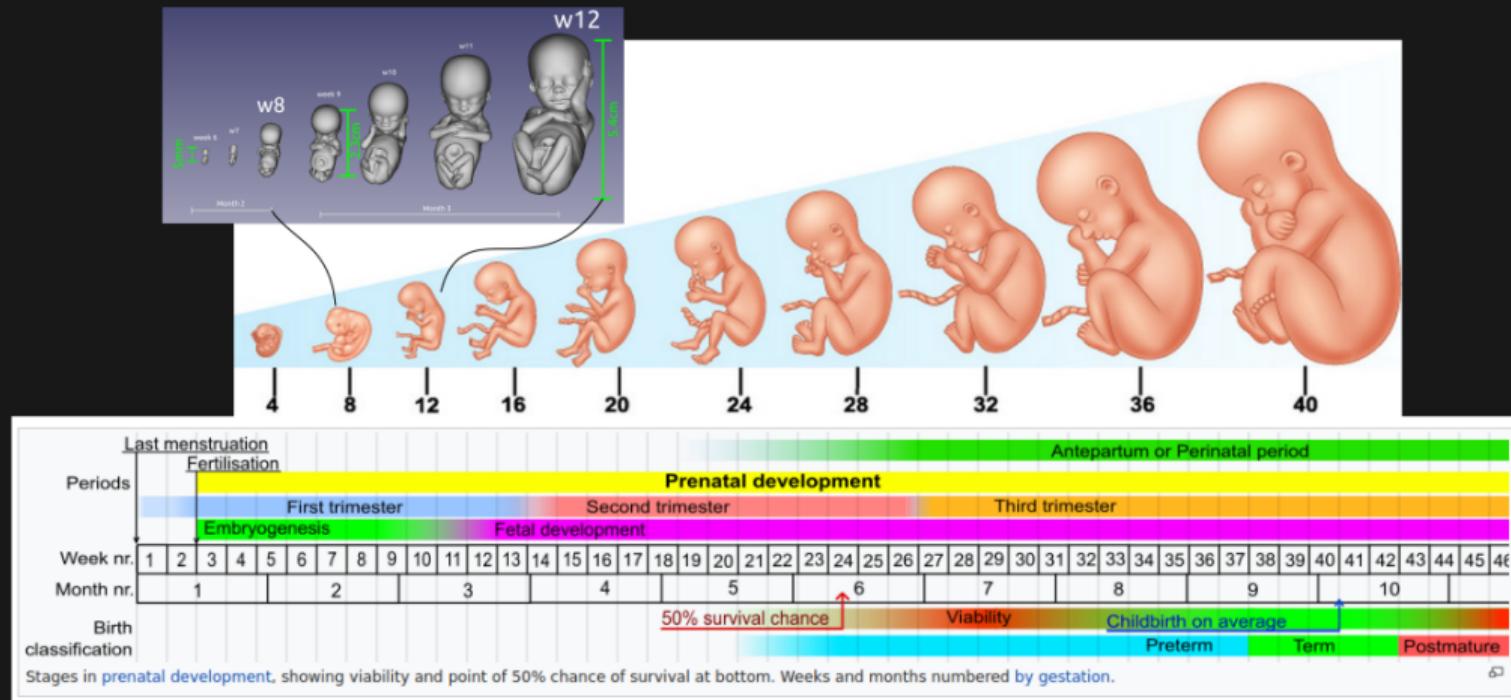
Nurses and Midwives



Physiotherapists

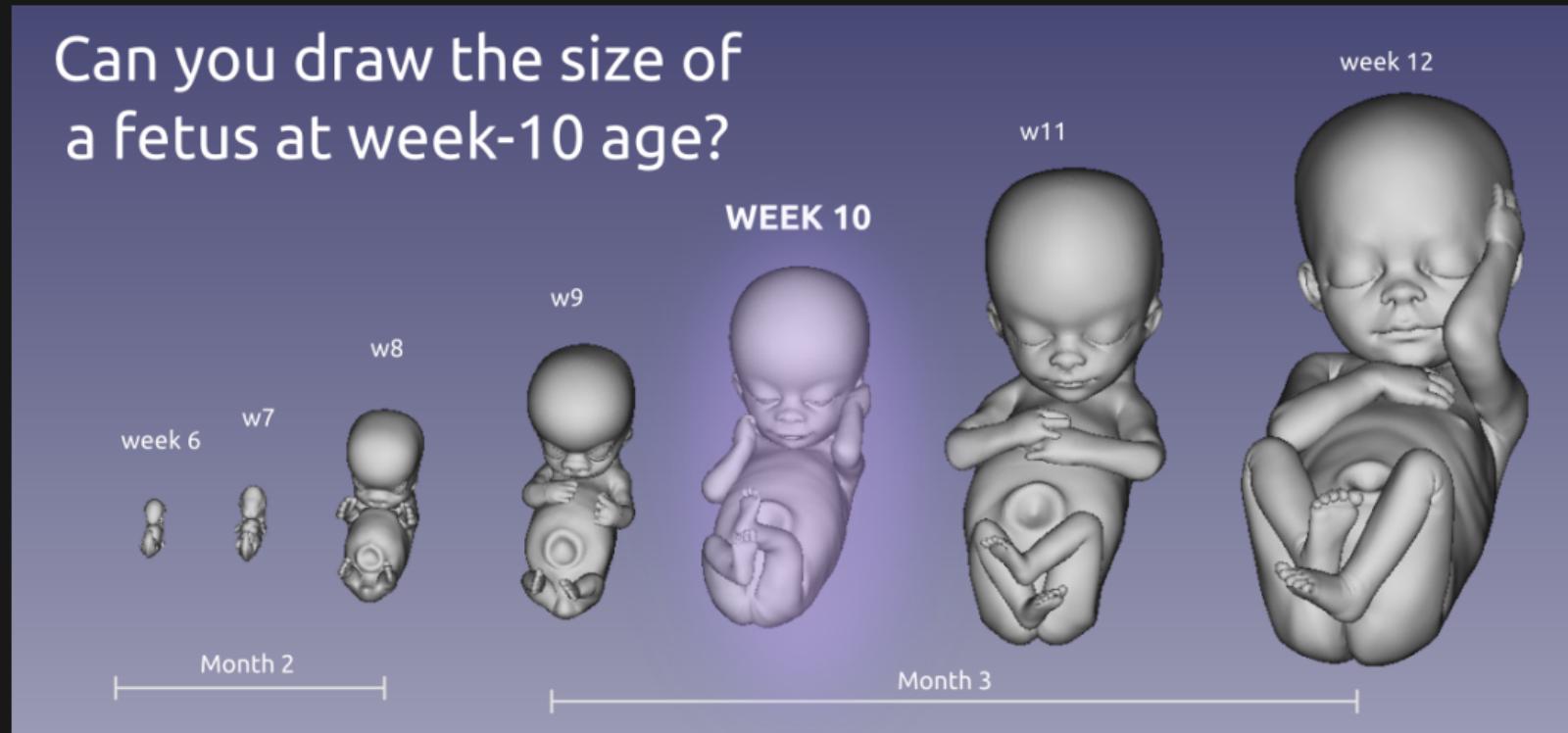
# Understanding Fetal Growth

## Understanding Fetal Growth



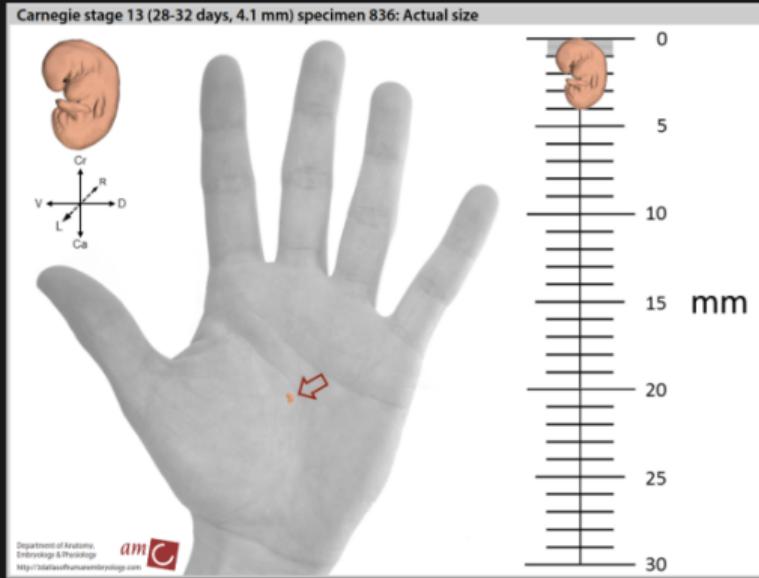
## [ACTIVITY]: Drawing fetuses

Can you draw the size of a fetus at week-10 age?

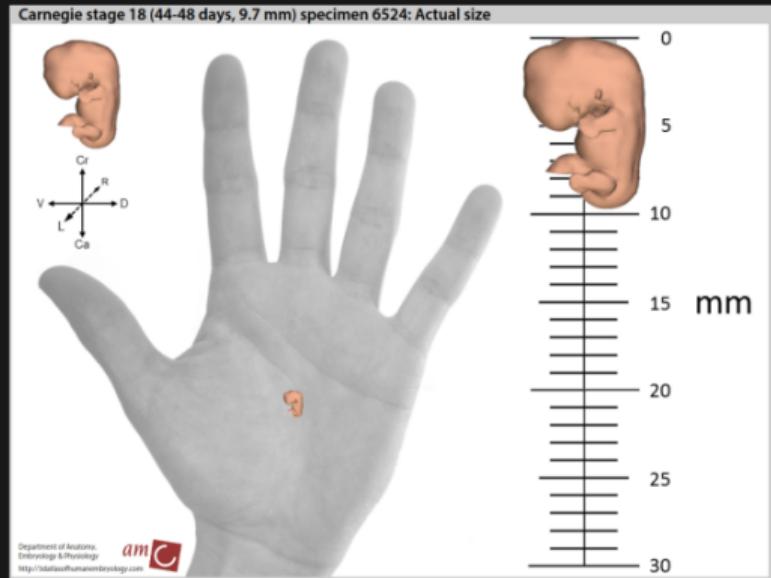


# [ACTIVITY]: Examples of fetuses at week-5 and week-6

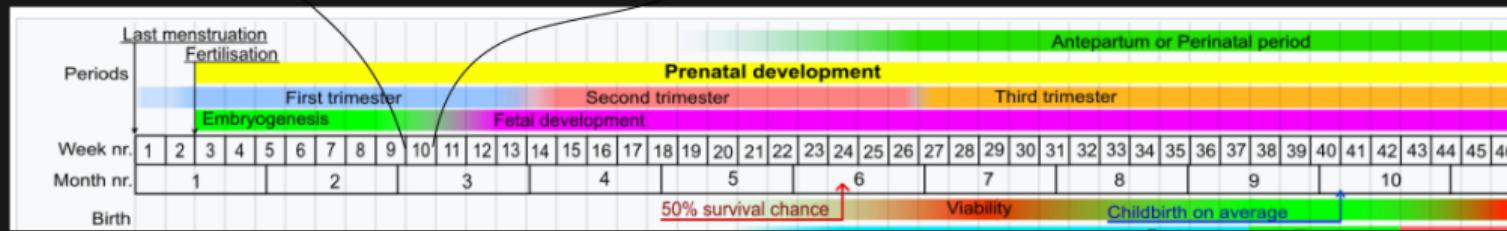
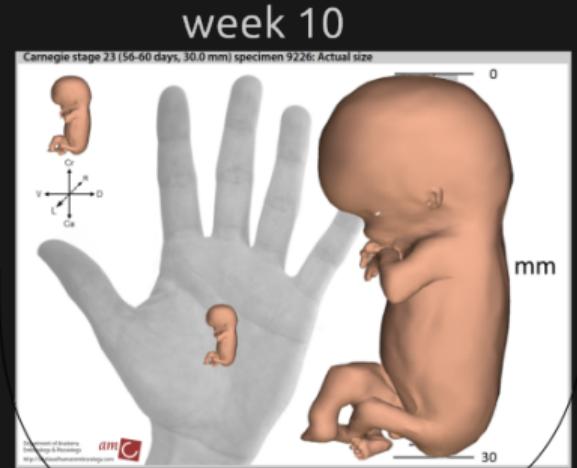
week 5



week 6

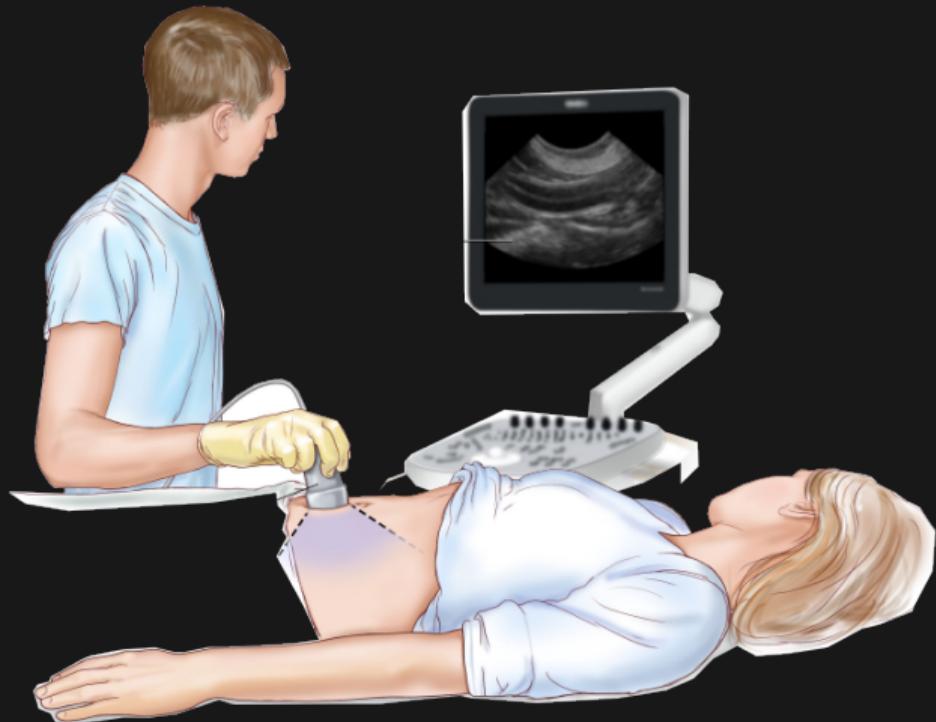


[ACTIVITY]: Fetus at week-10



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

# Sonographer



Prepare Exam Room  
& Equipment



Use Sonography  
Equipment



Friendly Disposition &  
Good Patient Care



Maintain Confidence

Do you know  
how clinicians can actually monitor  
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?

# [APPLICATIONS] Modelling US imaging

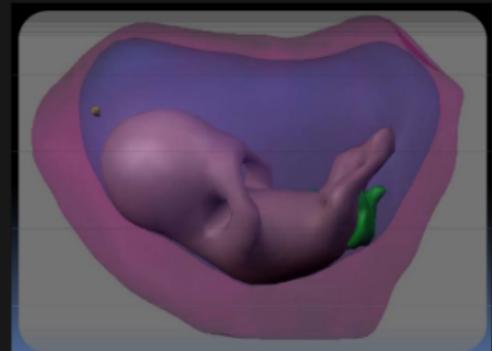
## Segmentation on 3D US data



## Tissue Labelling

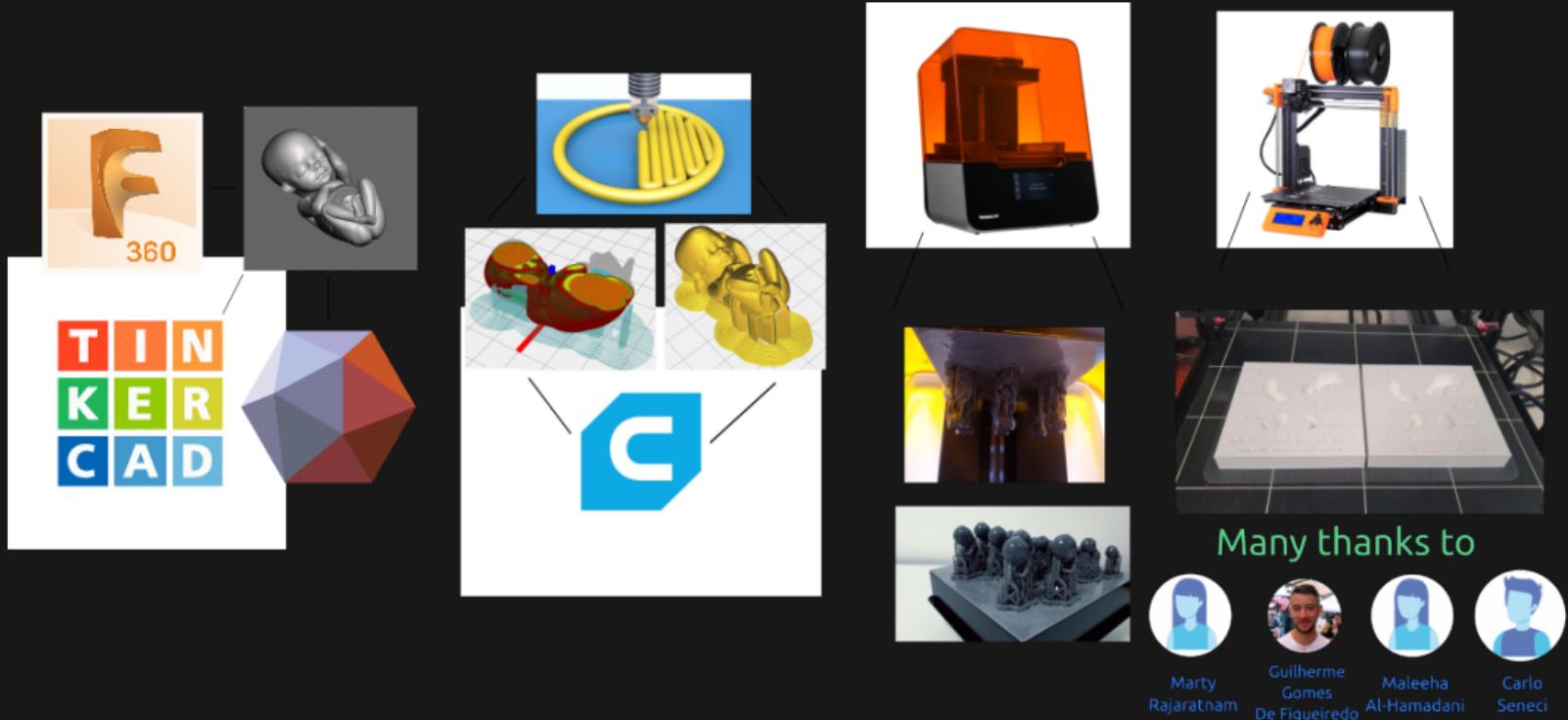


## Surface Reconstruction

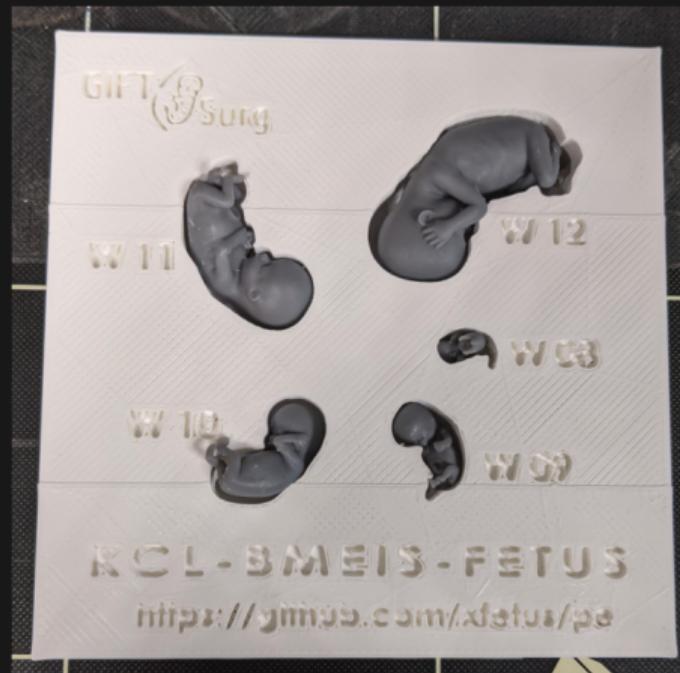
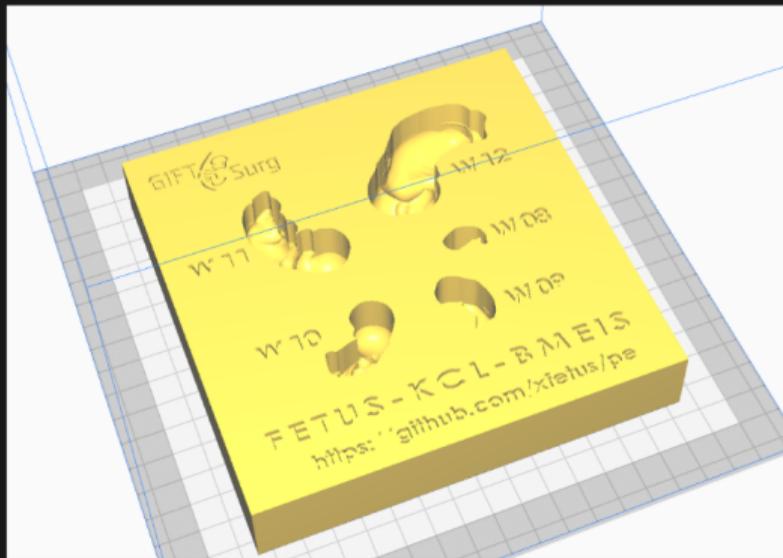


Does anybody know anything about  
3D printing?

# [👤APPLICATIONS] 3D printing fetuses

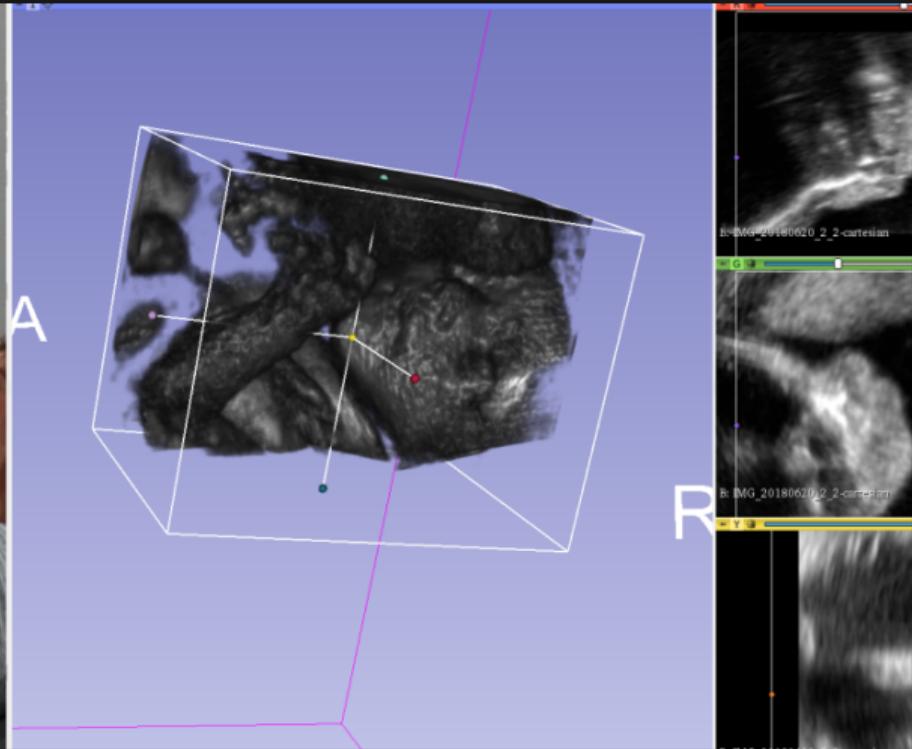


# [ACTIVITY]: Fetal growth of 3D printed fetuses

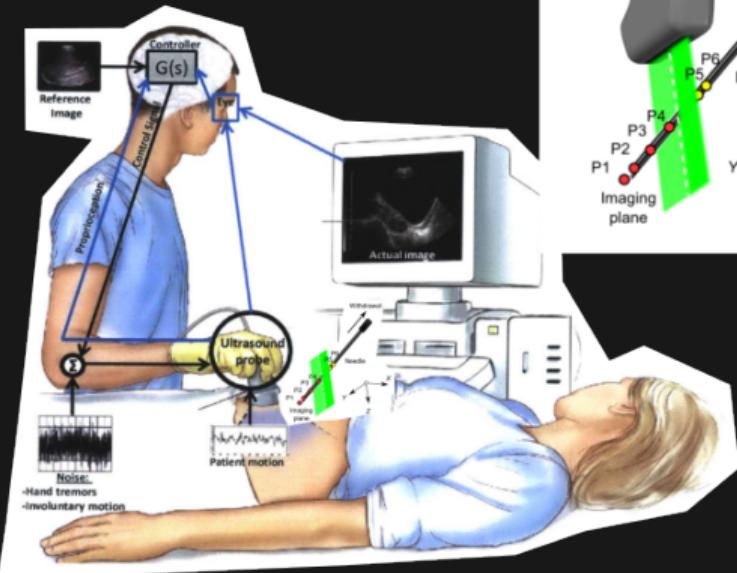


Can you identify body parts of a fetus  
with Ultrasound?

# [ACTIVITY]: Interactive Ultrasound Imaging



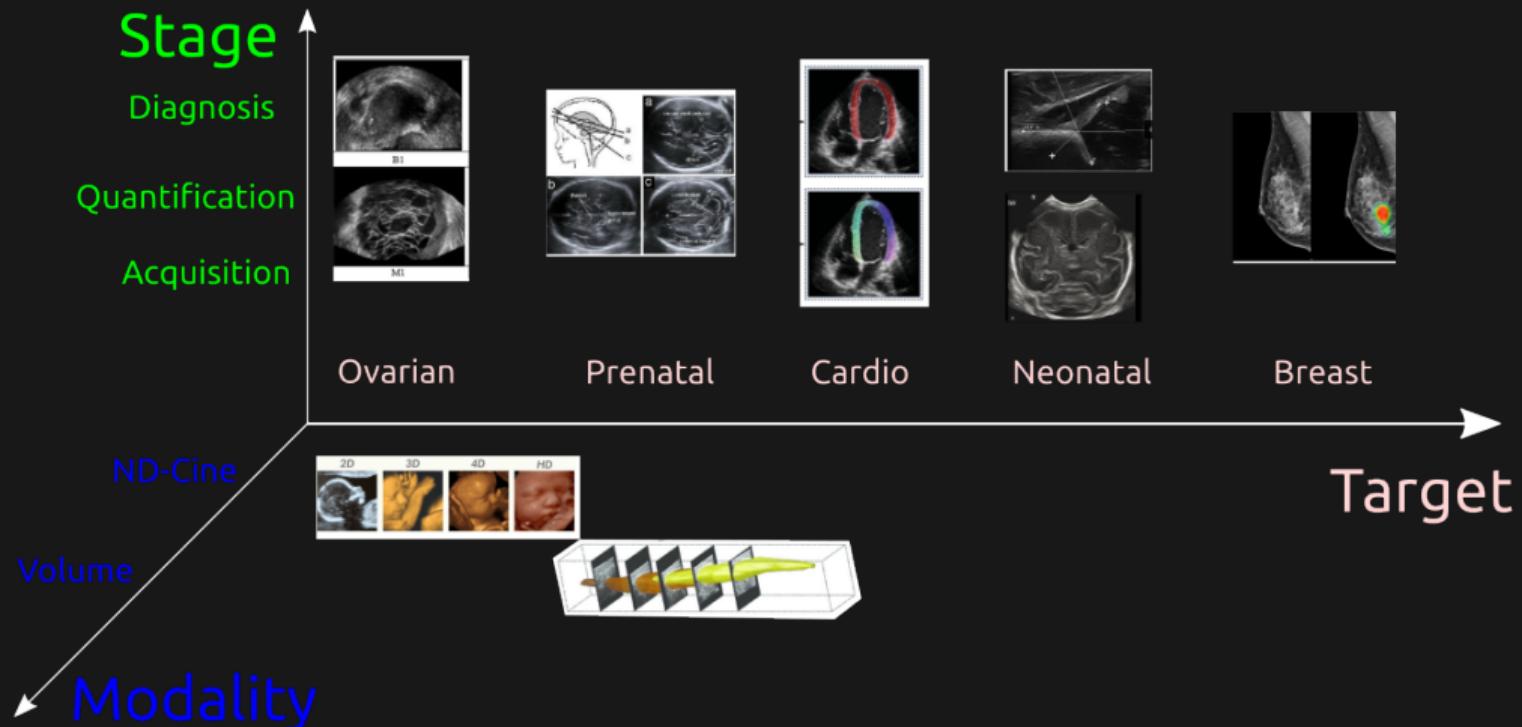
# [APPLICATIONS] Ultrasound-guided intervention



## Challenges:

- Skillfullness of sonographers
- Anatomical view changes
- Tracking needles

# [👤APPLICATIONS] AI-empowered Ultrasound

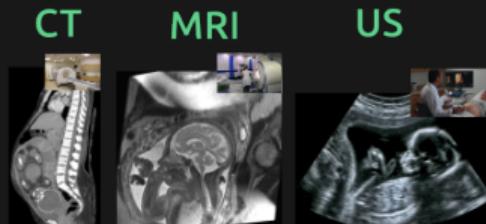


# Takeaway messages

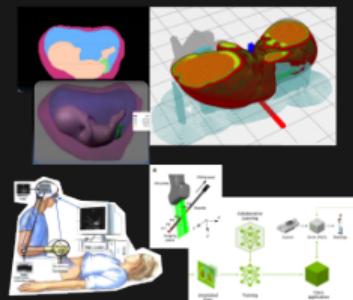
- Biomedical Engineers
- Maths and Physics
- Biology and Chemistry
- Computer Science



- Medical Imaging
- Computational Tomography
- Magnetide Resonance
- Ultrasound imaging

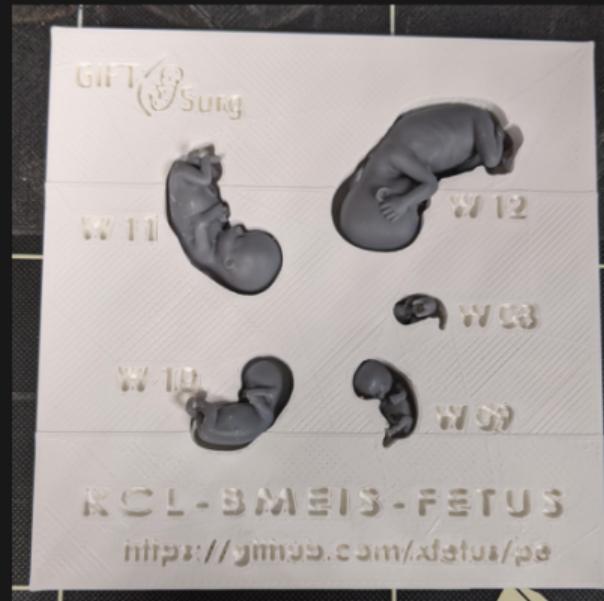
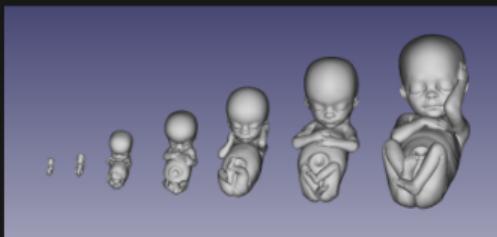


- Applications of US
- Modelling US
- 3D printing
- US-guided Interventions
- AI-empowered US



# [👤ACTIVITY]: Pop Quiz and Souvenirs

## Souvenirs



ACTIVITY]: Pop Quiz and Souvenirs

- \* Q1. What is the most common imaging technique to monitor fetal development?
- \* Q2. Can you name the person's job who performs the imaging of fetus?
- \* Q3. Can you name three imaging techniques to monitor fetal development?

## 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

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

## Public Engagement Officers



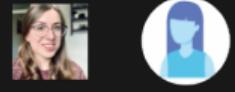
Bella Spencer  
Melissa Bovis

## Clinical Fellows



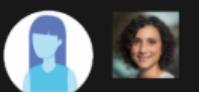
Yada Kunpalin  
Brian Dromey

## Quality Management



Jacqueline Beddoe-Rosendo  
Clare Heaysman

## Operations Managers



Alima Rahman  
Valentina Vitiello

## Investigators



Anna David Vercauteren  
Tom  
Wenfeng Xia  
Sebastien Ourselin

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