

Finding a fETus with UltraSound (FETUS)

Westminster STEAM Week #WSW2022

15th March 2022



Thea Bautista, Goosie Leung and
Miguel Xochicale

✉ miguel.xochicale@kcl.ac.uk
😺 @mxochicale 🐦 @_mxochicale



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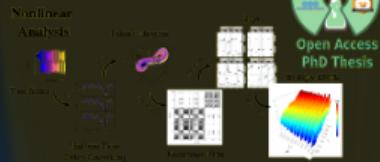
Contents

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

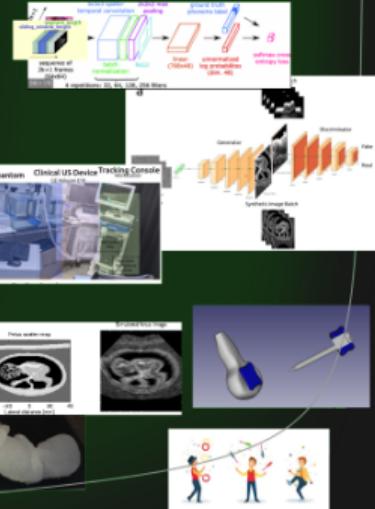
Miguel Xochicale



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?

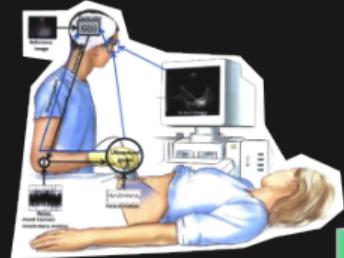


KING'S
College
LONDON

School of Biomedical and
Imaging Science



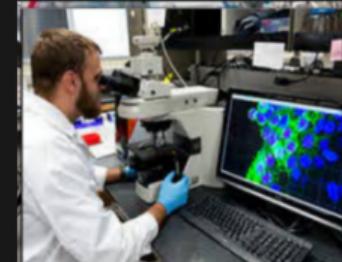
Ultrasound Imaging



Machine Learning and Deep Learning with Medical Imaging



Biomedical Imaging



Biomedical Engineering



**PET and MR Acquisition
and Reconstruction**

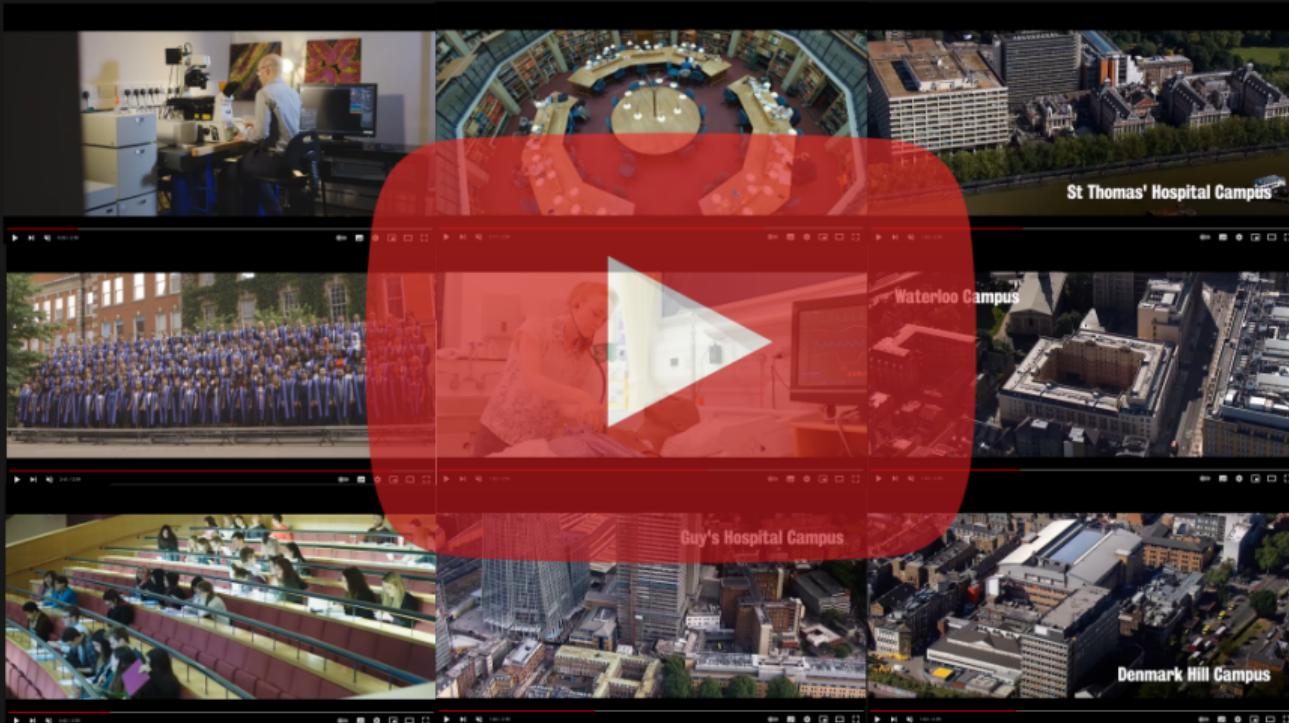


Image Computing, Analysis and Robotics



Image-guided navigation

Faculty of Life Sciences & Medicine: video



School of Biomedical Engineering & Imaging Sciences

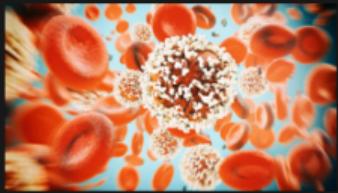
School of Immunology & Microbial Sciences



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

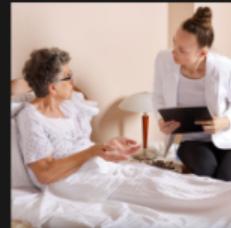
Sonographers



Radiologists



Social workers



Healthcare Professionals



General Doctor
and Surgeons



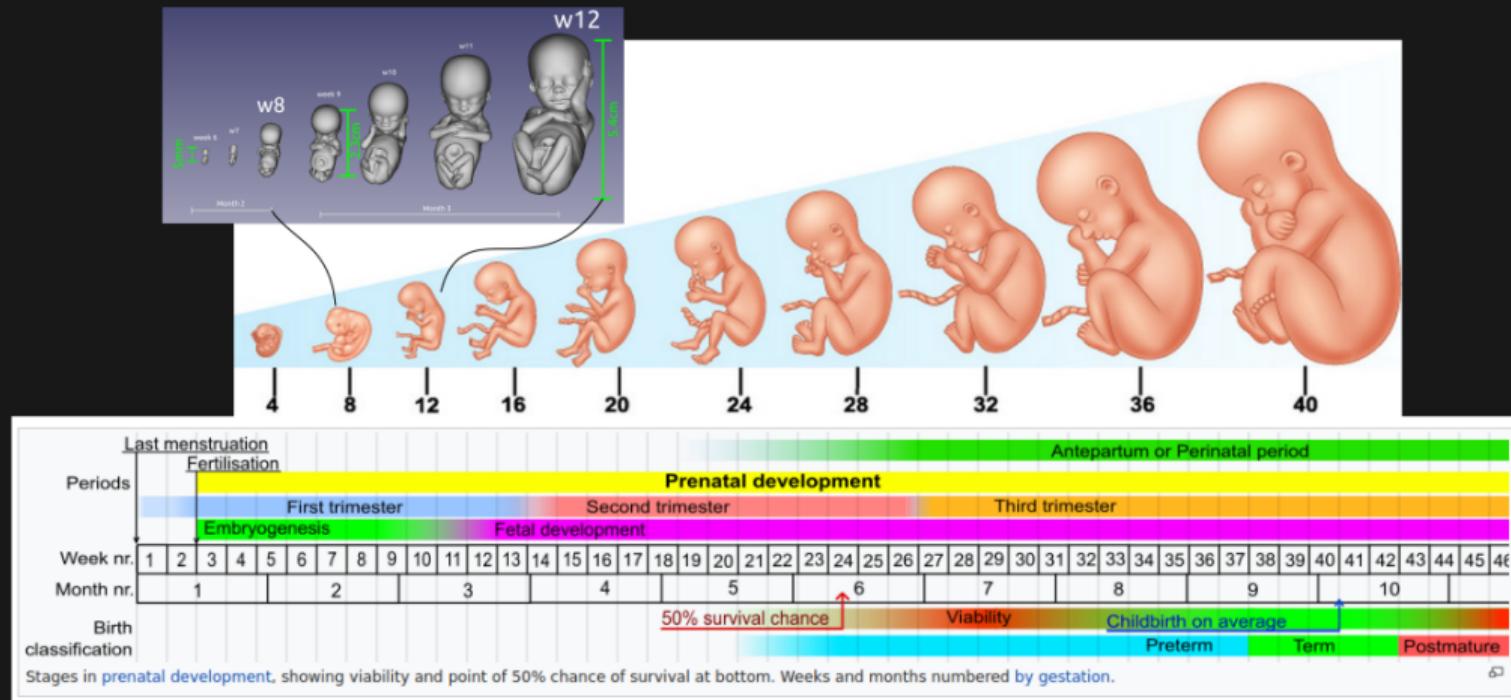
Nurses and Midwives



Physiotherapists

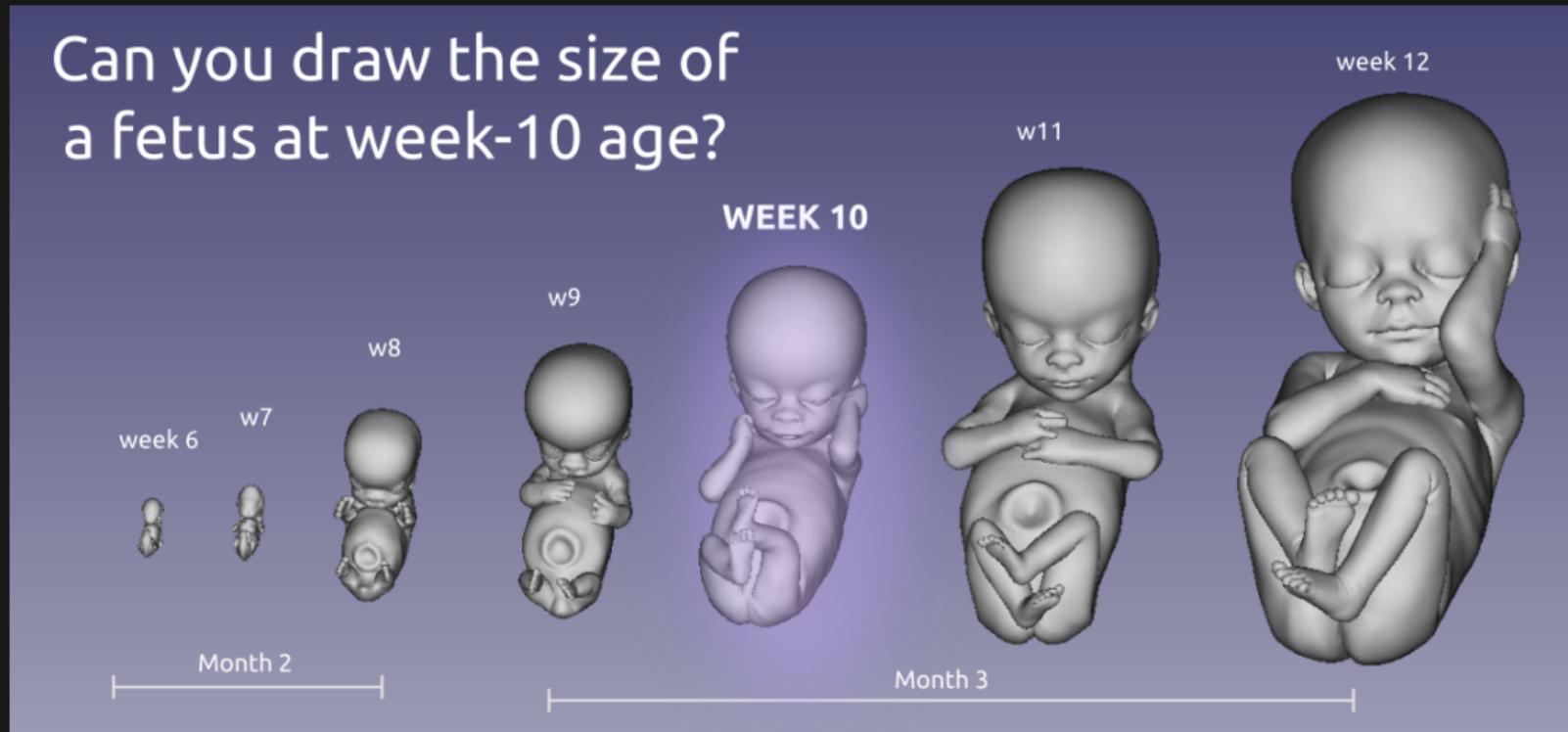
Understanding Fetal Growth

Understanding Fetal Growth



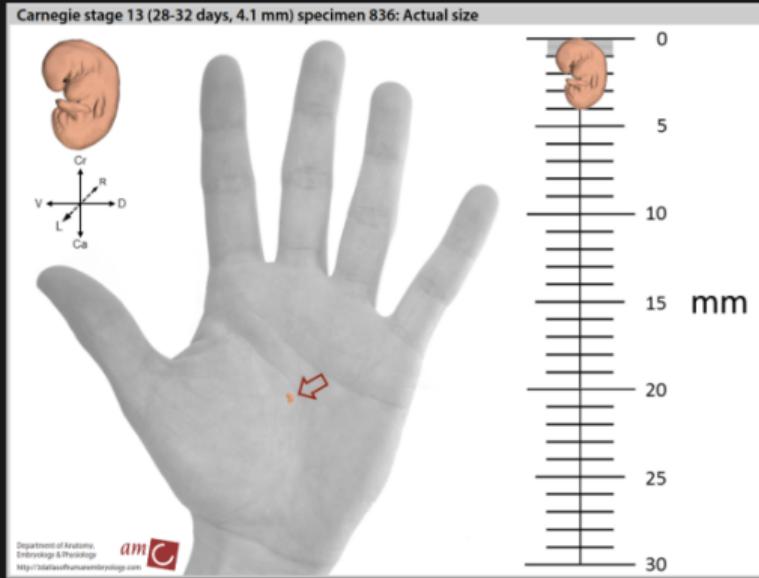
[ACTIVITY]: Drawing fetuses

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

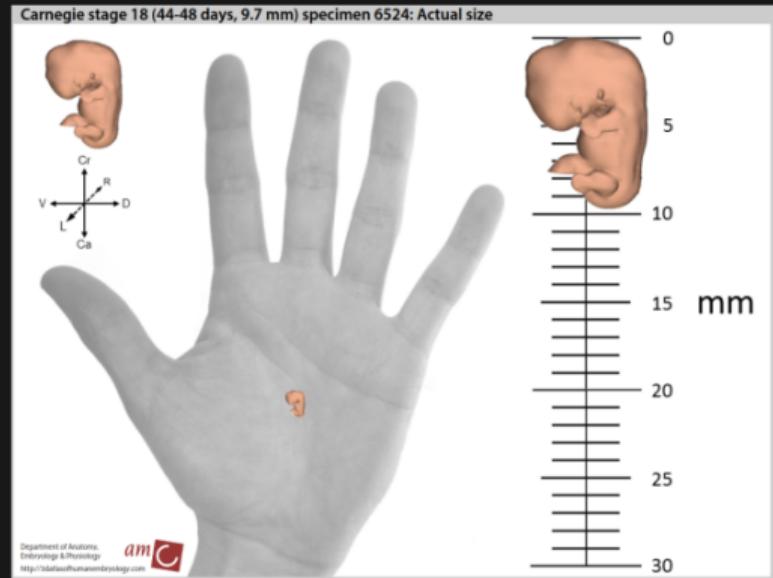


[ACTIVITY]: Examples of fetuses at week-5 and week-6

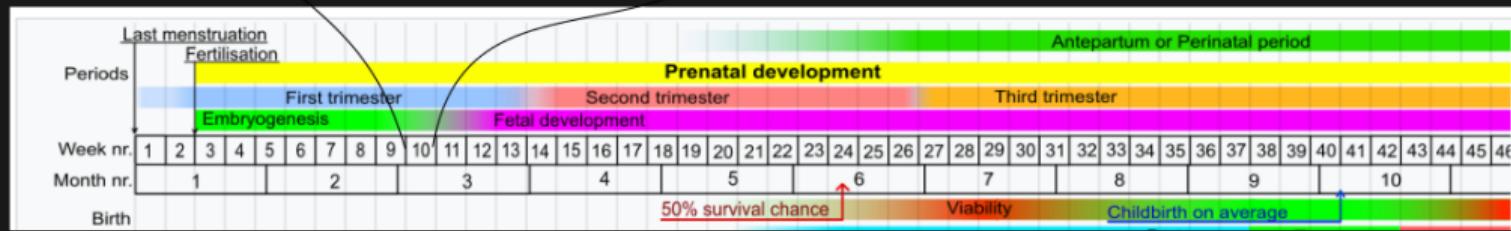
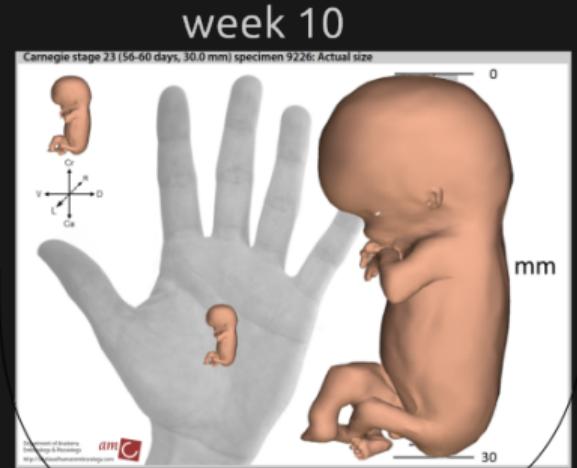
week 5



week 6

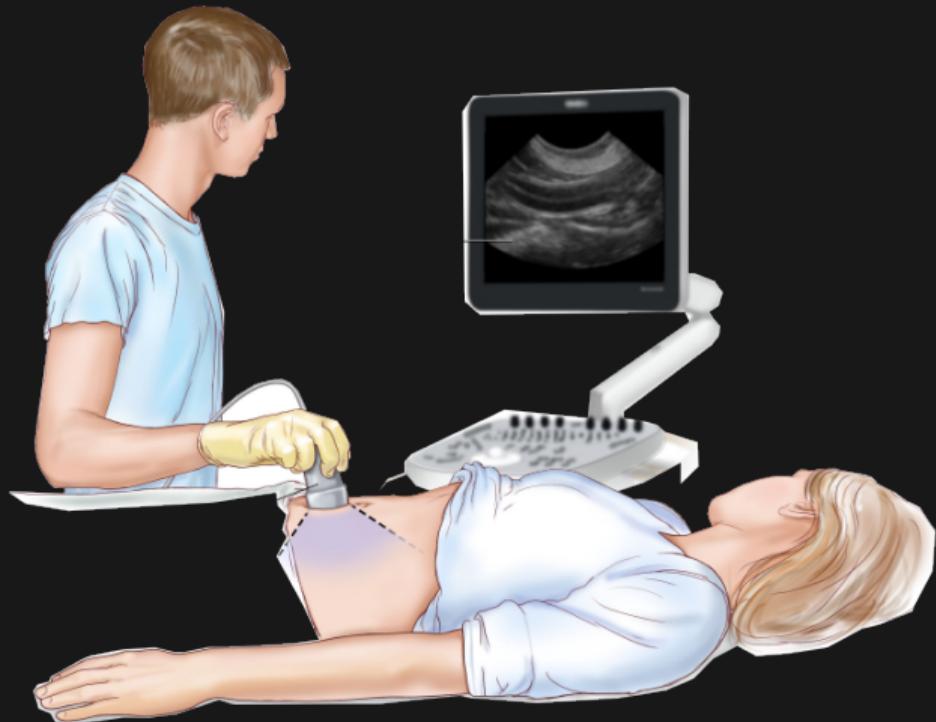


[ACTIVITY]: Fetus at week-10



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

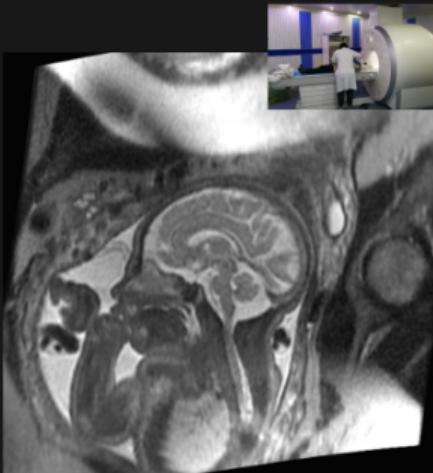


Medical Imaging in Pregnancy

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

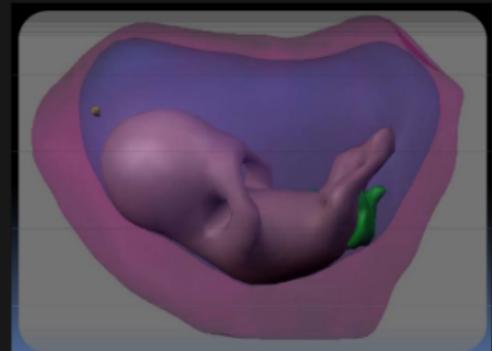
Segmentation on 3D US data



Tissue Labelling

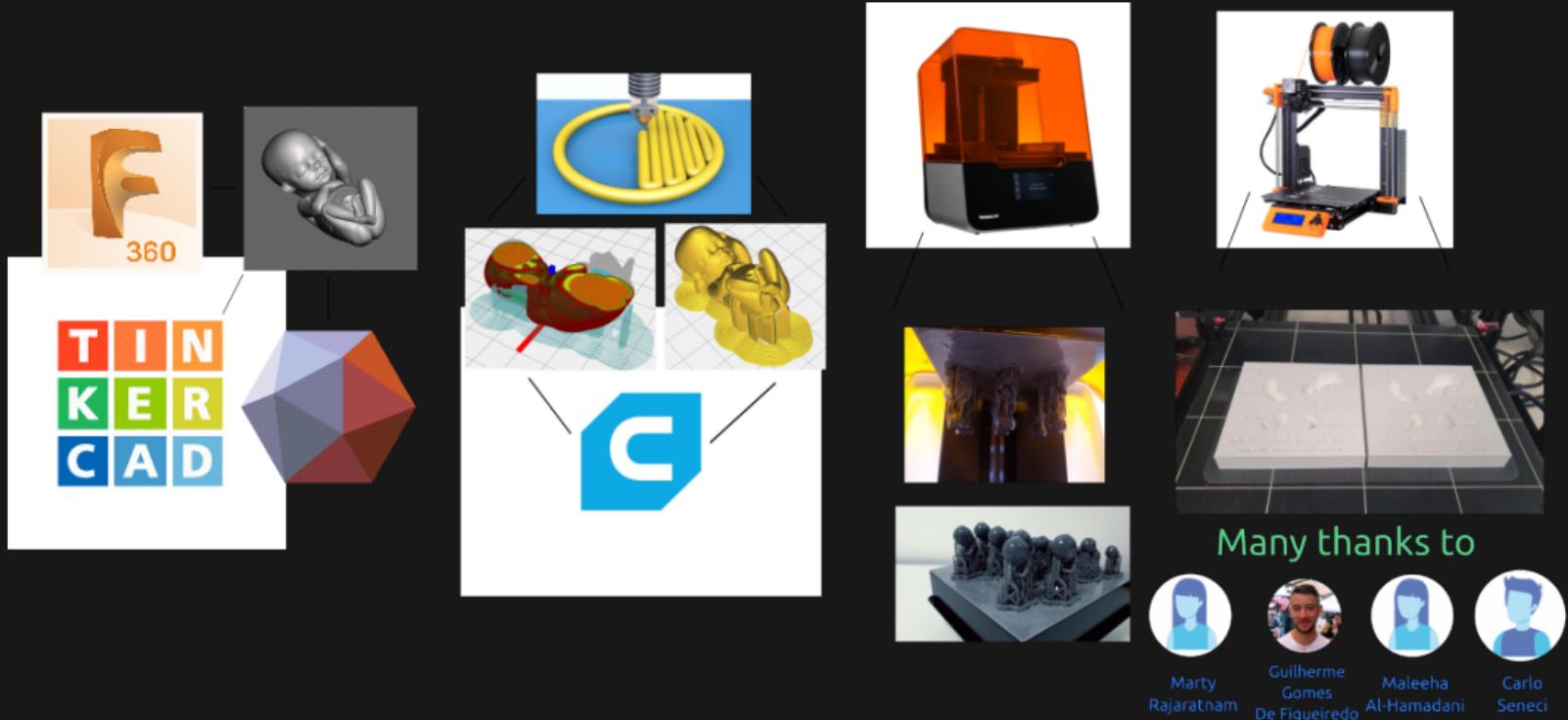


Surface Reconstruction

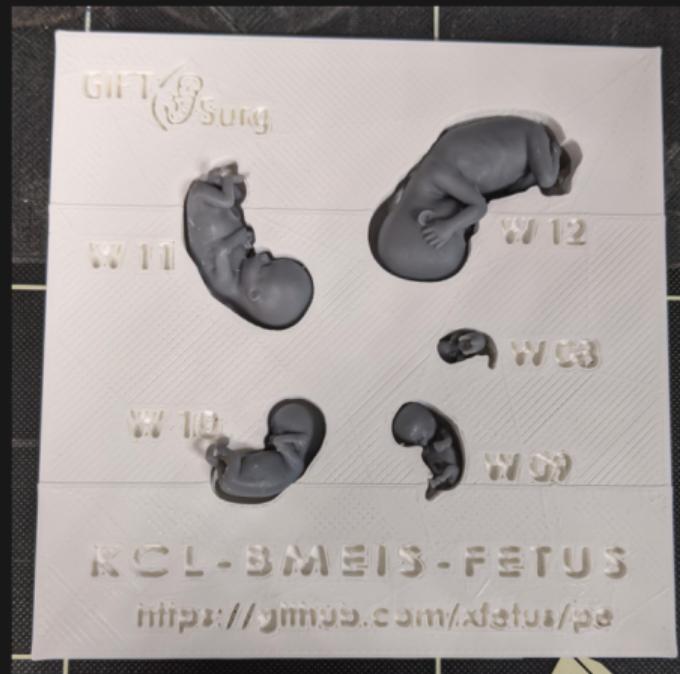
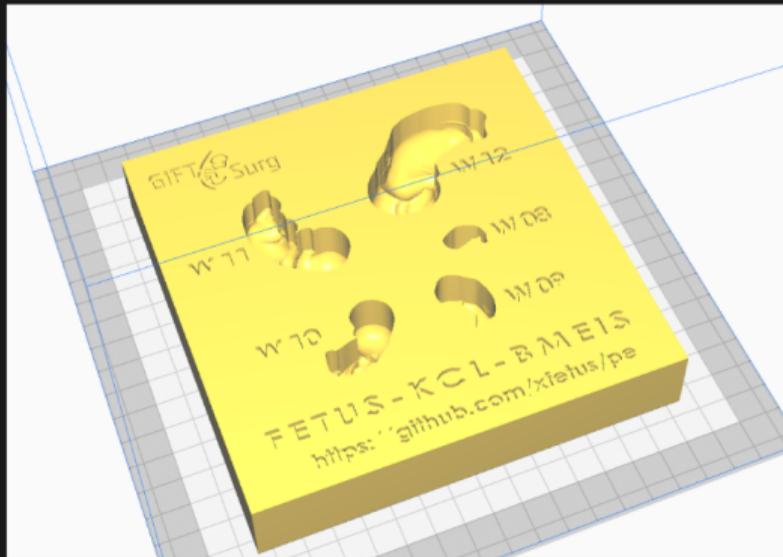


Does anybody know anything about
3D printing?

[👤APPLICATIONS] 3D printing fetuses

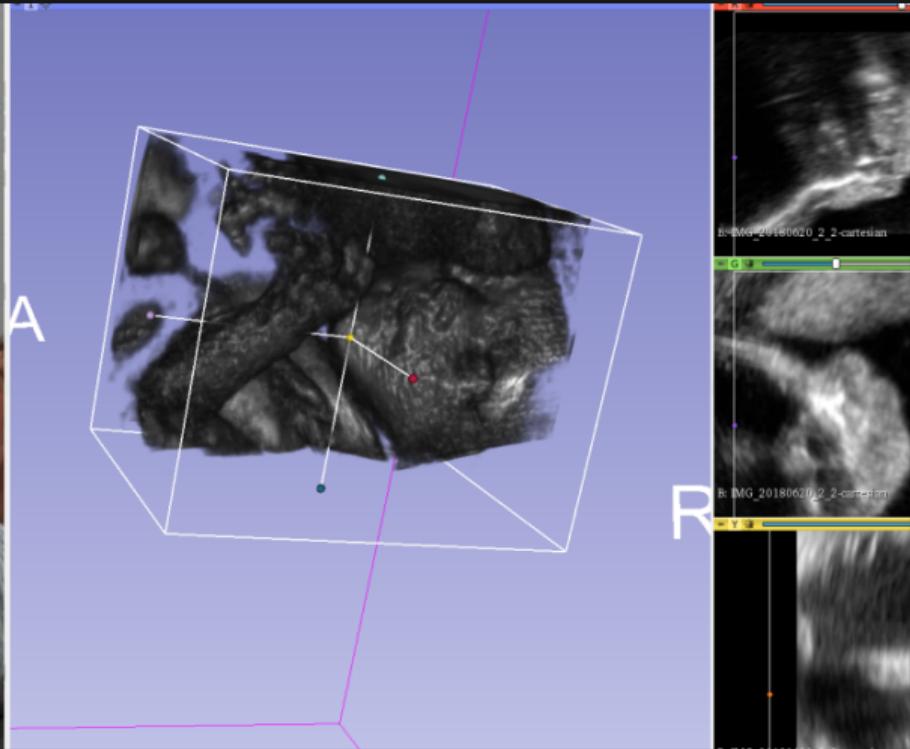


[ACTIVITY]: Fetal growth of 3D printed fetuses

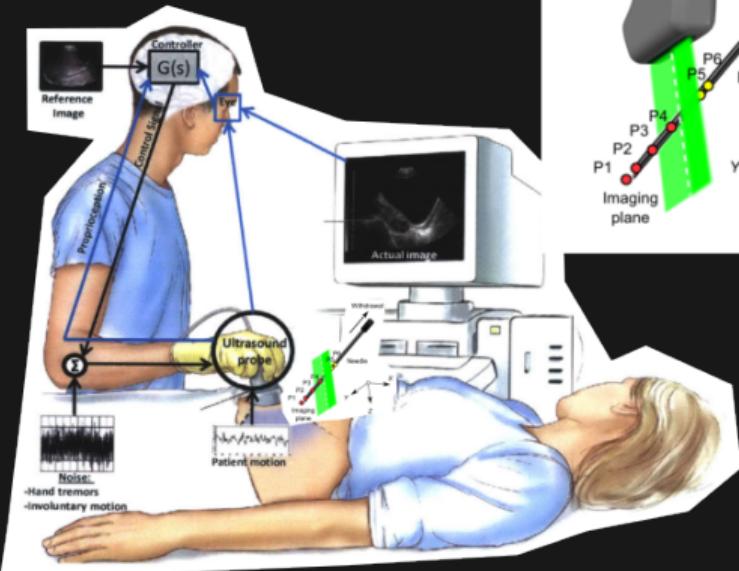


Can you identify body parts of a fetus
with Ultrasound?

[ACTIVITY]: Interactive Ultrasound Imaging



[APPLICATIONS] Ultrasound-guided intervention



Challenges:

- Skillfullness of sonographers
- Anatomical view changes
- Tracking needles

[APPLICATIONS] AI-empowered Ultrasound

Stage

Diagnosis

Quantification

Acquisition

Cine

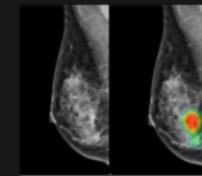
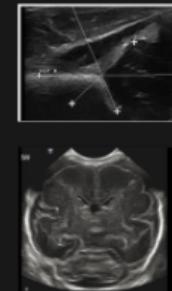
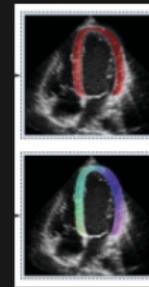
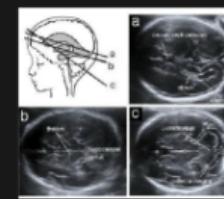
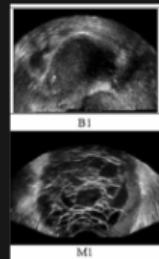
Volume

4D Cine



Ovarian Prenatal Cardio Neonatal Breast

Target

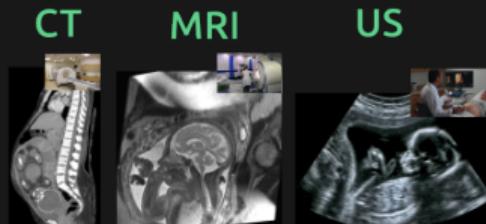


Takeaway messages

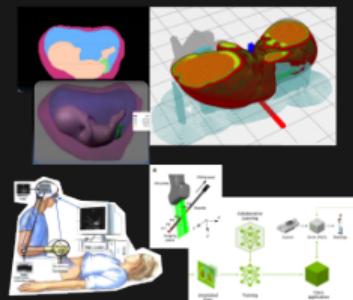
- Biomedical Engineers
- Maths and Physics
- Biology and Chemistry
- Computer Science



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

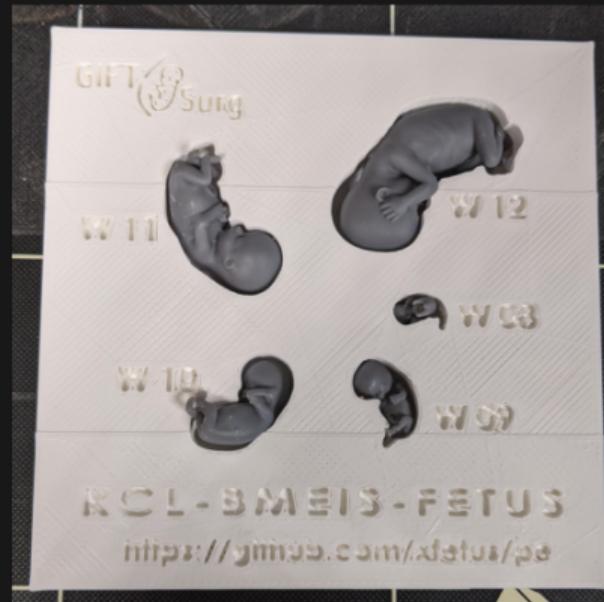
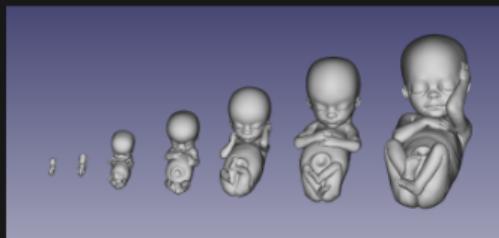


- Applications of US
- Modelling US
- 3D printing
- US-guided Interventions
- AI-empowered US



[👤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



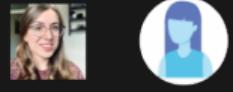
Bella Spencer
Melissa Bovis

Clinical Fellows



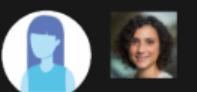
Yada Kunpalin
Brian Dromey

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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