

Finding a fETus with UltraSound (FETUS)

King's Health Partners Summer School #2021

6th July 2021



Shu Wang, Ou Zhanchong, Tareen Dawood and
Miguel Xochicale

✉ miguel.xochicale@kcl.ac.uk
☞ @mxochicale ✉ @_mxochicale



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



Who am I?



Miguel
Xochicale



H.S.

2000

B.Sc.

M.Sc.

T.A.

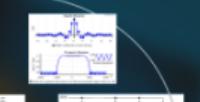
2010

Ph.D.

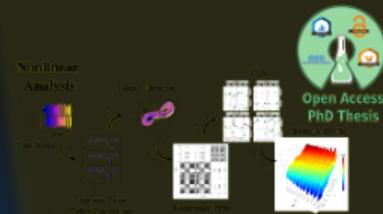
2020

2030

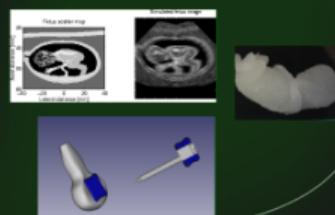
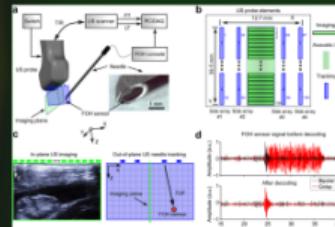
$t[\text{years}]$



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



Research Associate in
Ultrasound Guidance Interventions
King's College London



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

Zhanchong
Ou



Guangdong
China

Shu
Wang



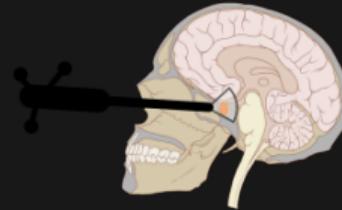
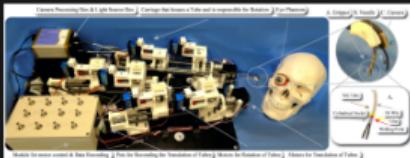
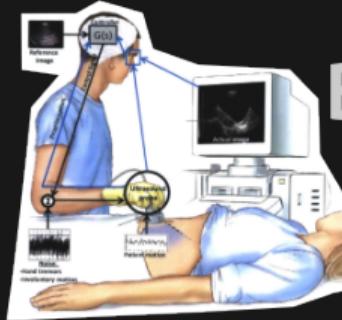
Beijing
China



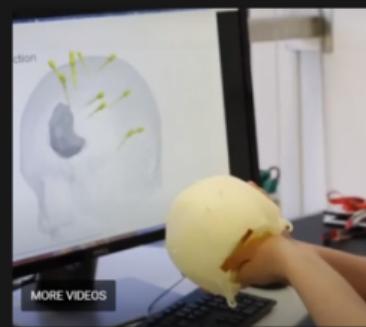
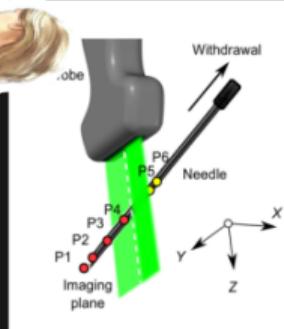
Tareen
Dawood



What does a Biomedical Engineer do?



Biomedical Engineering

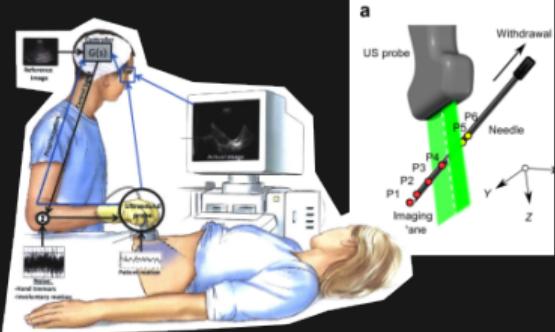


Where we are based?



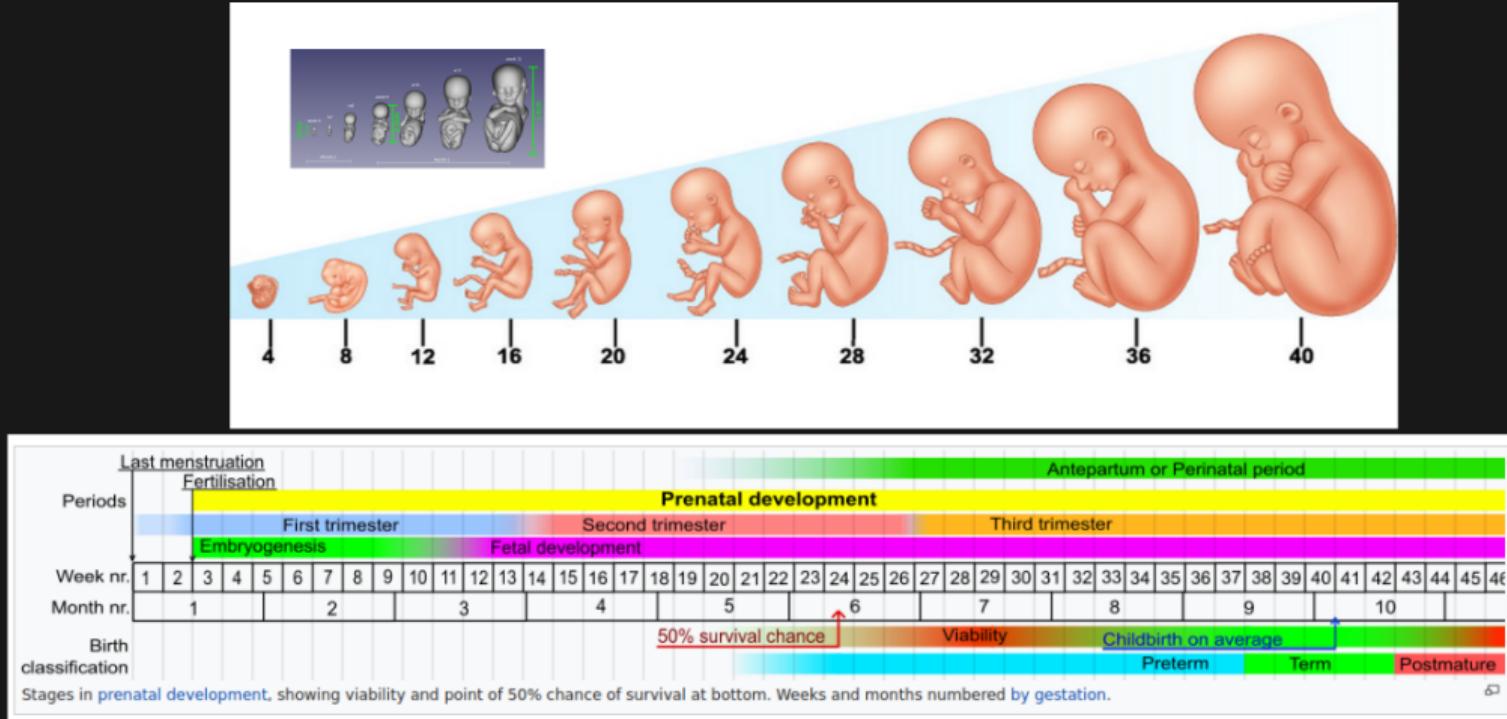
School of Biomedical and Imaging Science

Department of Surgical and Interventional Engineering



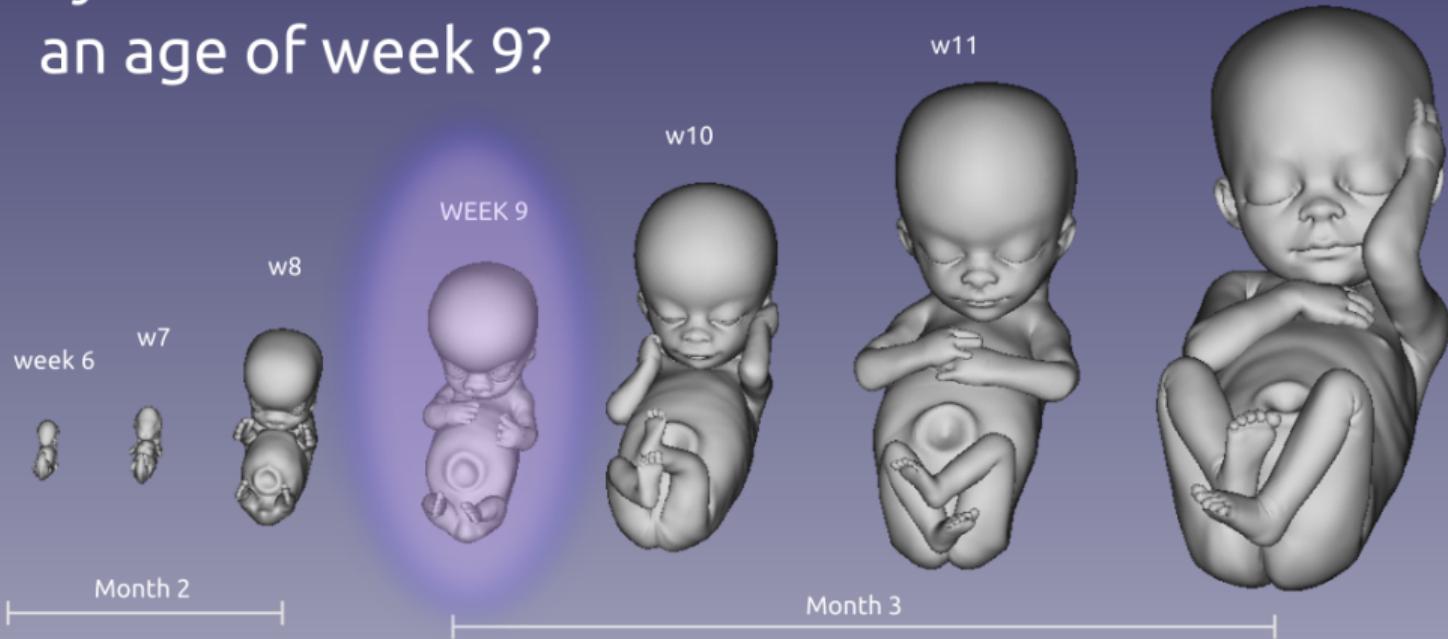
Understanding Fetal Growth

Understanding Fetal Growth



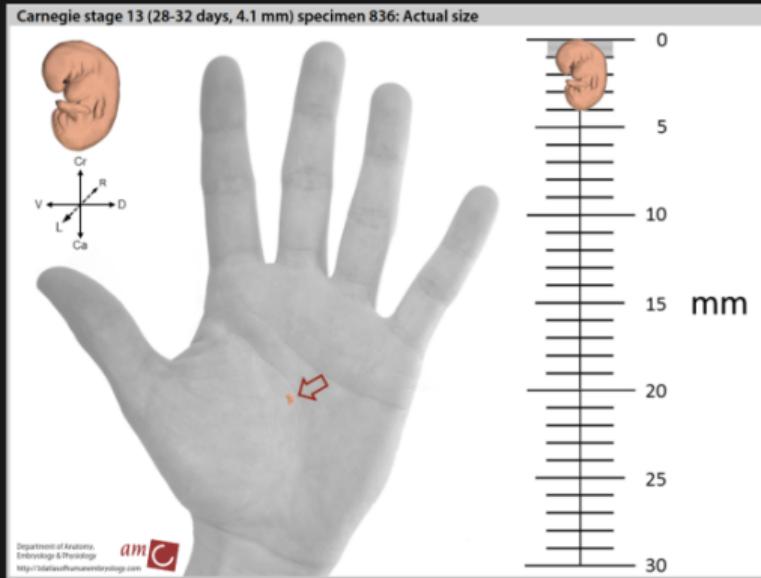
Guessing Fetal Growth

Can you draw a fetus of
an age of week 9?

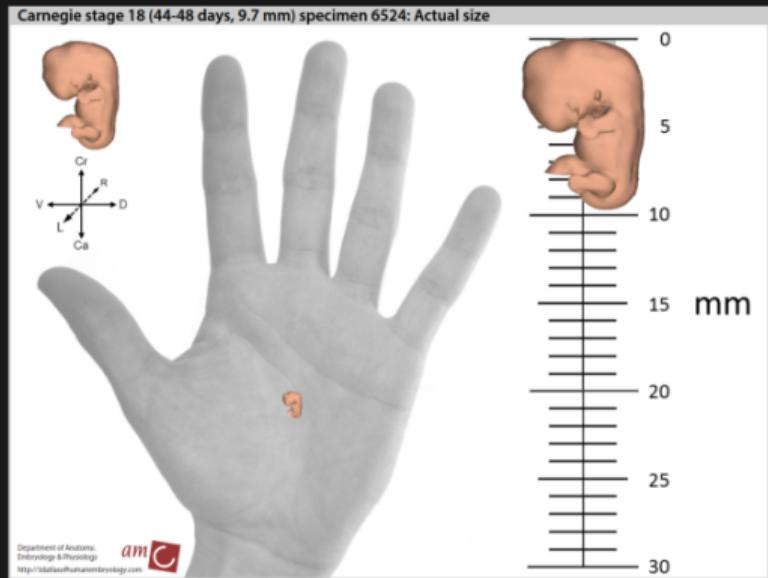


Understanding Fetal Growth

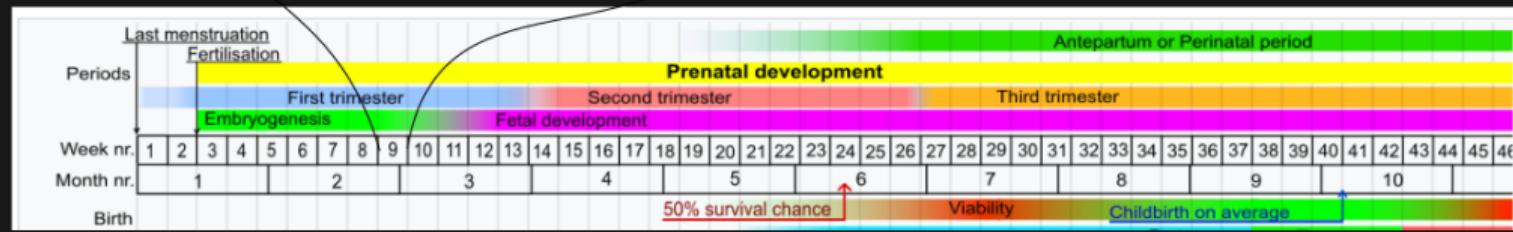
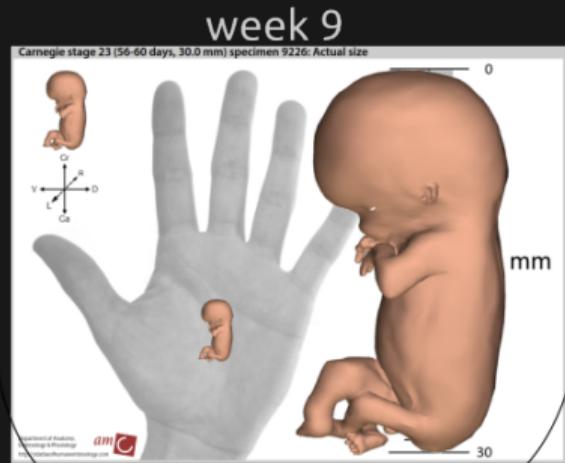
week 5



week 6



Understanding Fetal Growth



Do you know how we can actually see a fetus?

Computational Tomography

CT

+ high image quality



- non-real-time

Computational Tomography



Magnetic Resonance Imaging

MRI

+ high image quality



- non-real-time

Magnetic Resonance Imaging



Ultrasound

US

Ultrasound

+real-time  - poor-image quality



Medical Imaging in Pregnancy

CT



+ high image quality - non-real-time

MRI



+ high image quality - non-real-time

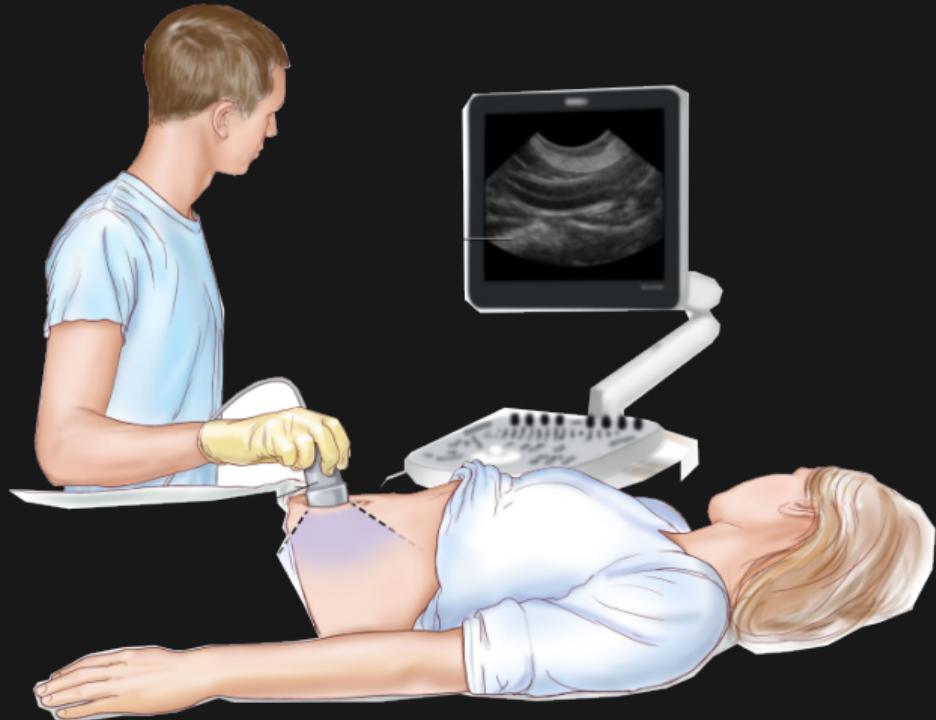
US



+ real-time - poor-image quality

Do you know what is the role of a
Sonographer?

The role of a Sonographer



 Prepare Exam Room & Equipment

 Use Sonography Equipment

 Friendly Disposition & Good Patient Care

 Maintain Confidence

How a Biomedical Engineer would help
a Sonographer?

Modelling US imaging

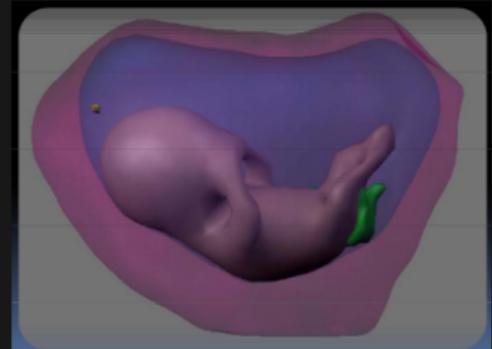
Segmentation on 3D US data



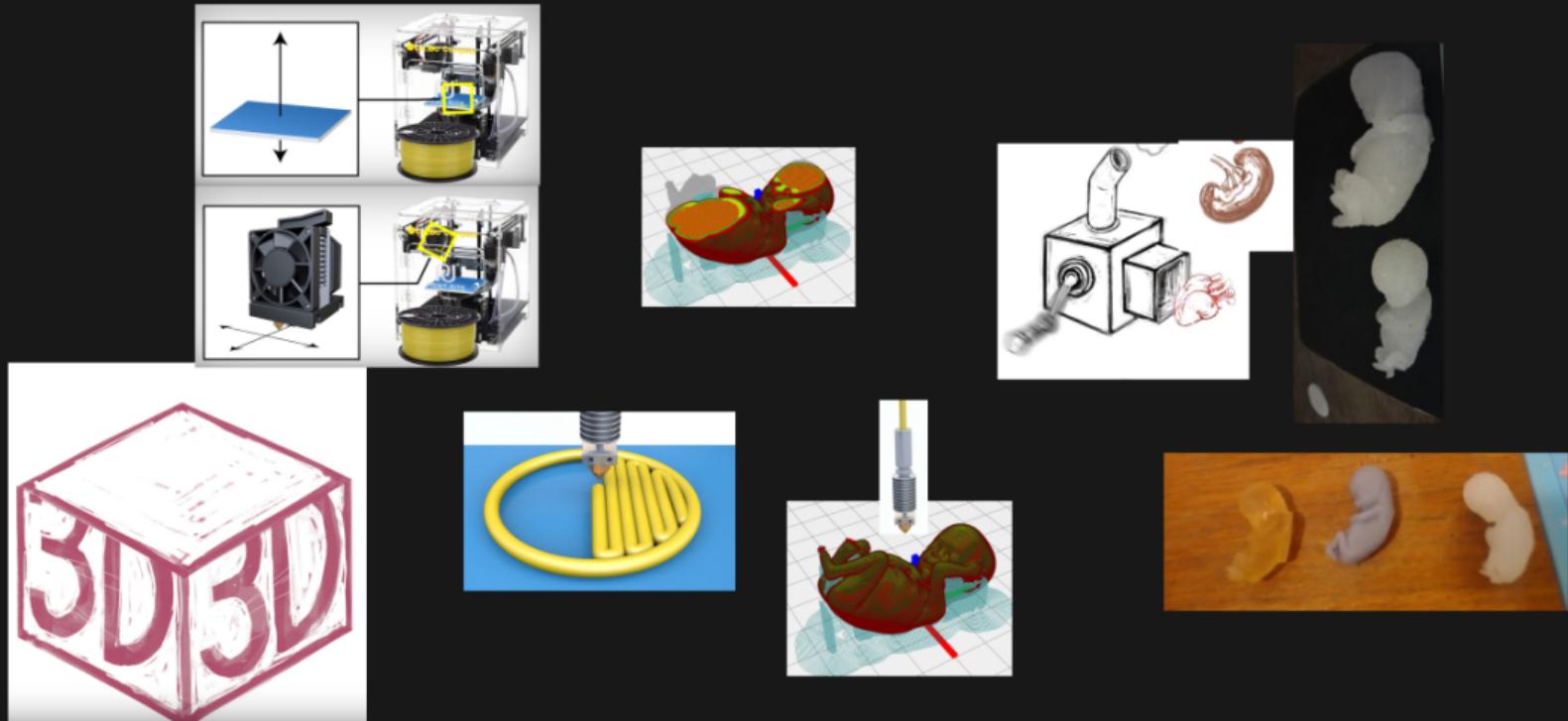
Tissue Labelling



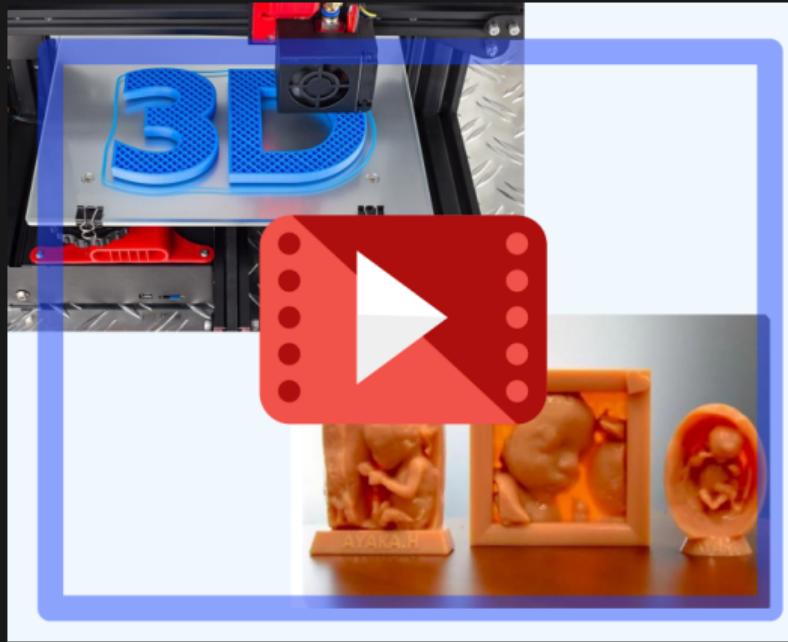
Surface Reconstruction



3D printing Fetuses



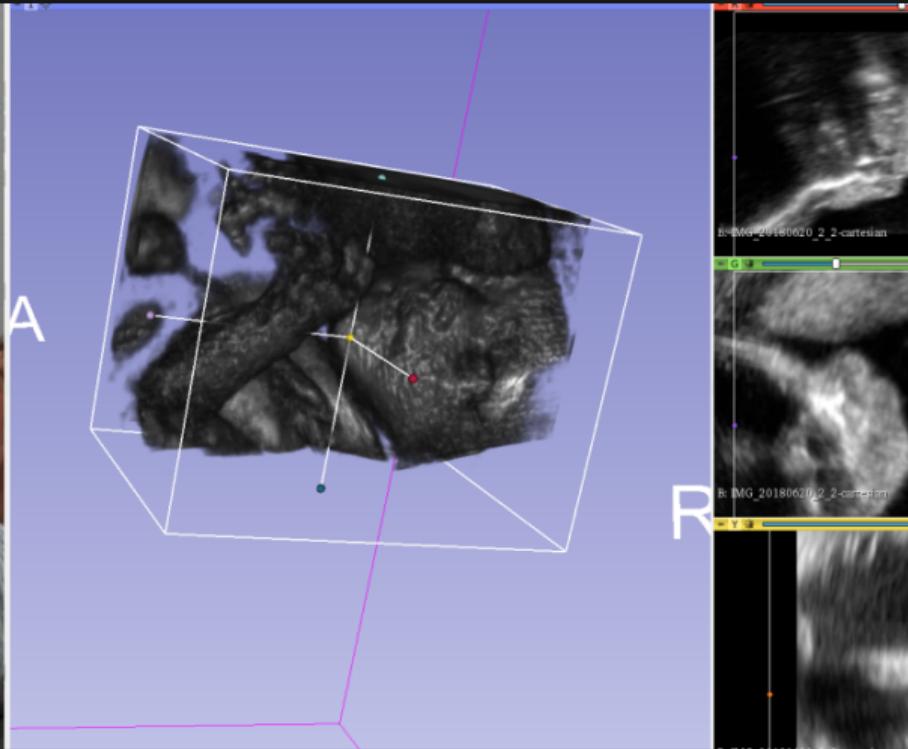
3D printing Fetuses



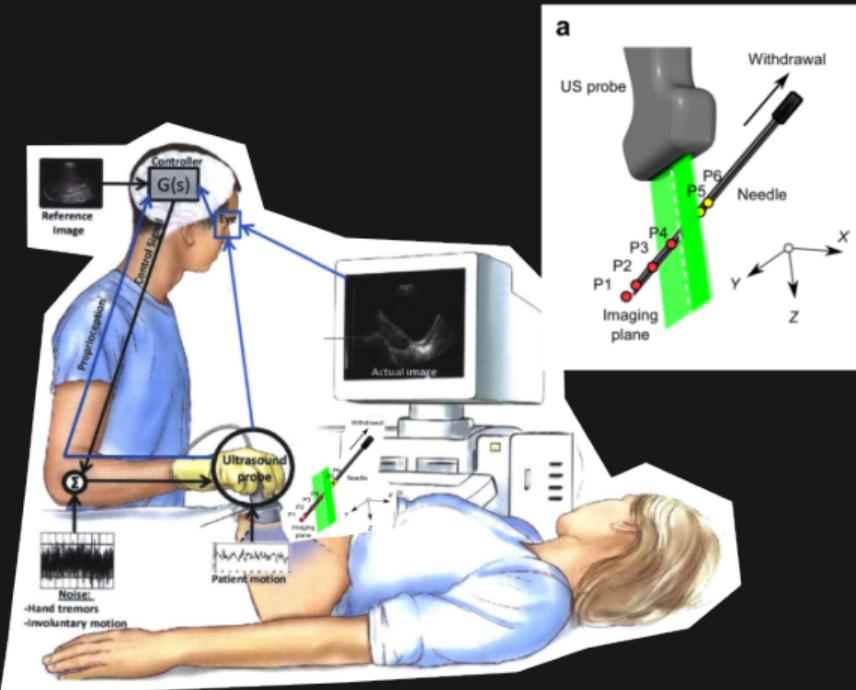
Interactive Ultrasound Imaging DEMO

Can you identify body parts of a fetus with Ultrasound?

Interactive Ultrasound Imaging DEMO



Ultrasound Needle-Tracking



Challenges:

- Tracking needles
- Skillfullness of sonographers
- Anatomical view changes

Takeaway messages

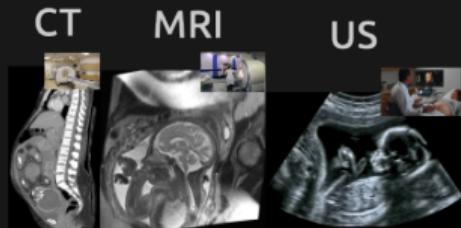
- Biomedical Engineers

- Electronics
- Mechanics
- Computer Science
- Medical Imaging



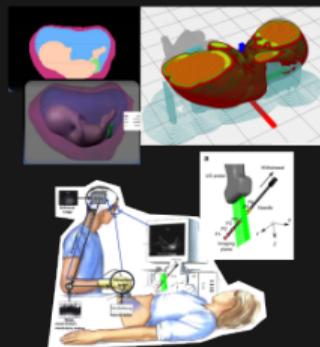
- Medical Imaging

- Computational Tomography
- Magnetide Resonance
- Ultrasound imaging



- Applications of US

- Modelling US
- 3D printing
- US needle tracking



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?

Pop Quiz and Souvenirs

Souvenirs



Acknowledgements



Shu
Wang



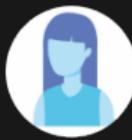
Ou
Zhanchong



Tareen
Dawood



Guilherme
Gomes De Figueiredo



Amal
Hussein



Miguel
Xochicale



Christian
Baker



Francois
Joubert



Sunish
Mathews



Fang-Yu
Lin

Research Students

Research Scientists



Bella
Spencer



Melissa
Bovis



Yada
Kunpalin



Brian
Dromey



Alima
Rahman



Valentina
Vitiello



Anna
David Vercauteren



Tom
Wenfeng
Xia



Sebastien
Ourselin

Public Engagement Officers

Clinical Fellows

Operations Managers

Investigators

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Miguel Xochicale

✉ miguel.xochicale@kcl.ac.uk
☞ @mxochicale ↗ @_mxochicale



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