

# Finding a fETus with UltraSound (FETUS)

King's Health Partners Summer School #2021

6th July 2021



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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.

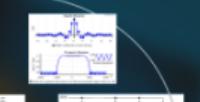
2010

Ph.D.

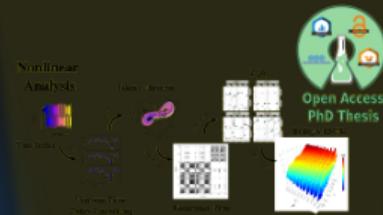
2020

2030

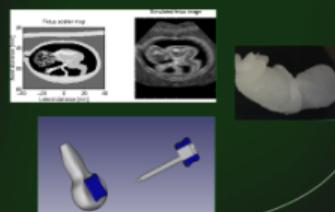
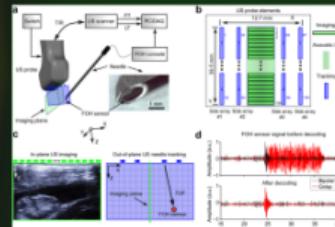
$t[\text{years}]$



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



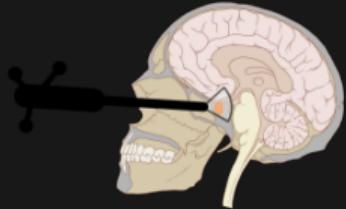
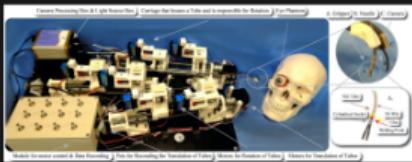
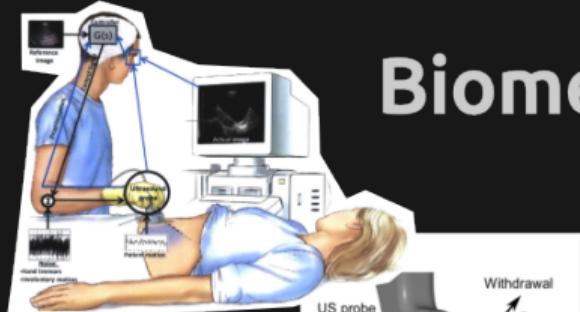
Beijing  
China



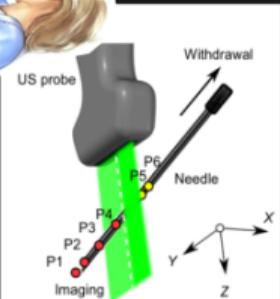
Tareen  
Dawood



Do you know what a Biomedical  
Engineer does?



# Biomedical Engineering at BMEIS

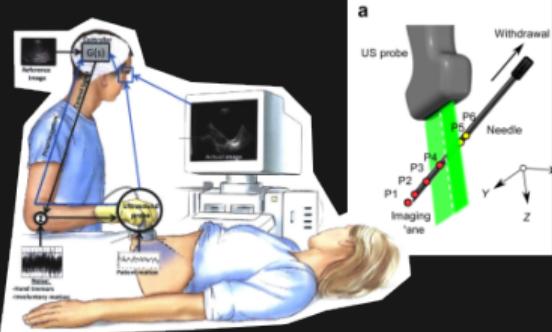


# Where we are based?



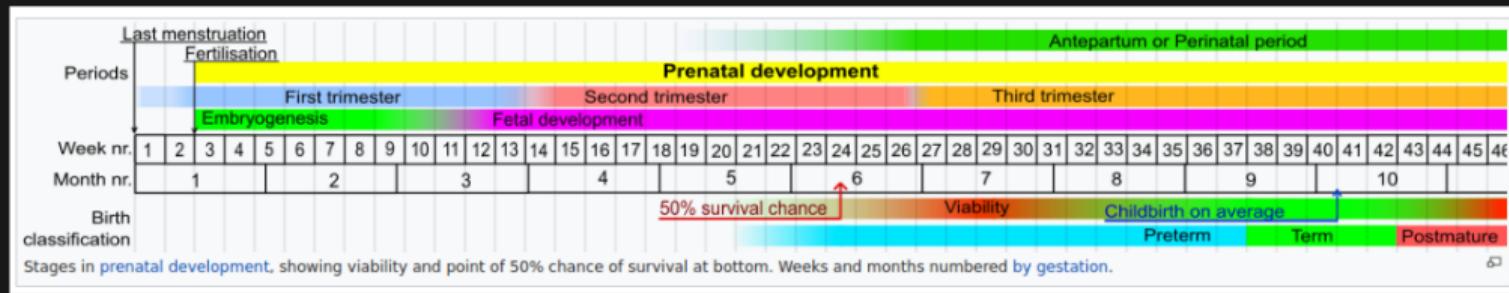
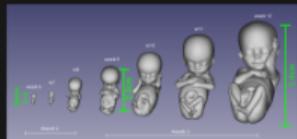
## School of Biomedical and Imaging Science

Department of Surgical and Interventional Engineering



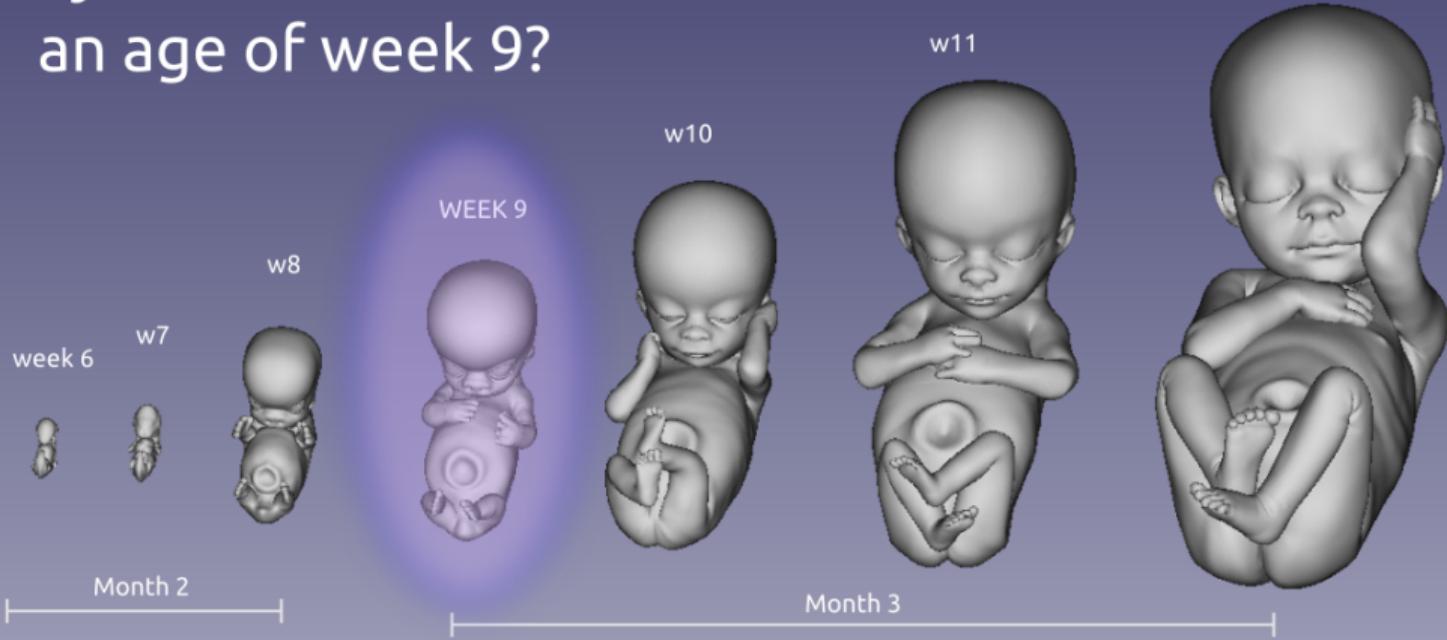
If you were a Sonographer for a day,  
what do you think would be the most  
challenging activities you would  
encounter?

## Fetal Growth



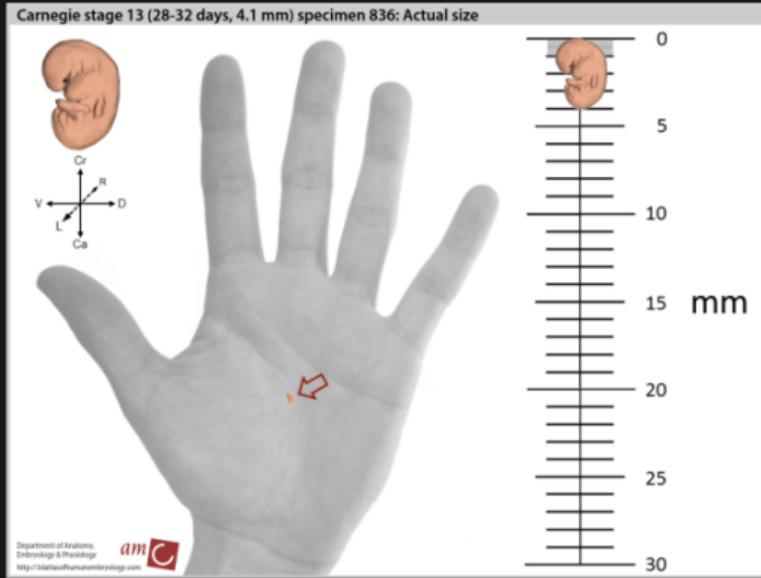
# Fetal Growth

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

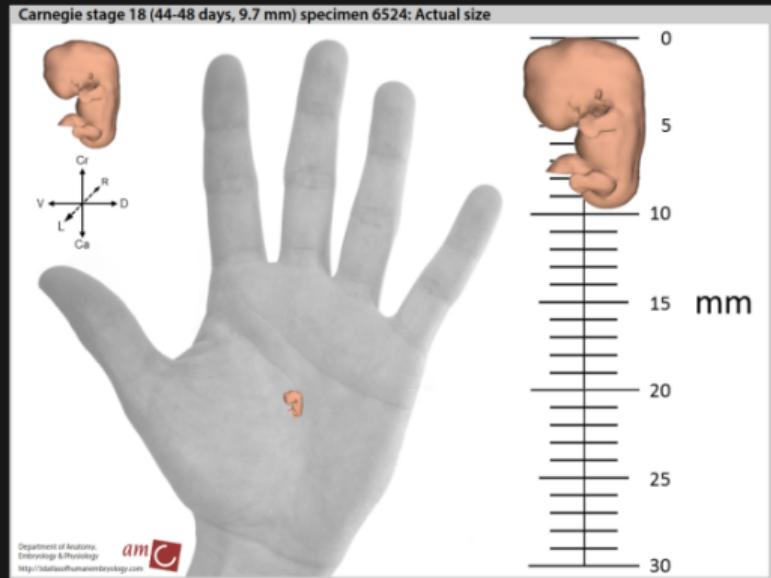


Can you guess the \*SIZE\* of these fetus?

week 5

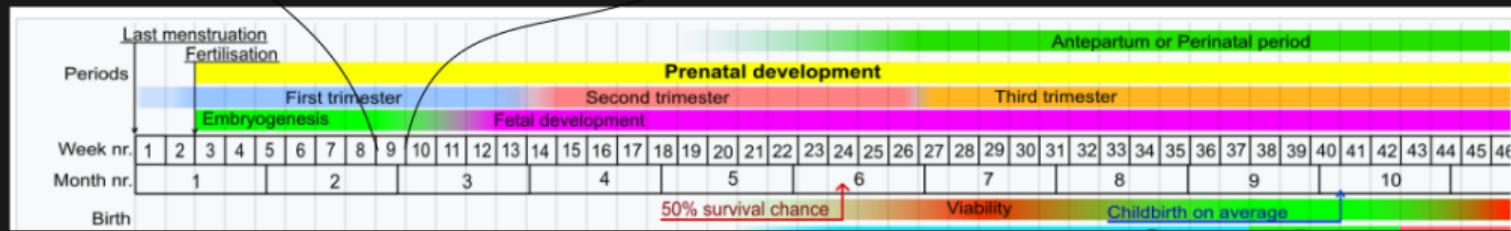
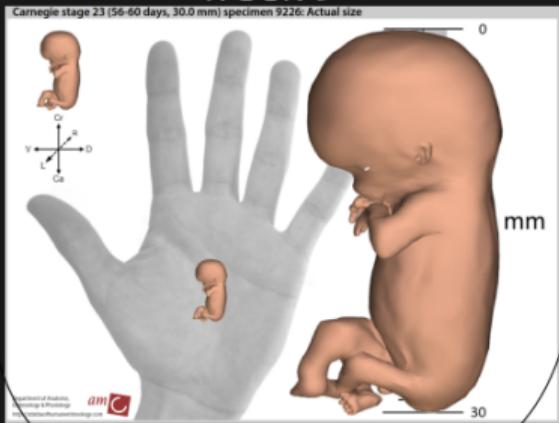


week 6



Can you guess the \*SIZE\* of these fetus?

week 9



Do you know how can we actually see a  
"non-born baby" fetus?

# Medical Imaging in Pregnancy

CT



MRI



US



+ high image quality - non-real-time

+ high image quality - non-real-time

+ real-time - poor-image quality

# 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

# Ultrasound

+real-time  - poor-image quality



How can a Biomedical Engineer would help a Sonographer?

# Modelling US imaging

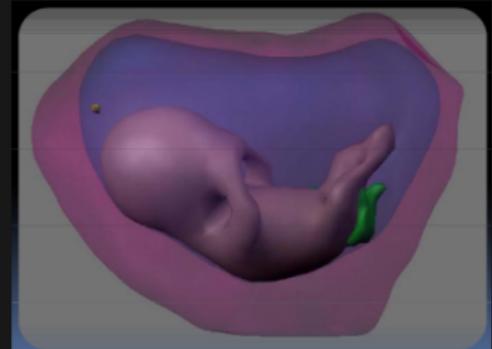
## Segmentation on 3D US data



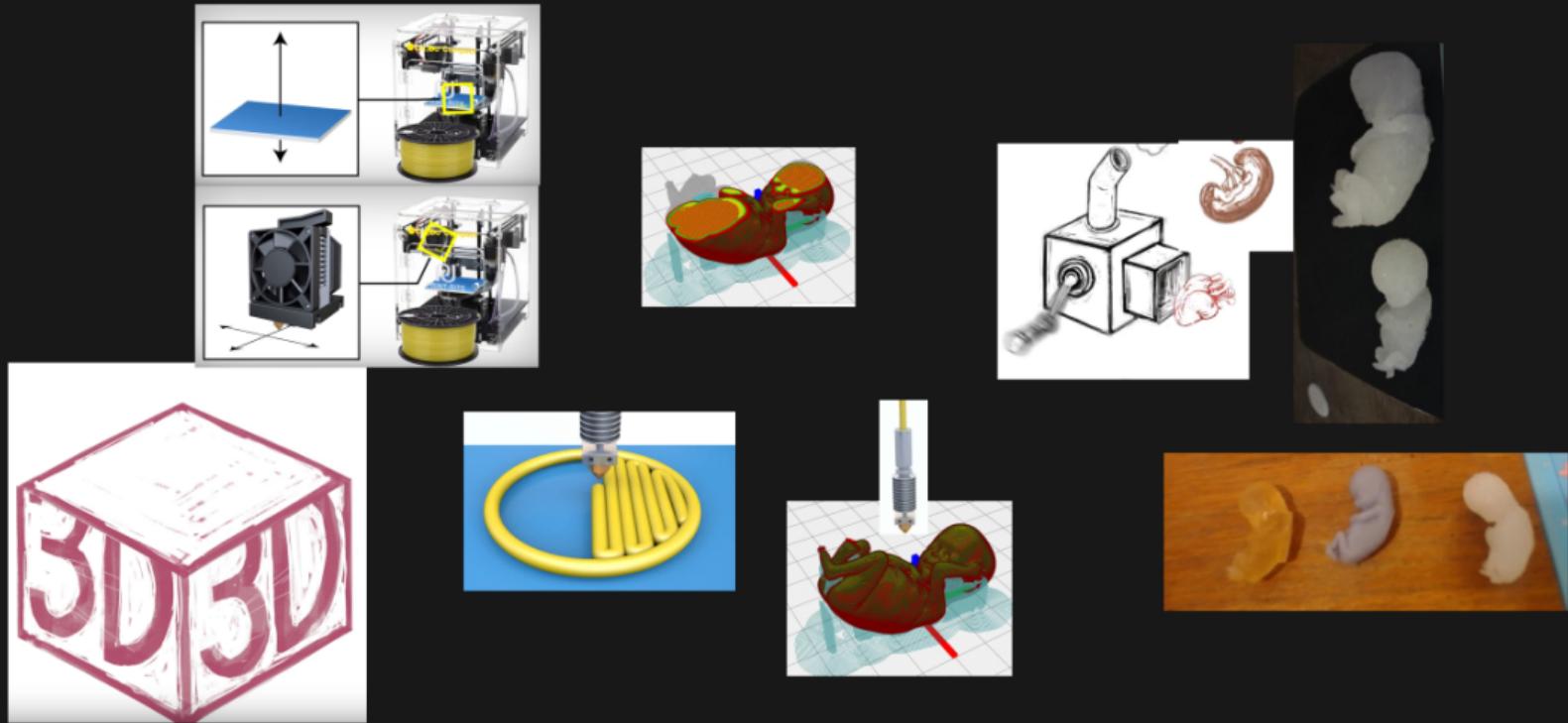
## Tissue Labelling



## Surface Reconstruction



# 3D printing a fetus



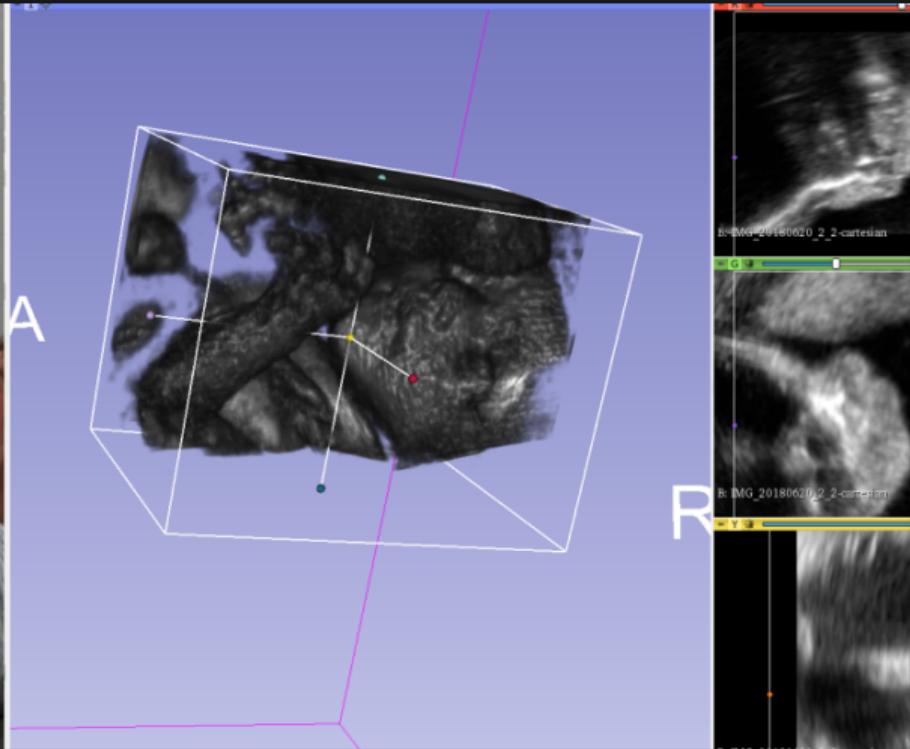
# 3D printing Fetus



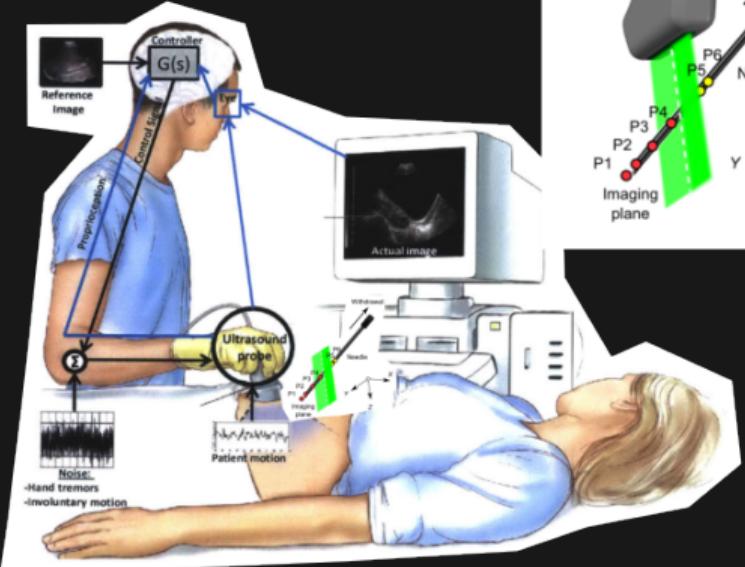
## Interactive DEMO

Can you identify the face of a FETUS  
using ultrasound?

# Interactive US imaging



# 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



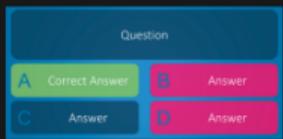
## - Applications of US

- Modelling US
- 3D printing
- US needle tracking



# Quick evaluation and Surprises

Q1



Q2

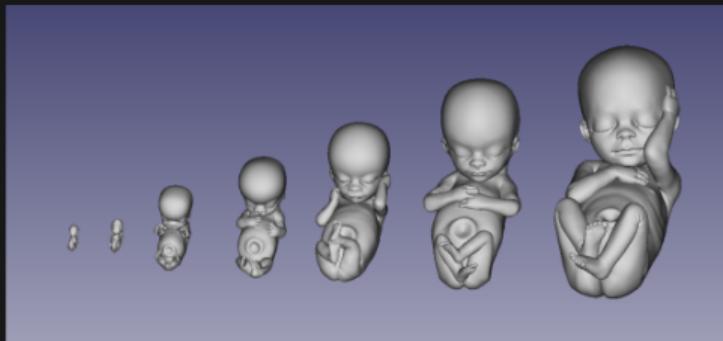


Q3



# Quick evaluation and Surprises

## Souvenirs



## Acknowledgements

# GIFT UNT team Surg



Miguel  
Xochicale



Shu  
Wang



Ou  
Zhanchong



Fang-Yu Lin

...



Name  
Surname



Name  
Surname



Name  
Surname

...



Anna  
David



Tom  
Vercauteren



Wenfeng  
Xia

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