Finding a fETus with UltraSound (FETUS)

King's Health Partners Summer School **#2021**

6th July 2021

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Miguel Xochicale

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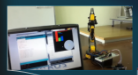
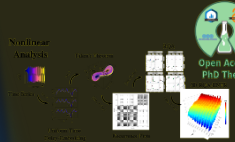
Contents

Who am I?

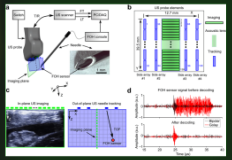
Miguel Xochicale

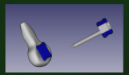


Ph.D. in Human-Robot Interaction
University of Birmingham



Research Associate in
Ultrasound Guidance Interventions
King's College London





H.S. | B.Sc. | M.Sc. | T.A. | R.A. | Ph.D. | R.A.

2000 2010 2020 2030 *t[years]*

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

Zhanchong Ou

Shu Wang

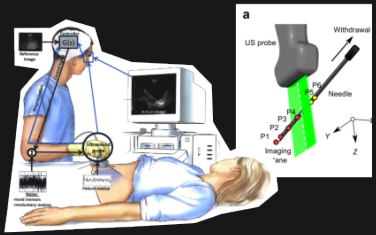
Miguel Xochicale

Where we are based?

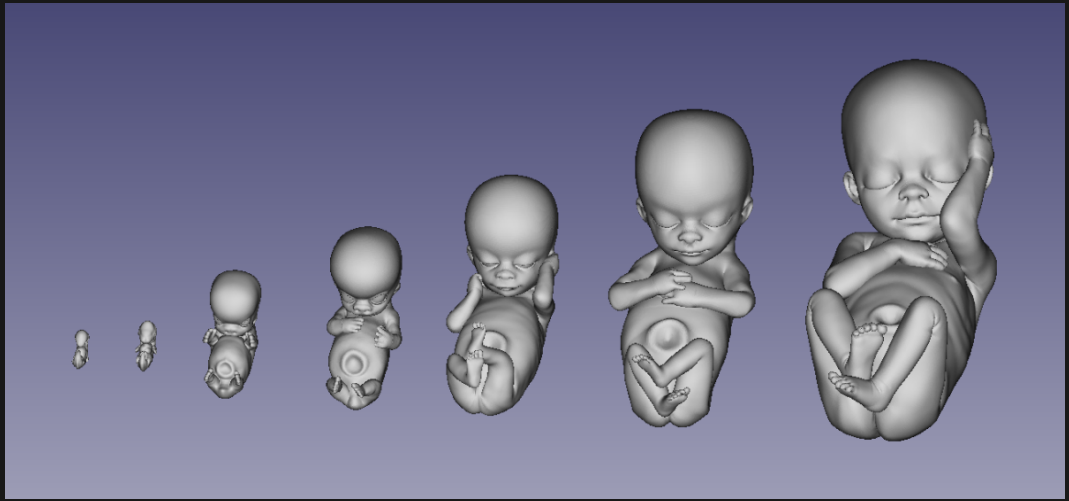
KING'S College LONDON

School of Biomedical and Imaging Science

Deparment of Surgical and Interventional Engineering

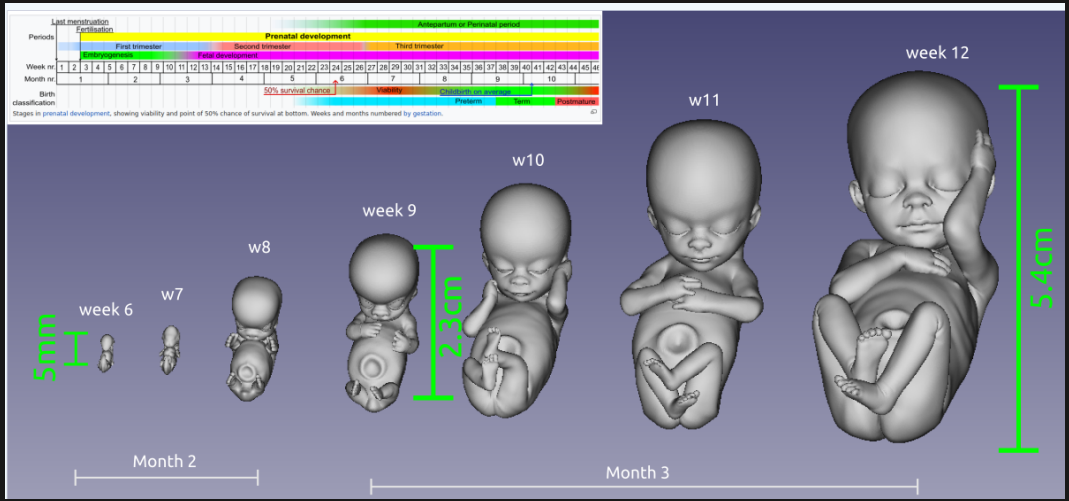


Can you guess the *AGE* of these fetus?

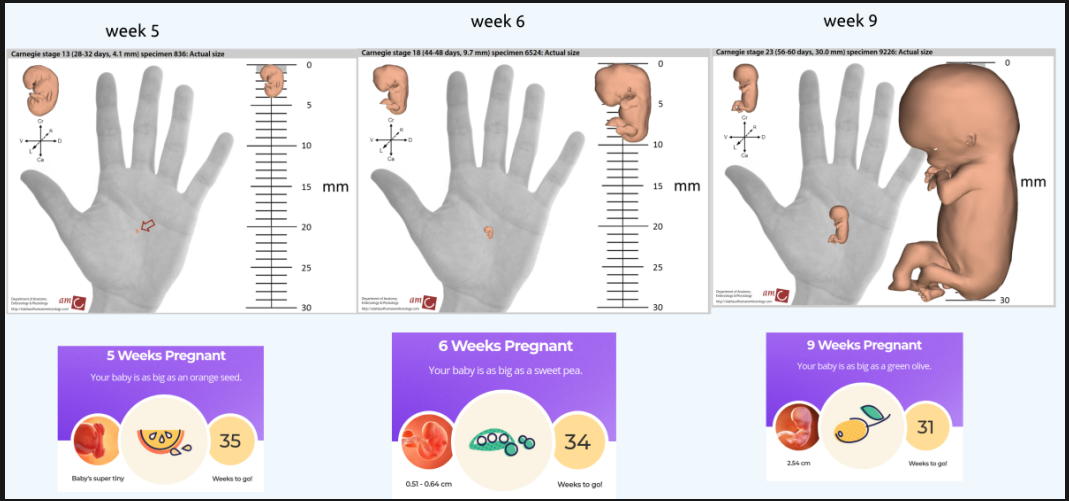


[Growing Baby: 3D Print-ready Models]

Can you guess the *AGE* of these fetus?



Can you guess the *SIZE* of these fetus?



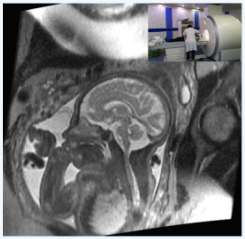
[de Bakker et al. 2016 in Science http://3datlas.3dembryo.nl/; https://www.whattoexpect.com/pregnancy/]

Medical Imaging in Pregnancy

CT

+ high image quality — - non-real-time

MRI



+ high image quality — - non-real-time

US

+real-time — - poor-image quality

[https://en.wikipedia.org/wiki/Medical_imaging_in_pregnancy]

Computational Tomography

CT

+ high image quality

- non-real-tim

Computational Tomography

[https://en.wikipedia.org/wiki/Medical_imaging_in_pregnancy]

Magnetic Resonance Imaging

MRI

+ high image quality

- non-real-time

Magnetic Resonance Imaging

[https://en.wikipedia.org/wiki/Medical_imaging_in_pregnancy]

Ultrasound

Ultrasound

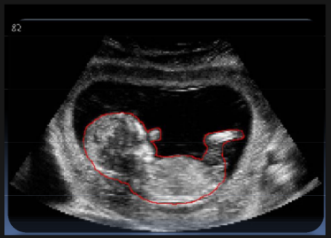
+real-time

- poor-image quality

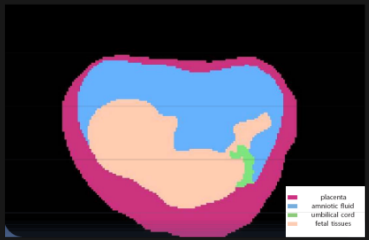
[https://en.wikipedia.org/wiki/Medical_imaging_in_pregnancy]

Modelling US imaging

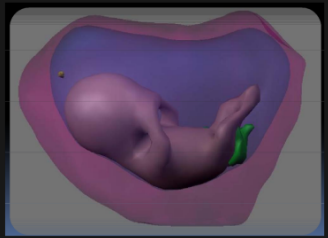
Segmentation on 3D US data



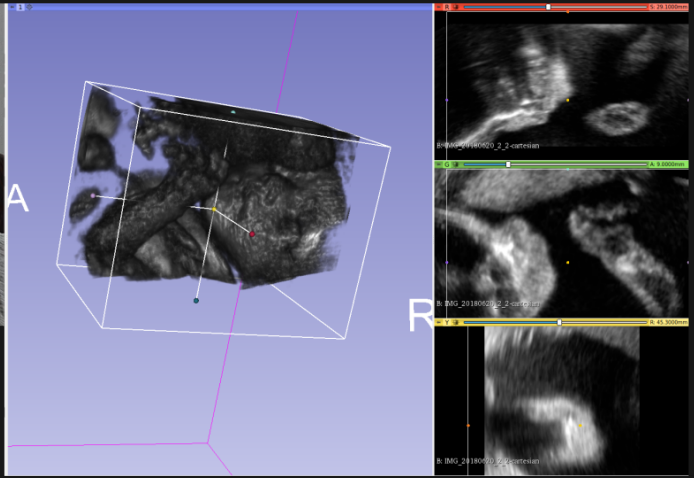
Tissue Labelling



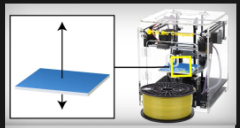
Surface Reconstruction

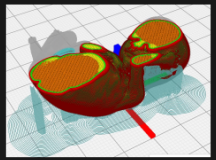


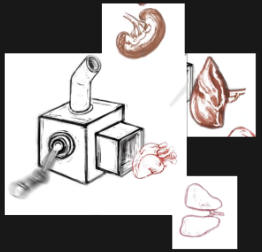
Interactive US imaging

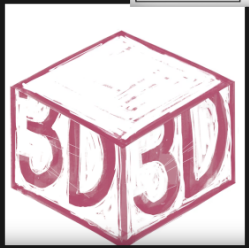


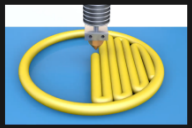
How to do and Why to do 3D printing?

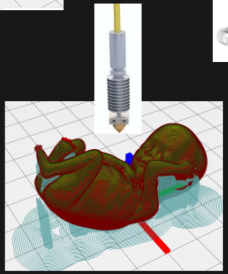










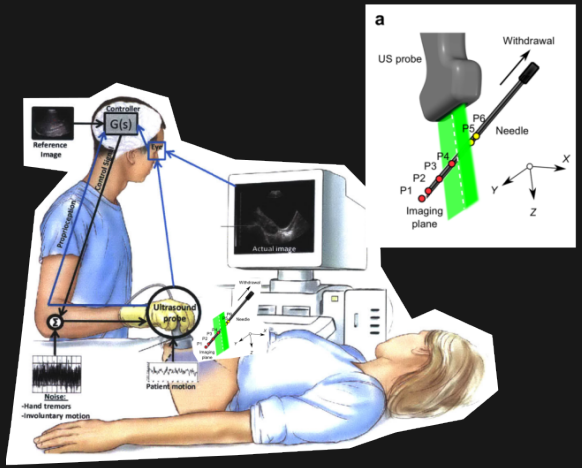


[Add references]

3D printing Fetus

[Add references]

The sonographer-probe-patient control system

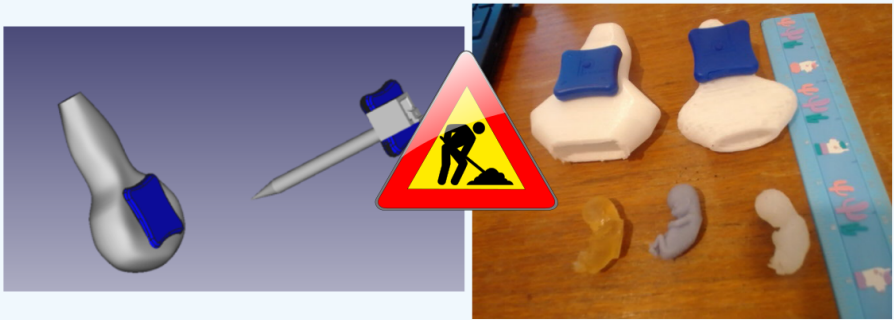


Challenges:
- Tracking needles
- Skillfullness of sonographers
- Anatomical view changes

[Wright-Gilbertson M. 2014 in PhD thesis: Xia et al., 2017 in Scientific Reports]

Simulator for Ultrasound-Guidance Interventions

Training in-plane/out-plane needle tracking



[add references]

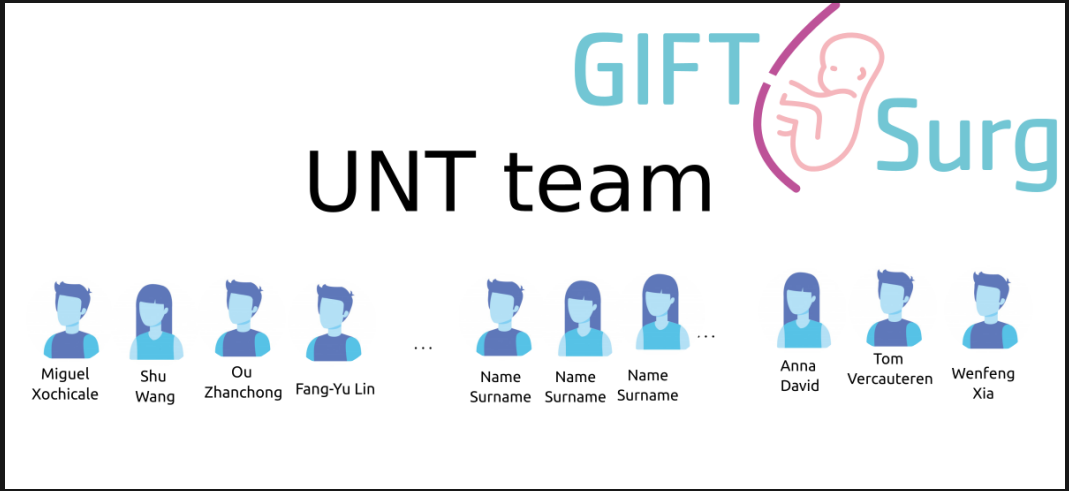
Takeaways

- Fetal development
- Ultrasound imaging
- 3D printing
- US needle tracking

Souvenirs

Evaluation

Acknowledgements



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