

## Colonoscopy Robot

Hongliang REN

# Clinical Needs: Steerable colonoscopy robots

# BN3101 Project Outline

- Clinical problem and needs
  - Anatomy
  - Clinical Background
  - Current Methods of treatment
  - Unmet needs/gaps
- Project
  - Definition
  - User Specifications
  - IP Search
  - ASTM standards

# Example User Specification: Metrics Benchmarking

Metric	Olympus
Ultimate Strength	NA
Volume of device	11(diameter) x 26 mm (length)
Average time of implantation	8 hours
Operation time	10 mins
Material	Biocompatible Plastic
Cost	USD2000
Actuation mode	Motorized
Number of steps for assembly and insertion	2



# User Specifications

Need/Metrics	Ultimate Strength	Volume of device	Average time of insertion	Operation/Scanning time	Material	Cost	Actuation mode	Number of steps for assembly and insertion
Easy insertion and deployment		X		X	X			X
Biocompatibility			X					
Ease of actuation		X					X	
Ease of removal		X	X					
Pain-free			X					
Good mechanical properties	X	X			X		X	
Cost					X	X		
Aesthetically pleasing		X					X	
Able to deploy and guide screw fixation accurately				X				X

Non-invasive or atraumatic

Easy to use, manipulate by users on their own

Repositionable

Retrievable

Minimal Foreign Body Response

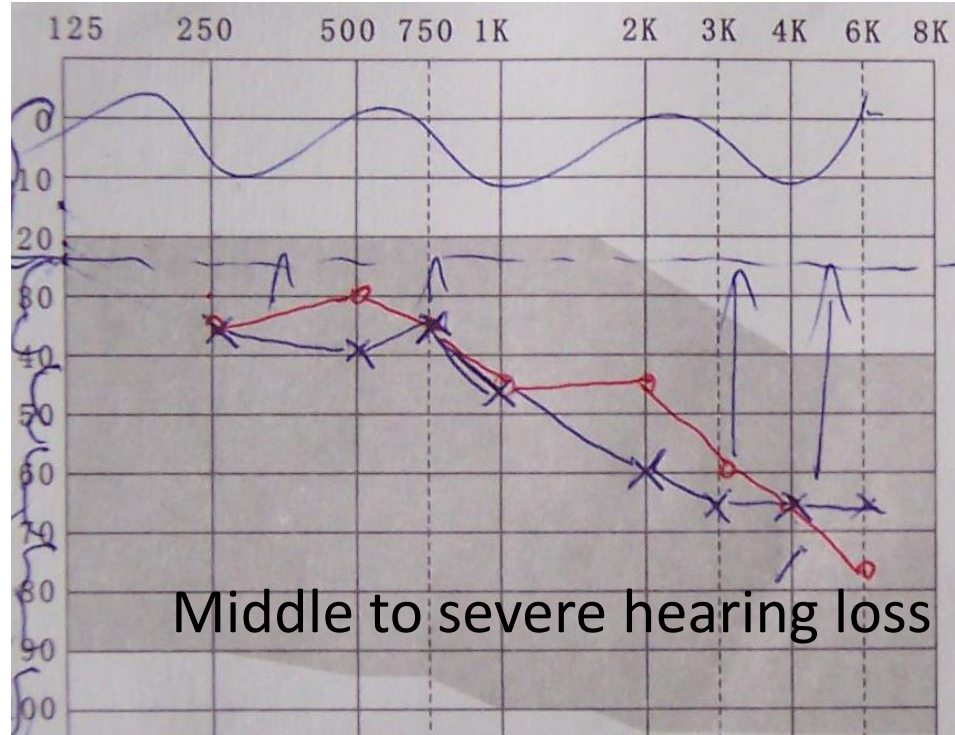
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Example FYI

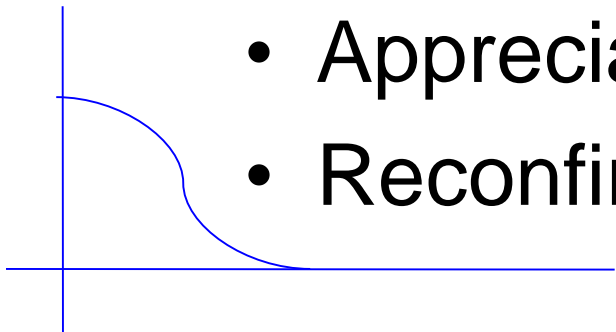
# Tutorials/QA/Supports

# Q & A

- Weekly Update/Tutorial
  - Mon
  - Brief **written** updates: work done, problems, plan
- Weekly QA hours
  - EA-05-30 (my office) or by appointment
  - 66012802 / 85788427
- Open for social networks, data sharing
  - LinkedIn, Whatsapp, Facebook, dropbox/onedrive preferred
  - ID: [hongliangren@msn.com](mailto:hongliangren@msn.com)
- In general reply in 24 hours and call me if not (I may miss messages from hundreds daily)



- My ears are defective Low Pass Filters
- Appreciate if speak loudly
- Reconfirm if unsure. Thanks!





## Safety alerts

**Strong  
magnets**

# Lessons

- Over-ambitious
- Key: Proof-of-concept
- Simplicity is Beauty



Google

# Project/Problem Based Learning

## Philosophy

I hear and I forget;  
I see and I remember;  
I do and I understand.



(Confucius  
circa 450BC)



demos

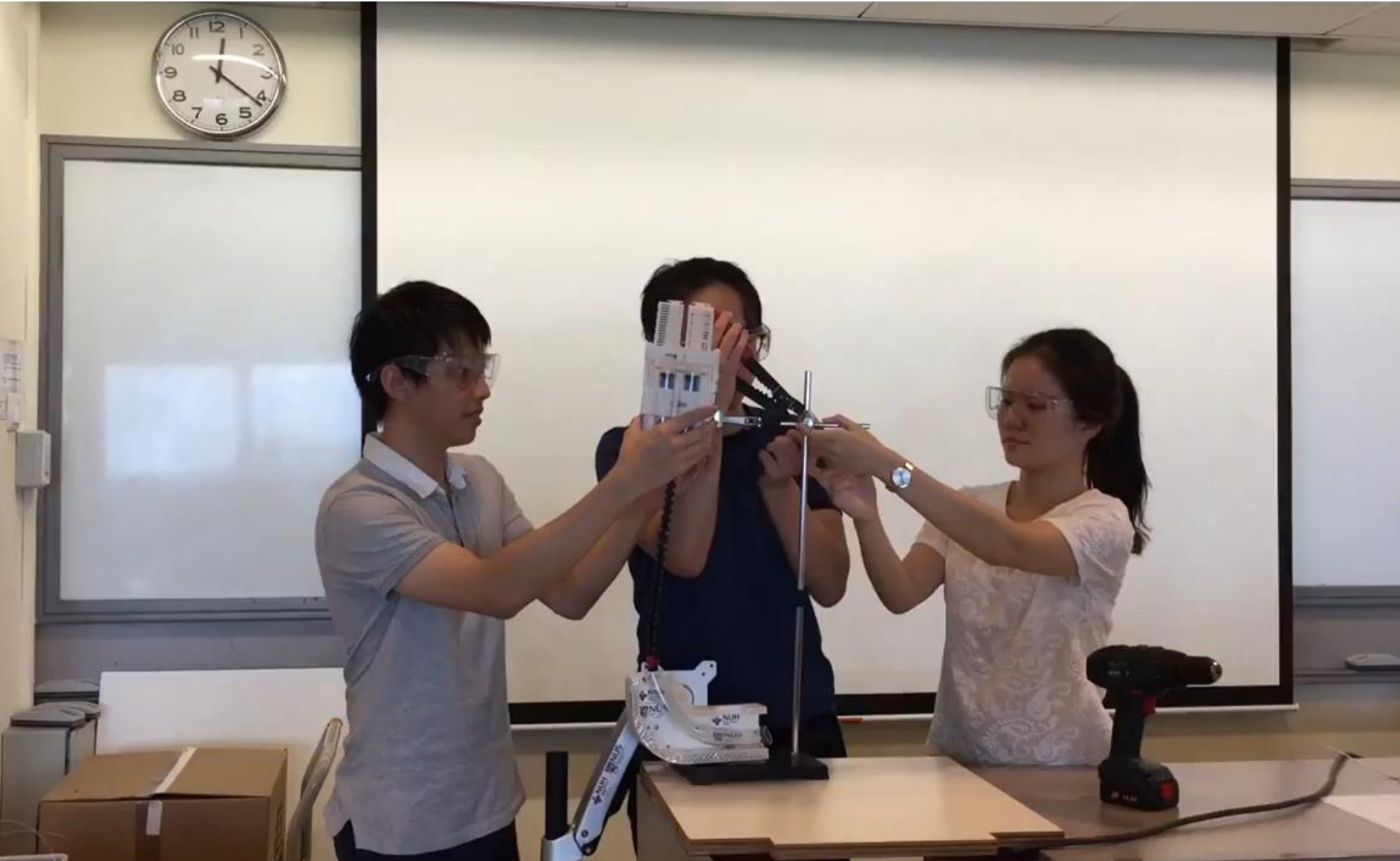
# Seminars/Prototype Demos



By 14/15 BN3101 students

<http://blog.nus.edu.sg/biommm/bn3101-ay1415-demo/>

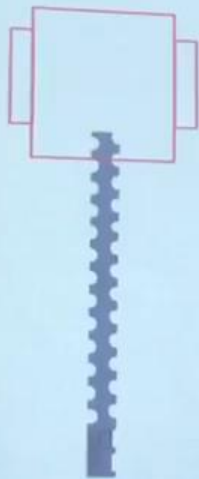
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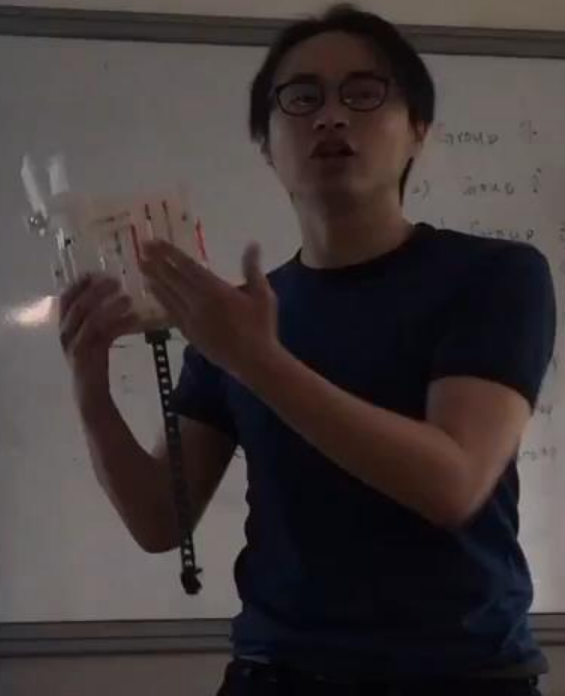
# Blended learning

## Other activities

Awards: **5-minutes pitch + Demo**



Handle Box



# Other activities

Final presentation & **awards:**





# Hospital Visits in AY 17/18

- Adding more real-world scenarios (NUH)



# What have been done by previous students

Magnetically Actuated Soft  
Origami Robots

# Introduction to Lab Web

- Project webpage:
  - <http://www.labren.org/mm/19bn3101/>
- Lab:
  - <http://bioeng.nus.edu.sg/mm>

## **wk2: Intellectual Property**

- Dr Ren is away **Week-3**
- Design conceptualization in Design Studio
- You can reach me by emails/whatsapp anytime.

**~END~**