

The Future of Engineering

Challenges and opportunities

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Conf of Eng and Tech for Suistanable Development

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Get source of this slides and see further references from <https://github.com/mxochicale/itds2020>.



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Short-bio

My Journey in Engineering and Science

- (1996-1999) High School in Electronics
- (1999-2004) BSc in Electronics
- (2004-2006) MSc in Signal Processing
- (2006-2012) Teaching Associate in Mechatronics
- (2013-2014) Research Assistant in Robotics at INAOE
- (2014-2019) PhD student in Human-Robot Interaction at Uni of Bham
- (2019-present) Research Associate in Ultrasound-Guidance Intervention at KCL



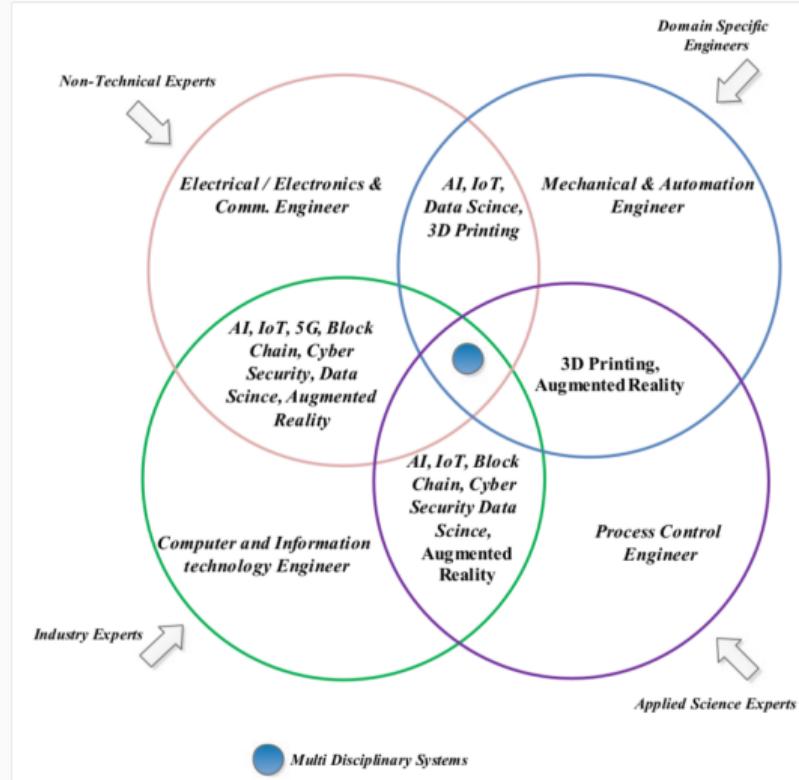
Challenges and Opportunities in Engineering

Challenges in Engineering

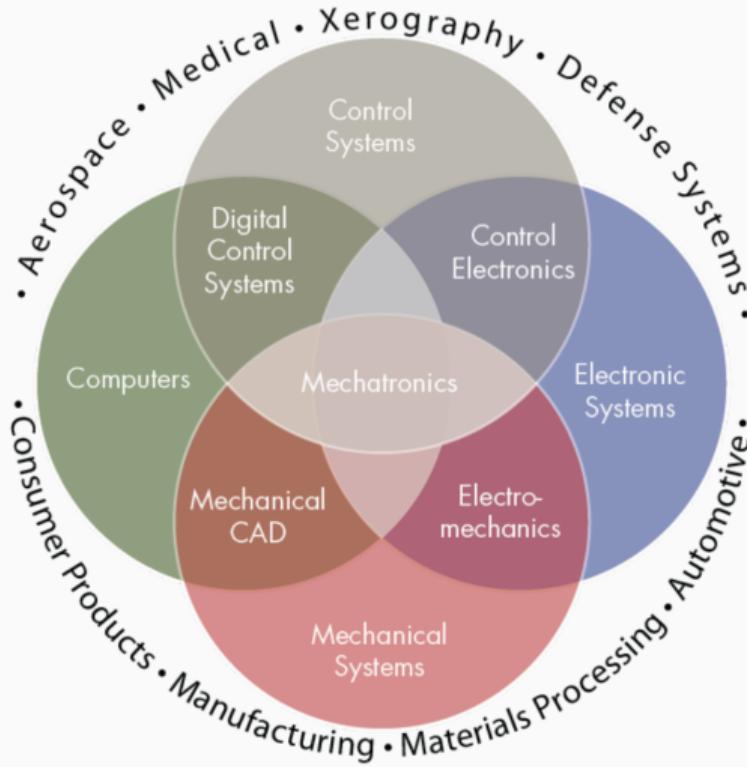
- Advance Personalised learning
- Make Solar Energy Economical
- Enhance Virtual Reality
- Reverse-engineer the brain
- Engineer better medicines
- Advance Health Informatics
- Restore and improve urban infrastructure
- Secure cyberspace
- Provide access to clean water
- Provide energy from fusion
- Develop Carbon Sequestration Methods
- Engineer the tools for science discovery



Engineering as Multidisciplinary Field



Robotics Engineering



Open-source projects

Open Source low-cost ventilator



Miguel Xochicale
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Great progress of #OpenSource low-cost #Ventilator(s) which will be also facing regulatory approvals of their design! If you can, contribute to them! 🙏🌍🌐

Gitlab: gitlab.com/TrevorSmale/OS...
Github: [github.com/jcl5m1/ventila...
oxvent.org](https://github.com/jcl5m1/ventila...)



7:49 pm · 20 Mar 2020 · Twitter Web App

OpenSource Rover



Miguel Xochicale
 @_mxochicale

Ever wanted to build your own #opensource rover? Well now you can! courtesy of @NASAJPL

WEBSITE: opensourcerover.jpl.nasa.gov
GITHUB: github.com/nasa-jpl/open...

For those who want to get involved in mechanical engineering, software, electronics, or robotics.



12:48 pm · 25 Jul 2020 · Twitter Web App

OpenSource Microscope



Miguel Xochicale
 @_mxochicale

💡 Microscopy for everyone courtesy of @OpenFlexure openflexure.org/projects/micro...

OpenFlexure Microscope



Build a Microscope

A guide to printing and assembling an OpenFlexure Microscope



Install the Software

Prepare your Raspberry Pi by installing Raspbian-OpenFlexure



Use your Microscope

Download and install software to control your microscope

The Future Engineering

Disruptive technologies



Future of Engineering in Robotics and AI

Blockchain and Cloud Robotics



"with the integration of #Blockchain, the #ROS interface for physical systems, Cloud #Robotics, and #IoRT, autonomous robotic agents could find a starting point for the technology needed in a robot economy" by M Arduengo, L Sentis

[arxiv.org/abs/1812.01755 \(v4\)](https://arxiv.org/abs/1812.01755)

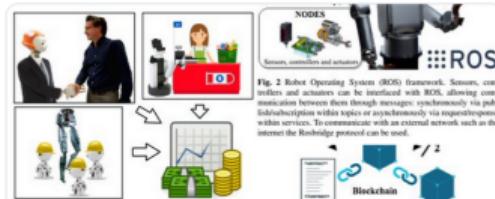


Fig. 1 Robots are rapidly developing capabilities that could one day allow them to participate as autonomous agents in economic activities with the potential to change the current socio-economic scenario. Some interesting examples of such activities could eventually range from entering into agreements with human owners, the purchase of goods and services and the participation in highly unstructured production processes.

9:02 pm · 20 Aug 2020 · Twitter Web App

AI in Surgery



Artificial Intelligence in Surgery

Zhou et al. Dec 2019 arxiv.org/abs/2001.00627

#AI #MedicalRobotics

"Recent successful and influential applications of AI in surgery are reviewed from pre-operative planning and intra-operative guidance to the integration of surgical robots"



Figure 3: An overview of popular AI techniques, challenges, and subareas of AI used in pre-operative planning, intra-operative guidance, and subareas of AI used in pre-operative planning, intra-operative guidance, and surgical robotics.

8:10 am · 17 Jul 2020 · Twitter Web App

6G: communicating with the brain



Neurosciences and 6G: Lessons from and Needs of Communicative Brains

Moioli, @PHJNardelli et al. Apr 2020
[arXiv: arxiv.org/abs/2004.01834](https://arxiv.org/abs/2004.01834)

citing [100] M. Mahmood et al. 2019 in
@NatMachIntell
nature.com/articles/s4225...

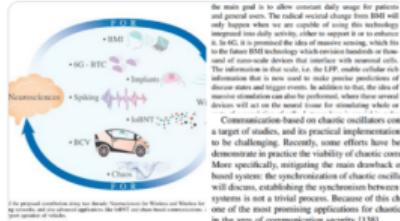


Figure 4: AI techniques for neural interfaces including perception, localization, and communication.

The main goal is to allow constant daily usage for patients and healthy users. The first step towards this goal is 6G which only happens when we are capable of using this technology integrated into daily activity, either to support it or to enhance it. This is where the need for AI comes in. We believe that in the future BMI technology which uses brain or other kind of non-scale devices that connect with neurons cells. The second step is the use of LFP and ECoG to obtain information that is now used to make proper predictions of disease states and trigger events. In addition to that, the idea of using AI to predict the next movement of the user and the device will act on the neural tissue for stimulating while or

Communication-based on chaotic oscillations could be a target of studies, and its practical implementation is to be challenging. Recently, some efforts have been made to mitigate the main drawback of these systems. More specifically, mitigating the main drawback of these systems, the synchronization of chaotic oscillations will occur, establishing the synchronization between these systems is not a trivial process. Because of this one of the most promising applications for chaotic oscillations is in the area of communication security [138].

MARINA | Edge AI @m_s304 · 8 Oct 2019

超薄型のフレキシブルな皮膚状の電極が開発され、障害のある方でもワイヤレスにセンサなどを操作できるようになったらしい。
深層学習でEEG信号(脳波)を分析しているとのこと。キャップを被り電極を装着せざつも皮膚に直接接続して、脳波を分析しているらしい!
news.nicovideo.jp/watch/rws962550

Show this thread

10:05 pm · 9 Jul 2020 · Twitter Web App

Few engineering skills

Explorer



Artist



Inventor



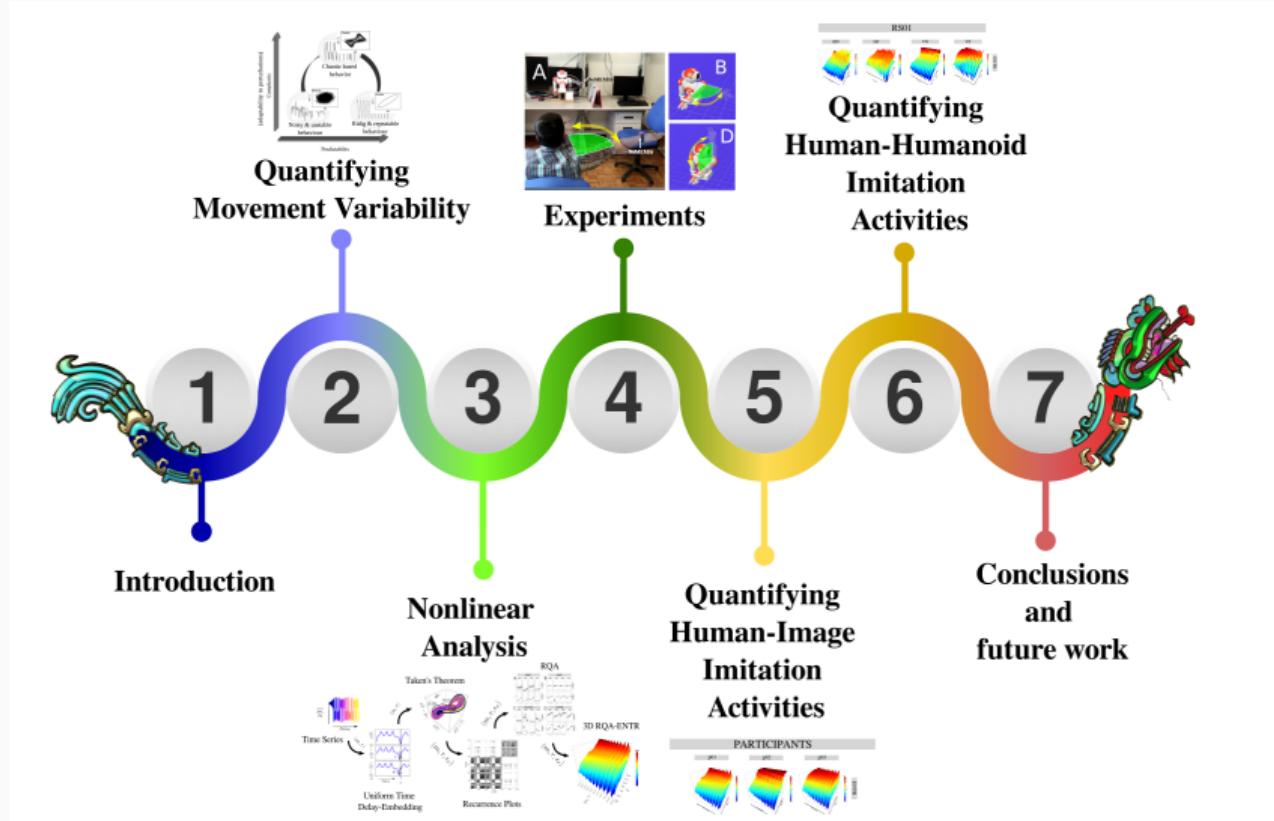
Game Changer



Rocket Launcher

My lines of research

Variability in HRI using nonlinear dynamics

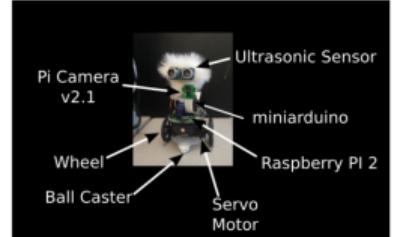


Artificial Intelligence and Robotics for Children

Prototype



Open Source Educative Robots



Free AIR for Children



Thanks
Questions?