

Department
Of Design

Human Music Interaction

Multisensory Music
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My Bio and Research



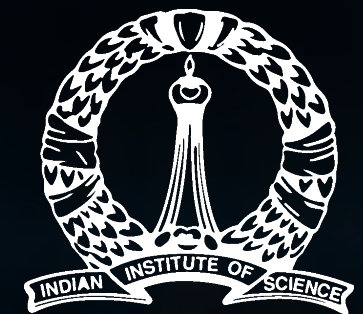
Bio:

- Bachelors in ECE at CEG, Anna University
- Master of Design at IITDM Kancheepuram
- PhD in HCI at CPDM, Indian Institute of Science (IISc) Bangalore
- Postdoc at UCL Interaction Center, University College London (UCL) UK



Research Areas:

- Human Computer Interaction
- Automotive UI
- Human Music Interaction
- Human Robot Interaction



Contents

- Introduction to Human Machine Interaction (HMI) / (HCI)
- Interaction Modalities
- Human Music Interaction
- Tools
- Applications

Human Computer Interaction (HCI/HMI)

- Multidisciplinary study and design of technologies for humans to interact with computers or machines.
- Interaction is a communication of information
- Communication is by means of a language (verbal, body, gesture, holistic)
- Involves senses, perception and action
- Human-Human interaction model to human-Machine Interaction





Human Sense

A human hand in a blue shirt sleeve reaches out from the right side of the frame, pointing towards a blue robotic hand on the left. The background is dark blue with some bokeh light effects.

- We sense certain changes in the environment and react to it
- What are the different senses?
- What are the possible reactions we do?

Gas leak



Hot summer



Loud music by sibling



Machine Sense: Sensors

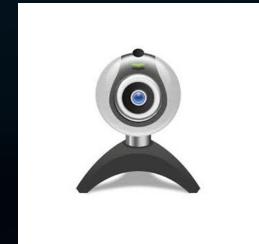
- Auditory

- Ears == Microphone



- Visual

- Eyes == Camera



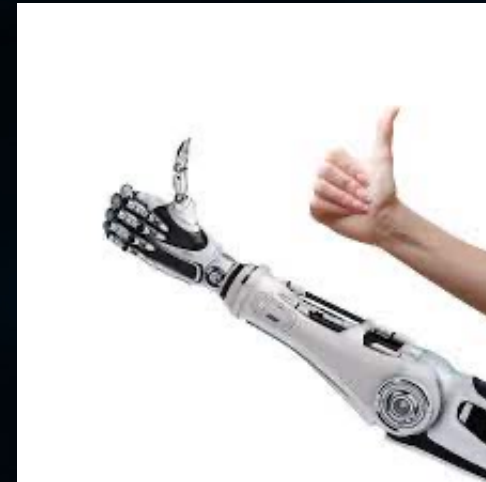
- Haptic

- Touch == Touch using charge or pressure



Machine Action: Actuators

- Speech
 - Vocals == speaker
- Motor action
 - Hands == robotic arms



Perception

A human hand and a robotic hand are shown reaching towards each other against a dark blue background. The human hand is on the right, and the robotic hand is on the left. The text is overlaid on the image.

- Perception (from Latin perceptio 'gathering, receiving') is the organization, identification, and interpretation of sensory information in order to represent and understand the presented information or environment

**Computer
Science**

HCI

**Social Sciences
and Humanities**

Top publications

Categories > Engineering & Computer Science > Human Computer Interaction ▾

Publication		h5-index	h5-median
1. Computer Human Interaction (CHI)	ACM	95	122
2. ACM Conference on Computer-Supported Cooperative Work & Social Computing	ACM	61	86
3. ACM Conference on Pervasive and Ubiquitous Computing (UbiComp)	ACM	54	91
4. ACM/IEEE International Conference on Human Robot Interaction	ACM + IEEE	46	66
5. IEEE Transactions on Affective Computing	IEEE	45	85
6. ACM Symposium on User Interface Software and Technology	ACM	44	68
7. International Journal of Human-Computer Studies		43	70
8. IEEE Transactions on Human-Machine Systems	IEEE	40	64
9. Behaviour & Information Technology		36	48
10. ACM Transactions on Computer-Human Interaction (TOCHI)	ACM	34	53
11. International Conference on Multimodal Interfaces (ICMI)	ACM	33	63
12. IEEE Transactions on Haptics	IEEE	31	44
13. International Journal of Human-Computer Interaction		31	44
14. Conference on Designing Interactive Systems	ACM	31	41
15. Universal Access in the Information Society		31	41
16. International Conference on Intelligent User Interfaces (IUI)	ACM	31	39
17. HCI International		30	45
18. Mobile HCI	ACM	30	43
19. IEEE Virtual Reality Conference	IEEE	28	38
20. International Conference on Tangible, Embedded, and Embodied Interaction	ACM	27	41

Dates and citation counts are estimated and are determined automatically by a computer program.



Interaction Modality

A hand in a light blue shirt sleeve reaches out from the right side of the frame, pointing towards a dark blue robotic hand on the left. The background is a dark, textured blue.

- the type of input or output that is associated to a specific interaction with a system.
- E.g., text input through a keyboard and text output through a terminal is a modality for interacting with a command-based user interface. (CLI)

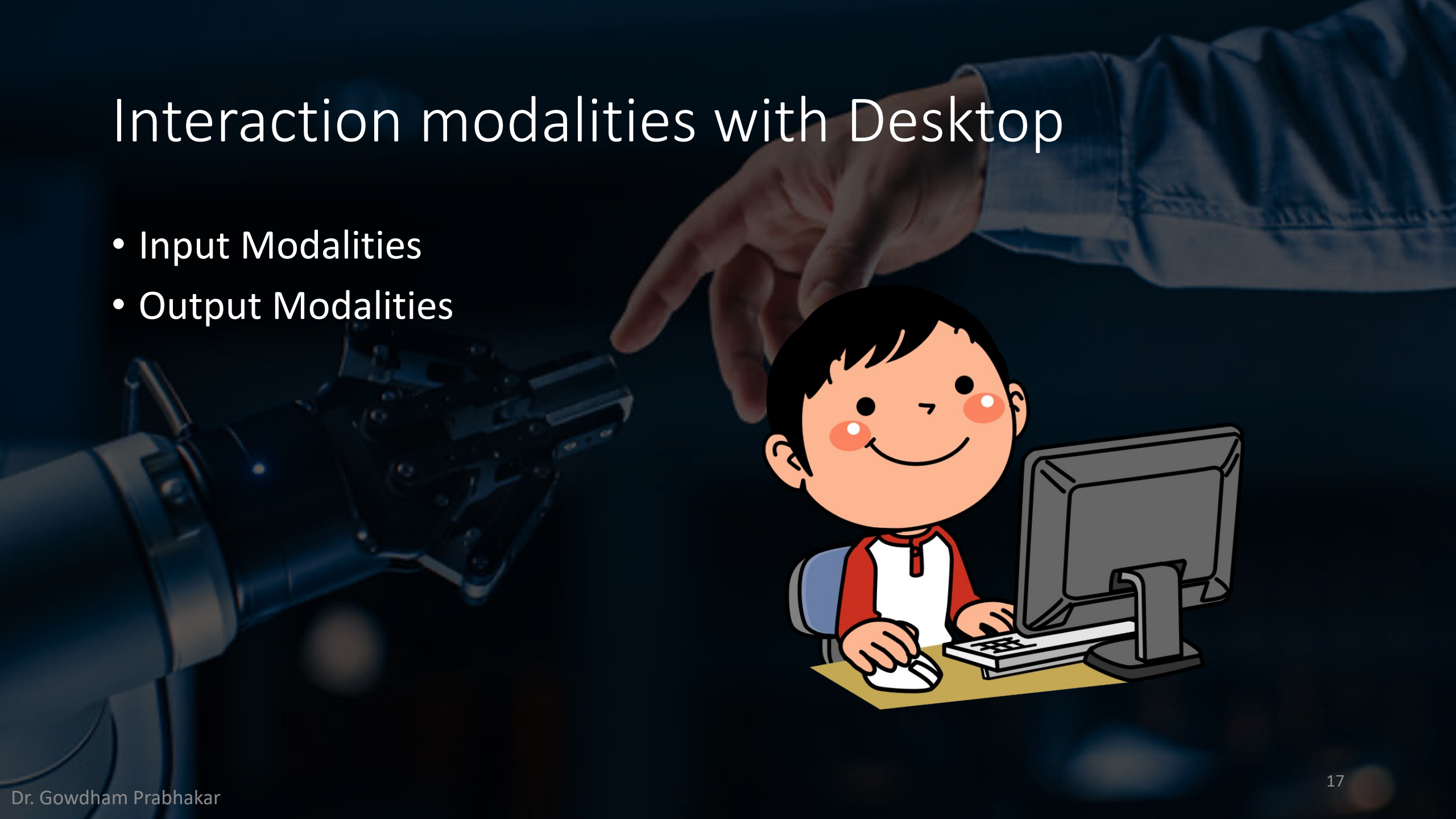
How do we interact with machines?

A human hand in a light blue shirt sleeve is reaching out from the right side of the frame, with the index finger pointing towards a robotic hand on the left. The robotic hand is dark blue and appears to be reaching out to meet the human hand. The background is a dark, textured blue.

- What do we need from machines?
 - Work
- How do we get the work done by machines?
 - Giving desired instruction to the machine (Input)
- How do we get satisfied with machines?
 - Get the desired work done by the machine (Output)

Interaction modalities with Desktop

- Input Modalities
- Output Modalities



Input Modalities

A hand in a blue shirt sleeve reaches out from the right side of the frame towards a robotic hand on the left. The background is dark blue with a subtle grid pattern.

- Pointing devices (mouse, pen tablet, light pen, touch screen, data glove, ...)
- Keyboard
- Sound input (microphone)
- Image input (camera)
- Others (sensors)

Output Modalities



Common modalities

- Vision – computer graphics typically through a screen
- Audition – various audio outputs
- Tactition – vibrations or other movement

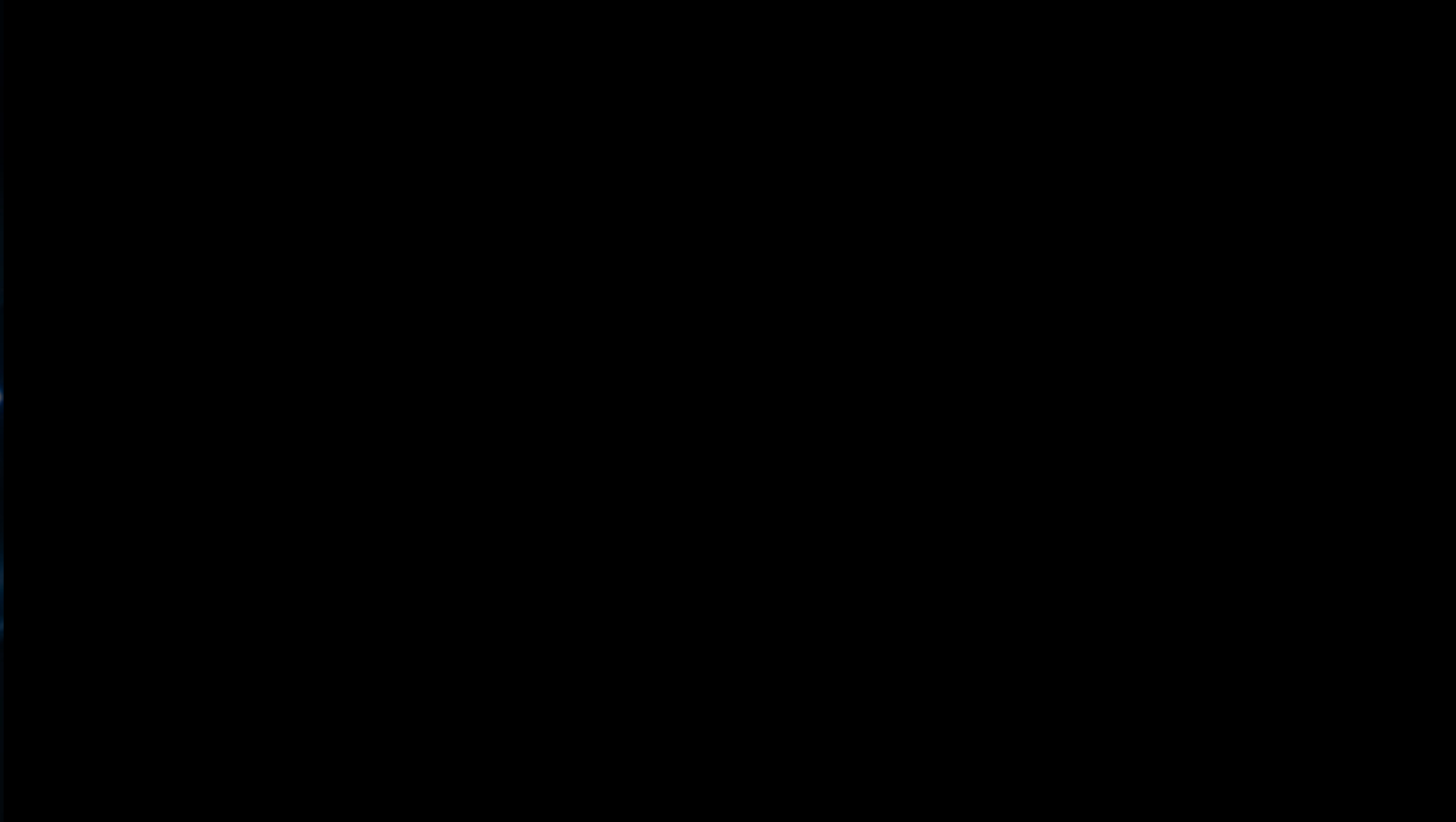
Uncommon modalities

- Gustation (taste)
- Olfaction (smell)
- Thermoception (heat)
- Nociception (pain)
- Equilibrioception (balance)

Eye Gaze Modality



Hand Tracking Modality



Gestures

- A gesture is a motion of the body that contains information
- Waving goodbye is a gesture
- Pressing a key on a keyboard is not a gesture because the motion of a finger on its way to hitting a key is neither observed nor significant
- All that matters is which key was pressed



Detect a gesture

- In a continuous feed of data/media, find the start and end of an event
- Check what gesture that event is
- Take action corresponding to the gesture

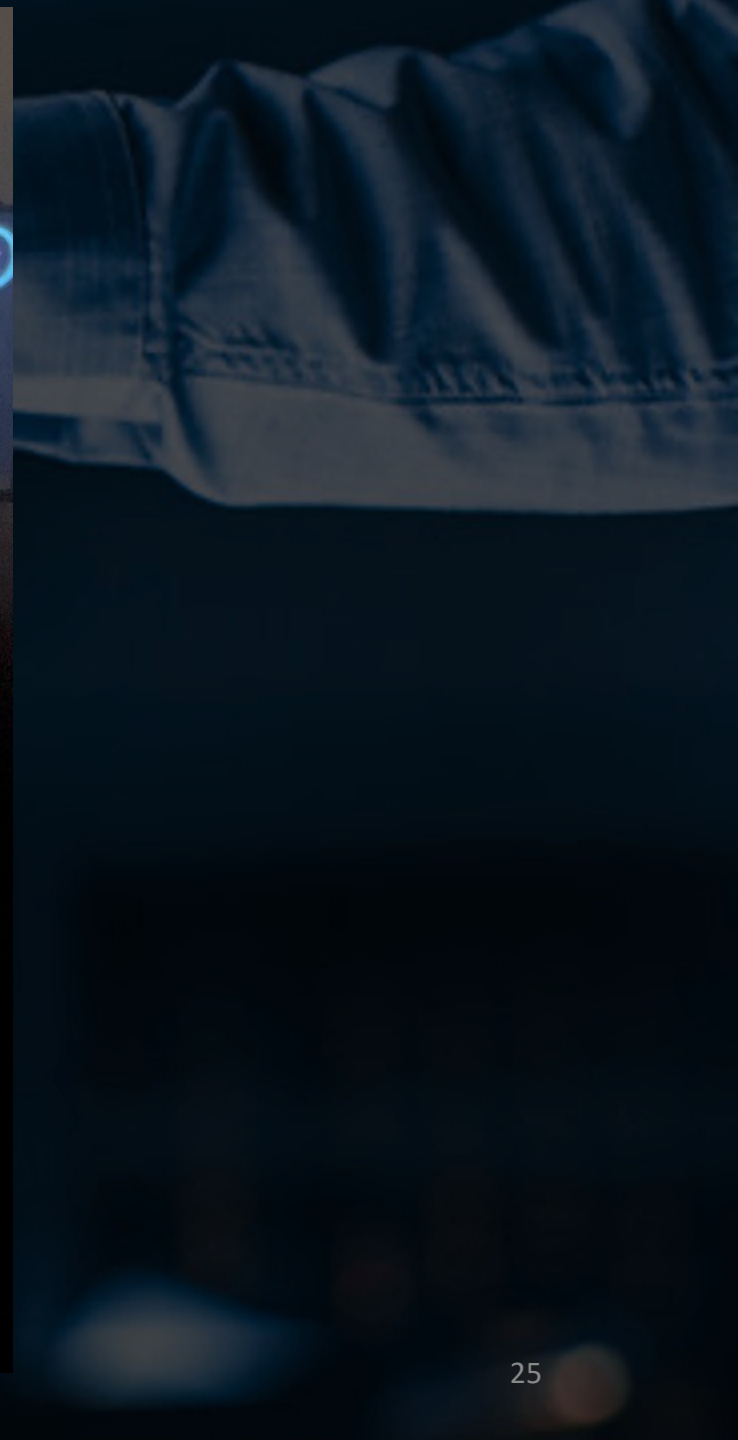
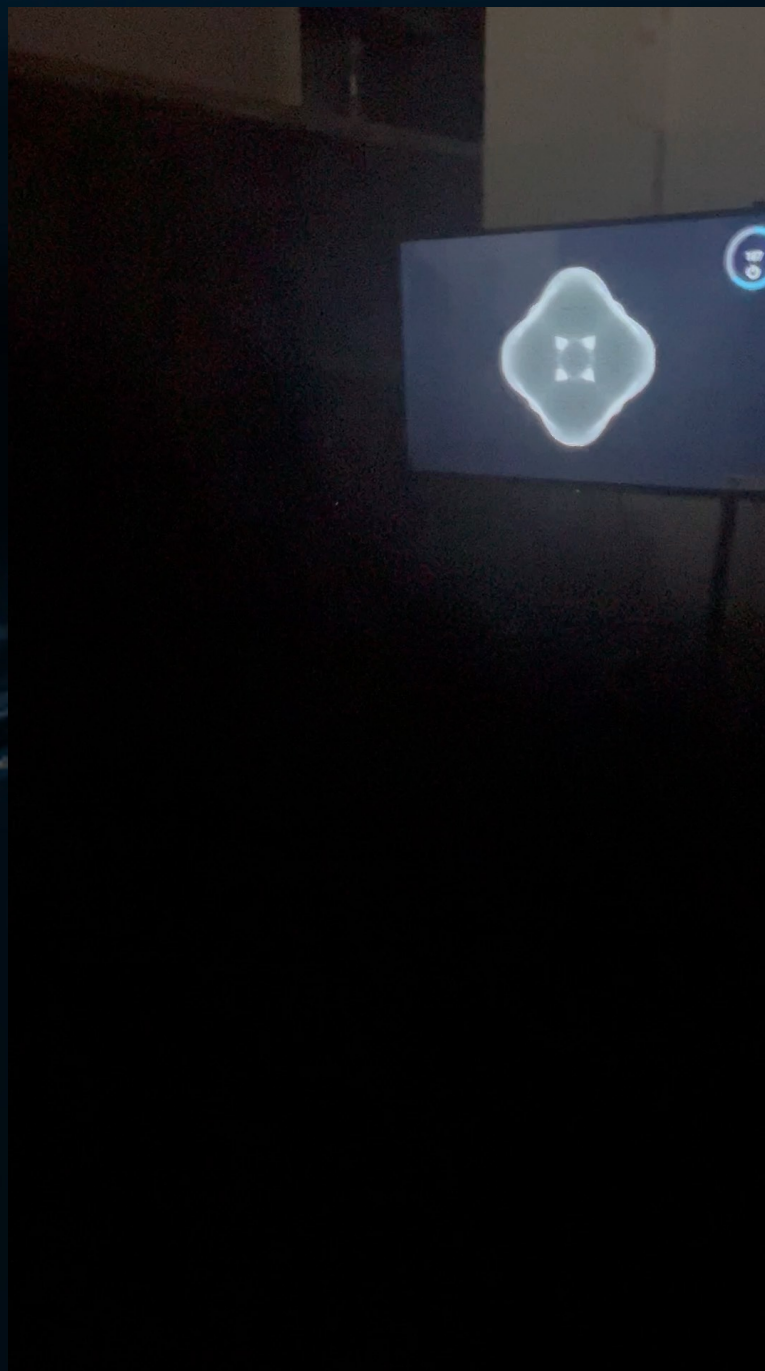
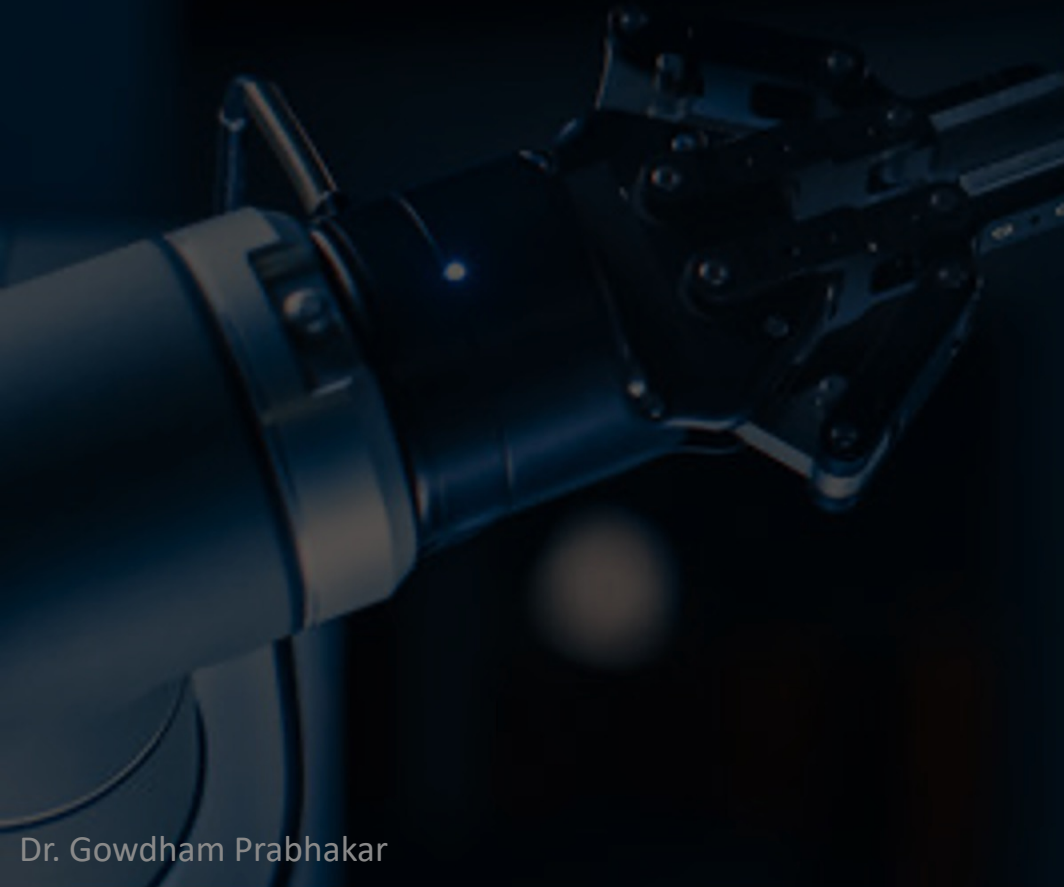
NB:

- Tracking and gesture is not same
- A body part's position or movement is tracked. From the tracked motion, we try to find or register a gesture.

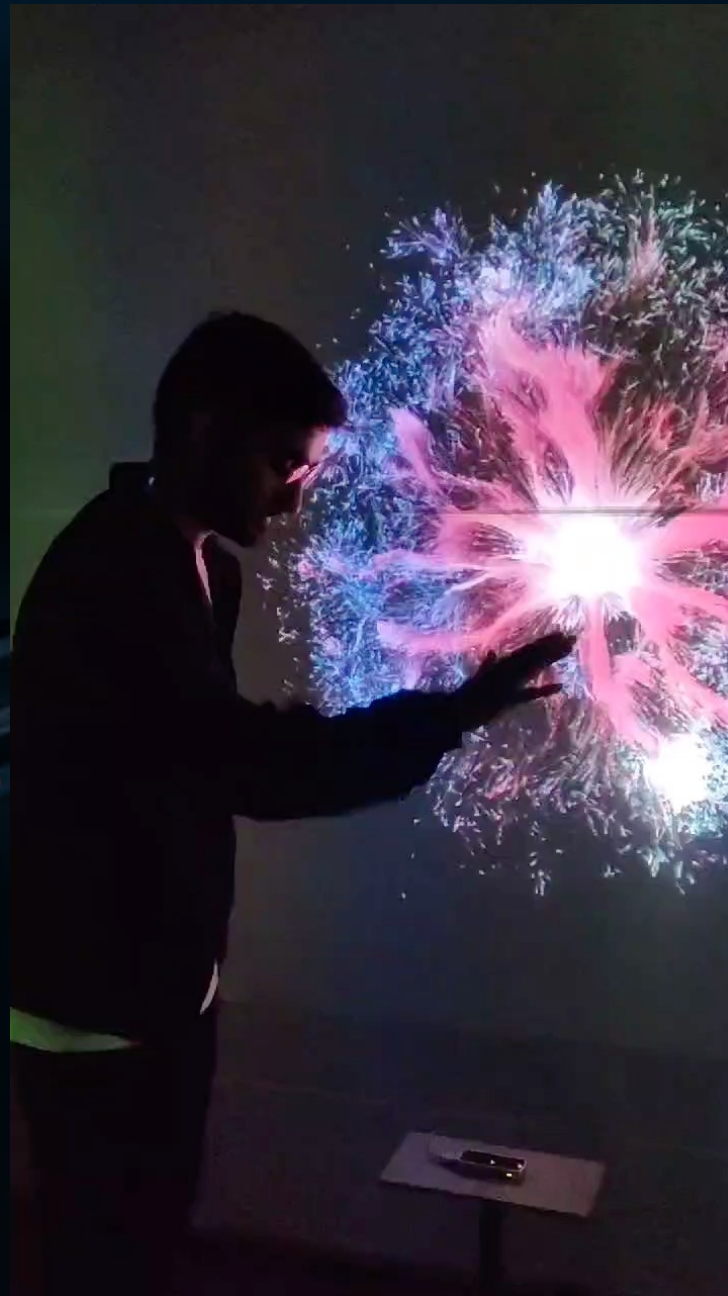
NIME Intro

Since its beginning in 2001 as a CHI workshop in Seattle, NIME brings together scientists, engineers, designers and artists around New Interfaces for Musical Expression.

Data Visualization



Data Sonification



Data physicalization



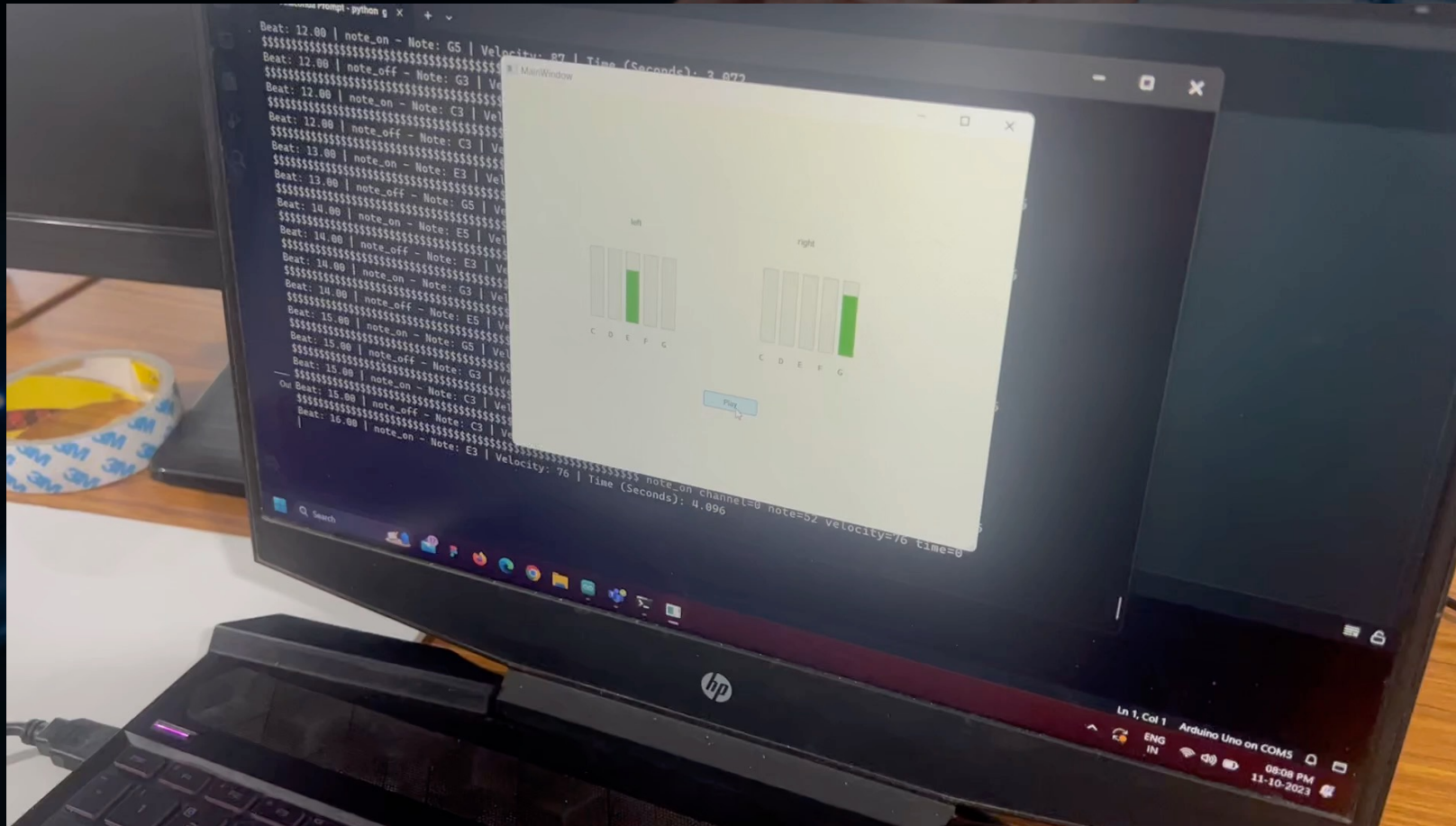
Multimodal Interaction



Tools

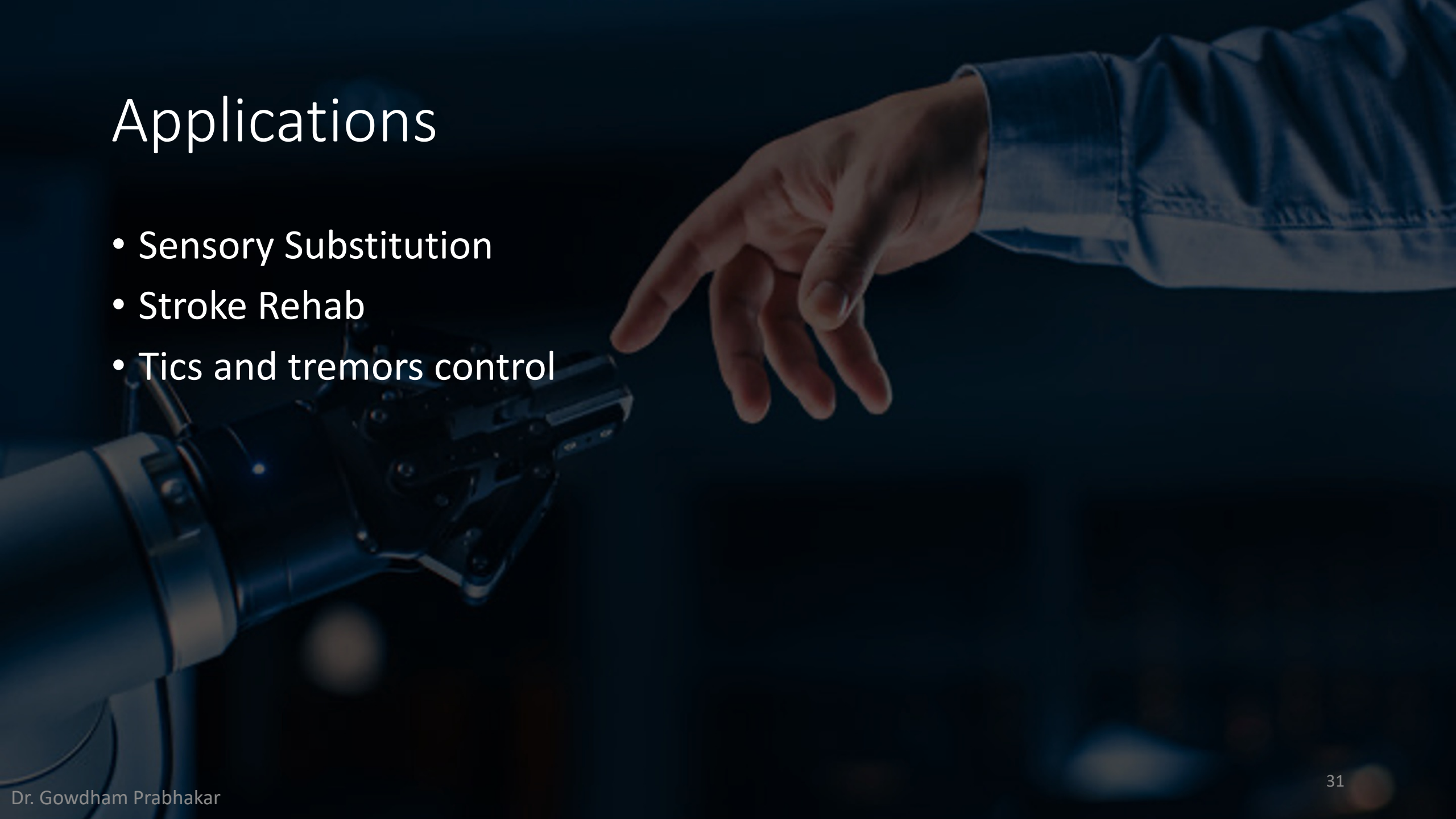
- Sensors: IMU, Kinect, LeapMoption, Mic, MIDI controller
- Actuators: Speakers, tweeters, LCD display, Projectors, LEDs, ferrofluid display
- Processing Unit: Arduino, Windows PC, Mac Studio
- Software: Logic Pro, Touch Designer

Musical Haptics

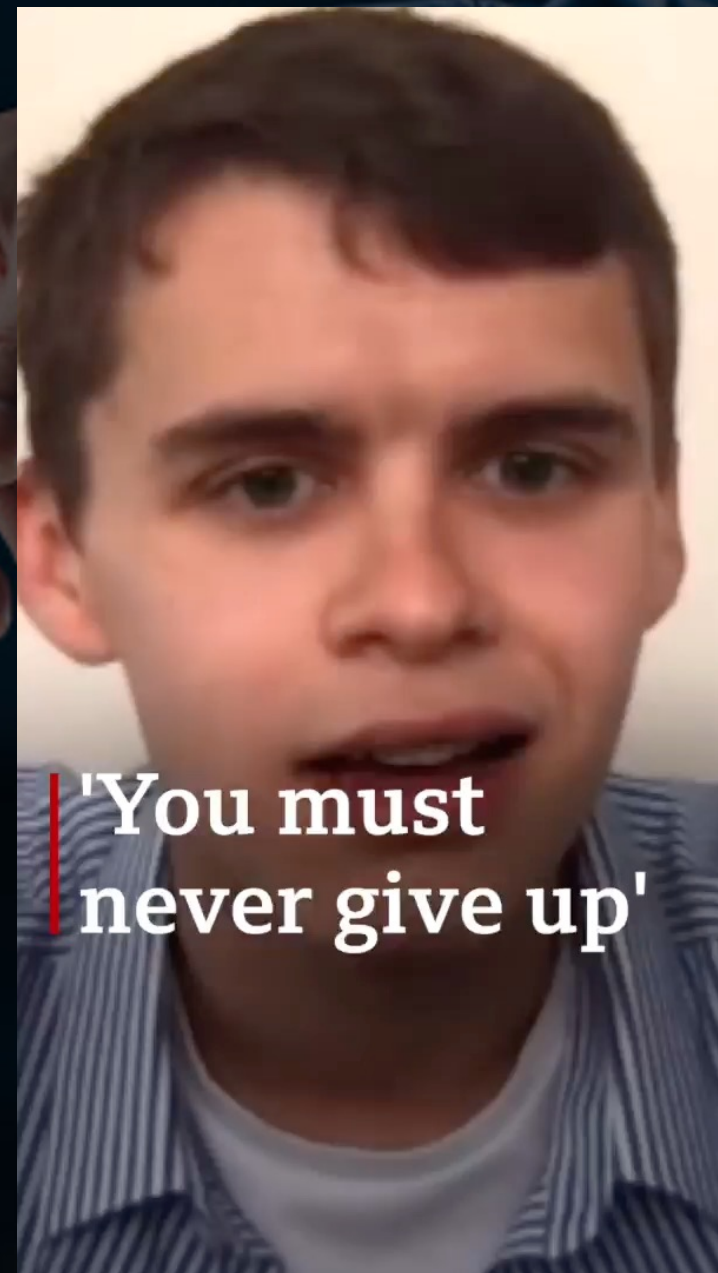


Applications

- Sensory Substitution
- Stroke Rehab
- Tics and tremors control



Tourette's syndrome



HMI Horizon

