

# HUBERT KIM

Research Scientist, Haptics

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## SKILLS

Human subject testing

Biopotential data processing

Digital signal processing

User interface design

Bare-metal programming

Adaptive control and machine learning

Psychophysics Study

## EDUCATION

### PhD,

Mechanical Engineering  
Virginia Tech, Blacksburg, VA  
Sept 2021

Dissertation: Joint Torque  
Feedback for Motion Training  
with an Elbow Exoskeleton

### BS, *cum laude*,

Mechanical Engineering  
NYU Tandon, Brooklyn, NY  
May 2015

## SUMMARY

A haptic researcher with specialties in human experiments, mechatronics, and signal processing. Seeks to join research/engineering team with project-driven environment to improve human and robot perception. Competent in:

- **Designing and executing human subject research** with analytical tools resulting in two journal articles
- **Developing concepts into prototypes** with manufacturing and programming skills resulting in open-sourced publication
- **Solving problems in frequency-domain** with signal processing skill, contributing to one peer-reviewed journal and four coauthored papers

## RESEARCH INTERESTS

- Human Intent Recognition
- Haptic Perception and Rendering
- Wearables

## AREAS OF EXPERTISE

### Human-centered Research

Gained as PhD Researcher | *Assistive Robotics Laboratory at Virginia Tech*

- Managed quantitative human subject studies to discover human perceptual threshold when wearing exoskeleton, as described in paper in *Scientific Reports*
- Oversaw design iterations of adaptive User Interface to measure kinesthetic perception resulting in 2020 ICRA conference presentation
- Analyzed user data resulting in discovery of active human joint stiffness, as evidenced by journal paper in *IEEE Access*.

### Mechatronic Product Development

Gained as PhD Researcher | *Assistive Robotics Laboratory at Virginia Tech*

- Led Arm Haptic Feedback Team with rapid prototyping and embedded programming as evidenced by open-source paper, *HardwareX*
- Collaborated with motor expert to solve Initial Pose Detection problem of Brushless DC motor as exhibited in *HardwareX*
- Mentored two professionals in mechatronics topics and advised two senior design teams, including team that participated in 2019 Cornell Cup Robotics

### Modeling and Simulation of Physical Human-robot Interaction

Gained as PhD Researcher | *Assistive Robotics Laboratory at Virginia Tech*

- Operated project assessing physical Human-Robot Interaction via control design technique ending with poster presentation at 2016 IROS conference
- Carried out system identification of wearables as demonstrated by development of impedance controller in poster

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## TECHNICAL SKILLS

Embedded Programming  
(C/C++ via CCStudio):

- UART/ I2C/ CAN
- Oscilloscopes/ logic analyzers

Data Acquisition and  
Simulation:

- MATLAB/LabVIEW

3D CAD:

- NX/SolidWorks

Statistics:

- JMP
- SPSS

Data Processing with NN:

- Python
- Tensorflow (Jupyter)

Physiological Sensors:

- EMG/IMU

## HONORS

Doctoral Scholarship

ICTAS, Virginia Tech

March 2016–July 2020

Best Mechanical Engineering  
Experience Award for  
Undergraduate

NYU Tandon

May 2015

## OTHER ACTIVITIES

- Basketball
- Weightlifting
- Reading Science Fiction
- NCEES: FE, NY, 2015

## AREAS OF EXPERTISE *continued*

### Signal Processing and Analysis

Gained as Undergraduate Researcher | *Dynamic System Laboratory at NYU*

- Conducted transfer function identification of smart material that led to validating physics-based model in energy harvesting field
- Performed impedance analysis on the smart materials to characterize the material's electro/mechanical properties using potentiostat ending with a journal from J. of Intell Mater Syst Struct
- Configured custom and off-shelf data acquisition systems leading to four journal publications and resulting in ICTAS funding (four-plus-year scholarship) for doctoral study

## SELECTED PUBLICATIONS

The Effects of Torque Magnitude and Stiffness in Arm Guidance through Joint Torque Feedback

Kim, H., Asbeck, A. [Under review]

- 2022
- [IEEE Access](#)

Just Noticeable Differences for Elbow Joint Torque Feedback

Kim, H., Asbeck, A.

- 2021
- [Scientific Report](#)

An Elbow Exoskeleton for Haptic Feedback Made with a Direct Drive Hobby Motor

Kim, H., Asbeck, A.

- 2020
- [HardwareX](#)

Just Noticeable Differences for Joint Torque Feedback During Static Poses

Kim, H., Guo, H., Asbeck, A.

- 2020
- [ICRA](#)

Voltage Attenuation along the Electrodes of Ionic Polymer Metal Composites

Kim, H., Cha, Y., Porfiri, M.

- 2016
- [Journal of Intell Mater Syst Struct](#)

## SCHOLARLY REVIEWS

Machine Learning Model Comparisons of User Independent & Dependent Intent Recognition Systems for Powered Prostheses

- 2020
- [IEEE Robotics and Automation](#)

Probabilistic Model-based Learning Control for Task-oriented Intention-driven Training with Soft Rehabilitation Robots

- 2020
- [Transactions on Mechatronics](#)