

# Kinjal Shah

☎ (908) 315 6945 • ✉ kshah31@jhu.edu • 🌐 kinjshah.com

## Education

### Johns Hopkins University, M.S.E. in Robotics

Baltimore, MD

Laboratory for Computational Sensing and Robotics, Whiting School of Engineering | GPA: 3.86

2019-2021

- Masters Thesis: Cognitive Load Aware User Interfaces for Mixed Reality Environments
- Research Interests: AI for Social Good, AR/VR, Accessibility, Human-AI Interfaces, Haptics
- Relevant coursework: Augmented Reality, Haptic Interface Design, Machine Learning, Deep Learning, Human Computer Interaction, Computer Integrated Surgery, Algorithms for Sensor Based Robotics

### University of Pennsylvania, B.S.E. in Bioengineering

Philadelphia, PA

School of Engineering and Applied Science | *Magna Cum Laude*

2012-2016

- Relevant coursework: Brain Computer Interfaces, Bioengineering Modeling and Design, Biomicrofluidics

### The Wharton School, B.S. in Economics

Philadelphia, PA

Concentration in Operations, Information, and Decisions | *Magna Cum Laude*

2012-2016

- Relevant coursework: Product Design, Venture Capital, Healthcare Policy, Decision Processes

## Research Experience

### Cognitive Load Aware User Interfaces for Mixed Reality Environments

Baltimore, MD

Thesis Advisor: Professor Mathias Unberath

July 2020-Present

*Accepted to Women in Machine Learning (WiML) Workshop 2020 - Poster Presentation*

- Designing causal models to enable detection of cognitive state changes via pupil tracking *in-the-wild*
- Developing workload aware intelligent agents for mixed reality applications using human-centered design process
- Creating dataset capturing eye motion under varying environmental conditions and cognitive demand

### Automated Point-of-Care Pancreatic Cancer Diagnostic

Philadelphia, PA

Research Advisor: Professor David Issadore

Aug 2015-May 2016

*Bioengineering Senior Design Award, First Honorable Mention – SEAS Senior Design Competition*

- Detected pancreatic cancer cell derived exosomes from human serum at concentrations modeling precancerous stages by developing an automated, microfluidics based point-of-care diagnostic device
- Created automated, cost-effective, on-chip serum processing and diagnosis protocol involving 3D printed encasing designed using SolidWorks, Arduino based microcontroller, and image processing using MATLAB

## Engineering Projects

### Early fall detection from video using 3D-CNNs

Baltimore, MD

*Winner of Intuitive Surgical Best Project Award*

Nov 2020-Present

- Adapted 3D-ResNet architecture to perform frame wise classification of falls using temporal information from video feed
- Implemented transfer learning approach using model pretrained on Kinetics-700 action recognition dataset and performed supervised fine-tuning on fall datasets

### Intraoperative Guidance of Orthopaedic Instruments

Baltimore, MD

*Accepted to SPIE Medical Imaging 2021*

Jan 2020-June 2020

- Implemented and evaluated performance of U-Net and Mask R-CNN architectures for guidewire detection task
- Designed simulated dataset generation pipeline enabling generalization to clinical images with 87% recall and 90% precision

### Haptic Feedback for Upper Limb Motion Guidance

Baltimore, MD

*Accepted to 2020 Haptics Symposium Work-in-Progress Track*

Sep 2019-Jan 2020

- Developed wearable device prototype to enable motion guidance for rehabilitation through cutaneous haptic feedback
- Designed velocity tracking and haptic feedback algorithm to control two vibration motors via a Raspberry Pi based on inertial measurement unit (IMU) data in Python

## Open Source Initiatives

### COVID-19 United States County-level Dataset

[https://github.com/JieYingWu/COVID-19\\_US\\_County-level\\_Summaries](https://github.com/JieYingWu/COVID-19_US_County-level_Summaries)

*Winner of Kaggle COVID-19 Dataset Award*

## Work Experience

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### Johns Hopkins University

Baltimore, MD

Teaching Assistant: Haptic Interface Design for Human-Robot Interaction

Fall 2020

- Conducted office hours, graded assignments, and supported first online delivery of course
- Mentored 33 students in completion of final projects

### Accenture

Philadelphia, PA

Life Sciences Consultant (2018-19), Senior Analyst (2017-18), Analyst (2016-17)

2016-2019

- Designed R&D technology strategy road-map for transformation initiative at a global biotechnology company
- Managed clinical cloud implementation from strategy definition through launch involving future state design, requirements gathering, user acceptance testing, and change management
- Assessed merger and acquisition options for client facing loss of patent protection on key revenue generator

## Poster Presentations

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*Causal model for cognitive load estimation in mixed-reality environments*

**Kinjal Shah**, Wenhao Gu, Mathias Unberath

Women in Machine Learning (WiML) 2020 - Poster

## Publications

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*Intraoperative Guidance of Orthopaedic Instruments Using 3D Correspondence of 2D Object Instance Segmentations*

Irina Bataeva, **Kinjal Shah**, Rohan Vijayan, Runze Han, Niral Sheth, Gerhard Kleinszig, Sebastian Vogt, Greg Osgood, Jeffrey H. Siewerdsen, Ali Uneri

SPIE Medical Imaging 2021

*Feasibility of Image-based Augmented Reality Guidance of Total Shoulder Arthroplasty Using Microsoft HoloLens 1*

Wenhao Gu, **Kinjal Shah**, Jonathan Knopf, Nassir Navab, Mathias Unberath

**Outstanding Paper Award**

MICCAI 2020 Joint Workshop on Augmented Environments for Computer-Assisted Interventions

Journal of Computer Methods in Biomechanics and Biomedical Engineering: Imaging & Visualization

*A County-level Dataset for Informing the United States' Response to COVID-19*

Benjamin D. Killeen, Jie Ying Wu, **Kinjal Shah**, Anna Zapaishchykova, Philipp Nikutta, Aniruddha Tamhane, Shreya Chakraborty, Jinchi Wei, Tiger Gao, Mareike Thies, Mathias Unberath

[https://github.com/JieYingWu/COVID-19\\_US\\_County-level\\_Summaries](https://github.com/JieYingWu/COVID-19_US_County-level_Summaries)

<https://arxiv.org/pdf/2004.00756.pdf>

*Proposing a framework for evaluating haptic feedback as a modality for velocity guidance*

**Kinjal Shah\***, Shweta Ravichandar\*, Jeremy D. Brown

Haptics Symposium 2020: Work-in-Progress Track

## Honors and Awards

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Intuitive Surgical Best Project Award

2020

MICCAI 2020 Student Participation Award

2020

Computer-Integrated Surgical Systems and Technology Project Award

2020

LCSR Faculty Scholarship

2019-2021

Ruhr Fellowship

2014

Advancing Women in Engineering Research Scholar

2013

## Skills

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- Programming: Python, C++/C#, MATLAB, Arduino
- Mixed Reality: Unity, Microsoft HoloLens, Pupil Core
- Machine Learning Libraries: PyTorch, TensorFlow, OpenCV
- CAD: SolidWorks, 3D Printing