

# Kinjal Shah

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## EDUCATION

- Johns Hopkins University**, MSE in Robotics | GPA: 3.87 May 2021  
Thesis: Enabling Cognitive Load Aware User Interfaces for Mixed Reality
- University of Pennsylvania**, Dual Degree Program | *Magna Cum Laude* | GPA: 3.67 Aug 2016  
**School of Engineering and Applied Science**, BSE in Bioengineering  
**The Wharton School**, BS in Economics

## WORK EXPERIENCE

- Johns Hopkins University | Course and Teaching Assistant** Baltimore, MD | Aug 2020-May 2021  
**Deep Learning** (Spring 2021), **Haptic Interface Design for Human-Robot Interaction** (Fall 2020)  
• Hosted office hours, graded assignments, and supported development of online course materials for 100+ students  
• Advised students on final projects from project scoping through implementation, testing, and debugging
- Accenture | Life Sciences Research and Development** Philadelphia, PA | Nov 2016-Apr 2019  
**Consultant** (2018-19), **Senior Analyst** (2017-18), **Analyst** (2016-17)  
• 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 Fortune 500 client facing loss of patent protection on key revenue generator
- Goldman Sachs | Cross Divisional Product Management Intern** Jersey City, NJ | May-Aug 2015  
• Managed merger of 2 internal clearing brokers requiring technology impact assessments, regulatory review, and user testing
- ThoughtTac | Market Research Lead** Philadelphia, PA | Jan-April 2015  
• Developed mobile health application prototype to deliver data driven personalized care to patients with schizophrenia

## RESEARCH EXPERIENCE

- Enabling Cognitive Load Aware User Interfaces for Mixed Reality** Baltimore, MD | Jul 2020-Present  
Thesis Advisor: Professor Mathias Unberath  
*Accepted to Women in Machine Learning (WiML) Workshop 2020 - Poster Presentation*  
• Conducted literature review to identify state-of-the-art methods for cognitive load estimation  
• Developed predictive models for detection of cognitive state changes from pupillometry data in unconstrained environments  
• Built real-time signal processing pipeline for multi-sensor time series data while maintaining temporal alignment  
• Designed experimental protocols for user study to capture eye tracking data under varied light and cognitive load levels
- Open Source: COVID-19 United States County-level Dataset** Baltimore, MD | Mar-May 2020  
[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*  
• Gathered machine-readable dataset, including demographic, socioeconomic, climate, and healthcare metrics, that may affect the spread or consequences of epidemiological outbreaks
- Automated Point-of-Care Pancreatic Cancer Diagnostic** Philadelphia, PA | Aug 2015-May 2016  
Research Advisor: Professor David Issadore  
*Bioengineering Senior Design Award, First Honorable Mention – SEAS Senior Design Competition*  
• Developed on-chip diagnostic protocol to detect pancreatic cancer cell derived exosomes at precancerous concentrations  
• Created control system with Arduino, image processing platform with MATLAB, and 3D printed encasing with SolidWorks

## SKILLS

- **Programming and Embedded Systems:** Python, C++, C#, MATLAB, Arduino, Raspberry PI, Git
- **Mixed Reality:** Unity, Microsoft HoloLens, Pupil Core, Human-AI Interfaces, Human Subjects Research, Haptic Interfaces
- **Machine Learning Libraries:** PyTorch, TensorFlow, OpenCV
- **Relevant Coursework:** Human Computer Interaction, Augmented Reality, Haptic Interface Design, Algorithms for Sensor Based Robotics, Deep Learning, Brain Computer Interfaces, Product Design, Venture Capital, Healthcare Policy

## ENGINEERING PROJECTS

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### Early Fall Detection from Video Using 3D-CNNs

Baltimore, MD | Nov-Dec 2020

*Winner of Intuitive Surgical Best Project Award*

- Automated fall detection dataset generation using natural language descriptions to filter falls from 20000+ action videos
- Implemented transfer learning using 3D-ResNet action recognition model with supervised fine-tuning on fall datasets
- Developed video-processing engine combining neural 3D-pose estimation and optical flow analysis to determine fall speed

### Intraoperative Guidance of Orthopaedic Instruments

Baltimore, MD | Jan-Jun 2020

*Accepted to SPIE Medical Imaging 2021*

- Implemented and evaluated performance of U-Net and Mask R-CNN architectures for surgical guidewire detection
- 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 | Sep 2019-Feb 2020

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

- Developed wearable device prototype to enable motion guidance for rehabilitation through cutaneous haptic feedback
- Designed haptic feedback algorithm to stimulate vibration motors via a Raspberry Pi in response to IMU sensor data

### Cockroach-Machine-Interface: Prosthesis Model

Philadelphia, PA | Apr 2015

- Built modulation circuit to receive human motion and deliver stimuli to a cockroach leg causing the firing of action potentials
- Programmed signal processing algorithm in MATLAB to convert human motion into target frequencies

## 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://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

AE-CAI Outstanding Paper Award

2020

Computer-Integrated Surgical Systems and Technology Project Award

2020

LCSR Faculty Scholarship

2019-2021

Bioengineering Senior Design Award

2016

Ruhr Fellowship

2014

Advancing Women in Engineering Research Scholar

2013