# Juan P Wachs, Ph.D.

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## Current Position:

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| 2020-present | James H. and Barbara H. Greene Professor, Edwardson School of Industrial Engineering, Purdue University |

## Education:

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| **B.Ed.Tech** (1995) | Electronics Education, ORT Academic College, Jerusalem, Israel, *Cum Laude* |
| **M.Sc** (2003) | Industrial Engineering and Management, Information Systems, Ben -Gurion University of the Negev, Israel; Advisors: Prof. Helman Stern and Prof. Yael Edan, *Magna Cum Laude. Thesis: Optimal Hand Gesture Vocabulary Design Methodology for Virtual Robotic Control* |
| **Ph.D.** (2008) | Industrial Engineering and Management, Intelligent Systems, Systems, Ben -Gurion University of the Negev, Israel ; Advisors: Prof. Helman Stern and Prof. Yael Edan, *Thesis: Optimal Hand Gesture Vocabulary Design Methodology for Virtual Robotic Control* |
| **Postdoctoral** (2007-2008) | Institute of Agricultural Engineering, Volcani Center, Ben-Gurion University of the Negev, Israel; *Developed computer vision and image processing algorithms for the detection of apples in canopies using multispectrial imaging*. *under the guidance of Dr. Victor Alchanti*. |
| **Postdoctoral** (2008-2009) | *Naval Postgraduate School, MOVES Institute, National Research Council Postdoctoral Fellowship, Monterey, CA; Developed computer vision and image processing algorithms for the detection and recognition of human poses, and tracking methods for UAVs. Under the guidance id Dr. Mathias Kolsch* |

## Academic Appointments:

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| 2009-2015 | Assistant Professor: Industrial Engineering, College of Engineering, Purdue University |
| 2015-2020 | Associate Professor, School of Industrial Engineering, College of Engineering, Purdue University |
| 2020-2024 | Full Professor, School of Industrial Engineering, College of Engineering, Purdue University |

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| 2024-2025 | James H. and Barbara H. Greene Professor, Edwardson School of Industrial Engineering, College of Engineering, Purdue University |

## Other Professional Positions:

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| 2004-2005 | Informatics Fellow. Washington Hospital Center, Washington, DC Institute for Medical Informatics, IMI. *Studied and developed the first touchless hand gesture interface for the Operating Room (Gestix), under the guidance of Dr. Craig Feied.* |
| 2018-Current | Adjunct Professor of Surgery, Indiana University, School of Medicine. *Collaborated with Chandru Sundaram in research projects involving the Da-Vinci Surgical Robot.* |
| 2021-2024 | Program Director, CISE/ IIS/ RI<br>National Science Foundation. *Co-chaired the Foundational Research in Robotics program. Assisted with programs such as Smart Health in the AI Era, AI Institutes and Computational Neuroscience.* |
| 2023-Current | Adjunct Professor, Computational Sensing and Robotics (LCSR), Whiting School of Engineering, Johns Hopkins University<br>*Collaborated with Peter Kazanzides in surgical robotics related projects.* |

## Honors, special recognitions and awards:

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| 2008 | National Research Council (NRC) Associateship Program Award, National Academies of Sciences. |
| 2013 | 2013 AFOSR Young Investigator Program |
| 2015 | 2015 Helmsley Senior Scientist Fellow |
| 2016-2017 | Fulbright U.S Scholar |
| 2018-2020 | James A. and Sharon M. Tompkins Rising Star Professorship |
| 2018-2021 | Distinguished Speaker of the ACM |
| 2020 | Faculty Inventor |
| 2020 | Purdue University Faculty Scholar |
| 2011, 2015, 2017, 2018, 2020, 2021 | Finalist (IEEE SMC) and Best Paper/Poster Awards for AAAI, IRIACV, IMAWM, HFES, RO-MAN and HFES. |
| 2024-Current | James H. and Barbara H. Greene Professor |

## Links /Press:

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|---|---|
| 2005 | "How to choose grad school?" Resources, IEEE Spectrum magazine, Sept. 2005, pp: 59-62. |
| 2006 | `Gestix' in beyond tomorrow. Beyond tomorrow (Australian TV show). Stories, Episode 15, e-medicine, 2006. www.beyondtomorrow.com |
| 2008 | "Surgeons may get minority report-style display," New Scientist magazine, 16 June, 2008 |
| 2011 | "Future surgeons may use robotic nurse, 'gesture recognition,'" Purdue Featured News, ScienceDaily, Bio-Medicine, Lafayette Online |
| 2011 | James A. and Sharon M. Tompkins Rising Star Professorship |
| 2012 | "Robots and people can all get along," NPR Marketplace, Radio broadcast, and online (March 30, 2012): http://www.marketplace.org/topics/tech/robots-ate-my-job/robots-andpeople-can-all-get-along |
| 2013 | "Surgeons could use his hand-gesture system to control robots," Profile. Spectrum Magazine, 19 Aug 2013. http://spectrum.ieee.org/geeklife/profiles/profile-juan-wachs |
| 2013 | CBN News (TV), Rise of the Machines: Robots Man's Best Friend? http://www.cbn.com/cbnnews/us/2014/June/Rise-of-the-Machines-Robots-Mans-Best-Friend/ |
| 2015 | "Surgical Technology Aims to Mimic 'Teleporting'". NPR. Inside Indiana Business. Sept. 28, 2015 |
| 2018 | Purdue Team Taps Into Augmented Reality For Medical Tech. Inside Indiana Business with Gerry Dick. TV Show. October 4,2018. http://www.insideindianabusiness.com/story/39233089/purdue-teamtaps-into-augmented-reality-for-medical-tech |
| 2020 | Juan Wachs Lab Website: https://web.ics.purdue.edu/~jpwachs/ |

## Committee and Service Activities:

### ***Departmental/ Educational Committees***

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|---|---|
| 2009 | Healthcare Engineering Signature Area Committee, Purdue University |
| 2009-2011 | Industrial Engineering Graduate Recruiting Committee, Purdue University |

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| 2011-2012 | Industrial Engineering Safety Committee, Purdue University |
| 2012-2014 | Faculty Search Committee, Purdue University |
| 2013, 2016, 2018 | Safety Committee, Purdue University **– *Chair*** |
| 2016, 2018, 2019 | Healthcare Engineering Signature Area Committee, Purdue University |
| 2019 | Undergraduate Committee, Purdue University **– *Chair*** |
| 2019 | Member of the PEI Faculty Council in Biomedical Engineering |
| 2020 | Member of the Undergraduate Committee, Purdue University |
| 2020 | Member of the Faculty Search Committee |
| 2020 | Member of the IE Department Chair Search Committee |
| 2024 | Member of the IE Search Committee for Full Chaired Professor |

## ***Workshop/ Conferences Organizer***

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| 2017 | ASL4GUP International Workshop in Conjunction with the IEEE Face and Gesture Recognition Conference (FG 2017) (**Chair**) |
| 2020 | IEEE FG 2020 in Argentina in 2020 (**Co-Chair**) |
| 2023 | Organization of the MICCAI 2023 Trauma Thompson Challenge |
| 2025 | Organization of the MICCAI 2025 Trauma Thompson Challenge (expected) |

## ***Service to the Government***

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| 2021 | Program Director of Robust Intelligent/ CISE at the National Science Foundation (NSF) and National Robotics Initiative (NRI) |
| 2022-2024 | **Co-Chair** of the Foundational Research in Robotics at NSF |
| 2022-2024 | **Co-Chair** of Intelligent Robotics and Autonomous Systems – (NITRD) working group |
| 2022-2024 | Program Director at NSF supporting the AI Research Institutes Program, CRCNS 2024, and Smart Health and Biomedical Research in the Era of Artificial Intelligence and Advanced Data Science (SCH). |

***External Advisory/Steering Committees***

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| 2008 | International Technical Program Committee, 12th online World Conference on Soft Computing in Industrial Applications, 2008. |
| 2012 | Program Committee, 17th Iberoamerican Conference on Pattern Recognition, CIARP 2012, Buenos Aires, Argentina, Sept 3-6, 2012 |
| 2012 | Program Committee, Third International Workshop on Human Behavior Understanding, 2012 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2012). |
| 2013 | Program Committee, 2013 SPIE Real-Time Image and Video Processing Conference. |
| 2014 | Program Committee, The 3rd International Conference on Robot Intelligence Technology and Applications, 2014 |
| 2014 | Program Committee, European Conference on Ambient Intelligence, 2014 |
| 2017 | Program Committee, International Conference on Computer Vision (ICCV) 2017 |

## Review and Referee Work:

### Journals:

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| 2013-2016 | Associate Editor of the Journal of Real-Time Image Processing |
| 2013-Present | Associate Editor for IEEE Transactions on Human-Machine Systems |
| 2016-Present | Associate Editor for Associate Editor for Frontiers in Robotics and AI |

### Ad Hoc Peer Review:

IEEE Systems, Man and Cybernetics Journals (Part A, B and C), International Journal of Automation in Construction, Computers in Biology and Medicine, Applied Ergonomics, Biosystem Engineering, Communications of the ACM, ACM CHI 2012, CIARP 2012, HBU 2012, ICRA 2012, IEEE Transactions on Circuits and Systems for Video Technology, Image and Vision Computing, International Journal of Neural Systems, Special Issue JRTIP, PloS One, Pattern Recognition, Pattern Recognition Letters, Artificial Intelligence in Medicine, Behavior Research Methods, Computer Supported Cooperative Work, Human Computer Interaction, Image and Vision, Machine Vision and Applications. Pattern Recognition, The Visual Computer, IEEE Transactions on Human-Machine Systems, Human Factors, UbiComp 2015, Frontiers in

Robotics and AI, International Journal of Robotics Research, International Journal of Medical Informatics, IEEE Access, Computers in Biology and Medicine, IEEE Transactions on Neural Networks and Learning Systems, Transactions on Computer-Human Interaction, Science Robotics, Psychopathology, Neural Networks, IEEE Transactions on Artificial Intelligence, AAAI, CVPR, Medical Image Analysis, Computer Vision and Image Understanding, International Journal of Computer Assisted Radiology and Surgery, Nature Communications, Scientific Reports, International Wound Journal.

## ***Grant Review:***

### ***International Grant Review***

2013 The United States – Israel Binational Agricultural Research and Development Fund

2015 Joint Research Proposal between the Austrian Science Fund (FWF) and the National Natural Science Foundation of China (NSFC) in the interdisciplinary field of Medical Image Processing

2018 United States – Israel Binational Science Foundation

2019 Canadian Institutes of Health Research - NSERC

### ***Federal Review Panels***

2010 NSF – RAPD Program - *Panelist*

2010 NSF IGERT Program - *Panelist*

2012 NSF National Robotics Initiative (NRI) program - *Panelist*

2013 NSF National Robotics Initiative (NRI) program - *Panelist*

2013 AFOSR Air Force Office of Scientific Research – *Ad-Hoc Reviewer*

2014 AFOSR Air Force Office of Scientific Research – *Ad-Hoc Reviewer*

2017 NSF National Robotics Initiative (NRI) program - *Panelist*

2019 NSF Partnerships for Innovation (PFI) program - *Panelist*

2020 NSF Partnerships for Innovation (PFI) program - *Panelist*

2020 NSF Center Site Visit (STC Program ) - *Panelist*

2020 NSF Future of Work prog – HTF program - *Panelist*

2022 Department of Transportation (DOT) – *Ad-Hoc Reviewer*

2023 ARPA-H – *Ad-Hoc Reviewer*

2024 NSF Foundational Research in Robotics-NRI PI Meeting 2024 – *Ad-Hoc Reviewer*

## Invited Lectures and Presentations:

### ***International:***

2010 Health and Vision. Universidad de Buenos Aires (UBA). Computer Vision Seminar, Argentina

2011 Surgical robotics and human-robot interaction. Intelligent Systems Weekly Seminar, Ben-Gurion University, Israel.

2012 Surgical robotics and human robot interaction. The William Davidson Faculty of Industrial Engineering and Management. Bi-weekly Faculty Workshop Technion, Israel

2012 Robot, pass me the scissors! How robots can assist us in the Operating Room. 17th Iberoamerican Conference on Pattern Recognition, CIARP 2012, Buenos Aires, Argentina. **Keynote Speaker**

2013 Gestures in the Operating Room- Can Save Lives. Body Tracking in Healthcare. Microsoft Research Symposium, UK, Nov.14-Nov-17, 2013. **Plenary Speaker**.

2015 Embodied Interaction in Healthcare New Opportunities for Old Challenges. Ben- Gurion University of the Negev, ABC Robotics Seminar, June, 29, Israel.

2015 IE for the Benefit of Society: A Non Traditional Take on Assistive Technologies. Universidad del Norte, Barranquilla, Colombia, July, 31. University Seminar. **Plenary Speaker**.

2016 Gist of a Gest: Can Machines Recognize “Almost” Spontaneous Gestures? , Universidad de Buenos Aires, Argentina, Sept. 14. Department Seminar

2016 El CYBERTOUCH: Humanos y Maquinas Colaborando en el Quirofano, Instituto Tecnologico de Buenos Aires (ITBA), Buenos Aires, November 23.

2017 Cybernetic Solutions to Remote Trauma Care. Hamlyn Symposium. British Geographic Society, London, UK, 2019. June 25. Invited Speaker.

2019 Robots without Borders: “A Brave New World in Healthcare Robotics“. Rambam. Healthcare Campus department of Obstetrics and Gynecology in Haifa, Israel, Oct. 10. Department Seminar.

2019 Towards Learning from Nothing: Paving the way for Ever Learning Machines. Technion, Haifa, Israel, Oct. 8. Department Seminar.

2020 “Challenges of Computer Vision in Medical Robotics”, Jul 9, 2020 at “SARAS endoscopic vision challenge for surgeon action detection (SARAS-ESAD 2020)”. **Keynote Speaker (over zoom)**

2021 "Is Wisdom in our hands? What gestures tell about our intentions?"

ACM DSP, 2021 at Bharati Vidyapeeth's College of Engineering, New Delhi, March 2021. **ACM Distinguish Speaker Series**

2022 "Bridging Fingers Gestures for Knowledge Gain." 2022. 12th International Workshop on Human Behavior Understanding (HBU) Held in conjunction with ICPR 2022, **Keynote**.

2022 University of Winchester, UK "Immersive Robotics and the Curse of Sterility.", Apr. 29, 2022. Psychology Department Seminar. United Kingdom, Invited Speaker

2023 "Gore Robots: From Blood and Guts to Bits and Bytes" at the University of British Columbia, Centre for Artificial Intelligence Decision-making and Action (CAIDA) Seminar, October 11. Canada, Invited Speaker

2024 Gore Bots: From Blood and Guts to Bits and Bytes. Mechanical Engineering Seminar, University of Toronto, Mar 24, 2024. Canada, Invited Speaker

## ***Regional/National:***

2012 Gestonurse: A Robotic Surgical Assistant. Invited Technical Sketch. The 7th ACM/IEEE International Conference on Human Robot Interaction (HRI 2012). March 5-8, 2012, Boston, Massachusetts. **Invited Speaker**

2012 Should robots work with us in the Operating Room?" IEEE Southeastern Michigan Spring Section Conference. Robotics and Automation Society. April 10, 2012, Dearborn, Michigan. **Plenary Speaker**

2013 Don't Give Knives to Robots: an Old-New Era in Surgical Robotics. 5th Annual Computational Science and Engineering Student Conference 2013. **Keynote.**

2015 A Transparent Display for Surgical Telementoring in Austere Environments. Military Health System Research Symposium. (MHSRS), Florida, 2015. **Speaker**

2018 Workload Assessment in Robot Assisted Surgery. 2018 Intuitive Surgical Research Symposium, January 19, 2018. Sunnyvale, CA. **Speaker**

2018 Telementoring using the STAR system – Teleporting Surgical Expertise. The Future VR/AR Network – Towards Virtual Human/Object Teleportation – NSF Vision Workshop on Networked Virtual and Augmented Reality Communications Workshop, Arlington, Virginia, April 23. **Speaker**

2018 Teleproctoring with Mixed Reality: A Comparative Evaluation in the Context of Lower-Limb Fasciotomies. Accepted as oral at the Military Health System Research Symposium. August 22 2018, Kissimmee, Florida. **Speaker**

2020 Presentation at the DVRK meeting at Surgical Intuitive: "POWER: Physiological and Objective Workload Estimation in Real-time". Jun 30, 2020.

2020 Presentation at the 5G-JBSA National Spectrum Consortium “Robot, pass me the scalpel! New Challenges for Surgical Robots” (virtual). Oct. 1, 2020.

2021 Talk at ErgoX Symposium HFES. Immersive Robotics and the Curse of Sterility. Nov 9, 2021. **Speaker**

2022 IEEE/ACM international conference on Connected Health: Applications, Systems “Disasters and Wartime Influences in Cyber-Healthcare.” and Engineering Technologies (CHASE) CHASE ’22, Nov 21, 2022. Dec 19, 2022. **Keynote.**

2022 ASAP: A Semi-Autonomous Precise robotic framework for remote surgery under delays. (oral). Military Health System Research Symposium (MHSRS), 12-15 September, Kissimmee, FL. **Speaker**

## ***University/Institute Invited Seminars/Symposia:***

2008 Hand Gesture Interaction for Healthcare Computer Science Department Seminar, Naval Postgraduate School, Monterey, CA, Feb 21, 2008.

2011 “What to Expect Your First Year!" New Faculty Orientation, Purdue University, Aug. 16, 2011.

2014 Hand Gesture Interaction for Healthcare - A New Challenge. IU School of Informatics and Computing. SOIC Colloquia. February 7, 2014.

2015 Wisdom in Our Fingers—Or How Embodied Interaction Can Shape Future Work. Dawn or Doom 2 Conference. Purdue University, Sept, 24, 2015.

2016 Wisdom in our fingers. **TEDx,** Purdue University, April 6, 2016.

2016 Wisdom in our Hands. **Mandela Washington Fellowship**, Purdue University, June 28, 2016

2017 Augmenting Physical Action with Gaming Technologies: A Brave New World in Healthcare. Che 461- Chemical Engineering Class, Purdue. Oct. 18, 2017.

2018 Augmenting Physical Action with Robotic Technologies: A Brave New World in Healthcare. IE Welcome Graduate Students Orientation. August 16, 2018.

2019 Robots without Borders: “A Brave New World in Healthcare Robotics“. BME Seminar Series, Purdue University, Jan 9, 2019.

2019 Towards Lifelong Learning Machines (L2L): How can zero shot learning lead to L2L ? . Statistics Colloquium Series, Purdue University, Sept 6, 2019

2020 The Cyber Touch: Empowering Medical Robots Through Gestures. University of Colorado, Denver. May 11, 2020 (virtual).

2020 "Rising to the Challenge" : The Future of Robotics & Healthcare. "Robot, pass me the scalpel! New Challenges for Surgical Robots" Talk at Purdue Series Sept. 29, 2020 (virtual).

2021 Computer Science and Engineering Seminar. Immersive Robotics and the Curse of Sterility. University of Virginia. Oct. 19, 2021.

2022 "Can Machined Learn with No Data", University of Florida. Nov 4, 2022.

2023 "Gore Robots: From Blood and Guts to Bits and Bytes" Johns Hopkins University, Baltimore, Maryland, LCSR Seminar, April 16, 2023

2023 "Gore Robots: From Blood and Guts to Bits and Bytes" at the University of Massachusetts, Boston, CS Seminar, April 18, 2023

2023 "Gore Robots: From Blood and Guts to Bits and Bytes" at the University of Maryland, The Institute for Systems Research, September 15, 2023.

2024 Gore Bots: From Blood and Guts to Bits and Bytes. Systems Engineering Seminar, University of Virginia, May 28, 2024.

2024 The Algorithmic Abyss: Exploring Autonomy without Robotic Horror. CS Seminar, University of Southern California, Oct. 23, 2024.

2024 The Algorithmic Abyss: Exploring Autonomy without AI Horror. IE Seminar. The Algorithmic Abyss: Exploring Autonomy without AI Horror. University of Wisconsin, Madison. Dec 16, 2024.

## ***Invited Extramural Lectures and Visiting Professorships:***

2012 Visiting Researcher. Air Force Research Laboratory, Rome (AFRL), New York.

2015 See-What-I-Do: Increasing mentor and trainee sense of co-presence in trauma surgeries with the STAR platform. August, 10, 2015. US Army Medical Research and Materiel Command (USAMRMC), Joint Program Committee (JPC-1). Fort Detrick, Maryland.

2017 Learning from Nothing: What One Shot Can Tell Us About Zero Shot Learning? AFOSR Young Investigators and YIP. Nov. 14, 2017.

2016 Visiting Professor. Universidad de Buenos Aires (UBA), Buenos Aires, Argentina

2018 See-What-I-Do: Increasing mentor and trainee sense of co-presence in trauma surgeries with the STAR platform. JPC-1. Medical Simulation Program Review. Department of Defense. TATRC. Feb 7, 2018.

2020 National Robotics Initiative Meeting: “Fingers See Things Differently (FIST-D): A Robotic Explosive Ordnance Disposal (EOD) based on Augmented Tactile Imaging”. National Science Foundation.. Feb 26, 2020.

2021 Talk at NSF Intelligent Information System Division. “Immersive Robotics and the Curse of Sterility.", Jan 15, 2021.

2021 Talk at DARPA I2O. Singularity Observational Learning (SOL). Oct. 24, 2021.

2021 Talk a the Agency of Healthcare Research and Quality “GestureClean: A Touchless Interaction Language for the Operating Room”, Dec. 29, 2021.

2024 “Can Machines Learn with No Data? One Step Towards Human-Like Learning”, U.S. Food and Drug Administration, Feb. 5, 2024.

### ***Community Outreach:***

2010 SPIRIT program, in which students from the Sunnyside Middle School visited the ISAT Lab during July 2010 and had “hands-on” experience with visual object oriented programming of our humanoid NAO.

2012 Presentation and discussion with ORT high school students in Buenos Aires, Argentina. Sept 3-6, 2012.

2014 Demos and interactive sessions with robots were offered to the 10th annual Boilermaker FIRST Robotics Regional. FIRST is an international high school robotics program whose mission is to inspire youth to pursue careers in the fields of science and technology.

2013-2016-2018 Visit of pre-scholar kids from the Patty Jischke Early Care and Education Center, to the ISAT lab where the children experienced playing with robotic arms and humanoids and learned about how robots can improve people’s wellbeing.

## Teaching:

### ***Course Director:***

2009-2010 **Director: IE 486 “Work Analysis and Design II”.** This semester long undergraduate course discusses applications of engineering, computer sciences,

information sciences, and psychological principles and methods related to the analysis and design of human work systems.

2010-2018 **Director: IE 590 "Robotics & Machine Vision".** This semester long master level course introduces students to robotics, machine vision from a human-machine interaction standpoint.

2011-2019 **Director: IE 474 "Industrial Control Systems".** The goal of this semester long undergraduate course is to develop the basic understanding of control system theory and its role in engineering design. The students are exposed to many theoretical and practical problems and their solutions.

2012, 2014 **Director: IE 332 "Computing in Industrial Engineering".** The goal of this semester long undergraduate course is to introduce the principles of core ideas and application areas in IE computing and continues the development of your critical thinking, problem solving, and engineering skills.

2013, 2015, 2019 **Director: IE 690 "Gestures & Bodial Systems".** The goal of this semester long PhD level course is to introduces students to methods for gesture detection and recognition using computer vision and pattern recognition techniques.

2015, 2018, 2020 **Director: IE 574 "Industrial Robotics & Flexible Assembly".** This semester long master level course introduces students to the design, selection and operation of intelligent robots and autonomous systems, and how to plan effective implementation and application of robotic automation.

2019 **Director: IE 590 "Deep Learning In Machine Vision".** This semester long master level course introduces students to the understanding of the principles guiding Convolutional Neural Networks for Visual Recognition.

2020 **Director: IE 590 "Special Topics in Machine Vision".** This semester long master level course introduces students to robotics, machine vision from a human-machine interaction standpoint.

2025 **Director: IE 549 "Machine Vision In Intelligent Robotic Systems".** This semester long master level course focuses on applying techniques from machine vision to the design of cybernetic systems with humans in through lectures, readings, hands-on-tools, discussions, and team project.

***Graduate/Undergraduate level course lectures:***

2016 Invited lecture for the Mandela Washington Fellowship. "Wisdom in our Hands"

2017 Guest Lecture for the ChE 46100 class in Chemical Engineering. “Augmenting Physical Action with Gaming Technologies: A Brave New World in Healthcare”

2018 Guest Lecture for the ChE 46100 class in Chemical Engineering. “Robots without Borders: “A Brave New World in Healthcare Robotics“”

2019 Guest Lecture for the ChE 46100 class in Chemical Engineering. “Robotic Solutions to Remote Trauma Care”

2022 Guest Lecture for the Wartime Influences in Healthcare elective nursing class NUR 399. “Robot, pass me the scalpel! New Challenges for Military Robots”

2024 Guest Lecture for the Wartime Influences in Healthcare elective nursing class NUR 399. “Gore Robots: From Blood and Guts to Bits and Bytes”

***Other courses/workshops:***

2008 Winter School of Image Processing. ECIMAG 2008. Universidad de Buenos Aires, Argentina, Jul. 23-Jul. 30, 2008

2011 Short Course in IEEE CIS Summer School 2011 "Computational Intelligence in Humanoid Robots”, Aug. 10, 2011.

2015 Short Course in Summer Course in Applied Machine Vision for Robotics Applications, Ben-Gurion University of the Negev, Beer Sheva, Israel July 4-16, 2015.

2016 CS 590: Vision por Maquina: Aplicaciones en Robotica (Universidad de Buenos Aires, Argentina). October-November 2016;

## Mentoring:

***Primary mentor/ co-mentor:***

**Post-doctoral/M.D. Fellows**

2010 Hoo Sang Ko, PhD. Co-mentor with S. Nof.
Current Position: Professor of Industrial Engineering Southern Illinois University Edwardsville

2014 Carlos Velasquez, PhD
Current Position: Researcher, Hamad Medical Corporation, Qatar

2013-2015 Dong Hye Ye, PhD. Co-mentor with Charlie Bouman
Current Position: Assistant Professor, Georgia State University

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| 2024-Current | Md Masudur Rahman, PhD<br>Current Position: Postdoc at Purdue University |

**Graduate/Medical Students:** (start dates are estimates)

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| 2010-2012 | Hao Zhong, M.Sc. Industrial Engineering. Co-mentor with S. Nof.<br>Current Position: Engineer at Meta |
| 2010-2014 | Mtihun Jacob, PhD. Industrial Engineering<br>Current Position: Staff Research Engineer at Google DeepMind Robotics |
| 2012-2014 | Ting Zhang, M.Sc. Co-mentor with Brad Duerstock<br>Current Position: Research Scientist, Meta Reality Labs Research |
| 2010-2014 | Yu-Ting, Li, Ph.D. Industrial Engineering<br>Current Position: Software Engineer, Meta |
| 2010-2014 | Hairong Jiang, Ph.D. Industrial Engineering. Co-mentor with Brad Duerstock<br>Current Position: Research Scientist, NVidia |
| 2013-2018 | Maria Eugenia Cabrera, Ph.D. Industrial Engineering.<br>Current Position: Assistant Professor at UMass Lowell, Computer Science. |
| 2014-2018 | Tian Zhou, Ph.D. Industrial Engineering.<br>Current Position: Data Scientist at Netflix Ads \| Ex-BCGer |
| 2015-2019 | Li Jing, Ph.D. Electrical and Computer Engineering. Co-mentor with C. Bouman<br>Current Position: Research Scientist, Samsung |
| 2015-2019 | Ting Zhang, Ph.D. Industrial Engineering. Co-mentor with Brad Duerstock<br>Current Position: Research Scientist, Meta Reality Labs Research |
| 2018-2020 | Natalia Sanchez Tamayo, M.Sc. Industrial Engineering<br>Current Position: Doctoral Student, Max-Planck Institute for Intelligent Systems |
| 2016-2020 | Edgar Rojas, Ph.D. Industrial Engineering<br>Current Position: Assistant Professor, Texas A&M University. |
| 2016-2022 | Akash Agarwal, Ph.D. Computer Science<br>Current Position: Security Engineer, Amazon |
| 2017-2021 | Naveen Madapana, Ph.D. Industrial Engineering.<br>Current Position: Machine Learning Researcher/Engineer Amazon Alexa AI |
| 2018-2023 | Glebys Gonzalez, Ph.D. Industrial Engineering.<br>Current Position: Postdoctoral Researcher, H. Lee Moffitt Cancer Center |

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| 2019-2021 | Daniela Chanci Arrubla, M.Sc. Industrial Engineering.<br>Current Position: Ph.D Student in BME, Duke University |
| 2019-2021 | Juan Antonio Barragan, M.Sc. Industrial Engineering.<br>Current Position: Ph.D Student in CS, Johns Hopkins University |
| 2019-2023 | Chenxi Xiao, Ph.D. Industrial Engineering.<br>Current Position: Assistant Professor, Shanghai Tech (Dept SIST), China. |
| 2020-2022 | Jose A, O. Barraza, M.Sc. Industrial Engineering. Co-mentor with B. Duerstock<br>Current Position: Ph.D. IE Student, Purdue University |
| 2022-present | Yupeng Zhuo, Industrial Engineering, Ph.D Program |
| 2023-present | Zhixian Hu, Industrial Engineering, Ph.D Program. Co-mentor with Yu She |

**Undergraduates:**

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| 2011 | Rachael Janney, Summer Undergraduate Research Fellowship, Mechanical Engineering, Purdue University |
| 2011 | Benjamin T. Martin, IE 499, Industrial Engineering , Purdue University |
| 2013 | Anmol Vittal Chavan, IE 499, DURI Program, Electrical Engineering, Purdue University |
| 2015 | Andrew Johnson, IE 499, Industrial Engineering, Purdue University |
| 2015 | Aviran Malik, IE 499, Mechanical Engineering, Purdue University |
| 2015 | Jee Eun Hong, IE 499, Industrial Engineering, Purdue University |
| 2015 | Monil Gandhi, IE 499, Industrial Engineering, Purdue University |
| 2015 | Sthitapragyan Parida, Summer Undergraduate Research Fellowship, Industrial Engineering, Purdue University |
| 2015 | Haley Berner,ABE 49800, Agricultural and Biological Engineering, Purdue University |
| 2015 | Esteban Schrader, IE 499, Industrial Engineering, Purdue University |
| 2016 | Monil Gandhi, IE 499, Industrial Engineering, Purdue University |
| 2018 | Juan Antonio Barragan, Engineering, Universidad Nacional de Colombia |
| 2018 | Mandira Marambe, Summer Undergraduate Research Fellowship, Industrial Engineering, Purdue University |
| 2019 | Aayush Dubey, IE 499, Computer Science, Purdue University |
| 2019 | Alejandra Diana Narvaez, Engineering, Universidad Nacional de Colombia |
| 2020 | Ritesh Kumar, PURE program, Industrial Engineering, Purdue University |
| 2021 | Maria Romeo Tricas, University of Carlos III, Madrid |

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| 2024 | Krish Sathyan Iyengar, Purdue University |
| 2024 | Xiangchen Yu, Data Science Program, Purdue University |
| 2024 | Nihar Bhardwaj Turlpati, Purdue University |
| 2025 | Aditya Sachin Pachpande, Purdue University |

## ***Student/Faculty Mentorship Committees***

**Ph.D. Students**

***Current*:**

- Jacob Patenaude (Materials Engineering)

***Past*:**

- Hina Chaudhry (Information Technology, Purdue Polytechnic), Graduated in 2010.
- Rodrigo Reyes (Industrial Engineering), Graduated in 2015.
- Yeum Chulmin (Industrial Engineering), Graduated in 2016.
- Zhan Tu (Industrial Engineering), Graduated in 2017.
- Nguyen Phuc Nguyen Vang, (Industrial Engineering) Graduated in 2018.
- Chun-Hao Hsu, (Electrical Engineering, dropped)
- Aniket Pal (Industrial Engineering) Graduated in 2020.
- Xiaoyu Liu (Industrial Engineering) Graduated in 2021
- Mythra Varun Balakuntala Srinivasa Mur (Information Technology, Purdue Polytechnic), Graduated in 2021
- Anh Duy Duong-Tran (Industrial Engineering), Graduated in 2022
- Marina Sala De Medeiros (Industrial Engineering), Graduated in 2020
- Maxwell Jacobson (Computer Science, dropped)
- Md Masudur Rahman (Computer Science), Graduated in 2024
- Jing Yang (Industrial Engineering), Graduated in 2023

## Grant Support:

### ***Federal Funding***

Current

*As Principal Investigator*

2021-2025 USAMRAA - W81XWH-21-C-0119
Connected and Autonomous Procedure Support Tools for Combat Trauma and Mass Casualty Management
Role: co-Investigator. PI: Christopher Colombo

2025-2027 NSF
EAGER: Theoretical Foundations for Integrating Foundational Models into Reinforcement Learning **(Recommended for Funding)**
Role: **Principal Investigator**

Completed

*As Principal Investigator*

2010-2012 AHRQ R03HS019837
Context-Based Hand-Gesture Recognition for the Operating Room
Role: **Principal Investigator**. Co-PI: Rebecca Packer

2013-2016 AFOSR FA9550-13-1-0141
AFOSR Young Investigator Research Program - "Embodied Interactions in Human-Machine Decision Making for Situation Awareness Enhancement Systems"
Role: **Principal Investigator**

2014-2017 USAMRAA JPC -1 - W81XWH-14-1-0042
"See-what-I-do: Increasing Mentor and Trainee Sense of co-presence in Trauma Surgeries with the STAR Platform"
Role: **Principal Investigator**. Co-PI: Voicu Popescu

2015-2016 ONR /NPS – N00244-16-2-0003
An efficient real-time method for detection and characterization of UAVs
Role: **Principal Investigator**. Co-PI: Charlie Bouman

2016-2017 ONR/NPS
A Proposal for Collaborative Research in Multi-Target Sense and Avoid for Small, Lightweight Unmanned Aerial Vehicles (UAVs)
Role: **Principal Investigator**. Co-PI: Charlie Bouman

2016-2019 AHRQ R18 - 1R18HS024887
GestureClean: A Touchless Interaction Language for the Operating Room
Role: **Principal Investigator**. Co-PI: Lisa Goffmann

2017-2019 USAMRAA JPC -1 - W81XWH-14-1-0042
"See-what-I-do: Increasing Mentor and Trainee Sense of co-presence in Trauma Surgeries with the STAR Platform" (Phase II)
Role: **Principal Investigator**. Co-PI: Co-PI: Voicu Popescu

2018-2020 USAMRAA - W81XWH-18-1-0769
Fundamental Theory for Dexterous Surgical Skills Transfer to Medical Robots
Role: **Principal Investigator**. Co-PI: Richard Voyles

2019-2021 NSF - PFI-TT- 1919214
A portable and real-time system for individuals with visual impairments to explore digital images using alternate feedback
Role: **Principal Investigator**. Co-PI: Brad Duerstock

2019-2021 NSF - 1925194
NRI: INT: FIngers See Things Differently (FIST-D): A Robotic Explosive Ordnance Disposal (EOD) based on Augmented Tactile Imaging
Role: **Principal Investigator**. Co-PI: Wenzhuo Wu

2020-2021 NSF - 2101135
I-Corps: An offline surgical telementoring platform that guides the surgeon via an augmented reality headset
Role: **Principal Investigator**

2022-2024 NIH R21 - R21LM013711
FIrst REsponse BUrn Diagnostic System (FIRE-BUDS)
Role: **Principal Investigator**. Co-PI: Gayle Gordillo

## Current

*As Co-Principal / co-Investigator*

2021-2025 USAMRAA - W81XWH-22-1-0146
AutoMated BUrn Diagnostic System For Healthcare (AMBUSH)
Role: Co-PI: Principal Investigator: Gayle Gordillo.

2021-2025 USAMRAA
Connected and Autonomous Procedure Support Tools for Combat Trauma and Mass Casualty Management
Role: co-PI. PI: Christopher Colombo

## Completed

*As Co-Principal / co-Investigator*

2014-2017 NSF / MRI - 1427872
Human Avatars - "Enabling Research in Natural Communication with Virtual Tutors, Therapists, and Robotic Companions"
Role: co-PI. PI: Mohammad Mahoor

2014-2020 NSF IUCRC - 1439717
UCRC for Robots and Sensors for the Human Well-being
Role: co-PI. PI: Richard Voyles

2019-2023 NSF - 1918327
FMitF: Collaborative Research: Track I: Embedding Constraint Reasoning in Machine Learning for Better Prediction and Decision-making
Role: co-PI. PI: Yexiang Xue

2019-2021 NIH R21 NBIB 5R21EB026177-02
Real-time non-intrusive workload monitoring-Integration of human factors in surgery training and assessment
Role: co-I. PI: Denny Yu

## ***Charitable Funding/ Foundation Funding:***

Current

*As Co-Principal / co-Investigator*

2024-2025 Showalter Trust.
Feeling the Difference: High-Resolution Tactile Mapping in Surgery
Role: Mentor. PI: Yu-She

Completed

*As Principal Investigator*

2013-2016 Qatar National Research Foundation – NPRP 449-2-181
Robotic Assistants in Operating Rooms in Qatar "Theory, Development and Integration"
Role: **Lead Principal Investigator**. Co-PI: Amer Chaikhouni

*As Co-Principal / co-Investigator*

2017-2018 Walther Oncology Physical Sciences & Engineering Research Embedding Program
Measuring Workload Through EEG Signals
Role: co-I. PI: Denny Yu

2019-2020 Trask Innovation Fund.
Portable and Real-time Image Perception System for the Blind
Role: co-I. PI: Brad Duerstock

## ***Industry:***

Current

*As Co-Principal / co-Investigator*

2022-2027 Surgical Intuitive
Beyond high vs. low assessment of workload and team skills: Continuous sensing enables prediction of incremental changes in cognitive and team skills
Role: co-I. PI: Denny Yu

Completed

*As Principal Investigator*

2018-2019 Surgical Intuitive
Telementoring using the Da-Vinci
Role: **Principal Investigator**. Co-PI: Denny Yu

2018-2019 Surgical Intuitive
Transforming training and augmenting performance with real-time cognitive workload sensing
Role: **Principal Investigator**. Co-PI: Denny Yu

*As Co-Principal / co-Investigator*

2011-2012 Endologix
Challenges of Selective Catheterization across the Aortic Bifurcation with Different Endografts
Role: co-I. PI: George Akingba

2017-2017 Surgical Intuitive
A non-intrusive tool to measure cognitive workload during surgery
Role: co-I. PI: Denny Yu

2019-2021 Ford Motor Company
Multimodal Cognitive and Perception Sensing For Situational Awareness
Role: co-I. PI: Denny Yu

## ***Internal/Other grants***

Current

*As Co-Principal / co-Investigator*

2023-2025 Purdue-IU School of Medicine Seed Funding
Bidirectional Coaching for Co-Robotic Assistance with Invasive and Non-Invasive Medical Procedures
Role: co-I. PI: Richard Voyles

Completed

*As Principal Investigator*

2009-2010 Purdue Research Foundation.
Travel Award
Role: **Principal Investigator**.

| | |
|---|---|
| 2009-2011 | CTSI - Indiana<br>A Window on Tissue - Tissue Depth Visualization using Face Orientation for Laparoscope Control<br>Role: **Principal Investigator**. Co-PI: Stephen Adams |
| 2010-2011 | Discovery Park Seed Grant<br>Collaborative Assistive Robotics<br>Role: **Principal Investigator**. Co-PI: Shimon Nof |
| 2011-2012 | Crane (Detector Suite To Enable Human-robot Interaction). **recommended/ not awarded**)<br>Role: **Principal Investigator**. Co-PI: Mathias Kolsch |
| 2012-2012 | Visionair<br>Travel Grant<br>Role: **Principal Investigator** |
| 2012-2013 | Office of Vice-president for Research<br>A Dual Robotic Arm to Enhance Cross disciplinary Capabilities and Exploration<br>Role: **Principal Investigator**. Co-PI: Brad Duerstock |
| 2012-2013 | CTSI – Indiana<br>Gestonurse: A Robotic Scrub Nurse That Understands Hand Gestures<br>Role: **Principal Investigator**. Co-PI: George Akingba |
| 2016-2017 | Office of Vice-president for Research<br>Making Brain Science Studies accessible to all with the Nautilus system g.Nautilus 32, g.LADYbird – 32.<br>Role: **Principal Investigator**. Co-PI: Gregory Francis |

*As Co-Principal / co-Investigator*

| | |
|---|---|
| 2015-2016 | Office of Vice President for Research:<br>Transdisciplinary and Interdisciplinary Research Grant - The Algorithmic Gardener – Tales of Nature and Code: Creating New Metaphors for Future Natures through Critical Gardening<br>Role: co-I. PI: Fabian Winkler |
| 2016-2018 | CTSI Indiana<br>Adaptive VR-based gesture recognition system for improved rehabilitation of quadriplegics due to spinal cord injury<br>Role: co-I. PI: Bad Duerstock |
| 2023-2024 | Connector Grant Competition<br>Transdisciplinary Scholarship at University of Calgary<br>Role: co-I. PI: Denny Yu |

## Publications:

High impact papers noted: ++ >500 citations, + >100 citations
These papers have been collectively cited >5,900 times: h-index=39
Co-authorship by my PhD indicated by $^{*G}$, or $^{PD}$ for postdocs, senior authorship indicated by $^{*}$

### ***Journals:***

**Published prior to enrolling in a PhD program**

(1) J. P. **Wachs***, H. Stern, M. Last (2002). Segmentation of Faces Using Fuzzy Min-Max Neural Network. *International Journal of Image and Graphics*. vol. 2, no. 4, pp. 587-601.

**PhD work**

(2) J. P. **Wachs***, H. Stern*, Y. Edan (2005). Cluster Labeling and Parameter Estimation for the Automated Setup of a Hand-Gesture Recognition System. *IEEE Trans. on Systems, Man and Cybernetics. Part A*. vol. 35, no. 6, pp. 932-944.

(3) J. P. **Wachs***, H. Stern, Y. Edan, M. Gillam, C. Feied, M. Smith, J. Handler (2006). A Real-Time Hand Gesture System Based on Evolutionary Search. *Vision*. vol. 22, no. 3, Dearborn, Mich.: Society of Manufacturing Engineers.

(4) J. P. **Wachs***, H. Stern, Y. Edan, M. Gillam, C. Feied, M. Smith, J. Handler (2008). A Real-Time Hand Gesture Interface for a Medical Image Guided System *International Journal of Intelligent Computing in Medical Sciences and Image Processing*. vol. 1, no. 3, issue 1, pp. 175-185.

(5) H. Stern*, J. P. **Wachs***, Y. Edan (2008). Designing Hand Gesture Vocabularies for Natural Interaction by Combining Psycho-Physiological and Recognition Factors. *International Journal of Semantic Computing.* Special Issue on Gesture in Multimodal Systems. vol. 2, no. 1, 2008, pp. 137-160.

(6) $^{+}$J. P. **Wachs***, H. Stern, Y. Edan, M. Gillam, C. Feied, M. Smith, J. Handler (2008). A gesture-based tool for sterile browsing of radiology images. *Journal of the American Medical Informatics Association (JAMIA)*. vol. 15, issue 3, pp. 321-323.

(7) J. P. **Wachs***, H. Stern, Y. Edan, M. Gillam, C. Feied, M. Smith, J. Handler (2009). A Novel Hand Gesture-based Image Browsing System for the Operating Room. *Hospital IT Europe*, vol. 2, no. 1, pp 43-45.

**Postdoctoral work**

(8) J. P. **Wachs***, M. Kölsch*, D. Goshorn (2010). Human Posture Detection for Intelligent Vehicles. Journal of real-time image processing. *Special Issue on Real-Time Vision-Based Motion Analysis and Intelligent Transportation Systems*, Springer, vol. 5, no. 4, pp. 231-244.

(9) $^{+}$J. P. **Wachs***, H. I. Stern, T. Burks V. Alchanatis, (2010). Low and High-level Visual Feature-based Apple Detection from Multi-modal Images. *Precision Agriculture* vol. 11, no. 6, pp 717-735.

(10) [++]J. P. **Wachs***, M. Kölsch, H. Stern, and Y. Edan (2011). Vision-Based Hand Gesture Applications: Challenges and Innovations. *Communications of the ACM*, Cover Article, Vol. 54, no. 2. pp. 60-71.

**Assistant Professor**

(11) J. P. **Wachs*** (2010). Gaze, Posture and Gesture Recognition to Minimize Focus Shifts for Intelligent Operating Rooms in a Collaborative Support System. International Journal of Computers, Communications and Control (IJCCC). Vol. V, no. 1, pp. 106-124.

(12) Y.T. Li[G], M. Jacob[*G], G. Akingba, J. P. **Wachs*** (2012). Gestonurse: A Robotic Surgical Nurse for Handling Surgical Instruments in the Operating Room. Journal of Robotic Surgery, vol. 6, no. 1, pp. 53-63.

(13) M. Jacob[G], YT. LiG, G. Akingba. J. P. **Wachs*** (2013). A Cyber-Physical Management System for Delivering and Monitoring Surgical Instruments in the OR. Surgical Innovation, Vol. 20, no. 4, pp. 377-384.

(14) A. Sadagic*, M. Kölsch*, G. Welch, C. Basu, C. Darken, J. P. **Wachs**, H. Fuchs, H. Towles, N. Rowe, J. M. Frahm, L. Guan, R. Kumar, H. Cheng (2013). Smart Instrumented Training Ranges: Bringing Automated System Solutions to Support Critical Domain Needs. Journal of Defense Modeling and Simulation. vol. 10, no. 3, pp. 327-342.

(15) M. Jacob[G], J. P. **Wachs***, R. Packer (2013). Hand Gesture-based Sterile Interface for the Operating Room Using Contextual Cues for the Navigation of Radiological Images. Journal of the American Medical Informatics Association (JAMIA), Vol. 20, no. e1, pp. e183-e186.

(16) M. Jacob[G], YT. Li[G], G. Akingba. J. P. **Wachs*** (2013). Collaboration with a Robotic Scrub Nurse. Communications of the ACM, vol. 56, no. 5, pp. 68-75.

(17) H. Zhong[G], J. P. **Wachs***, S. Nof* (2013). A Collaborative Telerobotics Network Framework with Hand Gesture Interface and Conflict Prevention. International Journal of Production Research, vol. 51, no. 15, pp. 4443-4463.

(18) J. H. Jiang[G], J. P. **Wachs***, and B. S. Duerstock. (2013) Real-time Facilitated Gesture Recognition Based Interfaces for Individuals with Upper-level Spinal Cord Injuries. Journal of Real-Time Image Processing (Vol. 11 Mo. 2, 2016, pp 301-314)

(19) Y. T. Li[G], J. P. **Wachs*** (2013). Recognizing Hand Gestures using the Hierarchical Elastic Graph Matching (HEGM) Method. Image and Vision Computing, vol. 31, no. 9, pp. 649-657.

(20) J. P. **Wachs***, G. Gomez. (2013). Telementoring Systems in the Operating Room: a New Approach in Medical Training. Medicina, vol. 73, no. 6, pp. 539-542.

(21) S. Y., Nof*, G. J., Cheng, A. M., Weiner, X. W., Chen, Bechar, A., M. G. Jones, C. B. Reed, A. Donmez, T. D. Weldon, P. Bermel, S. S. T. S. Bukkapatnam, C. Cheng, S. R. T. Kumara, A. Bement, R. Koubek, B. Bidanda, Y. C. Shin, A. Capponi, S. Lee, M. R. Lehto, A. L. Liu, O. Nohadani, M. Dantus, P. W. Lorraine, D. D. Nolte, R. W. Proctor, H. P.

Sardesai, L. Shi, J. P. **Wachs**, XC. Zhang, (2013). Laser and Photonic Systems Integration: Emerging Innovations and Framework for Research and Education. Human Factors and Ergonomics in Manufacturing & Service Industries, vol. 23, no. 6, pp. 483-516.

(22) S. S. Zhang*, J. P. **Wachs** (2013). The Improvement and Application of Intelligence Tracking Algorithm for Moving Logistics Objects Based on Machine Vision Sensor. Sensor Letters, Vol. 11, no. 5, pp. 862-869.

(23) Y. T. Li[G], J. P. **Wachs*** (2014). HEGM: A Hierarchical Elastic Graph Matching for Hand Gesture Recognition. Pattern Recognition, vol. 47, no.1, pp. 80-88.

(24) [+]M. Jacob[G], J. P. **Wachs*** (2014). Context-based Hand Gesture Recognition for the Operating Room. Pattern Recognition Letters, vol. 36, pp. 196-203.

(25) J. H. Jiang[G], B. S. Duerstock, J. P. **Wachs*** (2014). A Machine Vision-Based Gestural Interface for People With Upper Extremity Physical Impairments. IEEE Transactions on Systems, Man, and Cybernetics – Systems, vol. 44, no. 5, pp. 630 – 641.

(26) L. G. Déniz*, J. P. **Wachs***, J. J. Berlles (2014) Guest Editorial - Special Issue on Robust Recognition Methods for Multimodal Interaction. Pattern Recognition Letters, Vol., 36, pp. 187-188.

(27) H. Zhong[G], J. P. **Wachs***, S. Nof* (2014). Telerobot-enabled HUB-CI Model for Collaborative Lifecycle Management of Design and Prototyping. Computers in Industry, vol. 65, no.4, pp. 550–562.

(28) J. H. Jiang[G], J. P. **Wachs***, B. S. Duerstock* (2014). Integrated Vision-Based System for Efficient, Semi-automated Control of a Robotic Manipulator. International Journal of Intelligent Computing and Cybernetics. Vol. 7 Issue: 3, pp. 253-266, [New]. http://dx.doi.org/10.1108/IJICC-09-2013-0042.

**Associate Professor**

(29) J. P. **Wachs***, D. Dori, B. Frenkel. Operation room tool handling and miscommunication scenarios: An Object-Process Methodology conceptual model. Artificial Intelligence in Medicine. 62.3 (2014): 153-163.

(30) Pereira[*G], A; **Wachs***, J. P.; Park, K; Rempel*, D. A User Developed 3D Hand Gesture Set for Common Human-Computer Interactions. The Journal of Human Factors. November 24, 2014, doi: 10.1177/0018720814559307.

(31) Blekhman[*G], A.; **Wachs***, J. P. Dori*, D. Model-Based System Specification with Tesperanto: Readable Text from Formal Graphics. IEEE Transactions on Systems, Man and Cybernetics: Systems. Volume: 45 Issue:11 , pp. 1448-1458..

(32) D. Andresen[*G], V. Popescu, M. Cabrera[*G], G. Gomez, S. Marley, B. Mullis, J. ***Wachs**. Virtual Annotations of the Surgical Field through an Augmented Reality Transparent Display. The Visual Computer. (2015): 1-18.

(33) Bechar*, A., S. Y. Nof, and J. P. **Wachs**. A review and framework of laser-based collaboration support. Annual Reviews in Control 39 (2015): 30-45.

(34) J. H. Jiang[*G], B. S. Duerstock, J. P. **Wachs*** (2015). User-Centered and Analytic-Based Approaches to Generate Usable Gestures for Individuals with Quadriplegia. IEEE Transactions on Human-Machine Systems. 10.1109/THMS.2015.2497346 Vol: 46, issue: 3, pp. 460 – 466, June 2016.

(35) M. Jacob[*G], J. P. **Wachs***. (2016) Optimal Modality Selection for Cooperative Human-Robot Task Completion. IEEE Transactions on Cybernetics. Vol: 46, issue: 12, pp. 3388-3400. Dec. 2016 .

(36) D. Andresen[*G], V. Popescu*, M. Cabrera G, G. Gomez, S. Marley, B. Mullis, J. **Wachs***. (2015) Medical Telementoring Using an Augmented Reality Transparent Display. Surgery. Vol. 159, issue 6 (2016): pp. 1646-1653.

(37) [+]H. Jiang [*G], T. Zhang G, B. Duerstock*, J. **Wachs***. Enhanced Control of a Wheelchair-Mounted Robotic Manipulator Using 3-D Vision and Multimodal Interaction. Computer Vision and Image Understanding. Volume 149 Issue C, August 2016, Pages 21-31. Doi. 10.1016/j.cviu.2016.03.015.

(38) O'Hara*, K., Sellen, A., & **Wachs**, J. (2016). Introduction to Special Issue on Body Tracking and Healthcare. Human–Computer Interaction, 31(3-4), 173-190.

(39) Zhou[*G], T., M. E. Cabrera* G, T. Low, C. Sundaram, and J. **Wachs***. "A Comparative Study for Telerobotic Surgery Using Free Hand Gestures." Journal of Human-Robot Interaction 5, no. 2 (2016): 1-28.

(40) Andersen, D., Popescu, V., Cabrera, M. E., Shanghavi, A., Gomez, G., Marley, S., Mullis, B. & **Wachs**, J. (2016). Avoiding Focus Shifts in Surgical Telementoring Using an Augmented Reality Transparent Display. Studies in Health Technology and Informatics. 2016; 220:9-14.

(41) T. Zhang[*G], B. *Duerstock, J. ***Wachs**. Multimodal Perception of Histological Images for Persons who are Blind or Visually Impaired. Transactions on Accessible Computing. Volume 9 Issue 3, January 2017, Article No. 7, DOI. 10.1145/3026794.

(42) H. Jiang[*G], B. *Duerstock, J. ***Wachs**. (2017) Variability Analysis on Gestures for People With Quadriplegia. IEEE Transactions on Cybernetics. Volume: 48, Issue: 1, pp: 346-356. 2018. DOI: 10.1109/TCYB.2016.2635481.

(43) T. Zhang[*G] , Y.T., LiG., J.P ***Wachs**. (2017). The Effect of Embodied Interaction in Visual-Spatial Navigation. ACM Transactions on Interactive Intelligent Systems. Volume 7 Issue 1, January 2017, Article No. 3. Doi 10.1145/2953887.

(44) D. Andresen[*G], V. Popescu*, M. CabreraG, G. Gomez, S. Marley, B. Mullis, J. ***Wachs**. (2017). An Augmented Reality Based Approach for Surgical Telementoring in Austere Environments. Journal of Military Medicine (2015 MHSRS Supplement). 182(S1), 310:315, 2017.

(45) Cabrera, M. E., & **Wachs**, J. P. (2017). A Human-Centered Approach to One-Shot Gesture Learning. Front. Robot. AI 4: 8. doi: 10.3389/frobt.

(46) T. Zhou[*G] and J. P. **Wachs***. (2018). Early Prediction for Physical Human Robot Collaboration in the Operating Room. Autonomous Robots. Vol. 42, No. 5. pp. 977–995

(47) T. Zhou[*G] and J. P. **Wachs***. Needle in a Haystack: Interactive Surgical Instrument Recognition through Perception and Manipulation. Robotics and Autonomous Systems. Vol. 97, 2019, pp. 182-192.

(48) E Andersen[*G], D. S., Cabrera[*G], M. E., Rojas-Muñoz[*G], E. J., Popescu, V. S., Gonzalez[*G], G. T., Mullis, B., **Wachs***, J. P. (2018). Augmented Reality Future Step Visualization for Robust Surgical Telementoring. Journal of the Society for Simulation in Healthcare. 2019 Feb;14(1):59-66.

(49) Madapana[*G] N, Gonzalez[*G] G, Rodgers R, Zhang L, **Wachs** JP* (2018) Gestures for Picture Archiving and Communication Systems (PACS) operation in the operating room: Is there any standard? PLoS ONE 13(6): e0198092.

(50) E. Rojas-Muñoz[*G], M. E. Cabrera[*G], D. Andersen[*G], V. Popescu, S. Marley, B. Mullis, B. Zarzaur, and J. ***Wachs** (2018), "Surgical Telementoring Without Encumbrance," Annals of Surgery., vol. Online-fir, p. 1, Apr. 2018.

(51) E. Rojas[*G], M. Cabrera[*G], D. Andresen[*G], V. Popescu*, B. Zarzaur, S. Marley, B. Mullis, J. ***Wachs**. (2018). Augmented Reality as a Medium for Improved Telementoring. Journal of Military Medicine. 2019 Mar 1;184 (Suppl 1):57-64. doi: 10.1093/milmed/usy300

(52) Mckee JL, McBeth P, **Wachs** J, Hamilton D, Ball C, Gillman L, Kirkpatrick A. Creating a physical telementored ultrasound supported medical interventions (TMUSMI) "box." Can J Surg, 2019 Vol. 62 (3 Suppl 2); S18-19.

(53) Madapana[*G] N, Gonzalez G, Rodgers R, Zhang L, **Wachs** J. (2019) Preference Elicitation: Obtaining Gestural Guidelines for PACS in Neurosurgery. International Journal for Medical Informatics. 130, 103934.

(54) T. Zhou[*G] and J. ***Wachs**. (2019). Spiking Neural Networks for Early Prediction in Human Robot Collaboration. International Journal of Robotics Research 38(14), 1619-1643.

(55) E. Rojas[*G], M. Cabrera, D. Andresen[*G], V. Popescu*, B. Zarzaur, S. Marley, B. Mullis, J. ***Wachs**. Telementoring in Leg Fasciotomies via Mixed-Reality: Clinical Evaluation of the STAR Platform. Military Medicine 2019 (185.Supplement_1 (2020): 513-520).

(56) Kirkpatrick AW, McKee JL, Netzer I, McKee IA, McBeth P, **Wachs** JP, Ball CG, Glassberg E. A Randomized Trial of Mentored vs Non-Mentored Military Medics Compared in the Application of a wound clamp without Prior Training: When to Shut Up and Just Watch!. Mil Med (in press). 185(Supplement_1), 67-72.

(57) [+]Wu, C., Cha, S., Sulek, J., Zhou, T., Sundaram, C., **Wachs**, J., & Yu, D. Eye-tracking Metrics Predicts Perceived Workload in Robotic Surgical Skills Training. Human Factors.

(58) Zhang[*G], B. Duerstock, J. **Wachs**. Classification of Blind Users' Image Exploratory Behaviors Using Spike-timing Neural Network. IEEE Transactions on Neural Systems & Rehabilitation Engineering.

(59) T. Zhou[*G], G. Gonzales, J. Chu, D. Yu and J. **Wachs** (2020). Multimodal Physiological Signals for Workload Prediction in Robot-Assisted Surgery". Transactions on Human-Robot Interaction. 9, no. 2.

(60) E. Rojas[*G], M. Cabrera, D. Andresen[*G], V. Popescu*, B. Zarzaur, S. Marley, B. Mullis, J. ***Wachs**. (2020). The System for Telementoring with Augmented Reality (STAR): A Head-Mounted Display to Improve Surgical Coaching and Confidence in Remote Areas. Surgery 167(4): 724-731.

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(62) Cabrera[*G], M., Novak G, K., Foti, D., Voyles, R., & **Wachs**, J. (2020). Electrophysiological indicators of gesture perception. Experimental Brain Research 238(3), 537-550. Part of Springer Nature 2020.

(63) Madapana[*G], N. GonzalesG, Zhang, L., Rodgers, R., **Wachs**, JP. (2020). Agreement Study Using Gesture Description Analysis. IEEE Transactions on Human-Machine Systems. vol. 50, no. 5, pp. 434-443, Oct. 2020, doi: 10.1109/THMS.2020.2992216.

(64) Rojas-Muñoz[*G], E., Lin, C., Lin., Sanchez-TamayoG, N., CabreraG, ME., AndersenG, D., Popescu, V., Barragan NogueraG, J.A., Zarzaur , B., Murphy, P., Anderson, K., Douglas, T., Griffis, C., McKee, J., Kirkpatrick, AW., **Wachs***, JP. Evaluation of an Augmented Reality Platform for Remote Surgical Telementoring: A Randomized Controlled Crossover Study in Cricothyroidotomies. NPJ digital medicine, 3(1), 1-9.

**Professor**

(65) Rojas-Munoz[*G], E. and **Wachs***, JP. (2020). Assessing Collaborative Physical Tasks via Gestural Analysis. IEEE Transactions of Human Machine Systems (IEEE THMS). 51.2 (2021): 152-161.

(66) M. M. Rahman[*G], N. Sanchez-Tamayo G, G. Gonzalez G*, M. Agarwal G*, V. Aggarwal, R. M. Voyles *, Y. Xue*, and J. **Wachs***. (2020) SARTRES: A Semi-Autonomous Robot TeleopeRation Environment for Surgery. Computer Methods in Biomechanics and Biomedical Engineering: Imaging & Visualization. 9.4 (2021): 376-383.

(67) Rojas-Munoz[*G], E. and Couperus, K. and **Wachs**[*], JP. (2020) The AI-Medic: An Artificial Intelligent Mentor for Trauma Surgery. Computer Methods in Biomechanics and Biomedical Engineering: Imaging & Visualization. 9.3 (2021): 313-321.

(68) [+]Zhang*[G], T; Yang*[G], J., Liang*[G], N., Pitts, B., Prakah-Asante, K., Currey, R., Duerstock, B., **Wachs**, J., Yu, D. Physiological Measurements of Situation Awareness: A Systematic Review. Human Factors, 0(0). https://doi.org/10.1177/0018720820969071

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(99) Kirkpatrick AW, Hawkins W, Conly JM, Dhillon P, **Wachs** J. Smarter Faster Just-in-Time Resuscitation: A Programmatic Evaluation of Unmanned Aerial Vehicle Delivered Resuscitation with Just-in-Time Remote Telementored Deployment. Presented in poster format the 11th World Society of Emergency General Surgery Congress, Rhodes, Greece June 25-28 2024.

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(102) Hu[*G] Z, **Wachs*** J, She Y. A Magnetic-Actuated Vision-Based Whisker Array for Contact Perception and Grasping. IEEE Conference on Robotics and Automation, ICRA 2025.

(103) E R. Henderson, D H. Gracias, V M. Ramakrishnan, St Tiomkin, J P. **Wachs**, and D A. Wollin "Democratizing advanced surgical guidance: decoupling the state-of-the-art from tertiary centers and breaking trail for autonomous robotic surgery in austere environments", Proc. SPIE 13301, Molecular-Guided Surgery: Molecules, Devices, and Applications XI, 133010A (19 March 2025); https://doi.org/10.1117/12.3049646

## ***Book Chapters, commentary and invited articles (non-peer reviewed):***

### Prior to enrolling in a PhD program

(1) J. P. **Wachs**, O. Shapira, and H. Stern (2005) A Method to Enhance the 'Possibilistic C-Means with Repulsion' Algorithm based on Cluster Validity Index. Applied Soft Computing Technologies: The Challenge of Complexity, Springer Verlag, Germany, Series: Advances in Soft Computing, Abraham, A.; Baets, B.D.; Köppen, M.; Nickolay, B. (Eds.), vol. 34, pp. 77-90.

### Postdoctoral work

(2) J. P. **Wachs**, H. Stern, Y. Edan, M. Gillam, C. Feied, M. Smith, J. Handler. (2006). A Real-Time Hand Gesture Interface for Medical Visualization Applications. Applications of Soft Computing: Recent Trends. Springer Verlag, Germany, Series: Advances in Soft Computing, Tiwari, A.; Knowles, J.; Avineri, E.; Dahal, K.; Roy, R. (Eds.), vol. 36, pp. 153-163.

(3) J. P. **Wachs**, H. Stern, Y. Edan, M. Gillam, C. Feied, M. Smith, J. Handler (2007). Gestix: A Doctor-Computer Sterile Gesture Interface for Dynamic Environments. Soft Computing in Industrial Applications. Recent and Emerging Methods and Techniques Series: Advances in Soft Computing, Vol. 39 Saad, A.; Avineri, E.; Dahal, K.; Sarfraz, M.; Roy, R. (Eds), pp. 30-39.

### Assistant Professor

(4) J. P. **Wachs**, H. Stern, T. Burks and V. Alchanatis. (2009). Multi-modal Registration Using a Combined Similarity Measure. Applications of Soft Computing: Updating the State of the Art Series: Advances in Intelligent and Soft Computing, Avineri, E.; Köppen, M.; Dahal, K.; Sunitiyoso, Y.; Roy, R. (Eds.), Springer, Vol. 52, pp.159-168.

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(8) Bao R., Grant, E., Kirkpatrick, A., **Wachs**, J., Ou, Y. (2024). First BONBID-HIE Lesion Segmentation Challenge and First Trauma Thompson Challenge, Held in Conjunction with MICCAI 2023, Vancouver, BC, Canada, October 16 and 12, 2023, Lecture Notes in Computer Science (LNCS, volume 14567).

## ***Submitted papers on arXiv***

(1) Mythra V. Balakuntala, Vishnunandan L. N. Venkatesh, Jyothsna Padmakumar Bindu, Richard M. Voyles, Juan **Wachs**. Extending Policy from One-Shot Learning through Coaching. https://arxiv.org/abs/1905.04841

(2) Naveen Madapana, Md Masudur Rahman, Natalia Sanchez-Tamayo, Mythra V. Balakuntala, Glebys Gonzalez, Jyothsna Padmakumar Bindu, L. N. Vishnunandan Venkatesh, Xingguang Zhang, Juan Barragan Noguera, Thomas Low, Richard Voyles, Yexiang Xue, Juan **Wachs**. DESK: A Robotic Activity Dataset for Dexterous Surgical Skills Transfer to Medical Robots. https://arxiv.org/abs/1903.00959

(3) Tian Zhou, Juan P. **Wachs**. Spiking Neural Networks for Early Prediction in Human Robot Collaboration. https://arxiv.org/abs/1807.11096

(4) Tian Zhou, Juan P. **Wachs**. Early Turn-taking Prediction with Spiking Neural Networks for Human Robot Collaboration. https://arxiv.org/abs/1709.09276

(5) Tian Zhou, Juan P. **Wachs**. Early Prediction for Physical Human Robot Collaboration in the Operating Room. https://arxiv.org/abs/1709.09269

(6) Tian Zhou, Maria E. Cabrera, Juan P. **Wachs**. Communication Modalities for Supervised Teleoperation in Highly Dexterous Tasks - Does one size fit all?. https://arxiv.org/abs/1704.05090

(7) Maxwell J. Jacobson, Daniela Chanci Arrubla, Maria Romeo Tricas, Gayle Gordillo, Yexiang Xue, Chandan Sen, Juan Wachs. Human-centered XAI for Burn Depth Characterization. https://arxiv.org/abs/2210.13535

(8) Zhixian Hu, Juan Wachs, Yu She. A Magnetic-Actuated Vision-Based Whisker Array for Contact Perception and Grasping. https://arxiv.org/abs/2503.00133

## ***Additional (selected) abstracts presented at scientific meetings (Posters)***

**Assistant Professor**

(1) J. P. **Wachs***, S. Adams (2010). “A Window on Tissue” - Tissue Depth Visualization using Face Orientation for Flexible Endoscope Control. In Proceedings of the American Medical Informatics Association Symposium (AMIA) 2010, Page – 1291.

(2) J. **Wachs***, and Dov Dori. A Conceptual Model For Tool Handling In The Operation Room. In Qatar Foundation Annual Research Conference, no. 1. 2014.

(3) D. Andresen *[G], V. Popescu, M. Cabrera*[G], G. Gomez, S. Marley, B. Mullis, J. ***Wachs**. A Transparent Display for Surgical Telementoring in Austere Environments. Military Health System Research Symposium (MHSRS), Florida, 2015.

**Associate Professor**

(4) E. Rojas[*G], M. Cabrera, D. Andresen[*G], V. Popescu*, B. Zarzaur, S. Marley, B. Mullis, J. ***Wachs**. (2018). Augmented Reality as a Medium for Improved Telementoring. Military Health System Research Symposium (MHSRS), Florida, 2017

(5) T. Zhou[*G], J. Cha[*G], Gonzales, J. **Wachs***, S. Chandru, D. Yu. Joint Surgeon Attributes Estimation in Robot-Assisted Surgery. (2018) Late-Breaking Report. 3th Annual ACM/IEEE International Conference on Human Robot Interaction, 2018.

(6) McKee JL, McBeth PB, McKee IA, Gillman L, **Wachs** JP, Barrett R, Leeper WR, Kirkpatrick AW. Remote just-in-time telementored tourniquet application: A double factorial randomized controlled trial examining two tactical tourniquets and scripted and unscripted mentor-mentee guidance – a pilot study. Presented in poster format by McKee JL at the Military Health System Research Symposium. August 22 2018, Kissimmee, Florida.

(7) G. Gonzales, N. Madapana[*G], R. Taneja, J. ***Wachs**. (2018). Looking Beyond the Gesture: Vocabulary Acceptability Criteria for Gesture Elicitation Studies. Human Factors and Ergonomics Society's 2018 International Annual Meeting, October 1-5 in Philadelphia, Pennsylvania (HFES 2018)

(8) E. Rojas-Muñoz[*G], M. E. Cabrera[*G], D. Andersen, V. Popescu, S. Marley, B. Mullis, B. Zarzaur, and J. ***Wachs**. (2018). Teleproctoring with Mixed Reality: A Comparative Evaluation in the Context of Lower-Limb Fasciotomies. Accepted as oral at the Military Health System Research Symposium. August 22 2018, Kissimmee, Florida.

(9) McKee JL, McBeth PB, Hamilton DR, **Wachs**, JP, Kirkpatrick AW (2018) Creating a Physical Tele-Mentored Ultrasound Supported Medical Interventions (TMUSMI) “Box”. Accepted as oral presentation at the TAC 2019 Annual Meeting & Conference is being held February 28 - March 1, 2019, in Calgary, Alberta, Canada.

(10) Cha[*G], J. S., Sulek, J., Sundaram, C., Cai, X., **Wachs**, W., Yu, D. (2019). Ergonomics driven training: Can wearable sensors guide robotic skills training? Association for Surgical Education. Chicago, IN. April 23-25, 2019.

(11) Andrew W Kirkpatrick, Ian McKee, Brian Knudsen, Clark C, Ryan Shelton, Anthony J LaPorta, Juan **Wachs**, Jessica L McKee. Hot Zone Hemorrhage Control: Technical Notes on Robotically Applied Hemostatic Clamping for Care-Under-Fire: Presented in oral format by AW Kirkpatrick at the Military Health System Research Symposium, Kissimmee, Florida, Aug 21 2019.

(12) Kirkpatrick AW, McKee I, Knudsen B, Clark C, Shelton R, LaPorta AJ, **Wachs** J, McKee JL. What do you do when a Tension Pneumothorax Needs Treatment and the Last Man Standing is Wearing a Bomb Disposal Suit? Remote Mentoring of In-transport Tube Thoracostomy by Procedure Naïve Personnel. Presented in oral format by McKee JL at the Military Health System Research Symposium, Kissimmee, Florida, Aug 19 2019. MHSRS-19-2525

(13) Kirkpatrick AW, McKee IA, Shelton R, McBeth P, Gillman L, Ball CG, Barrett R, **Wachs** J, McKee JL. It’s okay to move your Lips when you Read: A Randomized Trial of low-Bandwidth Mentoring versus Reading the Manufacturer Instructions Regarding Tourniquet Application. Presented in Poster Format at Presented in oral format by JL McKee at the Military Health System Research Symposium, Kissimmee, Florida, Aug 21 2019. MHSRS-19-02535.

(14) Mckee JL, McBeth P, **Wachs** J, Hamilton D, Ball CG, Gillman LM, Kirkpatrick AW. Building a "Real" Telemedicine Ultrasound Supported Medical Intervention (TMUSMI)

Mousetrap: Creating a Practical Multi-Modality Telementoring Capacity for Far Forward Resuscitation. Presented in Poster Format at Presented in poster format by JL McKee at the Military Health System Research Symposium, Kissimmee, Florida, Aug 21 2019. MHSRS-19-02537.

(15) Edgar Rojas-Muñoz[*G], Chengyuan Lin[*G], Natalia Sanchez-Tamayo[*G], Maria Eugenia Cabrera[*G], Daniel Andersen[*G], Voicu Popescu, PhD1, Juan Barragan Noguera[*G], Ben L. Zarzaur, Patrick Murphy, Kathryn Anderson, Thomas J. Douglas, Clare Griffis, Andrew W. Kirkpatrick, Juan P. **Wach*s**. A Portable and Self-contained Approach for Surgical Telementoring: Towards Remote, Point of Injury Care. Presented in Poster Format at the Military Health System Research Symposium, Kissimmee, Florida, Aug 21 2019. MHSRS-19-02537.

(16) Natalia Sanchez-Tamayo[*G], Glebys Gonzalez[*G], Naveen Madapana[*G], Molly O'Brien[*G], Yexiang Xue, Richard Voyles, Vaneet Aggarwal, Gregory Hager, Andrew W Kirkpatrick, Steve Overholser, Juan **Wachs***. From the Desk (Dexterous Surgical Skill) to the Battlefield -A Robotics Exploratory Study. Presented in Poster Format at the Military Health System Research Symposium, Kissimmee, Florida, Aug 22, 2019. MHSRS-19-02537.

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(17) Chanci-Arrubla[*G]., D., Madapana, N., **Wachs***, JP. (2020) Correlation Between Gestures' Qualitative Properties and Usability metrics. Human Factors and Ergonomics Society (HFES). 64th International Annual Meeting October 5 - 9, 2020. **Best Paper Award**.

(18) Cha[*G], J., JM, Yang, J., S. Chandru, JP. **Wachs***, D. Yu. (2021). Measuring Cognitive Load from EEG during Motor Control Calibration in Robotic- Assisted Surgery (2021). In Proceedings of the HFES Annual Meeting 2021 (65th International Annual Meeting).

(19) G. Gonzalez[*G], M. M. Rahma[G]n, M. Agarwa[G]l, V. Aggarwal, R. M. Voyles, Y. Xue, and J. **Wachs***. (2022). ASAP: A Semi-Autonomous Precise robotic framework for remote surgery under delays. (oral). Military Health System Research Symposium (MHSRS), 12-15 September, Kissimmee, FL.

(20) Yang[*G], J., **Wachs**[*], JP, Yu, D. (2022) An Adaptive Human-Robotic Interaction Architecture for Augmenting Surgery Performance Using Real-time Workload Measurement. (oral). Military Health System Research Symposium (MHSRS), 12-15 September, Kissimmee, FL.

(21) Barragan[*G], J., Yu, D., **Wachs***, JP. (2022). Semi-Autonomous blood suction robotic assistant for remote surgical procedures. Military Health System Research Symposium (MHSRS), 12-15 September, Kissimmee, FL.

(22) Rojas[*G], E., Tung[G]a, A., **Wachs***, J. (2022). The AI Mentor: Towards Autonomous Surgical Telementoring. Military Health System Research Symposium (MHSRS), 12-15 September, Kissimmee, FL.

(23) Ocegueda Barraza[*G], A.; Morgan, E., Duerstock, B., **Wachs***. J. (2022). Development of an Intelligent Soft Orthotic Device (ISOD) for Adaptive Hand Rehabilitation. Military Health System Research Symposium (MHSRS), 12-15 September, Kissimmee, FL.

(24) Jacobson[*G], M.; Chanci Arrubla[G], D,; Romeo Tricas[G], M. Steiner S., Gnyawali, S., El Masry, M., Gordillo, G., Sen, C;, Xue, Y; **Wachs***, J. (2022). Multi-modality Burn Wound Characterization using Artificial Intelligence. Military Health System Research Symposium (MHSRS), 12-15 September, Kissimmee, FL.

(25) Balakuntala[*G], M., Deepak[G], R. Voyles, R., **Wachs**, Learning Robotic Ultrasound through Coaching. The 15th Hamlyn Symposium on Medical Robotics.

(26) Deepak[*G], R, Saha, Chandru, **Wachs**, JP., Voyles, R. UltraGelBot: Autonomous Gel Dispenser for Robotic Ultrasound. The Hamlyn Symposium of Medical Robotics 2024. Oral Presentation.