Curriculum Vitae

Patrick Joseph Flynn
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Education

- Ph.D. (Computer Science), Michigan State University, 1990.
- M.S. (Computer Science), Michigan State University, 1986.
- B.S. (Electrical Engineering, honors), Michigan State University, 1985.

Professional Experience

- 2001–2026: University of Notre Dame.
    - Fritz Duda Family Professor of Engineering, Emeritus, 2026–∞.
    - Professor of Computer Science and Engineering, Emeritus, 2026–∞.
    - Fritz Duda Family Professor of Engineering, 2014–2026.
    - Professor of Computer Science and Engineering, 2004–2026.
    - Chair, Department of Computer Science and Engineering, July 2017–June 2022.
    - Concurrent Professor of Electrical Engineering, 2004–2021.
    - Director, Notre Dame California/Provost Fellow, 2016–2017.
    - Associate Professor of Computer Science and Engineering, 2001–2004.
    - Concurrent Associate Professor of Electrical Engineering, 2003–2004.
    - Affiliations: Lucy Family Institute for Data and Society, 2021–2026; Notre Dame Technology Ethics Center, 2019–2023; Pulte Institute for Global Development, 2019–2020; Center for Advanced Diagnostics and Therapeutics/Institute for Precision Health, 2013–2021 (steering committee, 2014–2016); Wireless Institute, 2010–2016.
- Fall 2022: Adjunct Professor, Elmore Family School of Electrical and Computer Engineering, Purdue University (sabbatical leave).
- 2007–2008: National Institute of Standards and Technology. Research Associate (sabbatical leave).
- 1998–2001: Ohio State University.
    - Associate Professor of Electrical Engineering, 1998–2001.
    - Associate Professor of Computer and Information Science (by courtesy), 2000–2001.
- 1991–1998: Washington State University.
    - Associate Director for Computer Science, School of EECS, 1997–1998.
    - Associate Professor of Electrical Engineering and Computer Science, 1996–1998.
    - Undergraduate Coordinator, School of EECS, 1994–1997.
    - Assistant Professor of Electrical Engineering and Computer Science, 1991–1996.
- 1990–1991: University of Notre Dame.
    - Visiting Assistant Professor of Computer Science & Engineering.
- 1983–1990: Michigan State University.
    - Department of Computer Science: Research Associate (postdoctoral), Graduate Research Assistant and Graduate Teaching Assistant, 1986–1990.

    - Department of Electrical Engineering and Systems Science: Undergraduate and Graduate Research Assistant, 1983–1986.
- 1987: Northrop Research and Technology Center. Research Intern.

Awards and Honors

- University of Notre Dame:
    - All-Faculty team, 2018.
    - ND LEAD academic leadership cohort, 2015–2016.
    - Inaugural appointee, Fritz Duda Family Chair in Engineering, July 2014-June 2026.
    - Grand Prize, McCloskey Business Plan Competition, Mendoza College of Business, 2013 (with Chris Poellabauer, Shane McQuillan, and Nikhil Yadav). $99,000 cash and in-kind prizes.
    - Undergraduate Teaching Award, Dept. of Computer Science and Engineering, 2006.
    - Faculty Fellow, John A. Kaneb Center for Teaching and Learning, 2004–2005.
- Other Universities:
    - Distinguished alumnus award, College of Engineering/Department of Computer Science and Engineering, Michigan State University, 2021.
    - Outstanding teaching award (computer science), College of Engineering and Architecture, Washington State University: 1994, 1997, 1998.
    - Outstanding graduate student, Department of Computer Science, Michigan State University, 1990.
    - GTE Graduate Fellowship, Department of Computer Science, Michigan State University, 1987–1989.
    - College of Engineering undergraduate scholarships, Michigan State University, 1983–1985.
    - National Merit Scholarship, Michigan State University, 1981–1985.
- IEEE:
    - **Meritorious Service Award**, IEEE Biometrics Council, 2025.
    - **Technical Achievement Award** “for pioneering techniques for biometric identification and for creating a world class multi-biometric image database”, IEEE Computer Society, 2016.
    - IEEE Computer Society “Golden Core” award, 2013.
    - **Meritorious Service Award**, IEEE Computer Society, 2013.
    - Elevated to **IEEE Fellow** “for contributions to biometric identification”, 2012.
    - Outstanding Reviewer Award: CVPR 2010, WACV 2024, CVPR 2026.
    - Certificates of Achievement, IEEE Computer Society, 1999, 2000, 2001.
- Other:
    - Elected **ACM Distinguished Scientist**, 2011.
    - Elected **IAPR Fellow** “for contributions to research in three-dimensional object recognition systems and biometrics”, 2006.
    - **Fellow**, Asia-Pacific Artificial Intelligence Association, 2022.
    - ACC Academic Leadership Network cohort, 2018–2019.
    - Certificates of Appreciation, International Association for Pattern Recognition, 2004, 2008.

- ‘Star’ and ‘Key Contributor’ research awards, Battelle Memorial Institute, 2000.
- Honorary society memberships: Tau Beta Pi, Eta Kappa Nu, Phi Kappa Phi, Sigma Xi, Upsilon Pi Epsilon.

Funding

Research - Active

- ‘Psychophysical and Algorithmic Studies of Synthetic Friction Ridge Detection’, FBI Biometric Center of Excellence (via West Virginia University), $351,581, May 2026–April 2027 (co-PI; lead PI W. Scheirer; other co-PI A. Czajka).
- ‘Remote Vital Signs for Neonates’, AngelEye Health, $41,197, April–October 2026 (sole PI).

Research - Completed

- ‘*Wriggling Bad*: Detection of novel superpotent opioids in a portable whole-animal bioassay’, Univ. of Notre Dame Sensor Initiative seed grant program, $30,000, 2026 (team member; lead PI Marya Lieberman; co-PI Holly Goodson).
- ‘Ear biometrics: Data Collection and Curation, and baseline matching results’, $354,491, FBI CJIS (via West Virginia University), March 2024–December 2025 (lead PI; co-PI Kevin Bowyer).
- ‘Iris Image Synthesis’, $253,332, FBI CJIS (via West Virginia University), March 2024–May 2025 (co-PI K.W. Bowyer; lead PI Adam Czajka; co-PI K.W. Bowyer).
- SCALE: A Microelectronic Workforce Development Production Project, $2,140,145, US Army, 2022–2024 (key participant; lead PI C. Sweet, “trusted AI” topic lead PI A. Czajka).
- ‘Pupil Dilation Modeling’, $286,397, FBI Biometric Center of Excellence (via West Virginia University), 2023–2024 (co-PI; lead PI A. Czajka; co-PI K. Bowyer).
- ‘Development of Open-Source Iris Recognition Methods for IREX 10 Evaluations’, $104,434, National Institute of Standards and technology, 2022–2023 (co-PI; lead PI A. Czajka).
- ‘Securiport/ND Physiological Feature Extraction and Analytics’, $624,726, Securiport LLC, 2022–2023 (lead PI; co-PI A. Czajka).
- “Gender Bias in Iris Recognition (GBIR),” FBI Biometric Center of Excellence (via West Virginia University, USA), March 2022–May 2023, $269,358 (senior personnel; sole PI A. Czajka).
- ‘Distant Observation Enhancement and Recognition System (DOERS)’, $834,373, IARPA, subcontractor to Kitware, 2021–2023 (lead PI; co-PIs K. Bowyer, A. Czajka, J. Cleland-Huang; parent award lead PI S. McCloskey, Kitware).
- ‘Variable Iris Image Quality (VII-Q) Data Corpus Development’, $29,835, National Institute of Standards and Technology, 2021–2022 (lead PI; co-PI A. Czajka).
- ‘Deception Detection in Video’, $635,408, Securiport LLC, 2019–2021 (lead PI; co-PIs K. Bowyer and A. Czajka).
- ‘Software tool and methodology for enhancement of unidentified decedent systems with postmortem automatic iris recognition’, National Institute of Justice, $642,979, 2019–2021 (co-PI; lead PI A. Czajka; co-PIs K. Bowyer, A. Ross (Michigan State), D. Chute (Dutchess County, NY Medical Examiner)).
- ‘Joint Exploitation of Personal and Premises Surveillance Video,’ $279,450, Department of Homeland Security (via Purdue University, via George Mason University), 2018–2021 (co-PI; lead PI E. Delp at Purdue; co-PI A. Reibman at Purdue).

- ‘Contactless Fingerprint Image Collection’, $207,473, FBI Biometric Center of Excellence (via West Virginia University), 2019–2020 (co-PI; lead PI A. Czajka; co-PIs K. Bowyer and W. Scheirer).
- ‘Media Forensics Integrity Analytics,’ $4,045,790 (Notre Dame share $1,163,392), DARPA, 2016–2020 (co-PI with W. Scheirer and K. Bowyer at ND; lead PI E. Delp (Purdue); co-PIs N. Memon (NYU), C.-C. J. Kuo (USC), M. Barni (Università degli Studi di Siena), S. Tubaro and P. Bestagini (Politecnico di Milano).
- ‘Video Redaction,’ $50,000, Department of Homeland Security (via Purdue University), 2018–2019 (co-PI; lead PI E. Delp at Purdue; co-PI A. Reibman at Purdue).
- ‘Synthesis of Realistic Example Face Videos,’ $247,391, FBI Biometric Center of Excellence (via West Virginia University), 2018–2019 (lead PI; co-PIs K. Bowyer, W. Scheirer, A. Czajka).
- ‘A Tool Supporting Human Examination of Post-Mortem Iris Images,’ $248,407, FBI Biometric Center of Excellence (via West Virginia University), 2017-2018 (co-PI; lead PI K. Bowyer; co-PIs A. Czajka, W. Scheirer).
- ‘Synthesis of Realistic Face Images (Phase 2)’, $234,685, FBI Biometric Center of Excellence (via West Virginia University), 2017-2018 (lead PI; co-PIs K. Bowyer and W. Scheirer).
- ‘Synthesis of Realistic Example Face Images’, $298,933, FBI Biometric Center of Excellence (via West Virginia University), 2015-2016 (lead PI; co-PI K. Bowyer).
- ‘Reposing Face Images To Improve Recognition Accuracy’, $335,920, FBI Biometric Center of Excellence (via West Virginia University), 2015-2016 (lead PI; co-PI K. Bowyer).
- 'Automatic Classification of Left/Right and Up/Down Orientation of Iris Images', $278,160, FBI Biometric Center of Excellence (via West Virginia University), 2015-2016, (co-PI; lead PI K. Bowyer).
- ‘2D/3D biometric acquisition and research’, $226,197, Digital Signal Corporation, 2015-2016 (lead PI; co-PI K. Bowyer).
- ‘eBOLO Tool for Greater Cleveland Rapid Transit’, $60,000, Dept. of Homeland Security (subcontract from Purdue University), 2014-2015 (PI).
- 'EAGER: Feasibility of Using Speech as a Biomarker for Concussions,' $300,000, NSF, 2014-2016 (co-PI; lead PI C. Poellabauer).
- ‘CI-New: An Open Speech Data Repository for Medical Prediction and Assessment of Neurological Disorders’, $636,643, NSF, 2014-2017 (co-PI; lead PI C. Poellabauer).
- ‘Detection and Exploitation of Periocular Features’, $200,000, FBI Biometric Center of Excellence (via West Virginia University), 2014-2015, (lead PI; co-PI K. Bowyer).
- ‘Video-Based Object Re-Identification across Multiple Cameras in Heterogeneous Camera Networks’, $90,000, Xerox Corporation, 2014-2017 (co-PI with K. Bowyer).
- ‘Using Speech as a Biomarker for Instant Concussion Diagnosis and Assessment’, $300,000, GE/NFL Head Health Challenge I program, 2014-2015 (co-PI; lead PI C. Poellabauer).
- ‘Morphing in Face Recognition’, $25,000, MITRE Corp., 2014 (co-PI; lead PI K. Bowyer).
- ‘Near-Infrared and Visible Light Face Recognition’, $200,000, FBI Biometric Center of Excellence (via West Virginia University), 2013-2014 (co-PI; lead PI K. Bowyer).
- ‘Iris Sensing and Recognition’, $83,020, Oak Ridge National Laboratories, 2013-2014 (PI).
- ‘Addressing Challenges to Robust Face Detection, Modeling, Tracking and Recognition in Stills and Video’, $245,536, Scitor Corp., 2012-2013 (co-PI; lead PI K. Bowyer).
- ‘Forensic Use of Dermal Marks’, $200,000, FBI Biometric Center of Excellence (via West Virginia University), 2012-2015 (PI).

- ‘Quality Metrics for the Prediction of Face Recognition Performance’, $100,000, NIST, 2012-2013 (co-PI; lead PI K. Bowyer).
- ‘Phase 1 - GOTS Platform for Face Detection, Tracking and Recognition’, $349,999, Scitor Corp., 2012-2013 (lead PI; co-PI K. Bowyer).
- ‘Concussion Detection Rapid Response’, Notre Dame Office of Research, $15,000, 2012-2013 (co-PI; lead PI C. Poellabauer).
- ‘Smartphone-Based Colorimetric Analysis of Medical and Food Safety Test Strips’, $148,004, Serim Research Corp., 2011-2015 (lead PI; co-PI C. Poellabauer).
- ‘Mitigation of Challenges to Iris Recognition’, $33,333, Department of Homeland Security (SBIR Phase I subcontract from Progeny Systems Corp), 2011 (co-PI; lead PI K. Bowyer).
- ‘Detection of Counterfeit Anti-Malarial Drugs’, University of Notre Dame Faculty Research Support Program, $98,090, 2011-2012 (co-PI with H. Goodson; lead PI M. Lieberman).
- ‘3D Mapping Research’, NAVTEQ Corp., $15,000, 2011 (PI; gift).
- ‘Multispectral, Multimodal, and Multiresolution Human Identification using Periocular Biometrics’, Intelligence Community Postdoctoral Research Fellowship Program, $240,000, 2010-2013 (lead PI; co-PI K. Bowyer).
- ‘BEST Data Collection, Validation and Research’, Army Research Laboratory, $2,593,101, 2010-2012 (lead PI; co-PI K. Bowyer).
- ‘Biometric Discrimination of Identical Twins using Facial Identification’, FBI, $142,600, 2010-2011 (lead PI; co-PI K. Bowyer). Funded as additional work in US Army contract below.
- ‘Face Annotation at the Macroscale and the Microscale: Tools, Techniques, and Applications in Forensic Identification,’ US Department of Justice, $760,256, 2009-2011 (lead PI; co-PI A.K. Jain, Michigan State University).
- ‘Biometric Discrimination of Identical Twins using Facial Identification’, FBI, $138,000, 2009-2011 (lead PI; co-PI K. Bowyer). Funded as additional work in US Army MBGC contract below.
- ‘On The Super-resolution of Iris Images From Video Streams’, WVU Center for Identification Technology Research (NSF I/UCRC), $27,000, 2009-2010 (co-PI with A. Ross).
- ‘MBGC Design, Data Collection, and Support’, US Army, $704,000, 2008-2009 (co-PI; lead PI K. Bowyer).
- ‘3D Mapping Research’, NAVTEQ, $50,000, 2008 (sole PI; gift).
- ‘HECURA: Deconstructing Clusters for High End Biometric Applications’, NSF, $199,208, 2007-2009 (co-PI; lead PI D. Thain).
- ‘Face Recognition from Video’, US Department of Justice, $362,476, 2006-2009 (lead PI; co-PIs K. Bowyer and N. Chawla).
- ‘Toward multi-modal face + ear “drive-by ID,”’ UNISYS, $90,000, 2007-2008 (co-PI; lead PI K. Bowyer).
- ‘Development of ear biometrics: 2D, 3D and morphable models’, UNISYS, $100,000, 2005-2006. (co-PI; lead PI K. Bowyer).
- ‘Advanced open image and video pre-processing platform for face imagery,’ UNISYS, $100,000, 2005-2006. (co-PI; lead PI K. Bowyer) .
- ‘Characterizing 3D face data, sensors, and collection procedures’, UNISYS, $50,000, 2005-2006. (co-PI; lead PI K. Bowyer) .
- ‘Research in Iris and 3-D Based Human Identification’, NSF, $1,796,408, 2003–2009, (co-PI; lead PI K. Bowyer) (funded as supplements to ‘Instrumentation for Multidimensional Imaging and Applications’; see below)

- ‘Hydra: A Robust and Self Managing Video Sensing System for Retrospective Surveillance’, NSF, $222,950, 2005–2006 (co-PI; lead PI S. Chandra).
- ‘Center for Advanced Biometric Research and Evaluation’, US Department of Justice, $250,000, 2005–2006 (co-PI with Dimitris Samaras (SUNY-Stony Brook); lead PI K. Bowyer).
- ‘Facial Feature Extraction and Quality Assessment for 2D/3D Multimodal Face Images’, Sandia National Laboratories, $35,000, 2004–2005 (sole PI).
- ‘Improving the Ease of Use of Iris Recognition Systems: Advanced Open Iris Biometrics’, National Geospatial Intelligence Agency, $240,000 (lead PI; K. Bowyer, co-PI), 2004–2006.
- ‘Multi-Source Image Correlation & Analysis’, Air Force Research Laboratories (Rome Labs), $75,000, 2004–2005 (co-PI with K. Bowyer; lead PI R. Stevenson).
- ‘Center for Advanced Biometric Research and Evaluation,’ US Department of Justice, $300,000, 2004–2006 (co-PI with D. Samaras (SUNY-Stony Brook); lead PI K. Bowyer).
- ‘Data Sets, Baseline Performance Reference Points, and Evaluation Metrics for HumanID’, DARPA/ONR, $1,095,000, 2002–2004 (co-PI; lead PI K. Bowyer).
- ‘Perceptual Learning’, Univ. of Notre Dame (College of Arts and Letters multiyear collaborative research grant program), $75,000, 2002–2003 (co-PI with K. Bowyer and M. Wenger; lead PI Bradley Gibson).
- ‘Building Complete Autonomous Robots’, Univ. of Notre Dame (College of Engineering GE Learning Excellence Fund program), $55,000, 2002–2003 (co-PI with A. Bowling; lead PI M. Scheutz).
- ‘Data Sets, Baseline Performance Reference Points, and Evaluation Metrics for HumanID’, DARPA/ONR (subcontract from U. of South Florida), $158,000, 2001–2002 (co-PI; lead PI K. Bowyer).
- ‘Remote Gait Analysis’, Ameritech Foundation/The Ohio State University, $20,000, 2001–2002 (co-PI; lead PI R. Parent).
- ‘Hierarchical Segmentation and Attribution of High Resolution Aerial Images with a View to Change Detection and Analysis’, NASA, $200,000, 2000–2001 (co-PI with S.-C. Zhu; lead PI K. Boyer).
- ‘Vehicle Occupant Motion Detection and Analysis’, Honda R&D, $60,000, 2000–2001 (co-PI; lead PI K. Boyer).
- ‘Model-Based Object Recognition using Multiple Sensor Modalities and Invariant Techniques’, Air Force Research Laboratory/Dayton Area Graduate Studies Institute/Veridian Engineering, $400,000, 2000–2002 (lead PI; co-PIs K. Boyer, M. Oxley, K. Sturtz, G. Arnold, V. Velten).
- ‘Lossy Image Compression in an ATR Context’, Air Force Research Laboratory, $40,000, 2000–2001 (lead PI; co-PI S. Ahalt).
- ‘Integration of Wave Theory and Statistical Pattern Classification for Ultrasound Imaging of Breast Tumors,’ NSF, $85,000, 1997–1999 (co-PI; lead PI S. Broschat).
- ‘Advanced Imaging Algorithms for an Optical Sonography Imaging System,’ Washington Technology Center and Advanced Diagnostics, Inc., $73,000 (cash) plus $245,000 (in-kind), 1997–1999 (lead PI; co-PIs S. Broschat and R. Tucker).
- ‘Visualization and Animation of Acoustic Propagation,’ ONR, $3,500, 1996 (co-PI with S. Broschat; lead PI J. Schneider).
- ‘Recurrent Modeling,’ NSF, $206,000, 1996–1999, (co-PI; lead PI J. Hart).
- ‘Model-Based Recognition of Free-Form Objects,’ NSF, $196,000,1995–1999 (sole PI).
- ‘Interactive and Automatic Recurrent Modeling Research,’ Intel, $93,000, 1995–1997 (co-PI; lead PI J. Hart).

- ‘Monte Carlo Simulations of Acoustic Propagation Through Shallow Water,’ $50,000, ONR, 1995–1996 (co-PI with J. Schneider; lead PI S. Broschat).
- ‘REU Supplement to IRI-9209212,’ NSF, $4,000, 1994–1995 (sole PI).
- ‘Monte Carlo Simulations of Acoustic Propagation Through Shallow Water,’ ONR, $55,000, 1994 (co-PI with J. Schneider; lead PI S. Broschat).
- ‘Model-Based Vision for 3D Objects,’ Washington Technology Center, $80,000, 1993–1995 (co-PI with L. Shapiro).
- ‘3D Object Recognition Using Real World Multispectral Imagery,’ Boeing Defense and Space Group, $30,000, Electronic Systems Division, 1993 (sole PI).
- ‘Feature Group Utility in Model-Based Object Recognition Systems,’ NSF (CISE Research Initiation Award), $100,000, 1992–1995 (sole PI).
- ‘Scaling Behavior in 3D Object Recognition Systems,’ Washington State University Research Grant-in-Aid program, $13,000, 1992–1993 (sole PI).
- ‘Reliable Surface Parameter Estimation in Three-Dimensional Vision,’ Jesse H. Jones Faculty Research Fund, University of Notre Dame, $10,000, 1991–1992 (co-PI with R. Stevenson).

Equipment/Software

- ‘Instrumentation for Multidimensional Imaging and Applications’, NSF, $249,000 (including $83,000 matching funds), 2001–2003 (lead PI; co-PIs K. Bowyer, D. Chen, R. Stevenson).
- ‘A High Performance Computing and Imaging Facility for Research in Image Understanding and Analysis’, NSF, $180,000 (including $60,000 matching funds), 1999–2002 (lead PI; co-PIs K. Boyer and T. Caelli).
- ‘Solid State Device Animation Laboratory,’ NSF, $102,000, 1996–1998 (co-PI with R. Rada; lead PI M. Osman).
- ‘High-Performance Networking and Computing Infrastructure for Imaging Research,’ NSF, $160,000 (including $55,000 matching funds), 1995–1997 (co-PI with J. Hart and R. Bamberger; lead PI T. Fischer).
- ‘Software for Graphics and Animation Production,’ Wavefront Technologies (lead PI; co-PI K. Singhrs), 1993–1998. This donation consisted of 5-14 licenses of several different software products (Composer, PowerAnimator, etc.) with a list price of approximately $3.0 million.
- ‘Video Acquisition, Display, and Processing Laboratory,’ NSF, $80,000, 1992–1993 (co-PI with R. Bamberger; lead PI T. Fischer).
- Animation software gift, Alias Research, Inc., one copy of software valued at $90,000, 1992 (lead PI; co-PI K. Singhrs).

Advising

All students graduated from Notre Dame with a Computer Science and Engineering graduate degree unless otherwise noted.

Postdoctoral scholars supported

- Daniel Henriques Moreira, 2017-2022.
- Andrey Kuehlkamp, 2018-2020.
- Ogechukwu Iloanusi, 2016-2017.
- Min-Ki Kim, 2013.
- Gaurav Aggarwal, 2011-2012 (with Kevin Bowyer).
- Soma Biswas, 2010-2012 (with Kevin Bowyer).

- Karen Hollingsworth, 2010-2012 (with Kevin Bowyer).
- Damon Woodard, 2004-2006.
- Kyong (Jin) Chang, 2004-2005 (with Kevin Bowyer).
- Jaesik Min, 2002-2004 (with Kevin Bowyer).

Ph.D. advisees (and first employment after graduation, plus current employment if known)

- Benjamin Sporrer, Ph.D. expected 2027.
- Deeksha Arun, Ph.D. expected 2026.
- Lu Niu, Ph.D. expected 2026.
- Nathan Vance, Ph.D. *Remote Physiological Monitoring: Domain Shifts and their Effects on Model Behavior*, 2024. Aunalytics.
- Patrick Tinsley (co-advisor with Adam Czajka), Ph.D. *Trust, AI, and Synthetic Biometrics*, 2024. AngelEye Health.
- Jeremy Speth (co-advisor with Adam Czajka), Ph.D. *Remote Vitals Estimation in an Open World*, 2023. Presage Technologies (now at Apple Computer). Best Dissertation Award from the IEEE Biometrics Council, 2024.
- Pei Li, Ph.D. *Studying Unconstrained Degraded Face Recognition and Redaction with Applications in Real Surveillance Environment*, 2020. Zoom.
- Sandipan Banerjee (co-advisor with Kevin Bowyer), Ph.D. *Exploring the Effects of Frontalization and Data Synthesis on Face Recognition*, 2019. Affectiva (now at Amazon).
- Jason Grant, Ph.D.: *Analysis of Crowd Behavior based on Optical Flow: Detection, Classification, and Clustering,* 2018. Faculty, Middlebury College (now faculty at Villanova University).
- Amanda Sgroi, Ph.D. (co-advisor with Kevin Bowyer): *Exploration of the Impostor Score Distribution for Face-Based Biometrics*, 2015. ChemImage (now at Neya Systems).
- Nisha Srinivas, Ph.D.: *Analysis of Facial Marks as Biometric Signatures for Forensic Facial Identification*, 2014. Oak Ridge National Laboratory (now at BigBear).
- Jeremiah Barr, Ph.D. (co-advisor with Kevin Bowyer): *Gallery-free Methods for Detecting and Recognizing People and Groups of Interest "in the wild"*, 2014. Noblis (now at Corteva).
- Feng Shen, Ph.D.: *A Visually Interpretable Iris Recognition System with Crypt Features*, 2014. Google (now at Roblox).
- Joseph Thompson, Ph.D.: *Simulation and Analysis of the Impact of Eye Morphology on Iris Recognition*, 2014. Google (now at Aurora).
- Jeffrey Paone, Ph.D.: *Liberating the Biometric Menagerie through Score Normalization Improvements*, 2013. Oak Ridge National Laboratories (now faculty at Colorado School of Mines).
- Alexandri Zavodny, Ph.D.: *Change Detection in LIDAR Scans of Urban Environments*, 2012. Nokia Location and Commerce (now at Rivian).
- Ryan Connaughton, Ph.D. (co-advisor with Kevin Bowyer): *Fusion of Face and Iris Biometrics Using a Stand-Off-Video* Sensor, 2011. Medstrat.
- Karen Hollingsworth, Ph.D. (co-advisor with Kevin Bowyer): *Increased Use of Available Image Data Decreases Errors in Iris Biometrics*, 2010. Postdoc at Notre Dame.
- Deborah Thomas, Ph.D. (co-advisor with Kevin Bowyer): *Face Recognition in Surveillance-Quality Video*, 2010. Faculty, Eastern Oregon University (now faculty at Corban University).

- Robert McKeon, Ph.D.: *Three-Dimensional Face Imaging and Recognition: A Sensor Design and Comparative Study*, 2010. Digital Signal Corp (now at Apple).
- Christopher Boehnen, Ph.D.: *Improving 3D Face Recognition Model Generation and Biometrics*, 2009. Oak Ridge National Laboratories (now retired). **PECASE awardee, 2019**.
- Tim Faltemeier, Ph.D. (co-advisor with Kevin Bowyer): *Flexible and Robust 3D Face Recognition*, 2007. Progeny Systems, Inc (acquired by AeroVironment).
- Xiaomei Liu, Ph.D. (co-advisor with Kevin Bowyer): *Optimizations in Iris Recognition*, 2006. Beckman Coulter (now at Dell EMC).
- Xin Chen, Ph.D. (co-advisor with Kevin Bowyer): *Modeling the Human Face Through Multiple View Three-Dimensional Stereopsis: A Survey and Comparative Analysis of Facial Recognition Over Multiple Modalities*, 2006. NAVTEQ (now at Salesforce).
- Kyong (Jin) Chang, Ph.D. (co-advisor with Kevin Bowyer): *New Multi-Biometric Approaches for Improved Person Identification*, 2004. Philips Medical Imaging.
- Damon Woodard, Ph.D.: *Finger Surface as a Biometric Identifier*, 2004. Faculty at Clemson University (now faculty at University of Florida).
- Richard Campbell, Ph.D. (Electrical Engineering, Ohio State): *Recognition of Free-Form 3D Objects in Range Data using Global and Local Features*, 2001. Sharp Microelectronics Laboratories (now at Logitech).

M.S. and B.S. thesis advisees

- Jason Grant, M.S.: *Exploring the Structure of the Similarity Score Space*, 2013.
- Joseph Thompson, M.S.: *Iris Perturbation Methods for Improved Recognition*, 2011.
- James Doyle, M.S.: *Quality Metrics for Biometrics*, 2011.
- Sarah Baker, M.S.: *Debunking Myths in Iris Recognition*, 2010 (co-advised with Kevin Bowyer).
- Tanya Peters, M.S.: *Effects of Segmentation Routine and Acquisition Environment on Iris Recognition*, 2009 (co-advised with Kevin Bowyer).
- Alexandri Zavodny, M.S.: *Analysis of Large-Scale Unstructured Urban Range Scan Data*, 2009.
- Christopher Fallin, B.S. (Honors): *Automatic Face Feature Localization for Face Recognition*, 2009.
- Karen Hollingsworth, M.S.: *Sources of Error in Iris Biometrics*, 2008 (co-advised with Kevin Bowyer).
- Christopher Boehnen, M.S.: *A Multi-Modal Approach to Frontal and Non Frontal Facial Feature Detection*, 2005.
- Haoshu Wang, M.S.: *Eye Location Sensitivity in Face Recognition*, 2004.
- Xin Chen, M.S.: *PCA-Based Face Recognition in Infrared Imagery: Baseline and Comparative Studies*, 2003 (co-advised with Kevin Bowyer).
- Gerald Dalley, B.S. (Electrical Engineering, with distinction, Ohio State): *A Software Testbed for Registration of Range Images*, 2000.
- Anand Kalyanaraman, M.S. (Electrical Engineering, Ohio State): *Edge Based Artifact Mitigation in a SPIHT Coding Framework*, 2000.
- Ruming Yin, M.S. (Electrical Engineering, Washington State; co-advisor with Shira Broschat): *Position-Dependent Defocus Processing in Optical Sonography*, 1999.
- Xiangrong Wang, M.S. (Computer Science, Washington State): *Implementation and Experiments with a Factorization-Based Structure from Motion Method*, 1995.
- Yan Chen, M.S. (Computer Science, Washington State; co-advisor with Shira Broschat): *Aggressive Region Growing with Various Filtering Techniques for Speckle Reduction*, 1995.

- Richard Campbell, M.S. (Electrical Engineering, Washington State): *Range Image Segmentation via Presegmentation and Quadric Surface Extraction*, 1995.
- Matthew Howell, M.S. (Computer Science, Washington State): *Adapting Geometric Hashing to Account for Sensor Error*, 1994.
- Samir Kapoor, M.S. (Electrical Engineering, Washington State): *Estimation of Motion Parameters for Single and Multiple Mobile Objects*, 1994.
- Jian Guo, M.S. (Computer Science, Washington State): *Curvature Estimation from Range Data*, 1994.
- Hongjiu Lu, M.S. (Computer Science, Washington State): *Ground State Texture Patterns for the Second-order Ising Model*, 1993.
- Zhiya Cai, M.S. (Computer Science, Washington State): *Design and Implementation of a 2D Geometric Modeler*, 1993.
- Bryan Triplett, M.S. (Computer Science, Washington State): *Resolution-Dependent Display of Quadric and Superquadric Surfaces*, 1992.
- Vinod Chandran, M.S. (Computer Science, Washington State): *Affine-Invariant Object Recognition Using the Radon Transform*, 1991.

Publications

Books

1. A.K. Jain and P.J. Flynn (eds.), *Three-Dimensional Object Recognition Systems*, Elsevier Science Publishers, 1993.
2. A.K. Jain, P.J. Flynn and A. Ross (eds.), *Handbook of Biometrics*, Springer, 2007.

Book chapters

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126. Xiaomei Liu, Kevin W. Bowyer, Patrick J. Flynn, Experimental Evaluation of Iris Recognition, *Proc. Face Recognition Grand Challenge Workshop*, San Diego, June 2005. DOI: 10.1109/CVPR.2005.576
127. Christopher Boehnen and Patrick Flynn, Accuracy of 3D Scanning Technologies in a Face Scanning Scenario, *Proc. 5th Int. Conf. on 3-D Digital Imaging and Modeling (3DIM 2005)*, Ottawa, pp. 310-317, June 2005. DOI: 10.1109/3DIM.2005.13
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131. Kyong Chang, Damon Woodard, Patrick Flynn and Kevin Bowyer, Three-Dimensional Face and Finger Biometrics, *Proc. EUSIPCO*, September 2004.
132. Kyong Chang, Kevin Bowyer, and Patrick Flynn, A Survey of Approaches to Three-Dimensional Face Recognition, *Proc. ICPR 2004*, vol. 1, pp. 358-361, August 2004. DOI: 10.1109/ICPR.2004.1334126 . Reprinted in *Journal of Intelligence Community Research and Development*.
133. Kyong Chang, Kevin Bowyer, and Patrick Flynn, Multi-biometrics using Facial Appearance, Shape, and Temperature, *Proc. 6th IEEE Int. Conf. on Automatic Face and Gesture Recognition (FG2004)*, May 2004, Seoul, pp. 43-48. 10.1109/AFGR.2004.1301507
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137. Kyong Chang, Kevin Bowyer, and Patrick Flynn, Face Recognition using 2D and 3D Facial Data, *Proc. ACM Workshop on Multimodal User Authentication*, Santa Barbara, December 2003, pp. 25-32.

138. Xin Chen, Patrick Flynn and Kevin Bowyer, Visible-light and infrared face recognition, *Proc. ACM Workshop on Multimodal User Authentication*, Santa Barbara, December 2003, pp. 48-55.
139. Xin Chen, Patrick Flynn and Kevin Bowyer, PCA-Based Face Recognition in Infrared Imagery: Baseline and Comparative Studies, *Proc. IEEE International Workshop on Analysis and Modeling of Faces and Gestures (AMFG 2003)*, Nice (France), Oct. 2003, 127-134. DOI: 10.1109/AMFG.2003.1240834
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149. Xiaodong Zhang, Shira Broschat, and Patrick Flynn, Inverse Imaging of the Breast using the Conjugate Gradient-Bivariate Material Classification Technique, *Proc. 1999 IEEE International Ultrasonics Symposium*, Lake Tahoe, NV, Oct. 1999. DOI: 10.1109/ULTSYM.1999.849303
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151. Richard Campbell and Patrick Flynn, Eigenshapes for 3D Object Recognition in Range Data, *Proc. IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR '99)*, pp. 505-510. DOI: 10.1109/CVPR.1999.784728

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153. Yan Chen, Ruming Yin, Patrick Flynn, and Shira Broschat, Aggressive region growing filtering for speckle reduction in ultrasound images, *Proc. 1998 ICA/ASA joint meeting*, June 1998, Seattle.
154. Wayne Cochran, John Hart and Patrick Flynn, On Approximating Rough Curves with Fractal Functions, *Proc. Graphics Interface '98*, Vancouver, June 1998.
155. Richard Campbell and Patrick Flynn, Model and Image Features for Free-Form Object Recognition, *Proc. Vision Interface '98*, Vancouver, June 1998.
156. Richard Campbell and Patrick Flynn, A WWW-Accessible Image and Model Database for Computer Vision Research, *Proc. IEEE Workshop on Empirical Evaluation Methods in Computer Vision*, Santa Barbara, June 1998.
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161. Patrick Flynn, Realistic Range Rendering, *Proc. IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR '94)*, 848-851, 1994. DOI: 10.1109/CVPR.1994.323911
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167. Timothy Newman, Patrick Flynn and Anil Jain, Model-Based Surface Classification, *Proc. SPIE Conference on Geometric Methods in Computer Vision* (SPIE vol. 1570), 250-261, 1991.
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169. Patrick Flynn and Anil Jain, BONSAI: 3D Object Recognition Using Constrained Search, *Proc. Third International Conference on Computer Vision*, 263-267, 1990. DOI: 10.1109/34.99239
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172. Patrick Flynn and Anil Jain, On Reliable Curvature Estimation, *Proc. IEEE Computer Society Conference on Computer Vision and Pattern Recognition* (CVPR '89), 110-116, 1989. DOI: 10.1109/CVPR.1989.37837
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174. Patrick Flynn, Gregory Hoshal and Marvin Siegel, Vital Life Signs Detection using Microwave Energy and Digital Signal Processing, *Proc. 1986 Computers in Cardiology Conference*, 505-506, 1986.
175. William Byrne, Roland Zapp, Patrick Flynn and Marvin Siegel, Adaptive Filtering in Microwave Remote Heart Monitors, *Proc. 7th Annual Conference of the IEEE Engineering in Medicine and Biology Society*, 1196-1199, 1985.

Classified Articles, Non-Refereed Articles, Editorials, Technical Reports, and Presentations without Proceedings

1. C. Crum, P. Flynn, and A. Czajka, Location, Location, Location: Viewing Generative AI's Latent Space Through the Lens of Property Law, poster at *R.I.S.E. AI* Conference, University of Notre Dame, October 2025.
2. Karen Hollingsworth, Kevin W. Bowyer, and Patrick J. Flynn, Useful Features for Human Verification in Near-Infrared Periocular Images, *Journal of Intelligence Community Research and Development*, permanently available on Intelink, 2012.
3. N. Srinivas, M. Pruitt, G. Aggarwal, P. Flynn and R. Vorder Bruegge, Preliminary Assessment of Discrimination of Twins in Photographs Based on Facial Blemishes, abstracted in *Proc. 63rd AAFS Annual Meeting* (American Academy of Forensic Sciences), p. 140, Chicago, January 2011.
4. K. Bowyer, P. Flynn, K. Hollingsworth, S. Baker, and S. Ring, Toward the next generation of iris biometrics science, *SPIE Newsroom*, 2009. DOI: 10.1117/2.1200904.1595.
5. P. J. Phillips, W. T. Scruggs, A. J. O'Toole, P. J. Flynn, K. W. Bowyer, C. L. Schott, M. Sharpe, FRVT 2006 and ICE 2006 Large-Scale Results, National Institute of Standards and Technology, NISTIR 7408, http://face.nist.gov, 2007.

6. Kyong I. Chang, Kevin W. Bowyer, Patrick J. Flynn and Xin Chen, Multi-biometrics Using Facial Appearance, Shape and Temperature, *Journal of Intelligence Community Research and Development*, permanently available on Intelink, 2006.
7. Kyong I. Chang, Kevin W. Bowyer, Patrick J. Flynn and Xin Chen, A Survey of 3D and Multi-Modal 3D+2D Face Recognition, *Journal of Intelligence Community Research and Development*, permanently available on Intelink, 2006.
8. Kyong I. Chang, Kevin W. Bowyer, Patrick J. Flynn and Xin Chen, Face Recognition Using 2D and 3D Facial Data, *Journal of Intelligence Community Research and Development*, permanently available on Intelink, 2006.
9. Kyong I. Chang, Kevin W. Bowyer, and Patrick J. Flynn, Visible-light and Infrared Facial Recognition, *Journal of Intelligence Community Research and Development*, permanently available on Intelink, 2005.
10. J. Ward, M. Wittman and P. Flynn, Visual Analysis of the Effects of Load Carriage on Gait, poster presentation at *Biometrics Consortium Conference 2004*, Washington DC, September 2004.
11. D. Woodard and P. Flynn, Finger Surface as a Biometric Identifier, presentation at *Biometrics Consortium Conference 2004*, Washington DC, September 2004.
12. J. Min, K. Bowyer, P. Flynn, X. Liu, Ensemble Eye Location Sampling for Improved Face Recognition Performance, poster presentation at *Biometrics Consortium Conference 2004*, Washington DC, September 2004.
13. Xin Chen, Patrick Flynn and Kevin Bowyer, PCA-based face Recognition in Infrared Imagery: Baseline and Comparative Results, *BC2003 Research Symposium*, Arlington VA, Sept. 2003.
14. Damon Woodard and Patrick Flynn, Hand Silhouette Curvature Measurements as a Biometric identifier, *BC2003 Research Symposium*, Arlington VA, Sept. 2003.
15. Patrick Flynn, Adam Hoover and Jonathon Phillips, Special Issue on Empirical Evaluation of Computer Vision Algorithms, *Computer Vision and Image Understanding* **84**(1):1-4, October 2001.
16. Kevin Bowyer and Patrick Flynn, A 20th Anniversary Survey: Introduction to Content-based Image Retrieval at the End of the Early Years, *IEEE Transactions on Pattern Analysis and Machine Intelligence* **22**(12):1348, December 2000. DOI: 10.1109/TPAMI.2000.895971
17. Kevin Bowyer, Patrick Flynn, and Rangachar Kasturi, Editorial: The 20th Anniversary of the IEEE Transactions on Pattern Analysis and Machine Intelligence, *IEEE Transactions on Pattern Analysis and Machine Intelligence* **22**(1):1-3, January 2000. DOI: 10.1109/TPAMI.2000.824818
18. Kevin Bowyer and Patrick Flynn, Editorial: Multiple Submission: Professionalism, Ethical Issues, and Copyright Legalities, *IEEE Transactions on Pattern Analysis and Machine Intelligence* **21**(5):385, May 1999.
19. Patrick Flynn, George Stockman and Octavia Camps, Editorial: Progress in CAD-Based Vision: An Introduction to the Special Issue, *Computer Vision and Image Understanding*, March 1998.
20. Shira Broschat, John Schneider, Frank Hastings, and Patrick Flynn, Computational and theoretical models for rough surface and bottom scattering, *Proc. 1997 Int. Conf. on Shallow-Water Acoustics*, Beijing, April 1997.
21. Wayne Cochran, John Hart and Patrick Flynn, Hashing Fractal Functions, *Proc. 1997 Western Computer Graphics Symposium (SKIGRAPH 97)*, Whistler, April 1997.
22. John Schneider, Frank Hastings, Patrick Flynn and Shira Broschat, Understanding Acoustic Propagation in Shallow Water via Animations, abstracted in *Journal of the Acoustical Society of America* **99**(4):2552 (part 2), April 1996.

23. Katsushi Ikeuchi and Patrick Flynn, Editorial: Recent Progress in CAD-Based Vision, *Computer Vision and Image Understanding* **61**(3):293-294, 1995.
24. Wayne Cochran, John Hart, and Patrick Flynn, Principal Component Classification for Fractal Volume Compression, *Proc. 1995 Western Computer Graphics Symposium (SKIGRAPH 95)*, Banff, March 1995.
25. Shira Broschat, John Schneider, and Patrick Flynn, Finite Difference Simulations of Propagation in a Shallow Water Environment, abstracted in *Journal of the Acoustical Society of America* **96**(5):3265 (part 2), November 1994.
26. Jianxin Hou, Ronald Thiessen, Robert Bamberger, and Patrick Flynn, Automatic Lineament Interpretation of Aeromagnetic Images of the Hanford Site, *Geological Society of America Annual Meeting (Abstracts with Programs: Geological Society of America)* **21**(7), October 1994.
27. Jianchang Mao, Anil Jain, and Patrick Flynn, Integration of Multiple Feature Groups and Multiple Views into a 3D Object Recognition System, *Proc. 2nd ESPRIT-ARPA/NSF Workshop on Invariance in Computer Vision*, Ponta Delgada (Azores), pp. 267-286, October 1993.

Patents granted

1. Robert T. Aloe and Patrick Flynn, APPARATUS AND METHODS FOR THREE-DIMENSIONAL IMAGING USING A STATIC LIGHT SCREEN, US Patent 8,760,510, issued June 26, 2014.
2. Toni Lee Owen Barstis, Patrick Joseph Flynn, and Marya Lieberman, Analytical devices for detection of low-quality pharmaceuticals, US Patent 9,354,181, issued May 31, 2016.
3. Jeremy Speth, Patrick Flynn, Adam Czajka, Kevin Bowyer, Nathan Carpenter, Leandro Olie, Video Based Detection of Pulse Waveform, US Patent 12,343,177B2, issued July 1, 2025.

Active patent applications

1. Jeremy Speth, Nathan Carpenter, Nathan Vance, Lu Niu Siamul Khan, Adam Czajka, Patrick Flynn, Liveness Detection, US Patent Application 18/625,685, filed April 2024.
2. Jeremy Speth, Nathan Vance, Patrick Flynn, Adam Czajka, Non-contrastive unsupervised learning of physiological signals from video, US Patent Application 18/389,049, filed November 2023.
3. N. Vance, J. Speth, S. Khan, A. Czajka, K. Bowyer, D. Wright, P. Flynn, N. Carpenter, L. Olie, Deception Detection, US Patent Application 18/115,414, filed February 28, 2023.
4. J. Speth, N. Vance, P. Flynn, A. Czajka, Non Contrastive Unsupervised Learning of Physiological Signals from Video, US Patent Application 63/424,606, filed November 11, 2022.
5. N. Vance, J. Speth, S. Khan, A. Czajka, K. Bowyer, P. Flynn, N. Carpenter, L. Olie, Trustworthy Anomaly-Aware Pulse Estimation, US Patent Application 63/388,984, Filed July 13, 2022.

Films

All films listed are short computer animated subjects produced by students in CS446/546 at Washington State University during 1992-1998, coordinated and taught by K. Singhrs and P.J. Flynn. Film rights for publication are secured through the WSU Research Foundation.

- 'Home Free,' (Jim Fricker and Xiaoling Chen, animators), *Imaginit!*, Miramar Films, 1996.
- 'Greed,' (Sean Jenkins, animator), shown at Eurographics 96, Poitiers, France. Also shown at ACADIA National Workshop (Association for CAD in Architecture), Seattle, 1995.
- 'Bryan Clock Tower,' (Pam Miles *et al.*, animators), shown at ACADIA National Workshop, Seattle, 1995.

- ‘WSU Animation 93-94’ and ‘WSU Animation 94-95,’ (class vanity collections) shown at ACADIA National Workshop, Seattle, 1995.

Software and Database Artifacts

- Biometrics Databases – Hundreds of thousands of biometrics samples of various types collected in support of multiple US Government sponsored biometrics evaluation activities. Addresses: http://www.nd.edu/~cvrl, http://face.nist.gov/frgc, http://iris.nist.gov/ice, http://face.nist.gov/mbgc.

Invited Presentations

- 2025: Universal Notre Dame Celebrations (Kalamazoo, MI).
- 2023: Universal Notre Dame Celebrations (Chico, CA and Salt Lake City, UT).
- 2022: Universal Notre Dame Celebrations (Albuquerque, NM and Spokane, WA).
- 2019: Universal Notre Dame Celebrations (Eastern North Carolina).
- 2018: Universal Notre Dame Celebrations (Lansing, MI and San Diego, CA), Iris Experts Group (Washington, DC), Shamrock Series academic events (New York City).
- 2017: Hesburgh Lecture (Palo Alto, CA).
- 2016: Universal Notre Dame Celebrations (McLean County, IL); Shamrock Series academic events (San Antonio, TX).
- 2015: Qualcomm (San Diego), Xerox PARC (Webster, NY); Rochester Institute of Technology (Rochester, NY); Universal Notre Dame Celebrations (McHenry County, IL).
- 2014: Universal Notre Dame Celebrations (Jackson, MI); Hesburgh Lecture (Boise, ID).
- 2013: Universal Notre Dame Celebrations (Springfield, OH); Center for Research in Computer Vision (Univ. of Central Florida); Oak Ridge National Laboratories (Oak Ridge, TN); Biometrics Consortium Conference (Tampa).
- 2012: Universal Notre Dame Celebrations (Peoria, IL and Kalamazoo, MI); Fourth Annual UMass and New England Area Librarian e-Science Symposium (Shrewsbury, MA); Biometrics, Identity, and Security (BIdS) Research Symposium (Tampa, FL).
- 2011: Keynote, Third IEEE Workshop on Information Forensics and Security (WIFS 2011) (Foz do Iguaçu, Brazil); eScience workshop (Notre Dame).
- 2010: Facial Identification Scientific Working Group (Orlando); Face Collaboration Group (Washington, DC); NDIA Biometrics Conference (Washington, DC); Indiana chapter of the International Association for Identification (Ft. Wayne, IN).
- 2009: Facial Identification Scientific Working Group (Jacksonville, FL).
- 2008: Biometrics Cluster Group (Washington DC); Biometrics: From Bones to Bits workshop (Booz Allen Hamilton, Washington, DC); keynote at 4th Workshop on Computational Vision (UNESP, Bauru, Brazil), Universidade Federal do Parana (Brazil).
- 2007: NAVTEQ Corp (Chicago); Georg-August-Universität (Göttingen, Germany).
- 2006: Indiana University-Purdue University at Indianapolis; Biometrics Summer School (Alghero, Italy).
- 2004: IBM T.J. Watson Research Center.
- 2001: University of Notre Dame.
- 2000: Ohio State University; University of Notre Dame.
- 1999: Michigan State University.
- 1998: Ohio State University.
- 1997: University of Kentucky.
- 1996: Michigan State University; University of Notre Dame.

- 1994: Carnegie Mellon University.
- 1993: Second EEC-US Workshop on Invariance in Computer Vision (Ponta Delgada, Azores); University of South Florida.
- 1992: Curtin University (Perth, Australia); University of Melbourne (Melbourne, Australia); Australian Pattern Recognition Workshop on 2D and 3D Spatial Data; Michigan State University; University of Notre Dame.
- 1991: University of Washington; Washington State University; Boeing Commercial Airplane Group; University of California at Santa Cruz; Oregon State University.
- 1990: University of Notre Dame; Old Dominion University; University of Missouri at Rolla; IBM T.J. Watson Research Center.

Research Interests

Computer vision, biometrics applications, geometric modeling, computer graphics and scientific visualization, signal and image processing, pattern recognition.

Teaching Interests

Computer vision, pattern recognition, computer graphics and animation, signal and image processing, computer architecture, networking, artificial intelligence, algorithms.

Courses Taught

Legend: 'U' indicates an undergraduate course, 'G' a graduate-level course. The term 'pilot' refers to the first offering of a course.

- 2025-2026: Data Science for Engineers (London summer 2025 program), Microprocessor-based Application Development (U)
- 2024-2025: Microprocessor-based Application Development (U, pilot); Neural Networks (U).
- 2023-2024: Introduction to Artificial Intelligence (U, pilot; Fall 2023 and Spring 2024 offerings).
- 2022-2023: Operating Systems (U, in Palo Alto, CA)
- 2021-2022: Machine Learning (U/G).
- 2020-2021: Introduction to Data Science (U, team-taught with Thomas Mustillo)
- 2019-2020: Introduction to Data Science (U, team-taught with Thomas Mustillo)
- 2018-2019: Introduction to Data Science (U, team-taught with Thomas Mustillo, pilot), Blockchain Technologies and Platforms (U, pilot).
- 2017-2018: Graduate Seminar (G; coordinator for two semesters)
- 2016-2017: Programming Paradigms (U) (in Palo Alto, CA).
- 2015-2016: Programming Paradigms (U).
- 2014-2015: Computer Graphics (U/G), Script-Based Programming I (U; pilot).
- 2013-2014: Computer Graphics (U/G), Mobile Application Development (U/G).
- 2012-2013: Computer Vision (U/G).
- 2011-2012: Computer Vision (U/G), Mobile Application Development (U).
- 2010-2011: Mobile Application Development (U/G), Face Recognition (U/G).
- 2009-2010: Computer Vision/Biometrics (U/G), Mobile Application Development (U; pilot).
- 2008-2009: Programming Paradigms (U).
- 2007-2008: Programming Paradigms (U; pilot), Advanced Pattern Recognition (G).
- 2006-2007: Introduction to Engineering Systems (U), Fundamentals of Computing II (U).
- 2005-2006: Computer Graphics (U/G), Fundamentals of Computing II (U).
- 2004-2005: Computer Graphics (U/G).

- 2003-2004: 3D photography (G), Logic Design (U), Research capstone design (U).
- 2002-2003: Artificial Intelligence (U/G), Computer Graphics (U/G), Digital Multimedia Hub System Design (U).
- 2001-2002: Computer Vision (G; pilot), Logic Design (U).
- 2000-2001: Introduction to Digital Logic (U).
- 1999-2000: Digital Design (U), Image and Video Compression (G), Introduction to Digital Logic (U).
- 1998-1999: Digital Design (U), Image Processing (G).
- 1997-1998: Computer Animation (U), Knowledge Discovery/Data Mining (G; team-taught with Zoran Obradovic), Image Processing (U).
- 1996-1997: Analog Communications (U), Computer Animation (U), Java Programming (U; pilot).
- 1995-1996: Computer Animation (U), Computer Vision (G).
- 1994-1995: Computer Animation (U), Computer Networks (U), Computers and Society (U; pilot).
- 1993-1994: Computer Vision (G), Computer Animation (U), Statistical Pattern Recognition (G).
- 1992-1993: Computer Vision (G), Computer Animation (U), Algorithms (U).
- 1991-1992: Computer Graphics (U and G).
- 1990-1991: Computer Architecture (G), Systems Programming (U), Computer Graphics (U).

Service

National and International Professional Activities

- Professional Society Memberships
    - Fellow: IEEE ("for contributions to biometric identification"), elevated 2012. IEEE member since 1984.
    - Fellow: IAPR ("for contributions to research in three-dimensional object recognition systems and biometrics"), elected 2006.
    - Distinguished Scientist: ACM, elected 2011. ACM Member since 1986.
    - Associate Member: International Association for Identification.
- Professional Society Service (excluding conference organization and reviewing)
    - Senior Member evaluation panel, IEEE, 2024.
    - Fellow Committee, IEEE Biometrics Council, 2023, 2024.
    - Award Selection Working Group, IEEE Biometrics Council, 2022-2024.
    - Editor-In-Chief, *IEEE Biometrics Compendium*, 2016-2017.
    - Member, IEEE Signal Processing Society Technical Committee on Information Forensics and Security, 2010-2012, 2015-2018. Member, TC-IFS Conference Committee, 2010-2012.
    - Member, IEEE Computer Society Fellow Committee, 2012, 2021.
    - IEEE Signal Processing Society representative to IEEE Biometrics Council Administrative Committee, 2012-2013.
    - Vice President for Conferences, IEEE Biometrics Council, 2010-2011.
    - Vice President for Finance, IEEE Biometrics Council, 2008-2009.
    - Associate Editor, *IEEE Transactions on Image Processing*, 2009-2012.

- Associate Editor, *IEEE Transactions on Information Forensics and Security*, 2009-2012.
- Constitution and Bylaws committee, International Association for Pattern Recognition, 2008-2012.
- Associate Editor, *Pattern Recognition Letters*, 2004-2006.
- Member, Education Committee, International Association for Pattern Recognition, 2006-2008. Chair, 2002-2004.
- Associate Editor-In-Chief, *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 1999-2000.
- Associate Editor, *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 1995-1998.
- Associate Editor, *Pattern Recognition*, 1994-1998.

- Other National Professional Service (excluding conference organization and reviewing)
  - Member, Panel on Mechanical Science and Engineering, Army Research Laboratory (National Academies of Sciences, Engineering, and Medicine), 2017.
  - Member, Facial Identification Subcommittee, IT/Multimedia Scientific Area Committee, Organization of Scientific Area Committees, Forensic Science Standards Board, chartered by National Institute of Standards and Technology, 2014-2017.
  - Member, Facial Identification Scientific Working Group (FISWG), chartered by FBI, 2009-2017.
  - Member, IAPR Constitution and Bylaws Committee, 2009-2010, 2012-2016.
  - Member, NDIA Industrial Committee on Biometrics, 2008-2010.
  - Member, IAPR Education Committee, 2006-2008.
  - Member, Computing Accreditation Commission, ABET, 2006-2007.
  - Member, computer systems support review panel, College of Engineering, Michigan State University, 2000.
  - Member, Board of Visitors/Strategic Partners Council, Department of Computer Science and Engineering, Michigan State University, 1998-2008.
  - Program Evaluator, Computing Accreditation Commission, ABET (formerly Computer Science Accreditation Commission, Computing Sciences Accreditation Board), 1995-2007.
  - Co-Guest Editor (with Jonathon Phillips and Adam Hoover), *Computer Vision and Image Understanding*, special issue on Empirical Evaluation Methods in Computer Vision, October 2001.
  - Co-Guest Editor (with George Stockman and Octavia Camps), *Computer Vision and Image Understanding*, special issue on CAD-Based Computer Vision, March 1998.
  - Co-Guest Editor (with Katsushi Ikeuchi), *Computer Vision, Graphics, and Image Processing: Image Understanding*, special issue on CAD-Based Computer Vision, 1995.
  - Invited participant, Second EEC-US Workshop on Invariance in Computer Vision, Ponta Delgada, Azores, October 1993.
  - Invited participant and panel chair, NSF Workshop on ‘Challenges in Computer Vision: Future Research Directions,’ Maui, June 1991.
  - Invited participant, NSF Range Image Processing Workshop, East Lansing, Michigan, May 1988.
- Conference-Related Activities (excluding program committee memberships)

- Co-organizer, 1st and 2nd Workshops on Interdisciplinary Applications of Biometrics and Identity Science (InterID 2023, InterID 2025) (with Tempestt Neal and Shaun Canavan).
- Co-General Chair, First IEEE/CVF workshop on Long-Range Recognition, workshop at WACV 2023 (with Scott McCloskey, Terry Boult, Ben Riggan, Vishal Patel, and Rama Chellappa).
- General co-Chair (with Mark Nixon), ICB 2019.
- Special Sessions co-Chair (with Mark Nixon), ICB 2018.
- Finance co-Chair (with Kevin Bowyer), WACV 2018.
- Finance co-Chair (with Kevin Bowyer), IJCB 2017.
- Awards co-chair, BTAS 2016.
- Area Chair for iris and ocular recognition, ICB 2016.
- Program co-Chair (with Ross Beveridge and Maja Pantic), BTAS 2015.
- Area Chair, 11th IEEE Int. Conf. on Automatic Face and Gesture Recognition (FG 2015).
- Area Chair for iris recognition, ICB 2013.
- Advisory Committee, BTAS 2013.
- General co-Chair (with Arun Ross), BTAS 2012.
- Track co-chair: ICPR 2010 (biometrics track).
- Program co-Chair, BTAS 2007, Washington DC.
- Publications Chair or co-Chair: FG 2013, IJCB 2011, BTAS 2010, 2009, 2008, 2007; CVPR 2009, 2007, 2003, 2001, 1999; ICPR 2008.
- Computer Chair, CVPR 2008.
- Tutorials Chair, IAPR-ICB 2007.
- General co-Chair (with Sharath Pankanti), Conference on Biometric Techniques for Human Identification, SPIE, 2006, Orlando.
- Workshops Chair, CVPR 1998.
- Tutorial presenter, CVPR 1993 and CVPR 1994.
- Session organizer and chair, IEEE International Conference on Systems, Man, and Cybernetics, Cambridge, November 1989.

- Reviewing activity
  - Program Committee memberships:
    - IEEE 17th Annual Computing and Communication Workshop and Conference (CCWC 2027).
    - IEEE 25th International Symposium on Biomedical Imaging (ISBI 2027).
    - British Machine Vision Comference, 2026.
    - IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR): 1992, 1994, 1998, 1999, 2001, 2002, 2004, 2005, 2006, 2010, 2011, 2012, 2013, 2019, 2021, 2023, 2024, 2025, 2026.
    - IEEE Winter Conference on Applications of Computer Vision (WACV): 2020, 2023, 2024, 2025, 2026, 2027.
    - IEEE Int. Conf. on Image Processing (ICIP), 2009, 2010, 2011, 2012, 2015, 2021, 2023, 2024.
    - IAPR/IEEE Int. Joint Conf. on Biometrics (IJCB), 2014, 2017, 2020, 2021, 2023, 2024, 2025, 2026.
    - IEEE Workshop on Information Forensics and Security, 2010, 2015, 2020, 2022.
    - IEEE Computer Society Workshop on Biometrics: 2006, 2008, 2009, 2010, 2024.

- WACV Workshop on Video-based Human Recognition at Extreme Far Distance, 2027.
- International Workshop on Synthetic Data for Face and Gesture Analysis, 2024, 2025.
- Fifth Workshop on Demographic Variations in Performance of Biometrics and Related Technology, 2024.
- IEEE Int. Conf. on Acoustics, Speech, and Signal Processing (ICASSP) 2012, 2013, 2014, 2015, 2016, 2018.
- Workshop on Biometrics in the Wild (BWild), 2017.
- American Society for Engineering Education (ASEE) Annual Conference, 2017.
- IEEE Conference on Automatic Face and Gesture Recognition (FG), 2017.
- IEEE Int. Conf. on Identity, Security, and Behavior Analysis (ISBA), 2015, 2016.
- IEEE BIdS Syposium, 2013.
- IEEE Int. Conf. on Biometrics: Theory, Applications, and Systems (BTAS), 2013, 2016.
- IAPR Int. Conf. on Biometrics (ICB), 2013, 2015.
- ECCV 2012 workshop: “What’s in a Face?”
- BIOSIG 2012, 2013.
- First IEEE International Workshop on Benchmarking Facial Image Analysis Technologies (BeFIT 2011).
- 3DIMPVT, 2011.
- International Conference on Computer Vision, 2011.
- International ACM Symposium on High Performance Distributed Computing, 2011.
- SIBGRAPI (Brazilian Conference on Graphics, Patterns and Images), 2010.
- ACCV Workshop on Large-scale 3D Modeling, 2009.
- IEEE Conf. on 3D Processing, Visualization and Transmission (3DPVT): 2008, 2010.
- IEEE Conf. on Object Tracking and Classification Beyond the Visible Spectrum (OTCBVS) 2009.
- European Conference on Computer Vision (ECCV 2006).
- IAPR International Conference on Biometrics (IAPR-ICB 2006, 2009, 2012, 2013).
- Int. Conf. on Biometric Authentication (ICBA 2005).
- SPIE Conference on Biometric Technology for Human Identification (2004, 2005, 2007, 2008, 2009, 2010).
- Workshop on Audio- and Video-Based Biometric Person Authentication (AVBPA): 2003, 2005.
- Biometrics Consortium Research Symposium (2003, 2004)
- Biometric Authentication Workshop 2004 (Prague)
- Int. Conference on Pattern Recognition: 1994, 2002, 2004, 2006, 2020.
- Conf. on 3D Digital Imaging and Modeling (3DIM): 1997, 1999, 2001, 2003, 2005, 2007, 2009.
- Int. Symp. on Computer Vision: 1995.
- Vision Interface 1995.
- IEEE Workshop on CAD-Based Computer Vision, 1994
- SPIE Conference on Applications of AI: Machine Vision and Robotics, 1993.

- Proposal reviewing: National Science Foundation, US National Institute of Justice, National Science and Engineering Research Council (Canada), Australian Research Council, Israel Science Foundation, The Royal Society (UK), Austrian Science Fund (FWF), Swiss National Science Foundation (SNF), Hasler Foundation, Irish Research Council, Taighde Éireann (Research Ireland).
- Manuscript reviewing activity: *Neural Computing and Applications*; *Forensic Science Communications*; *IEEE Transactions on Pattern Analysis and Machine Intelligence*; *IEEE Transactions on Information Forensics and Security*; *IEEE Transactions on Neural Networks*; *IEEE Transactions on Image Processing*; *IEEE Transactions on Robotics and Automation*; *IEEE Transactions on Systems, Man, and Cybernetics*; *IEEE Transactions on Knowledge and Data Engineering*; *IEEE Transactions on Geoscience and Remote Sensing*; *IEEE Transactions on Ultrasonics, Ferroelectronics, and Frequency Control*; *IEEE Signal Processing Letters*; *IEEE Robotics and Automation Magazine*, *Computer Vision and Image Understanding* (fka *CVGIP*, *CVGIP: Image Understanding*), *International Journal of Computer Vision*, *International Journal of Pattern Recognition and Artificial Intelligence*, *Pattern Recognition Letters*, *Pattern Recognition*, *Machine Vision and Applications*, *IEE Proceedings: Vision, Image, and Signal Processing*, *Image and Vision Computing*, *The Computer Journal*, *Electronics Letters*, *Communications of the ACM*, *ACM Computing Surveys*, *Signal Image and Video Processing*, *Neurocomputing*, and dozens of computer vision conferences and workshops.

Department-level Service

- University of Notre Dame
  - Graduate Studies committee, 2001-2003, 2012-2017, 2023-2026.
  - Department chair, 2017-2022. Member *ex officio* of all department committees.
  - Committee on Reappointments, Promotions, and Tenure, 2022-2026. Chair *ex officio*, 2018-2022.
  - Committee on Appointments, 2022-2026. Chair *ex officio*, 2018-2022.
  - Committee on Appointments and Promotions, 2002-2011, 2013-2017. Chair *ex officio*, 2017-2018.
  - Faculty Search committee, 2001-2007, 2011-2012, 2013-2014, 2023-2024 (chair, 2002-2003, 2006-2007).
  - Curriculum Committee, 2002-2006, 2008-2013 (chair, 2002-2006, 2008-2010).
  - Assessment Committee, 2006-2010 (chair, 2006-2007).
  - Computing Committee, 2010-2017.
  - ABET team, 2023.
- Ohio State University
  - Computer Engineering area committee: 1998-2001 (chair, 1999-2001).
  - Computer Engineering faculty search chair, 1999-2001.
  - Computing facilities committee, 1999-2001 (chair, 2000-2001).
  - Curriculum committee, 1999-2001.
  - Alumni society faculty representative, 1999.
  - Industrial fellowship committee, 1999.
  - Graduate recruiting and financial aid subcommittee, 1998-1999.
- Washington State University

- Associate Director (associate chair) for Computer Science, School of EECS, 1997-1998.
- Computer Science Undergraduate Coordinator, 1994-97.
- Computer Science Curriculum Committee, 1992-1998 (chair, 1992-93, 1997-1998).
- Computer Engineering Curriculum Committee, 1995-1998.
- Computer Science Faculty Recruiting Committee, 1991-93, 1996-98 (chair, 1997-1998).
- EECS Promotion and Tenure Committee, 1996-98 (chair, 1997-1998).
- EECS Graduate Studies Committee, 1991-93.

University-level Service

- University of Notre Dame (major roles boldfaced).
  - Co-chair (with Prof. Michael Hildreth), Task force on Data, AI, and Computing in and for Curriculum and Learning, 2025-2026.
  - University of Notre Dame – Tantur Regional Advisory Committee, 2024-2026.
  - Reviewer, Provost's Postdoctoral Fellows program, 2025.
  - Faculty/Director search committee, Office of Technology and Digital Studies, College of Arts & Letters, 2024.
  - Faculty Appeals Committee reviewer pool, 2023-2024.
  - Named University Chair review committee (chair, *ad hoc*), 2022.
  - Vice-Provost for Research Search Committee, 2021.
  - Chief Information Officer Search Committee, 2010, 2018, 2021.
  - College Council, College of Engineering, 2006-2008, 2012-2016, 2017-2022 (*ex officio*).
  - Faculty Representative, ESTEEM graduate program, 2018-2026.
  - Director, Blockchain/Bitcoin initiative, 2014-2026.
  - Lecturer, Hesburgh Lecture Series, 2013-2026.
  - Department Chairs' Advisory Group, 2018-2021. Chair, 2020-2021.
  - Academic Council, 2018-2021. Executive Committee of Academic Council, 2018-2021.
  - Provost Search Committee, 2019-2020.
  - Co-chair (with Corey Angst), Data and Society Institute task force/faculty director search committee, 2019-2020.
  - Chair, Seed Grant Committee, Science of Wellness Initiative, 2018.
  - Director, Notre Dame California, 2016-2017.
  - University Committee on Appeals, 2014-2017.
  - Faculty Fellow, Lewis Residence Hall, 2015-2016.
  - University Committee on Research and Sponsored Programs, 2013-2016, 2025-2026.
  - Faculty Committee for Digital Strategy, 2013-2015.
  - University Committee on Women Faculty and Students, 2015, 2016.
  - mobileND Program Steering Committee, 2014.
  - Provost's Advisory Committee, 2011-2014.
  - Dean of Engineering Review Committee, 2002-2003, 2011-2012.
  - Graduate Council, 2010-2011.
  - Faculty Senate, 2002-2006, 2010-2012.
  - Statistics Advisory Group, Dept. of Applied and Computational Mathematics and Statistics, 2010-2011.
  - Human Subjects Institutional Review Board, 2009-2014.
  - *Ad hoc* Committee to Develop Guidelines for Promotion of Research Faculty, 2009.
  - Advisor, Tau Beta Pi student chapter, 2008-2016. Chief advisor, 2008-2014.

    - University Committee on Academic Technologies, 2007-2013.
    - *Ad hoc* Committee on Design Curricula, 2008.
    - College Computing Committee, 2007-2011, 2012-2016. Chair, 2008-2010.
    - Engineering South/Engineering Learning Center Design Committee, 2006.
    - University Committee on Elections, 2005-2006.
    - Advisory Committee to the Provost on the Evaluation of Teaching (Faculty Senate representative), 2005-2008.
    - College of Engineering Honors Curriculum committee, 2004-2005.
    - *Ad hoc* space planning committee, College of Engineering, 2002.
    - College of Engineering Undergraduate Studies Committee, 2002-2006.
    - Science Learning Center Visualization Facility design group, 2001-2002.
    - Cognitive Science *ad hoc* planning group, 2001-2002.
- Ohio State University
    - OSU 'Roads Scholar', 1999
    - Faculty Phonathon (undergraduate recruiting), 1999-2000.
- Washington State University
    - General Education Committee, 1997-1998 (Computer Literacy Subcommittee, 1996-1998).
    - New Student Orientation academic advising, 1996-1998.
    - 'Student Access to Computers' Committee, 1997.
    - Four-Year Degree Program Advisory Board, 1997-1998.
    - New Student Orientation Planning Group, 1997.
    - President's Academic Steering Committee for Computing and Telecommunications, 1996-1998.
    - Faculty Phonathon (undergraduate recruiting), 1992-1998.
    - Graduate School internal review committee for M.S. program in Architecture, 1993-1994, 1996.
    - Provost's Virtual University task force, 1995.
    - Steering Committee, workshops on teaching and learning with technology, 1995.

Entrepreneurial Activity

- 2010-2014: Co-founder and member, CloverApps LLC (mobile application development)
- 2013-2019: Member, CNVRS LLC (social networking applications)
- 2013-2015: Co-founder and scientific advisor, Contect, Inc. (traumatic brain injury detection software)
- 2014-2016: Member, VehWare LLC (machine vision systems for commercial transportation)
- 2016-: Scientific Advisor, FaceTec, Inc.

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