Kushal Vangara

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SUMMARY

- Ph.D. graduate with 6+ years of experience in Machine Learning, Computer Vision, Software Engineering, and Responsible AI, spanning both research and applied system development.
- Led multiple U.S. government-sponsored research projects, managing cross-functional teams and delivering results on tight deadlines; skilled in building end-to-end solutions across biometrics, facial analysis, personality computing, and cybersecurity.
- Proficient in full-stack development, algorithm design, and deploying cloud-based ML systems with a focus on ethical, user-centered AI.

EDUCATION

Ph.D. in Computer Science May 2025
Florida Institute of Technology, Florida, USA
Dissertation: *Personality Trait Recognition through Deep Neural Temporal Modeling of Non-Verbal Behavior*
Advisor: Dr. Michael C. King

M.S. in Information Assurance & Cybersecurity May 2018
Florida Institute of Technology, Florida, USA
Thesis: *Transfer Learning with Convolutional Neural Networks (CNNs) Applied to Periocular Biometrics*
Advisor: Dr. Michael C. King

B.Tech. in Electronics and Communications Engineering July 2014
Jawaharlal Nehru Technological University, Hyderabad, India
Projects: Developed IoT automation and prototyping solutions using Arduino and Raspberry Pi

SKILLS

Programming	Python (including *NumPy, Pandas, scikit-learn*), Deep Learning frameworks (*PyTorch, TensorFlow, JAX*), OpenCV, R, C/C++, MATLAB, Bash scripting
Cloud & Big Data	High-performance and accelerated computing (*CUDA, HPC*), Cloud platforms and services (*AWS with SageMaker, GCP*), Distributed data processing, SQL and NoSQL databases (e.g., *PostgreSQL, MongoDB*)
DevOps & MLOps	Version control and collaboration (*Git, GitHub*), Containerization and orchestration (*Docker, Kubernetes*), Workflow and pipeline management (*MLflow, Apache Airflow*), CI/CD, Automated testing and code quality tools
Data Visualization	Data visualization libraries (*Matplotlib, Seaborn, Plotly*), Dashboard and analytics tools (*Grafana, Tableau*), Reporting automation and interactive data exploration
Languages	Fluent in English, Hindi, and Telugu

WORK AUTHORIZATION

F-1 OPT – Authorized to work in the U.S. with potential STEM extension

PROFESSIONAL EXPERIENCE

Doctoral Research Assistant
L3Harris Institute for Assured Information, FL, USA May 2018 – Present

- Conducted research on advanced face recognition systems, leveraging computer vision techniques and training ML models (CNNs) to enhance biometric identification accuracy.
- Curated and processed large-scale datasets; developed automated data pipelines and performed rigorous statistical analysis to improve model robustness and fairness.
- Designed and deployed full stack web applications to support data annotation, visualization, and experimental analysis, integrating front-end interfaces with scalable back-end and database infrastructure.
- Led small research teams, coordinated task assignments, mentored junior researchers, and managed project deliverables across multiple U.S. government-funded initiatives.
- Configured high-performance computing (HPC) systems, NAS storage servers, managed SQL and data servers and internal lab networking; established the IdentityLab infrastructure to support scalable, secure, and data-intensive multi-modal research.
- Published research findings in peer-reviewed conferences; collaborated with multidisciplinary teams to translate research into practical applications.
- Research on face recognition bias featured in major media outlets including *WIRED*, *The New York Times*, and *Biometric Update*, highlighting its societal relevance and policy implications.

Research Assistant
Florida Institute of Technology, FL, USA Jan 2016 – Dec 2017

- Designed and implemented portable biometric systems using Raspberry Pi and Kinect, enhancing system flexibility and field deployment capability.
- Conducted security vulnerability assessments and benchmarked CPU architectures to optimize system performance and reliability.
- Documented technical findings and assisted in presenting results at internal review sessions to inform project direction.

Internship
TalentSprint, Hyderabad, India Jan 2015 – July 2015

- Developed an E-Billing web application with Java, Spring Framework, and SQL, implementing an MVC architecture for scalability and maintainability.
- Collaborated with cross-functional teams to deliver features on schedule, automating manual billing processes and improving efficiency.
- Performed unit testing and debugging to ensure application reliability and seamless user experience.

Embedded Systems Intern
Potential Labs, Hyderabad, India July 2014 – Dec 2014

- Designed, tested, and debugged electronic circuits and PCBs as part of IoT solution development.
- Assisted in hardware integration and system validation, ensuring compliance with technical specifications.
- Supported prototype development through hands-on assembly and troubleshooting, contributing to early-stage product improvements.

PROJECTS

Computational Psychology 2021–2025

- Designed and implemented multimodal data collection protocols using `OpenFace`, `MediaPipe`, and `Praat` to capture naturalistic visual and vocal features for personality assessment.
- Developed spatiotemporal deep learning models with `PyTorch` using LSTMs, 3D CNNs, Transformers and Mamba architectures for gesture and expression recognition.
- Built scalable pipelines for behavioral signal processing and passive trait inference, achieving trait prediction correlations ($r > 0.6$) with psychometric ground truth.
- Utilized `scikit-learn` and `Matplotlib` for model evaluation (F1, RMSE, Pearson correlation) and result visualization.
- Advanced multi-view facial expression analysis and personality trait inference using AI models, contributing novel frameworks for behavioral biometrics beyond identity recognition.

Research Software & Infrastructure Development 2020–2024

- Designed and implemented full-stack web applications for research data collection, analysis, and visualization, using React, Node.js, Python (Flask/Django), and PostgreSQL.
- Developed scalable, user-friendly interfaces to support interdisciplinary collaboration and streamline experimental workflows.
- Configured and maintained lab infrastructure including high-performance computing clusters, NAS servers, and secured networking environments to support computational research.
- Managed setup and ongoing maintenance of IdentityLab, ensuring robust network connectivity, server reliability, and integration with cloud platforms.
- Coordinated cross-functional teams and vendors to optimize system performance, security, and scalability aligned with research objectives.

Long-Range Biometric Identification 2022–2023

- Built real-time modules for long-range face analytics using `YOLOv5`, `OpenCV`, GFP-GAN, and Hugging Face models, addressing distortion, motion blur, and low resolution.
- Integrated facial attributes (age, gender) into biometric pipelines to support fairness-aware evaluations across demographics.
- Applied resolution-aware and domain adaptation techniques, achieving >85% rank-1 accuracy beyond 50 meters.
- Deployed lightweight inference pipelines with `TensorRT` and `ONNX Runtime` for real-time edge applications.

GAN-Based Synthetic Content Detection 2020–2021

- Researched facial synthesis using `StyleGAN2` and `ProGAN`; developed detection models with `EfficientNet`, `ResNet50`, and `XceptionNet` in `TensorFlow`.
- Constructed a labeled dataset of 50,000+ real and synthetic faces; automated preprocessing pipelines with `Albumentations` and `TFRecord`.
- Achieved >92% accuracy and AUC >0.95 on adversarial media detection benchmarks (e.g., Celeb-DF, DFD).
- Employed `Grad-CAM` and `LIME` for model interpretability and forensic anomaly localization.

Person Re-identification 2019

- Built deep person re-ID models with `ResNet50` and triplet loss in `PyTorch`, focusing on soft biometrics like gait and clothing attributes.
- Evaluated performance in cross-spectral conditions (visible/NIR/thermal), improving mAP by 15% on SYSU-MM01 and RegDB datasets.
- Integrated spatial-temporal modeling and tracking using `DensePose`, `OpenPose`, and `SORT` for real-world deployment.
- Developed a research framework for scalable multi-camera re-ID in crowded urban surveillance environments.

Face Recognition Research 2018–2020

- Analyzed demographic bias in commercial and open-source face recognition models (`FaceNet`, `ArcFace`) using datasets like Morph and MS1MV2; trained new models with convolutional neural networks and custom loss functions using `PyTorch` and `TensorFlow`.
- Applied fairness-enhancing techniques, including data augmentation with `imgaug` and re-weighted loss functions, reducing false match rates by 30% in minority groups.
- Conducted large-scale evaluation (>1M image pairs) using `Apache Spark` and `Dask`, with metrics such as EER, FMR/FRR, and DET curves.
- Investigated the effect of age and skin tone on matcher performance, highlighting critical gaps in deep face recognition robustness and advocating for inclusive dataset development.
- Curated a multi-spectral dataset (RGB, NIR, UV) with annotations for skin tone, pose, and distance to support inclusive model development.
- Co-authored studies on racial and gender disparities in face recognition accuracy, publishing findings at IEEE biometrics and fairness workshops; contributed to internal ethics initiatives and algorithmic bias mitigation toolkits.

TEACHING EXPERIENCE

Teaching Assistant
Florida Institute of Technology, FL Spring 2025

– Assisted in delivering a graduate Cyber Identity course (*CSE-5800*), supporting lecture preparation, grading assignments, and administering exams.

– Mentored students through review sessions and collaborated with faculty to enhance course content with current research and industry best practices.

Teaching Assistant
Florida Institute of Technology, FL Fall 2024

– Developed and taught components of a graduate-level biometrics course (*CYB-5677*), including lecture materials, assignments, and exams.

– Conducted assessments and provided detailed feedback to promote student success and mastery of complex biometric concepts.

– Integrated real-world case studies and hands-on exercises to bridge theoretical knowledge with practical applications.

SELECTED PRESENTATIONS

Invited Presentation Sep 2023
Center for Advanced Manufacturing and Innovative Design (CAMID) Melbourne, FL
– Presented a poster at the Computational Cybersecurity in Compromised Environments (C3E) workshop, titled: *"Deep Learning-Based Personality Trait Analysis from Facial Expressions."*

Invited Presentation Feb 2020
University of North Carolina Wilmington Wilmington, NC
– Invited to present at the Cyber Identity and Behavior Analytics Research Consortium workshop, titled: *"Facing Off with Deep Fakes."*

Invited Presentation Dec 2016
Thales USA Orlando, FL
– Invited to present at the Thales Project Arduino Showcase, titled: *"Enhanced Space Navigation and Orientation Suit."*

MAJOR COLLABORATORS

- Dr. Kevin Bowyer from the University of Notre Dame
- Dr. Charles A. Morgan III from the University of New Haven
- Dr. Mark Liberman from Linguistic Data Consortium, University of Pennsylvania
- Dr. Vanessa A. Edkins, Emeritus Faculty, Florida Institute of Technology

PUBLICATIONS

- **Kushal Vangara**, Xavier Merino, Gabriella Pangelinan, and Michael King "One Face, Many Views: Cross-View Consistency of Facial Action Unit Analysis in Multi-Camera Settings". In: *Proceedings of the TrustFAA Workshop at the 2025 IEEE International Conference on Automatic Face and Gesture Recognition (FG)*. May 2025

- **Kushal Vangara**, Gabriella Pangelinan, Xavier Merino, Gary Burns, and Michael King "Beyond the Smile: Predicting Personality from Facial Movements Using AI". in: *Society for Industrial and Organizational Psychology Annual Conference*. Apr. 2025

- **Kushal Vangara**, Gabriella Pangelinan, Xavier Merino, Gary Burns, and Michael King "Indirect Assessment of Personality from Facial Expressions". In: *Society for Personality and Social Psychology Annual Convention*. Feb. 2025

- Cody E Harrell, Gary N Burns, Michael C King, William B Ridgway, **Kushal Vangara**, Zachary B Hesson, Vanessa A Edkins, and Charles A Morgan III "Investigating the overlapping concepts of the Dark Core and the General Factor of Personality". In: *Personality and Individual Differences* 225 (2024), p. 112650. ISSN: 0191-8869

- Gabriella Pangelinan, KS Krishnapriya, Vitor Albiero, Grace Bezold, Kai Zhang, **Kushal Vangara**, Michael C King, and Kevin W Bowyer "Exploring Causes of Demographic Variations In Face Recognition Accuracy". In: *Computer Vision: Challenges, Trends, and Opportunities* (2024), p. 61

- Gabriella Pangelinan, Xavier Merino, Samuel Langborgh, **Kushal Vangara**, Joyce Annan, Audison Beaubrun, Troy Weekes, and Michael King "The CHROMA-FIT Dataset: Characterizing Human Ranges of Melanin for Increased Tone-Awareness". In: *Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision (WACV) Workshops*. Jan. 2024, pp. 1170–1178

- Kevin W Bowyer, Michael C King, Walter J Scheirer, and **Kushal Vangara** "The "Criminality From Face" Illusion". In: *IEEE Transactions on Technology and Society* 1.4 (2020), pp. 175–183
- Vitor Albiero, KS Krishnapriya, **Kushal Vangara**, Kai Zhang, Michael C King, and Kevin W Bowyer "Analysis of gender inequality in face recognition accuracy". In: *Proceedings of the IEEE Winter Conference on Applications of Computer Vision Workshops*. 2020, pp. 81–89
- KS Krishnapriya, Vitor Albiero, **Kushal Vangara**, Michael C King, and Kevin W Bowyer "Issues related to face recognition accuracy varying based on race and skin tone". In: *IEEE Transactions on Technology and Society* 1.1 (2020), pp. 8–20
- Vitor Albiero, Kevin Bowyer, **Kushal Vangara**, and Michael King "Does face recognition accuracy get better with age? Deep face matchers say no". In: *The IEEE Winter Conference on Applications of Computer Vision*. 2020, pp. 261–269
- KS Krishnapriya, **Kushal Vangara**, Michael C King, Vitor Albiero, and Kevin Bowyer "Characterizing the variability in face recognition accuracy relative to race". In: *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition Workshops*. 2019, pp. 0–0
- Tiziano Bernard, Andrea Gonzalez, Vincenzo Miale, **Kushal Vangara**, Lucas Stephane, and Winston E Scott "Haptic feedback astronaut suit for mitigating extra-vehicular activity spatial disorientation". In: *AIAA SPACE and Astronautics Forum and Exposition*. 2017, p. 5113

REVIEWER

Served as peer reviewer for journals and conferences in computer vision, biometrics, and security:

- IEEE Winter Conference on Applications of Computer Vision (WACV)
- ACM Transactions on Privacy and Security (TOPS)
- IEEE International Conference on Automatic Face and Gesture Recognition (FG)
- Workshop on Demographic Variations in Performance of Biometrics and Related Technology (DVPBA)
- International Conference on Artificial Intelligence, Computer, Data Sciences and Applications (ACDSA)
- Advances in Science, Technology and Engineering Systems Journal (ASTESJ)
- International Journal of Computer Science and Information Security (IJCSIS)

PROFESSIONAL AFFILIATIONS

- Institute of Electrical and Electronics Engineers (IEEE)
- Association for Computing Machinery (ACM)
- Society for Personality and Social Psychology (SPSP)
- European Association of Biometrics (EAB)
- American Radio Relay League (ARRL), Call Sign: KQ4YAG