JORGE ENRIQUE CAVIEDES, PH.D.

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RESEARCH & DEVELOPMENT SCIENTIST – IP CONSULTANT

MEDIA PROCESSING & INTERACTION | COMPUTER VISION | BIOMEDICAL INFORMATICS

Research professor, lecturer on Biomedical Informatics, Multimedia Information Systems and Digital Video Processing. Industry pioneering R&D scientist with subject matter expertise on wearable sensors and biofeedback for spinal therapy, high-end video processing, 3D, image quality models and methods, immersive communication, and computer vision systems. Track record of driving technology innovations that revolutionize engineering efforts and advance the competitive position of global companies. With expertise in:

Multimedia IP Tech Consultant | Wearable Sensors | Spine Therapy |Diagnostic Image Quality Metrics | Digital Image Processing | Interactive Media | Computer Vision Signal Processing | Artificial Intelligence | Immersive Communication

KEY DIFFERENTIATORS

- 5+ years of experience as IP consulting including competitive analysis, portfolio evaluation, preparation of documents including EOUs, TEPS covering architecture, coding, display (2D, 3D, VR), image/video processing, ADAS from companies including Intel, NVD, Google, Samsung, Sony, ARM, Apple, Mediatek
- 8+ years of academic experience as research professor, adjunct faculty, lecturer, visiting professor, and student advisor
- Leverages 20+ years of leadership experience as a Principal Engineer/ Principal Scientist; brings a unique ability to deliver state of the art technology to real products
- Delivered four generations of video processing algorithms and architecture for Intel media System-on-Chips (SoCs)
- Expertise in wearable sensors, therapeutic spine exercise, conceptual distance metrics, mixed-initiative user interfaces, immersive user experience and case-based-reasoning systems

PROFESSIONAL OVERVIEW

TEXAS IP LABS

IP Consultant *(2016-2020)*

IP portfolio analysis and reporting, EOU, TEP preparation for full patents and filings

STRATEGIC IP INITIATIVES INC

IP Consultant *(2023-)*

Technical analysis and EOU research for image sensors processing and architecture

ARIZONA STATE UNIVERSITY

Research Professor– ASU-Mayo Center for Innovative Imaging - Arizona State University *(1018-2021)*

Adjunct Professor and Lecturer – Arizona State University *(2005-)*

Teaching: BMI 505 Foundations of BMI Methods, ECE 408 Multimedia Information systems, ECE 509 Digital Video Processing

Research:

- Arizona State University, Global Sport Institute seed grant program 2019-2020 "*Personalized Immersive Biofeedback for Spinal Fitness Training and Rehab Therapy*"
- Arizona State University, Research Faculty / Research Scientists Support Seed Grant 2019 "Preliminary Design of Immersive Biofeedback for Low Back Physical Therapy"
- Arizona State University, Global Sport Institute 2018 inaugural GSI seed grant program "*Wireless Sensors for Spine Posture Monitoring During Exercise to Enable Biofeedback,*"
- Research advisor for seed grant from Institute for Social Science Research (ISSR) "Form's influence on message content and Effect: Formalists Analysis of Extremist Videos," PI Dr. Scott Ruston, Center for Strategic Communication.

Recent seminars/presentations:

"The Case for Operational Image Quality Models and Metrics for Diagnostic MRI," Oral presentation at ISMRM Workshop on Data Sampling & Image Reconstruction, Sedona, AZ, January 2020.

"Spine posture detection and correction using active and passive biofeedback," Oral Presentation at the 12th International Conference of the Society on Scoliosis Orthopaedic and Rehabilitation Treatment, SOSORT 2017, Lyon, France, May 2017.

Intelligent Control Systems Design and Application to Computer Vision Performance Improvement, SenSIP Seminar Series. https://www.facebook.com/ASU.SenSIP.Center/?pnref=story

Overview of Operational Requirements for No-Reference Video Quality Metrics, VQEG meeting March 2016, ftp://vqeg.its.bldrdoc.gov/Documents/VQEG_SanDiego_Feb16/MeetingFiles/

INTEL CORPORATION 2003-2015

Principal Engineer – Computer Vision Group, Intel Labs *(2014-2015)*

Drove the design, development, execution, and implementation of scientific research projects to fuel Intel's growth in the areas of computing, communication, technology, and new business opportunity.

- Conducted seminal work on computer vision algorithms including signal quality and structural complexity metrics for adaptive control and performance optimization, depth processing for immersive media communication, and skin segmentation for computer vision applications.
- Pioneered the convergence of image processing and computer vision by pursuing applied research on adaptive pre-processing and control systems to improve system performance.
- Substantially improved task performance and robustness in face identification, recognition, and hand gesture recognition systems; achieved a ~30% reduction of false negatives and a ~80% reduction of false positives; reduced errors in hand gesture recognition by up to 70%. Collaterals include four US patent filings, three published papers, and Matlab prototypes.

Principal Engineer Video Processing Algorithms & Architectures; R&D Manager – Intel Architecture Group *(2011-2013)*

- Led a high performance team that delivered high end visual quality (HD/ ultra-HD) algorithms and set performance standards to non-traditional platforms such as PCs, Laptops, tablets, and smart phones.
- Successfully upgraded the Intel GPU media processing chain incorporating 4K up-conversion and frame rate conversion algorithms, content adaptive processing, and optimized configuration settings. Provided visual quality content and scoring methodology. Updated four versions of the system and created model for three future generations.
- Provided IP development expertise and validation support for the media processing components of Intel GPU.

Principal Engineer Video Processing Algorithms & Architectures; R&D Manager – Intel Digital Home Group *(2003-2011)*

- Led a research team in charge of development, and delivery of advanced video processing algorithms/architectures for Intel products, including full video processing pipe for four generations of media system-on-a-chip (SoCs).
- Developed cutting edge image/video processing algorithms including noise reduction, post-processing, enhancement, motion compensated deinterlacing & frame-rate conversion, and color/contrast enhancement.
- Spearheaded the formalization of the video processing IP development process from proof of concept to final product. Specified all deliverables and approval criteria including documentation, tests, and testing methods. Provided a triage workflow for field engineering to resolve visual quality issues.
- Established the first state-of-the art video processing R&D lab, including experimental setups with latest display technology, production studio video simulators, 3D & 4K support, and perceptual quality evaluation setup.
- Regarded as Intel's preeminent visual quality and video processing expert; provided expertise and contributions in video processing that enabled Intel SoCs to be highly ranked in the market by leading consumer electronics companies.
- Established and managed research contracts with RIT, ASU, UCSB.

PHILIPS RESEARCH USA 2001-2003

Principal Member Research Staff & Project Leader

Developed Objective Image Quality Metrics, patented methods to measure visual quality on digital images without a reference; conducted experimental validation and applied the metrics to control video processing, video chain optimization, and quality of service.

LABORATOIRE D'ELECTRONIQUE PHILIPS FRANCE 1999-2001

Principal Member Research Staff & Project Leader

Video post-processing to reduce compression artifacts, patented algorithms to reduce MPEG compression artifacts, conducted simulations and visual quality evaluations; lead sponsored research on human visual system modeling at University of Nantes and Caen. Member of Philips Digital TV Design project.

ACADEMIC CAREER EXPERIENCE

ARIZONA STATE UNIVERSITY	Adjunct Professor (2005-Present)
UNIVERSITY OF THE ANDES	Fulbright Professor Medical Informatics
UC Santa Barbara	Ph.D. Thesis Committee Member (2004)
Universite de Nice-Sofia Antipolis	Ph.D. Thesis Jury (2000)

ACADEMIC CREDENTIALS & PROFESSIONAL DEVELOPMENT

Medical Informatics– Post-doc	**COLUMBIA UNIVERSITY**
Ph.D., Biomedical Engineering	**VANDERBILT UNIVERSITY; NASHVILLE, TN**
Master of Science, Biomedical Engineering	**VANDERBILT UNIVERSITY; NASHVILLE, TN**
Bachelor of Science, Electrical Engineering	**UNIVERSIDAD DE LOS ANDES; BOGOTÁ, COLOMBIA**
International Computer Vision Summer School, ICVSS 2015	**U. OF CAMBRIDGE, U. OF CATANIA**
Strategic Analysis for Leaders, Managing at Intel, Finance for Decision Making	INTEL CORPORATION
Business Acumen, Strategy and Action	THE LEADER'S VOICE PROGRAM, STANFORD UNIVERSITY

SELECTION OF PATENTS

Caviedes J.E., et al. "Methods and systems for capturing and visualizing spinal motion," Patent US20080287796A1, Dec 2020

Caviedes J. E., et al. "Joint enhancement of lightness, color and contrast of images and video." Patent 9,710,890. July 18, 2017.

Caviedes J. E., et al. "Techniques for Context and Performance Adaptive Processing in Ultra Low-Power Computer Vision Systems." Patent 9,621,741. April 11, 2017.

Caviedes J. E., et al. "Control of computer vision pre-processing based on image matching using structural similarity." Patent 9,613,294. April 4, 2017.

Caviedes J. E., et al. "Control of video processing algorithms based on measured perceptual quality characteristics." Patent 8,994,882. March 31, 2015.

Caviedes J. E., et al. "Frame rate conversion using motion estimation and compensation" Patent 8,724,022. May 13, 2014.

Caviedes J. E., et al. "Method and apparatus to present three-dimensional video on a two-dimensional display driven by user interaction." Patent 9,641,800. May 2, 2017.

Caviedes J. E., "No-reference video quality model" Patent 8,457,193. June 4, 2013.

Caviedes J. E., et al. "Conferencing system and method for the automatic determination of preset positions corresponding to participants in video-mediated communications." Patent US7057636B1. Dec. 22, 1998.

-Holder of 50+ US Patents. Full list Available Upon Request-

SELECTION OF PUBLICATIONS

J.E. Caviedes, B. Li, P. Swan, and J. Chen, *A New Wearable Stretch Sensor Array for 3D Spine Model Visualization During Therapeutic Exercise*, in Medical Engineering & Physics, vol. 99, Jan. 2022, https://doi.org/10.1016/j.medengphy.2021.11.008.

J.E. Caviedes, B. Li, and V.C. Jammula, "Wearable sensor array design for spine posture monitoring during exercise incorporating biofeedback," in IEEE Transactions on Biomedical Engineering, Feb 5, 2020. doi: 10.1109/TBME.2020.2971907.

J.E. Caviedes and J. Cimino, Towards the development of a conceptual distance metric for the UMLS, Journal of Biomedical Informatics, 37 (2004), 77-85. <awarded most cited paper 4 years in a row 2011-2014.

S.L. Wu, J.E. Caviedes, L. Karam, and I. Heynderickx, The Effect of Applying 2D Enhancement Algorithms on 3D Video Content, Journal of Electrical and Computer Engineering, Volume 2014.

J.E. Caviedes, "The Evolution of Video Processing Technology and Its Main Drivers," Invited Paper, Proceedings of the IEEE, Vol. 100, No. 4, April 2012.

J.E. Caviedes and F. Oberti, Measuring image enhancement and degradation without a reference, In Digital Video Image Quality and Perceptual Coding, H.R.Wu and K.R. Rao, eds. CRC Press by Taylor and Francis, 2006.

-Full list Available Upon Request-

SELECTION OF INTERNATIONAL CONFERENCES & WORKSHOPS

J. E. Caviedes, B. K. Patel, R. Gutzwiller, B. Li, R. Bhat and S. Chhabra, "A Cognitive Perspective on Subjective and Objective Diagnostic Image Quality Models," *2022 IEEE International Conference on Image Processing (ICIP)*, 2022, pp. 246-250, doi: 10.1109/ICIP46576.2022.9897481.

J. Chen, J. Caviedes, B. Li, "Classification of Single-Axis Spinal Motion Using a Wearable System of Stretch Sensors for At-home Physical Therapy" Annu Int Conf IEEE Eng Med Biol Soc. 2021 Nov;2021:7404-7407. doi: 10.1109/EMBC46164.2021.9630663. PMID: 34892808.

J.E. Caviedes and S.L. Wu, "A Practical Approach to Signal Quality Metrics for Computer Vision Applications," in Proceedings of VPQM15, Chandler, AZ, February 2015.

J.E. Caviedes, S.L. Wu, "Combining Computer Vision and Video Processing to Achieve Immersive Mobile Video Conferencing," in Proceedings of IEEE International Conference on Image Processing, ICIP 2014, Paris, France, October 2014.

J.E. Caviedes, S.L. Wu, and T. Lee, "An overview of immersive mobile videoconferencing system design and quality of experience," in Proceedings of VPQM14, Chandler, AZ, January 2014.

-Full list Available Upon Request-

STUDENT ADVISOR/MENTOR

Capstone project Director, "Dynamic Spinal Model for Immersive Therapeutic Biofeedback," Christopher Boor, Michael Fraiz, Siyao Hu, Martha Martinez, and Weston Paige. Spring & Fall 2019.

Barret Honors Thesis co-advisor w/Heni Ben Amor, "Automatic Song Lyric Generation and Classification with Long Short-Term Networks," Amit Tallapragada.

Post-doc advisor to Chin Chye Koh, UCSB "Design of a Consumer Digital Video Library" currently maintained by NIST, www.cdvl.org

UC Santa Barbara Ph.D. Thesis Committee Member (2004). No-reference and reduced reference quality metrics: new contributions. Mylene Farias, currently Associate Professor at University of Brasilia, Brazil. Also post-doc advisor for Mylene at Intel Corp in 2005.

Université de Nice-Sofia Antipolis, Ph.D. Thesis Jury (2000). OMD: Une méthode de décodage optimal orientée objet pour les séquences d'images. Joel Yung, currently with Orange Labs, France

PROFESSIONAL RECOGNITION

Arizona State University Global Sports Institute Scholar, January 2020

Intel Digital Home Group Divisional Recognition Award, 2008 | Intel Digital Home Group Divisional Recognition Award, 2005

Fulbright Scholar Award – University of the Andes, Bogota, Colombia, 1998

SERVICE

General Chair, First through Ninth International Workshop (2005-2015)	VIDEO PROCESSING AND QUALITY METRICS
Juror (2014)	2015 CES INNOVATION AWARDS
Co-editor (2011)	SPRINGER SIGNAL IMAGE AND VIDEO PROCESSING JOURNAL
Invited Speaker (2009)	IEEE CS SOCIETY PHOENIX CHAPTER
Technical Reviewer (2007)	ICME, ICIP, JALN
Technical Reviewer (2006)	IEEE TRANSACTIONS ON IMAGE PROCESSING, SIGNAL PROCESSING LETTERS
Technical Reviewer (2004)	JOURNAL OF BIOMEDICAL INFORMATICS
Co-editor (2004)	EURASIP JOURNAL IMAGE COMMUNICATION
Expert Assessor of International Standing (2002)	AUSTRALIAN RESEARCH COUNCIL

BOARD &PROFESSIONAL MEMBERSHIPS

Member	RSNA, Medical Image Perception Society, IEEE
Board Member	ITU'S VIDEO QUALITY EXPERTS GROUP
Senior Member	IEEE SOCIETY
Co-chair	ICCE 2008 SPECIAL SESSION
Chair, special session Objective Video Quality Metrics	ICIP
Colloquium Chair, Settings for Synchronous, Asynchronous and Bimodal Distance Learning	DISTANCE TEACHING & LEARNING CONF

LANGUAGES

Fluent in English, Spanish, and French; intermediate Dutch