Andrea Dunn Beltran

Graduate Student

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Education

UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL
Spring 2024 – Present | Chapel Hill, NC

Master of Science in Computer Science

Relevant Coursework: Artificial Intelligence; 3D Generative Models; Visual Recognition with Transformers; Computational Biology; Mobile Health Systems

UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL
Fall 2020 – Fall 2023 | Chapel Hill, NC

Bachelor of Science in Computer Science & Applied Mathematics

Relevant Coursework: Algorithms and Analysis; Machine Learning; Neural Rendering; Probabilistic Models and Deep Structured Prediction; 3D Computer Vision; Optimization for Machine Learning; Introduction to Probability

Research Experience

UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL | Research Assistant
Spring 2023 – Present | Chapel Hill, NC

Next-gen 3D Modeling of Endoscopy Videos

- ➔ **Lead (4D Bronchoscopies)**: Designed synthetic breathing-lung dataset generation pipeline and reconstruction pipeline.
- ➔ **Lead (NFL-BA)**: Augmented dense SLAM by integrating near-field lighting cues into the bundle adjustment objective and achieving state-of-the-art results on the C3VD dataset.
- ➔ **2nd Author: PPS-Ctrl**: Contributed to the evaluation pipeline for Stable Diffusion + ControlNet conditioned on Per-Pixel Shading, producing more photorealistic sim-to-real colonoscopy translations and depth estimation.
- ➔ **UG contributor**: Assisted data cleaning & analysis of preliminary algorithms leveraging optical flow and reflectance cues.

Task-Aware 3D Knowledge Acquisition

- ➔ **2nd Author (VIN-NBV)**: Supported development and baseline implementation of a View Introspection Network for next-best-view selection, improving reconstruction quality by 30%; Aided evaluation efforts.
- ➔ **UG contributor**: Conducted literature review and designed data preparation and evaluation pipelines.

UNIVERSITY OF SOUTHERN CALIFORNIA | Undergraduate Research Assistant
Summer 2023 | Los Angeles, CA

NSF REU: Robotics and Autonomous Systems — RL with Temporal-Logic Constraints on the Toyota HSR

- ➔ Explored single-agent reinforcement learning with temporal-logic specifications on the Toyota Human Support Robot (HSR) platform.
- ➔ Built Python-based Gazebo and OpenAI Gym environments for RL training and developed data-collection pipelines for imitation learning; presented results at the SoCal REU Symposium.

RICE UNIVERSITY | Undergraduate Research Assistant
Summer 2022 | Houston, TX

REU: Data Science — Online Learning for Multi-Label Medical Imaging

- ➔ Built an online-streaming pipeline and custom TensorFlow CNNs to address class-imbalanced chest X-ray datasets.
- ➔ Conducted ablation studies on learning-rate schedulers and indexing schemes to mitigate catastrophic forgetting.
- ➔ Automated data augmentation and continual-learning workflows; presented findings at the Rice REU Symposium.

UNC STEM CELL CORE FACILITY | Intern
Fall 2021 – Spring 2022 | Chapel Hill, NC

Modulation of tau tubulin kinases (TTBK1 and TTBK2) impacts ciliogenesis

- ➔ Stained and imaged over 200 cilia per month using immunofluorescence and high-resolution microscopy.
- ➔ Developed ImageJ macros and a Python-based segmentation pipeline to automate cilia count and length measurements, reducing analysis time by 80%.
- ➔ Results featured in a Scientific Reports publication.

UNC DEPARTMENT OF PHARMACOLOGY | Intern — Summer 2018, Summer 2019, Fall 2020 – Spring 2021 | Chapel Hill, NC

Gary L. Johnson Lab

- ➔ Assisted with dose–response and viability assays on TNBC cell lines, confirming apoptosis via caspase-3 cleavage.
- ➔ Gained proficiency in sterile cell culture, Western blotting, gel electrophoresis, plasmid mini/maxi-prep, bacterial transformation, and fluorescence microscopy.
- ➔ Generated data supporting a BRCA2-mutation study publication.

Publications

- ➔ **NFL-BA: Improving Endoscopic SLAM with Near-Field Light Bundle Adjustment**, Andrea Dunn Beltran, Daniel Rho, Marc Niethammer & Roni Sengupta. Under review (arXiv 2025).
- ➔ **PPS-Ctrl: Controllable Sim-to-Real Translation for Colonoscopy Depth Estimation**, Xinqi (Ana) Xiong, Andrea Dunn Beltran, Jun Myeong Choi, Marc Niethammer & Roni Sengupta. Under review (arXiv 2025).
- ➔ **VIN-NBV: A View Introspection Network for Next-Best-View Selection for Resource-Efficient 3D Reconstruction**, Noah Frahm, Dongxu Zhao*, Andrea Dunn Beltran*, Ron Alterovitz, Jan-Michael Frahm, Junier Oliva & Roni Sengupta. Under review (arXiv 2025).
- ➔ **Modulation of tau tubulin kinases (TTBK1 and TTBK2) impacts ciliogenesis**, Frances Bashore, Ariana Marquez, Apirat Chaikuad, Stefanie Howell, Andrea Dunn, Álvaro Beltran, Jeffery Smith, David Drewry, Adriana Beltran & Alison Axtman. Scientific Reports, 2023.

* indicates equal contribution

Teaching

UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL — Chapel Hill, NC

Graduate Teaching Assistant

- ➔ **COMP 776: Computer Vision in the 3D World (Fall 2023, Fall 2024)**: Supported instructor in class prep, authored solution manuals, and led weekly office hours sections.
- ➔ **COMP 116: Scientific Programming (Lead TA, Spring 2024)**: Designed lesson plans and review guides for 110+ students; restructured grading system to improve fairness and efficiency.

Undergraduate Teaching Assistant

- ➔ **APPL 101: Intro to Engineering (Fall 2022)**: Created MATLAB lesson plans for the needs of a class of over 60 students with varying programming experiences.

Skills & Achievements

PROGRAMMING LANGUAGES Python • MATLAB • C • Java • JavaScript • SQL • R • MIPS • HTML

SOFTWARE & TOOLS LaTeX • Linux/Unix • Git • Docker • CUDA • Blender • 3DSlicer • ImageJ • VTK/ITK

ML & DATA PyTorch • TensorFlow • OpenCV • NumPy • ROS • Pandas • Open3D • Scikit-Learn • Matplotlib • OpenAI Gym

AWARDS & HONORS CVPR BP Scholarship (2025) • CVPR DEI Scholarship (2024) • Dean's List (2021, 2022, 2023) • Hayden B. Renwick Scholar (2021–2023)

Outreach & Community

MENTORSHIP MIT Summer Geometry Initiative Mentor: SLAM • UNC–Intel REU Mentor: Deep-Fake Detectors • Graduate Women in CS Mentor • Mentored new undergraduates in the lab

ADMINISTRATION UNC Dept. of Applied Sciences & Engineering Program Committee Member • UNC Dept. of Computer Science DEI Ambassador (undergraduate) • UNC Dept. of Computer Science Student Association Officer (graduate)

COMMUNITY & CLUBS (Graduate) Women in Computer Science • Afro-Latinx Vice President • CS+SG

PROFESSIONAL AFFILIATIONS SACNAS • CVF • LatinX in AI