

# Thanh M. Vu

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## Education

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Ph.D. in Computer Science — University of North Carolina at Chapel Hill Aug 2018 – Exp. Jul 2023

- Focus: Computer Vision/ML/AI — Coursework: 3D Vision, ML, Semi-supervised learning, Generative models, Parallel computing

B.S. in Computer Science & Minor in Mathematics — Lafayette College | GPA: 3.97/4.00 Aug 2014 – May 2018

## Experience

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### Google X — AI Resident

May 2021 – Present

MANAGERS: DR. BAOCHEN SUN, DR. YUEQI LI

Mountain View, CA

- Led a total of 4 CV/ML projects with Alphabet's Mineral.ai and Google Brain to help scale sustainable agriculture with AI
- Recognized by Mineral's CTO for developing novel solutions leveraging perception and generative models
- Authored 2 research papers and filed 2 pending US patents based on their findings. More details below

#### Object Detection, Domain Adaptation, and Synthetic Data:

- Developing a patent-pending, versatile, and easy-to-adopt training method to improve object detection models such as Faster R-CNN, YOLOv7, and Transformer-based DETR. Achieved a new state-of-the-art in domain adaptation applications
- Proposed a scalable, production-friendly solution via Generative Adversarial Network (GAN), inspiring a follow-up study
- Identified a -15% accuracy drop due to a scale shift issue and evaluated multiscale training and FPN effectiveness

#### Efficient Segmentation and Depth Estimation with Multi-Task NAS:

- Developed a scalable, patent-pending framework in collaboration with Google Brain to improve image segmentation and depth estimation on resource-constrained edge platforms, using hardware-aware multi-task neural architecture search
- Achieved superior accuracy while using only 1/10th the computation compared to state-of-the-art approaches
- Reduced on-device latency for semantic segmentation in agricultural applications by 30% in production models

### UNC 3D Vision — PhD Research Assistant

Aug 2018 – Present

ADVISER: DR. JAN-MICHAEL FRAHM

Chapel Hill, NC

- Led the computer vision efforts in a team of 9 to develop real-time deep learning models for Autonomous Vehicles
- Designed an adjustable CNN architecture that enables fine-grained trade-offs between speed and accuracy depending on available budgets during inference. Outperformed the previous state-of-the-art methods by 78%
- Collaborations: Schedulability trade-offs in multi-object tracking; Rethinking object detection CNN for time sensitivity

### Lenovo — AR Engineer Intern

Jun 2020 – Jul 2020

TEAM: CLOUD & SOFTWARE ENGINEERING LAB

Morrisville, NC

- Developed enterprise AR apps for the A6 headset using image tracking and Unity, exceeding customer expectation

### Amazon — Software Engineer Intern

May 2017 – Aug 2017

TEAM: DIGITAL BOOK STORE

Seattle, WA

- Implemented a Kindle app's feature that allows over 100M users access to more search results with 50% fewer clicks

### Lafayette CS Dept — CV/ML Research Assistant

May 2015 – May 2018

ADVISERS: DR. AMIR SADOVNIK, DR. CHUN WAI LIEW

Easton, PA

- Visual Similarity: Designed a Triplet network to hierarchically learn the aesthetic fashion compatibility of clothing items
- Object Detection: Designed an object detection-based poster retrieval system that outperformed SIFT-based methods
- 3D LiDAR Viewer: Built a web-based 3D point cloud viewer to render 1.5B+ LiDAR points of Easton's oldest building
- Mobile Recognition: Developed on-device building recognition for mobile platforms using OpenCV's feature extraction

## Skills

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- Languages: Python, C++/C/C#, Java, HTML, CSS/SASS, JavaScript, SQL, Matlab, R
- Deep Learning: PyTorch, TensorFlow, Detectron2, Caffe, CUDA, Docker, Google Cloud Platform
- Technologies: NumPy, OpenCV, Unity, Android, Git, Confluence, Jira, JSP, jQuery, MVC, Spring, AJAX, JSP
- Leadership: Vice President @TEDxLaf ('16-'17). Project Lead: AI Horizons ('17), United Way DB ('16), MiniFacebook ('16)

## Publications

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- **T Vu**, B Sun, B Yuan, A Ngai, Y Li, JM Frahm. "LossMix: Simplify and Generalize Mixup for Object Detection and Beyond." arXiv preprint arXiv:2303.10343, 2023.
- **T Vu**, Y Zhao, C Wen, Y Li, JM Frahm. "Toward Edge-Efficient Dense Predictions with Synergistic Multi-Task NAS." WACV, 2023.
- T Amert, M Yang, S Voronov, S Nandi, **T Vu**, JH Anderson, FD Smith. "The price of schedulability in cyclic workloads: The history-vs.-response-time-vs.-accuracy trade-off." Journal of Systems Architecture, 2021.
- **T Vu**, M Eder, T Price, JM Frahm. "Any-Width Networks." CVPRW, 2020.
- T Amert, M Yang, S Nandi, **T Vu**, JH Anderson, FD Smith. "The Price of Schedulability in Multi-Object Tracking: The History-vs.-Accuracy Trade-Off." ISORC, 2020.
- M Eder, T Price, **T Vu**, A Bapat, JM Frahm. "Mapped Convolutions." arXiv preprint arXiv:1906.11096, 2019.
- M Yang, S Wang, J Bakita, **T Vu**, FD Smith, JH Anderson, JM Frahm. "Re-thinking CNN Frameworks for Time-Sensitive Autonomous-Driving Applications: Addressing an Industrial Challenge." RTAS, 2019.
- **T Vu**. "Learning Visual Compatibility: An Improved Method for Visual Compatibility Embedding." Undergraduate Thesis, 2018.
- A Sadovnik, W Gharbi, **T Vu**, A Gallagher. "Finding your lookalike: Measuring face similarity rather than identity." CVPRW, 2018.
- **T Vu**, A Sadovnik. "Robust Automatic Poster Recognition." EXCEL Scholars Technical Report, 2017.
- **T Vu**, D Piros, A Sadovnik. "How your phone recognizes your home: An investigation of mobile object recognition." NCUR, 2016.

## Patents

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- **T Vu**, B Sun, B Yuan, A Ngai, Y Li. *Improving Cross-Domain Adaptive Teacher for Object Detection with Joint Intra-Domain and Inter-Domain Mixing*. Pending US Patent Application, 2022.
- **T Vu**, Y Zhao, C Wen, Y Li, Z Yuan. *Joint Training of Network Architecture Search and Multi-Task Dense Prediction Models For Edge Deployment*. Pending US Patent Application, 2022.

## Projects

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- AI Horizons: Led a team of 5 to design AI-based solutions for 4 different use cases, namely personalized tour guides, multi-robot navigation in restaurants, health monitoring for the elderly, and multi-camera person search (2017)
- United Way K-12 Database: Led a team of 4 to create a database & web interface for 200K+ data points using PostgreSQL, Ruby on Rails, and D3.js. Awarded the best app among 6 teams and exceeded the expectations of our client (2017)
- MiniFacebook: Led a team of 3 to create a user-centered social platform that features blogging, instant messaging, and group communication capabilities with both text-based and graphical interfaces. Won the best app among 5 teams (2016)

## Awards & Services

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- Conference Reviewer: ECCV 2020, CVPR 2022, ECCV 2022, WACV 2023, CVPR 2023, ICCV 2023
- Teaching and Tutoring: CRLA-Certified Tutor ('15-'18), CS TA ('16, '17), Drop-in CS Tutor ('16-'18), Calculus Tutor ('16-'18)
- Honors and Awards: UNC Travel Grant ('23), 2nd Place ACM ICPC Mid-Atlantic ('16), PBK ('18), PME ('18), UPE ('17)