Minh Do

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ABOUT ME

- As a research associate at NTU's Hardware and Embedded System lab, I developed and optimized computer vision and deep learning models for resource-constrained devices, ensuring robust and real-time performance.
- Contribute to major projects on traffic surveillance intelligence and enforcement systems, infrastructure-to-vehicle (I2V) interaction, and autonomous drones.
- Specialize in real-time change detection, object detection, single-camera tracking, multi-camera tracking, and crowd estimation on embedded systems.

WORKING EXPERIENCE

Hardware and Embedded System Lab, College of Computing and Data Science, NTU — Singapore

Research Associate | AI, Computer Vision & Embedded System   *Nov. 2023 – Present*

- **Autonomous Drone in Maze**
  - Developed a seamless simulation environment by integrating Hardware-in-the-loop (HIL) pipelines and implementing real-time algorithms, enabling drone flight simulation on a workstation while SLAM, mapping, planning, navigation, and control modules run in real-time on Jetson Xavier NX.
  - Profiled, optimized, and allocated computing resources on embedded CPU-GPU-DLA (deep learning accelerator), enabling SLAM at 20 Hz, mapping at 5 Hz, planning, and navigation at 50 Hz, and object detection at 5 Hz, achieved drone flight speeds of 4 m/s in free space and 1 m/s in dense obstacles on Jetson Xavier NX, while achieving a 22% reduction in power consumption.

Research Engineer | AI, Computer Vision & Embedded System   *Nov. 2021 – Nov. 2023*

- **Infrastructure to Vehicle (I2V) Communication for Driving Assistance**
  - Developed a lightweight change detection algorithm at 30 Hz on embedded systems (Odroid N2+) to figure out potential objects, enabling on/off heavy object detection module, saving computing resources for other tasks, and reducing power usage by 30%.
  - Optimized deep learning models for vehicle tracking (7 Hz) and crowd counting (1 Hz) using quantization and pruning, enabling 4 edge devices (Odroid N2+) to process live feeds from 9 cameras and communicate with autonomous vehicles for driving assistance via ROS over the network.
  - Analyzed 152 hours of traffic videos from 19 cameras using object detection and tracking to count persons, vehicles, and waiting times, reducing human effort in traffic demand analysis by supervising 15 student assistants in data preparation and improving model training accuracy with transfer learning.

Research Engineer | AI, Computer Vision & Embedded System   *Nov. 2016 – Nov. 2021*

- **Sensing and Management for Agile Transport**
  - Designed and configured multiple cameras (27 cameras) at different 8 locations, collecting high-quality videos for accurate traffic demand analytics.
  - Developed lightweight computer vision algorithms, and optimized deep learning models using quantization and pruning techniques on embedded platforms (Odroid XU4, Odroid N2+) for real-time traffic density estimation, illegal parking detection, illegal entry detection, virtual right of way, crowd counting, and vision-based smart traffic light systems.
  - Conducted field trials, optimized and deployed of the developed applications on embedded devices for real-time traffic participants analysis on the NTU campus, partner company's campus, and Singapore roads.

SKILLS

- **Software and Hardware**
  - **Language and framework**: Python, C/C++, Pytorch, Tensorflow, NCNN, ONNX, OpenCV, ROS.
  - **Hardware**: sensors (humidity, light, infrared, temperature, accelerator, cameras), microcontrollers (8051, MSP430, Arduino), embedded platforms (Odroid XU4, Odroid N2+, Jetson TX1, Jetson Xavier NX).
  - **Software tools:** Git, Visual Studio Code, Docker.
  - **Deep learning skills:** Data preparation, learning techniques (transfer learning, distillation learning, supervised, self-supervised learning, and unsupervised learning), compression techniques (quantization, pruning), deploying deep learning models on embedded devices.
  - **Computer vision skills:** Used to work with change detection, image classification, object detection, image segmentation, crowd counting, and single and multi-camera tracking.
- **Language Proficiency**
  - Vietnamese: Native language. English (IELTS 6.5, tested on Dec 2020).

EDUCATION

Nanyang Technological University (NTU)   Singapore
Master of Engineering in Computer Science   *Jan. 2021 – Aug. 2023*

- **Concentrations:** Computer vision, deep learning, and embedded systems | **GPA**: 4.5/5.0 (First-class Honours).
- **Thesis**: "Multi-Camera Tracking for Smart Urban Mobility".
  - Devised and implemented an enhanced multi-camera tracking in a distributed camera network on an ARM processor, significantly boosting system efficiency and performance on embedded platforms.

The University of Da Nang, University of Science and Technology (DUT)   Da Nang City, Viet Nam
Bachelor of Engineering in Electronics and Telecommunications Engineering   *Aug. 2011 – Aug. 2016*

- **Concentrations:** Embedded system | **GPA**: 8.14/10 equivalent to 3.36/4.0 (Distinction), ranked 5/240 in class
- **Thesis**: " Robotic Arm Design for Armless People Controlled by Head Gestures and Eyebrow"
- **Awards**:
  - GE (General Electric) Foundation Scholar-Leader Scholarship (US$3450), one of ten undergraduate students in Vietnam   2012 – 2016
  - 3rd prize at the Science Research Contest of DUT   2016
  - 1st prize at Vietnam TI MCU Design Contest of Texas Instrument Company   2015
  - Exchange program at Utsunomiya University in Japan   2015

PUBLICATION

- **Van Minh Do**, Meiqing Wu, Siew-kei Lam, and Thambipillai Srikanthan. "Achieving Real-time Visual Tracking with Low-Cost Edge AI", 2024 ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS).

- **Van Minh Do**, Meiqing Wu, Siew-kei Lam, and Thambipillai Srikanthan. "Real-time Multi-Camera Tracking in Distributed Camera Networks", Journal of Real-Time Image Processing.

- Singh, G., Wu, M., **Van Minh Do**. and Lam, S.K., 2022. Fast Semantic-Aware Motion State Detection for Visual SLAM in Dynamic Environments. IEEE Transactions on Intelligent Transportation Systems, 23(12), pp.23014-23030.

- Gaurav Singh, Meiqing Wu, Siew-Kei Lam, and **Van Minh Do** "Hierarchical Loop Closure Detection for Long-term Visual SLAM with Semantic-Geometric Descriptors", 24th IEEE International Conference on Intelligent Transportation (ITSC), September 2021.