Started as a gifted student in Mathematics at a high school in Vietnam, I spent my youth developing a solid mathematical background and fostering a huge passion for science in general. Then, with the motivation of becoming a scientist in a math-related field, I established my Bachelor's degree in Mathematics and Computer Science at the University of Science, Vietnam National University, where I was eventually attracted by the Artificial Intelligence (AI) area. Toward building a successful research career in AI, I have early shaped my own long-term research interests to pursue, which are developing AI models with human-level generalization ability and employing AI in medical and healthcare applications.

Derived from the vision of the field leader, Jürgen Schmidhuber [1], existing AI models fall short of human-level generalization. In particular, such models *require large amounts of annotated data for training*, *are vulnerable under data distribution shifts during testing*, and *struggle with learning to process novel tasks without forgetting previously acquired abilities*. Fortunately, I early had an opportunity to explore the first issue when I joined the Artificial Intelligence Solution for Industrial Applications (AISIA) Research Lab as a Fresher and did my first research project on building an accurate Deep Learning system for classifying sentiment of customer feedback on e-commerce platforms in Vietnam, which was then extended to form my graduation thesis [2] under the supervision of Prof. Binh T. Nguyen. During this time, we mainly coped with the shortage of available annotated data in Vietnamese, a low-resource language, and came up with the solution of multi-source transfer learning, in which we proposed an efficient Mixture-of-Experts mechanism to take advantage of multiple pre-trained language models, both mono- and multi-lingual, and eventually achieved promising performance with very limited data. The experience gained from this project highly encouraged me to continue exploring this research issue in the future.

At the end of 2020, I left AISIA Research Lab to join the Smart Health Center (SHC) at Vingroup Big Data Institute (VinBigData) to strive towards my second research interest, employing AI in medical and healthcare applications. At SHC-VinBigData, we engage with the mission of constructing open large-scale medical datasets and developing high-performance computer-aided diagnosis systems for the Vietnamese community. However, during the annotation collection process of Chest X-ray scans, we faced a crucial problem of high inter-observer variability where multiple experts provided subjective noisy estimates of "truth" under the influence of their varying skill levels and biases. Blindly treating these noisy annotations as the ground truth limited the performance of supervised learning models in the presence of strong disagreement. To alleviate the problem, we proposed an annotation fusion procedure coupled with a new re-weighted loss function for effective training of Deep Learning-based detectors to localize 14 critical radiographic findings on Chest X-ray scans [3]. Despite the improvement from our method, this particular problem of high inter-observer variability is still open and far from being resolved, especially in the medical domain. After more than one year at SHC-VinBigData, at the beginning of 2022, I was introduced and transferred to the VinUni-Illinois Smart Health Center (VISHC), VinUniversity, where I continued my career in the second research direction. At VISHC, we concentrate on developing smart health solutions to provide widely accessible monitoring, screening, and diagnosis for people all over the world. Driven by this mission, our team led by Prof. Cuong D. Do, targeted building a screening tool for cardiovascular diseases based on electrocardiograms, which is the gold standard for diagnosing these kinds of diseases. To this end, we designed an accurate Deep Learning system that is able to identify multiple heart arrhythmias on electrocardiograms and is also lightweight enough to be easily integrated into edge devices for screening deployment. Moreover, we equipped our system with the ability to explain its predictions, making those predictions more reliable to humans [4], [5]. With the consistent motivation of bridging the gap between research and translational applications, we constantly contributed to employing AI to improve current healthcare diagnosis and services, thereby, together with the research community, making our world a better place to live.

Since 01/2023, I have switched to work on the topic of Federated Learning (FL), where our research lab, the Information Security Lab at VinUni, led by Prof. Kok-Seng Wong, has investigated various aspects of FL such as personalization and generalization in the FL context, as well as real-world behaviors of FL algorithms deployed on IoT devices. During this period, I had an opportunity to return to a fundamental problem and progress my own ambition of developing AI models with human-level generalization ability.

In particular, we studied the problem of domain generalization under the FL setting and established a novel algorithm for decentralized training DL models with the goal of comprehensively distilling domain-invariant representation while fully respecting the privacy-preserving principles of FL [6]. Hence, the method enables such models to be robust under data distribution shifts, addressing the second issue of human-level generalization as mentioned above. Our work has been submitted and is under review at the NeurIPS Conference 2023. To conclude, at the moment, with all gained research achievements and experience at various institutes in Vietnam, I am now ready to look for an opportunity to pursue a prestigious Ph.D. program in AI and make huge progress on my research journey.

For my Ph.D. duration, while I am open to investigating interesting research ideas within the broader field, I am particularly interested in continuing to develop my own research ambition in AI to address three aforementioned issues toward human-level generalization. For the first issue of *the requirement for large amounts of annotated data for training*, I desire to go beyond the fully supervised learning regime and explore the high potential of semi-supervised learning and self-supervised pre-training which underpin recent successes in Computer Vision and Natural Language Processing applications. For the second issue of *the vulnerability to data distribution shifts during testing*, I observe that existing domain generalization methods fall into a common limitation that the invariance of the representation is mainly enforced among source domains and this might lead to suboptimal performance when testing on extremely arbitrary domains. Targeting this long-standing limitation is a challenging but high-reward direction. For the third issue of *the struggle with learning continually*, architecture-based is the promising approach that aims to develop an extensible model that can evolve over time, reusing previously acquired knowledge to learn to process new tasks efficiently, while avoiding forgetting previously acquired abilities at the same time. Although the three aforementioned issues are considered and addressed separately, a unified solution such as a totally new line of architecture is waiting to be discovered to tackle the AI model's shortcoming of human-level generalization completely.

Finally, I would be thrilled to pursue the Ph.D. program at A2I2 at Deakin University due to its solid mission of exploring fundamental AI problems while also translating those solutions into products to make the world better. Especially, I appreciate Prof. Truyen Tran's works on the topic of New kinds of Machine Learning where he is exploring new forms of computation and supervision to address the existing shortcomings of Machine Learning models. Moreover, his works on employing AI in Healthcare and Scientific Discovery attract me a lot due to the huge impact on the real world. I believe that my in-depth research experience and early perspectives on AI well match Prof. Truyen Tran's interests and make me a potential candidate for the Ph.D. program at A2I2 at Deakin University.

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