

Applied Deep Learning Graduate Certificate

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ELECTRICAL & COMPUTER
ENGINEERING

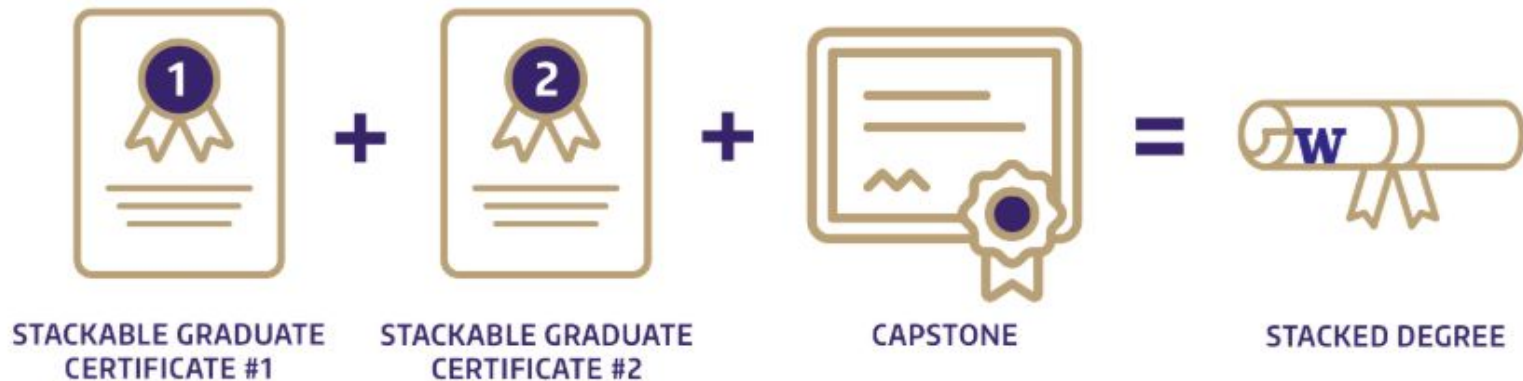
UNIVERSITY *of* WASHINGTON



Applied Deep Learning

Seeking Curriculum Committee approval for a new Graduate Certificate in Applied Deep Learning

- Fee-based
- Stackable



Applied Deep Learning

The certificate will be stackable with the following degrees:

College of Engineering Stackable Degrees

- Master of Engineering in Multidisciplinary Engineering
- Master of Science in Artificial Intelligence and Machine Learning for Engineering

Foster School of Business and College of Engineering Stackable Degrees (proposed)

- Master of Science in Engineering Management (MSEM)
- Master of Science in AI Systems and Business Strategy

Applied Deep Learning

Existing stackable graduate certificates in CoE

William E. Boeing Department of Aeronautics & Astronautics (A&A)

- Aerospace Composite Structures
- Modern Aerospace Structures
- Aerospace Control Systems

Paul G. Allen School of Computer Science and Engineering (CSE)

- Modern AI Methods

Human Centered Design & Engineering (HCDE)

- User Centered Design
- Human Centered AI

Industrial & Systems Engineering (ISE)

- Systems Engineering Leadership
- Data Analytics for Systems Operations
- Systems Engineering Design and Analysis

Mechanical Engineering (ME)

- Data-Driven Methods for Controls and Dynamic Systems for Engineering

Material Science & Engineering (MSE)

- Data Science for Materials

Multidisciplinary Certificates

- Artificial Intelligence and Machine Learning for Engineering (all departments)
- Composite Structures: Materials and Manufacturing (MSE/ME)

Applied Deep Learning

Learning Outcomes

By completing the Applied Deep Learning graduate certificate, students will be able to:

- Explain and apply foundational principles of artificial neural networks (ANNs)
- Develop strong computational modeling skills
- Implement and evaluate diverse deep learning architectures
- Apply advanced deep learning techniques for real-world optimization
- Integrate deep learning methods into an end-to-end applied project

(See PNOI for additional details)

Applied Deep Learning

Course 1: Foundations of Applied Deep Learning (4 credits)

This course introduces the foundations of data-driven modeling through artificial neural networks, emphasizing applications involving signal, image, sequence, and structured data. Students explore linear/logistic regression, multi-layer perceptrons (MLPs), convolutional neural networks (CNNs), recurrent neural networks (RNNs), and encoder-decoder architectures. Core training algorithms, including stochastic gradient descent, Adam and techniques such as initialization, regularization, and data augmentation strategies are examined in depth. Hands-on assignments use real-world datasets from scientific, engineering, and business domains, enabling students to understand and evaluate model behavior, training techniques, performance trade-offs between models, and use cases such as image, text, and sequential data.

Background: Course 1 and 2 are based on the PMP course “Practical Introduction to Deep Learning Applications and Theory”, taught twice by ECE PhD student Jimin Kim. PMP hired Jimin after graduation to develop these two courses for the stackable certificate.

Applied Deep Learning

Course 2: Advanced Methods in Applied Deep Learning (4 credits)

This course explores advanced architectures for unsupervised learning, generative modeling, sequence processing and model optimization techniques. Students work with Transformers, Autoencoders, VAEs, GANs, Diffusion models, and Reinforcement Learning agents alongside learning optimization strategies including transfer learning and model compression. Applications span image and language generation, time-series modeling, and sequential control problems relevant to science, industry, and finance. Hands-on labs with real-world datasets help students understand the potential, limitations, and deployment considerations of these modern deep learning methods.

Background: Course 1 and 2 are based on the PMP course Practical Introduction to Deep Learning Applications and Theory, taught twice by ECE PhD student Jimin Kim. PMP hired Jimin after graduation to develop these two courses for the stackable certificate.

Applied Deep Learning

Course 3: Elective in Applied Deep Learning (4 credits)

The third course in the certificate is an elective that allows students to tailor their learning to a specific application area of interest. Each elective focuses on a targeted domain, such as cybersecurity, neurotechnology, signal processing, communications, embedded computing, or fintech, and offers students the opportunity to apply deep learning methods to specialized datasets and real-world problems within that field. By selecting an elective aligned with their academic goals or professional focus, students can deepen their expertise, explore advanced domain-specific challenges, and develop hands-on experience that complements the core deep learning curriculum.

These courses can come from our existing curriculum in our Professional Master's Program such as Tiny Machine Learning for Ultra Low-Power Edge Computing, Machine Learning for Cybersecurity, and Deep Learning for Embedded Real Time Intelligence as well as courses that will be developed in the future.

Applied Deep Learning

Course 4: Culminating Experience (3 credits)

In this culminating course, students design and execute a substantial applied deep learning project, from problem definition through model deployment. Culminating experience may focus on scientific modeling, engineering applications, or business and fintech challenges such as forecasting, anomaly detection, risk modeling, or NLP automation. Students deliver a full technical report, reproducible code, and an oral presentation, demonstrating their ability to build robust deep learning solutions for real-world impact.

Applied Deep Learning vs. other certs

CoE AI and ML for Engineering

- Focuses more theoretical aspects of AI, optimization and control theory, system modeling and simulations such as fluid mechanics, robotics, and manufacturing

CSE Modern AI Methods

- Focuses on broad AI methods for applications in Computer Vision and NLP

ECE Certificate in ML and DL: Application Frontiers

- Not stackable, 12 vs. 15 credits, provides maximum flexibility (students can choose any 3 from a selection of 12+ ML/ DL/ AI related PMP courses), no culminating experience

(See PNOI for additional details)