

SMARTSTART

Curriculum Framework

(Machine Learning Course for Preservice Early Childhood Teachers)

This course series introduces the fundamental concepts, foundations, and pedagogical approaches of Machine Learning (ML), while exploring its practical applications across educational and real-world contexts. Participants will engage with interactive activities and examples that demonstrate how ML systems function and how Artificial Intelligence (AI)-related concepts can be taught effectively. The courses also examine ethical considerations and promote a human-centered mindset, particularly in early childhood education, emphasizing fairness, inclusion, privacy, and responsible technology use. Finally, participants will learn how to transform ML concepts into meaningful classroom experiences by designing and implementing creative, learner-centered, ML-inspired projects that foster critical thinking, collaboration, and digital literacy.

MODULE 1: General Introduction to Machine Learning (ML), Foundations & Pedagogy

Module Overview: This module provides an introductory, non-technical exploration of ML and its pedagogical implications for Early Childhood Education (ECE). The contents cover core ML concepts, main types of ML, and how ML systems learn from data. The opportunities and challenges of ML within ECE settings and the foundational principles of AI pedagogy were also introduced with a focus on practical relevance rather than technical proficiency among pre-service teachers with no or little background in computing.

List of Topics:

Topic 1: What is Machine Learning? Core Concepts for Pre-service Teachers

Topic 2: Types of Machine Learning (Supervised, Unsupervised, and Reinforcement Learning)

Topic 3: How ML Models Work: Data, Features & Opportunities for Application in Early Childhood Education

Topic 4: General Introduction to AI Pedagogy

MODULE 2: ML Applications and Activities

Module Overview: This module provides a practice-oriented, pedagogically grounded exploration of ML applications in ECE. It introduces unplugged ML activities, child-friendly digital tools such as Google Teachable Machine and gamified learning approaches that support engagement and collaboration. The module further examines how ML and AI tools can assist educators in planning, documentation and evaluation processes, with continuous reflection on ethical, data protection and child-rights considerations.

List of Topics:

Topic 1: Unplugged ML Activities for Early Childhood Classrooms

Topic 2: Exploring Visual Machine Learning Tools for Child-friendly ML Activities

Topic 3: Exploring and Designing Gamified ML Tools and Activities

Topic 4: ML as support for educator's work in Early Childhood Education

MODULE 3: Ethics of ML and a Human-Centered Mindset in Early Childhood Education

Module Overview: This module progresses through four key topics designed for pre-service early childhood educators. It starts by (1) establishing why the ethics of ML is critical in early childhood and examining children's developmental characteristics and ethical vulnerabilities. It then moves to (2) applying human-centered principles and ethical frameworks to contexts, followed by (3) developing pedagogical mediation strategies and language reframing skills. The module concludes by (4) defining ethical red lines and reflecting on professional responsibility and identity. Throughout, the module remains non-technical and practice-oriented, systematically utilizing three core pedagogical methods:

List of Topics:

Topic 1: Developmental Characteristics and Foundations of ML Ethics in Early Childhood Education

Topic 2: Human-Centered Principles and Ethical Frameworks

Topic 3: Pedagogical Mediation and Language Framing

Topic 4: Ethical Red Lines and Professional Identity

Module 4 – From Concept to Classroom: Designing and Implementing ML-Inspired Projects

Module Overview: This module is designed as a project-based learning experience for pre-service early childhood educators. Participants will work on a practical project, building on concepts learned in previous modules. By the end of this module, participants will design and implement their own ML-inspired project for early childhood education settings.

List of Topics:

Topic 1: Introduction to the Project Concept & Initial Planning

Topic 2: ML Concepts in Early Childhood Education (ECE)

Topic 3: Classroom Scenarios and Lesson Planning

Topic 4: Reflection, Final Project Development & Presentation
