Maryland CTE Programs of Study

Machine Learning & Data Science III (2025)

GENERAL REQUIREMENTS This course is recommended for students in Grades 11-12 1

1 GENERAL REQUIREMENTS This course is recommended for students in Grades 11-12 1

INTRODUCTION 2

A Career and Technical Education (CTE) instruction in Machine Learning and Data Science provides content aligned with challenging academic standards and essential technical knowledge for students to prepare for roles in data science, artificial intelligence, and advanced data analytics. 2.A

B The Digital Technology (DT) Career Cluster in this course focuses on foundational to advanced skills in data science, including machine learning methodologies, model evaluation, and application in real-world AI scenarios. 2.B

C Machine Learning and Data Science III introduces students to deep learning, natural language processing (NLP), clustering, and unsupervised learning techniques, with a focus on ethical data practices. Students engage in hands-on projects that simulate industry applications and develop skills to build and evaluate sophisticated machine learning models. 2.C

D Students will participate in at least two Career-Connected Education and Work-Based Learning experiences, including industry internships or project collaborations with professionals in the field. 2.D

E Students are encouraged to participate in extended learning experiences through aligned Career and Technical Student Organizations (CTSOs), fulfilling cocurricular requirements under the Carl D. Perkins Act. 2.E

KNOWLEDGE AND SKILLS 3

A The student demonstrates the skills necessary for career development, employability, and successful course completion. The student is expected to: 3.A

1 Demonstrate professional work behaviors like punctuality, adaptability, initiative, and problem-solving. 3.A.1

2 Create and present a portfolio showcasing advanced data science projects and certifications. 3.A.2

Skip to main content

3 Demonstrate professional work behaviors like punctuality, adaptability, initiative, and problem-solving. 3.A.3

4 Develop interview skills tailored to data science roles, focusing on analytical and technical abilities. 3.A.4

5 Reflect on lessons learned while supervising automated systems and outline a maintenance plan for ongoing model reliability. 3.A.5

B The student demonstrates the skills for Machine Learning and Data Science. The student is expected to: 3.B

1 Apply deep learning techniques, including neural networks (CNNs and RNNs), for tasks such as image and text classification. 3.B.1

2 Utilize NLP techniques for text processing tasks, such as sentiment analysis and topic modeling. 3.B.2

3 Implement clustering algorithms like K-means for unsupervised learning projects and analyze results for real-world applications. 3.B.3

4 Detect, measure, and mitigate bias in deployed models; document mitigation steps in the project portfolio 3.B.4

5 Design end-to-end ML/DS workflows that integrate with business processes and human- centered design principles. 3.B.5

C The student demonstrates the skills for Portfolio Development. The student is expected to: 3.C

1 Document machine learning project workflows, including data preprocessing, model development, and evaluation phases. 3.C.1

2 Develop a professional portfolio demonstrating problem-solving and technical skills applied to real-world data science projects. 3.C.2

3 Designing end-to-end ML/DS workflows integrated with business processes and human- centered design principles. 3.C.3

4 Supervising and validating automated decision systems through people-centered quality- assurance practices. 3.C.4

5 Ensuring ethical, responsible model deployment, including bias detection and mitigation. 3.C.5

6 Showcasing case studies of data-driven solutions implemented in product or service environments. 3.C.6

7 Detailing the quality-assurance steps taken to validate model performance. 3.C.7

8 Reflecting on lessons learned in supervising automated systems and ensuring ongoing model reliability. 3.C.8

9 Reflect on lessons learned while supervising automated systems and outline a maintenance plan for ongoing model reliability. 3.C.9

10 Apply prompt patterns (role/goal/context/examples) and compare outputs with/without examples on the same task. 3.C.10

Skip to main content

The student develops environmental sustainability with architecture of hardware and software. The student is expected to: 3.D

1. Data Analysis for Environmental Impact: Use data science tools to analyze environmental data, such as emissions, energy usage, and resource consumption, interpreting trends to communicate environmental impact effectively. 3.D.1
2. Predictive Modeling for Conservation: Develop machine learning models to predict the impact of environmental changes, like climate shifts or deforestation, and explore applications in renewable energy forecasting. 3.D.2
3. Sustainable Data Practices: Understand the energy consumption of data storage and processing and learn techniques for optimizing code and using efficient algorithms to reduce the environmental footprint of data science projects. 3.D.3
4. Explore quantization trade-offs (size vs. quality) and document when a 4-bit model is “accessible” for a task. 3.D.4

E The student develops financial literacy with project based learning. The student is expected to: 3.E

1. Data Science for Personal Finance: Apply data science techniques to analyze personal financial data, including savings, investments, and expenses, developing skills in budgeting and financial forecasting. 3.E.1
2. Machine Learning in Investment Analysis: Utilize machine learning models to analyze stock market data, forecast trends, and assess investment risks, including building simple recommendation systems for diversified portfolios. 3.E.2
3. Financial Data Ethics: Explore ethical considerations in financial data handling, such as data privacy, security, and responsible use, assessing the implications of algorithms used in personal finance and investment platforms. 3.E.3

F The student develops civic engagement with project based learning. The student is expected to: 3.F

1. Data-Driven Decision Making in Civic Issues: Analyze datasets related to social issues (e.g., education, healthcare, housing) to address community needs and propose data-driven improvements for local communities. 3.F.1
2. Social Impact Measurement: Use data science methods to assess the effectiveness of civic programs or public policies, such as public health initiatives, by applying machine learning for classification or clustering. 3.F.2