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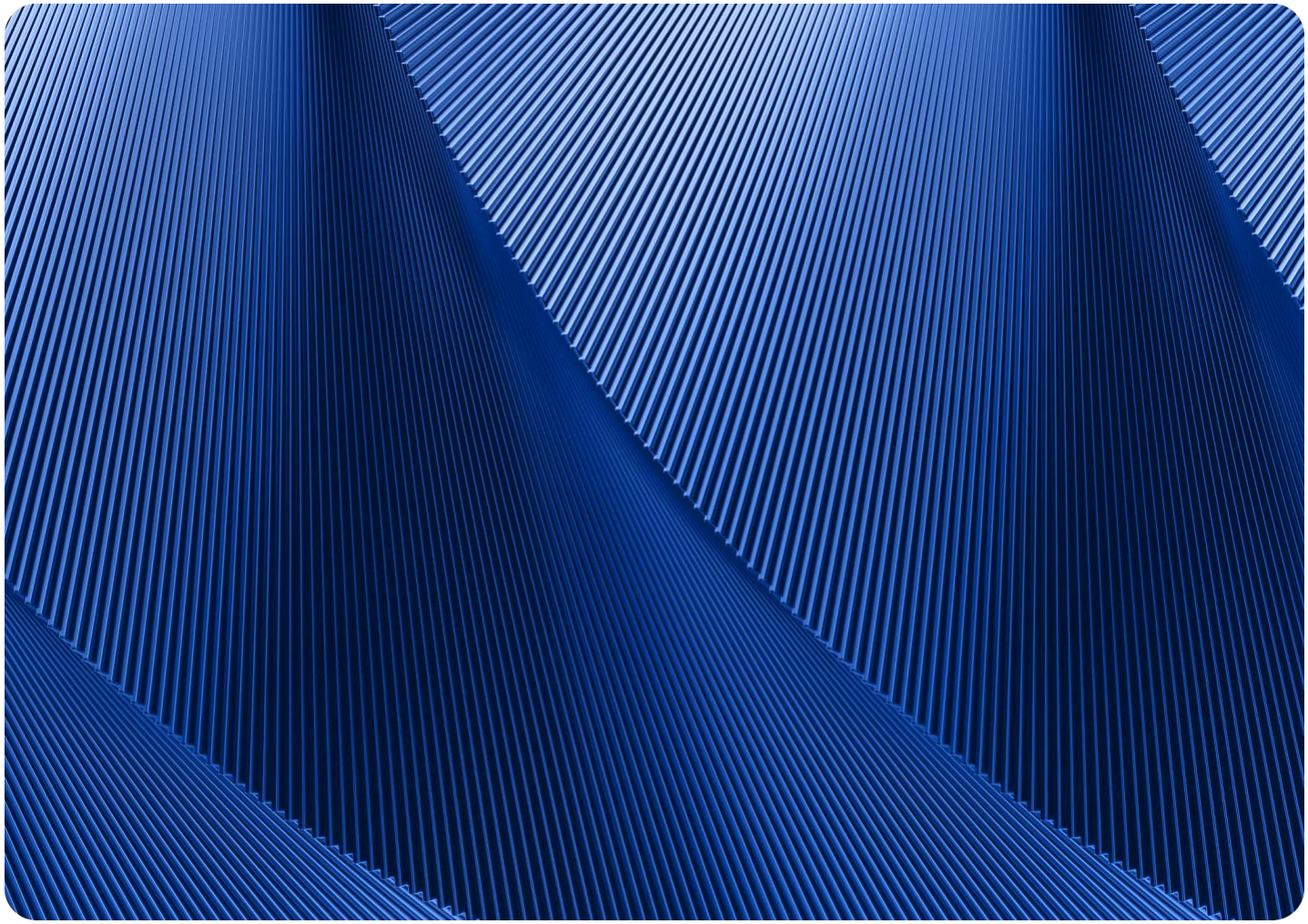
Miami Dade College

Course Syllabus

Introduction to Natural Language Processing

This introductory course provides hands-on experience with Natural Language Processing concepts, and real-world applications.



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Course Description

Students will learn fundamental concepts in Computer Vision (CV) and image processing, including introduction to necessary proprietary and opensource Python libraries.

Prerequisites:
Machine Learning Foundations
Introduction to Python

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Course Competencies

Competency 1
Students will describe Computer Vision and associated applications by:
a) Defining Computer Vision and the evolution of the field b) Identifying and listing several applications of Computer Vision c) Discussing the societal impact of Computer Vision d) Recognizing and demonstrating the mathematical concepts used for various computer vision applications
Competency 2
Students will describe the data acquisition and exploration processes in Computer Vision by:
a) Analyzing the steps involved in executing a Computer Vision project b) Distinguishing between types of Computer Vision data, various data sources, and methods involved in acquiring computer vision data c) Evaluating the ethical considerations during acquiring data for Computer Vision d) Describing and applying preprocessing methods on several example datasets e) Balancing an imbalanced dataset f) Describing and differentiating image segmentation and color segmentation g) Implementing advanced pre-processing of computer vision datasets
Competency 3
Students will explore Convolutional Neural Networks (CNN) by:
a) Comparing and contrasting the biological visual cortex and CNN b) Describing and tuning the hyperparameters in CNN c) Defining and explaining activation functions and their importance d) Constructing CNN models and differentiating between several CNN layers e) Distinguishing between popular CNN architectures f) Explaining the workings of transfer learning g) Exploring and implementing pre-trained models

Competency 4
Students will implement Computer Vision projects using proprietary and open-source Python libraries:
a) Outlining several proprietary and open-source Python library operations and functions b) Demonstrating the use of proprietary and open-source computer vision applications
Competency 5
Students will explore Generative Adversarial Networks (GANs) by:
a) Explaining the internal workings of GANs b) Identifying several applications of GANs c) Evaluating the ethical considerations behind using GANs d) Developing an end-to-end GAN model
Competency 6
Students will explore vendor Computer Vision solutions by:
a) Recognizing vendor-specific implementation of the AI project cycle b) Develop various solutions utilizing vendor-pre-trained models and toolkits c) Describing, identifying, and building Edge AI and IoT applications and solutions d) Summarizing and deploying CV models and Edge IoT and AI solutions on vendor clouds
Competency 7
Students will explore the future of Computer Vision by:
a) Discussing advancements in the field of Computer Vision b) Assessing future ethical and computational limitations for Computer Vision application

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Instructional Resources

No prescribed textbook is required due to the rapidly evolving nature of computer vision tools, frameworks, and best practices. Instructors will curate up-to-date articles, tutorials, documentation, and other resources available to provide the latest advancements and diverse perspectives. This approach ensures flexibility to tailor content to class needs and incorporate emerging topics and industry practices.

Platforms and Tools:
Kaggle, Google Colab, Jupyter notebook, Orange data mining, Python 3.7+, Anaconda, Intel® OpenVINO 2021

Recommended Reading:

- *Computer Vision: Algorithms and Applications,* 2nd Edition, Richard Szeliski
- *Computer and Machine Vision: Theory, Algorithms, Practicalities*, 4th Edition, *E. R. Davies*

Grading Schema

Assignment Type	Percentage of Grade
Assignments	20%
Discussions	10%
Projects	40%
Attendance	10%
Quizzes	20%

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Course Outline

Week starting on / Module	Module Topic
Week 1	Intro to Computer vision and syllabus overview
Week 2	Math for Computer Vision
Week 3	Data acquisition
Week 4	Data exploration I & II
Week 5	Intro to CNN
Week 6	Building blocks of CNN
Week 7	Transfer learning
Week 8	Opencv & YOLO
Week 9	Generative adversarial network
Week 10	Harnessing Pretrained Models and Toolkits for Diverse Solutions
Week 11	Edge AI
Week 12	Future of computer vision