**STATE UNIVERSITY OF NEW YORK**
**COLLEGE OF TECHNOLOGY**
**CANTON, NEW YORK**

# MASTER SYLLABUS

# DATA 421- Deep learning Fundamentals

**Created by: Kambiz Ghazinour**
**Updated by:**

**SCHOOL OF SCIENCE, HEALTH AND CRIMINAL JUSTICE**
**CENTER FOR CRIMINAL JUSTICE, INTELLIGENCE AND CYBERSECURITY**
**SPRING 2023**

**A.** **TITLE**: Deep learning Fundamentals

**B.** **COURSE NUMBER:** DATA 421

**C.** **CREDIT HOURS:** 3

**D.** **WRITING INTENSIVE COURSE**: No

**E.** **GER CATEGORY:** None

**F.** **SEMESTER(S) OFFERED:** Fall and Spring

**G.** **COURSE DESCRIPTION:** This course reviews the deep learning concepts, methods, and approaches and provides some examples of deep learning applications in prediction and classification.

**H.** **PRE-REQUISITES/CO-REQUISITES:**

Prerequisite: DATA/CYBR 315 - Data Mining and Machine Learning
Co-requisite: None
Pre- or co-requisite(s): None

**I.** **STUDENT LEARNING OUTCOMES:**

| ***Course Student Learning_ Outcome [SLO]*** | ***ISLO*** |
|---|---|
| Analyze deep learning and its application | 3 |
| Examine supervised learning, concepts, types, and examples. | 5 |
| Examine unsupervised learning, concepts, types, and examples. | 5 |
| Analyze the ANN structure, fundamentals, and the most popular ones, like perceptron. | 5 |
| Analyze the CNN structure and applications with example | 5 |
| Analyze the RNN structure and applications with example | 5 |
| Analyze the GAN structure and applications with example | 5 |

| KEY | Institutional Student Learning Outcomes [ISLO 1 – 5] |
|---|---|
| **ISLO #** | **ISLO & Subsets** |
| **1** | **Communication Skills**<br>Oral [O], Written [W] |
| **2** | **Critical Thinking**<br>*Critical Analysis [CA] , Inquiry & Analysis [IA] , Problem Solving [PS]* |
| **3** | **Foundational Skills**<br>*Information Management [IM], Quantitative Lit,/Reasoning [QTR]* |
| **4** | **Social Responsibility**<br>*Ethical Reasoning [ER], Global Learning [GL], Intercultural Knowledge [IK], Teamwork [T]* |
| **5** | **Industry, Professional, Discipline Specific Knowledge and Skills** |

**J.** **APPLIED LEARNING COMPONENT:** **Yes _ No X_**

**K.** **TEXTS:**

**Deep Learning**
**Ian Goodfellow, Yoshua Bengio, Aaron Courville**

**Deep Learning in practice**
**Mehdi Ghayoumi**

**L.** **REFERENCES:**
Various internet sources (ZyBooks, YouTube, CISA, others)

**M.** **EQUIPMENT:** None

**N.** **GRADING METHOD:** A-F

**O.** **SUGGESTED MEASUREMENT CRITERIA/METHODS:**

- **Participation Assignments**
- **Challenge Assignments**
- **Quizzes**
- **Exams**

**P.** **DETAILED COURSE OUTLINE:**

I Introduction to Deep learning
II. Supervised learning
III. Unsupervised learning
IV. Artificial Neural Networks
V. Convolutional Neural Networks
VI. Recurrent Neural Network
VII. Generative Adversarial Networks

**Q.** **LAB** NA