MASTER SYLLABUS

DATA 421- Deep learning Fundamentals

Created by: Kambiz Ghazinour
Updated by:
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:**

<table>
<thead>
<tr>
<th>Course Student Learning Outcome [SLO]</th>
<th>ISLO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analyze deep learning and its application</td>
<td>3</td>
</tr>
<tr>
<td>Examine supervised learning, concepts, types, and examples.</td>
<td>5</td>
</tr>
<tr>
<td>Examine unsupervised learning, concepts, types, and examples.</td>
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<tr>
<td>Analyze the ANN structure, fundamentals, and the most popular ones, like perceptron.</td>
<td>5</td>
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<tr>
<td>Analyze the CNN structure and applications with example</td>
<td>5</td>
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<tr>
<td>Analyze the RNN structure and applications with example</td>
<td>5</td>
</tr>
<tr>
<td>Analyze the GAN structure and applications with example</td>
<td>5</td>
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<tr>
<td>KEY</td>
<td>Institutional Student Learning Outcomes [ISLO 1 – 5]</td>
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<tr>
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<td>----------------------------------------------------</td>
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<tr>
<td>ISLO #</td>
<td>ISLO &amp; Subsets</td>
</tr>
</tbody>
</table>
| 1 | Communication Skills  
   Oral [O], Written [W] |
| 2 | Critical Thinking  
   Critical Analysis [CA], Inquiry & Analysis [IA], Problem Solving [PS] |
| 3 | Foundational Skills  
   Information Management [IM], Quantitative Lit./Reasoning [QTR] |
| 4 | Social Responsibility  
   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