STATE UNIVERSITY OF NEW YORK

COLLEGE OF TECHNOLOGY

CANTON, NEW YORK

MASTER SYLLABUS

DATA 422, Advanced AI and ChatGPT

Created by: Mehdi Ghayoumi

Updated by: Kambiz Ghazinour

SCHOOL OF SCIENCE, HEALTH, & CRIMINAL JUSTICE

CYBERSECURITY DEPARTMENT

Spring 2024

A. **TITLE**:   Advanced AI and ChatGPT

B. **COURSE NUMBER:** DATA 422

C. **CREDIT HOURS: 3**

D. **WRITING INTENSIVE COURSE**: n/a

E. **GER CATEGORY:** n/a

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

G. **COURSE DESCRIPTION:** The Advanced AI and ChatGPT course offers a specialized exploration into the realm of advanced topics in artificial intelligence, with a keen focus on the ChatGPT models. Building upon foundational AI knowledge, this course dives deep into the architecture, training, and deployment of state-of-the-art chatbots. Participants will gain hands-on experience in fine-tuning conversational models, addressing challenges in chatbot design, and understanding the ethical implications of deploying such models. Upon completion, participants will be equipped with the skills to develop, refine, and implement advanced conversational AI solutions in various domains.

Key Takeaways:

- Comprehensive understanding of the ChatGPT and similar conversational AI models.
- Practical skills in training, fine-tuning, and deploying chatbots.
- Insights into the challenges and solutions in creating context-aware, human-like chatbots.
- Ethical awareness of potential biases, fairness, and responsible deployment of conversational AI.

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

a. Pre-requisite(s): DATA 240 - AI Fundamentals

I. STUDENT LEARNING OUTCOMES:

Course Student Learning Outcome [SLO]	PSLO ()	GER	ISLO
a. Explain Conversational AI Architecture			2. Critical Thinking [CA]
b. Describe the Training and Fine-tuning of Conversational Models			2. Critical Thinking [CA]
c. Explain Design and Development of Chatbots			2. Critical Thinking [PS]
d. Explain Natural Language Processing Techniques			2. Critical Thinking [PS]
e. Describe Ethical Deployment of Conversational AI			2. Critical Thinking [PS]
f. Apply Problem-solving in Conversational AI			2. Critical Thinking [PS]
g. Describe the implementation of Multi-turn Conversations			2. Critical Thinking [PS]
h. Explain Advanced Topics in Conversational AI			2. Critical Thinking [PS]
i. List Ethical Considerations in AI Deployment			2. Critical Thinking [PS]

KEY	Institutional Student Learning Outcomes [ISLO 1 – 5]
ISLO #	ISLO & Subsets
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_____

If Yes, select one or more of the following categories:

Classroom/Lab___   Civic Engagement___

Internship___   Creative Works/Senior Project___

Clinical Practicum___   Research___

Practicum___   Entrepreneurship___

Service Learning___   (program, class, project)

Community Service___

K.   SUGGESTED TEXTS:

1. **Conversational AI: Chatbots, NLP, and Beyond" by Charlie Gerard.**
   - This text will serve as the foundational material for understanding the landscape of conversational AI, including the development and deployment of chatbots and the role of natural language processing (NLP).
2. **"GAN in Practice" by Mehdi Ghayoumi.**
   - Authored by the course instructor, this book will provide insights into generative adversarial networks (GANs), which are crucial for understanding some of the advanced data generation techniques that can be used in training conversational models.
3. **Various articles and papers from OpenAI, Google AI, and other leading AI research institutions.**
   - A curated selection of cutting-edge research will keep students abreast of the latest developments and practical applications in the field of conversational AI.

L.   REFERENCES: n/a

M.   EQUIPMENT: n/a

N.   GRADING METHOD: A-F

O.   SUGGESTED MEASUREMENT CRITERIA/METHODS:
- **Participation Assignments**
- **Challenge Assignments**
- **Quizzes**
- **Exams**

P.   DETAILED COURSE OUTLINE:

Week 1: Introduction to Conversational AI
- Overview of the course, syllabus, and expectations.
- Evolution of chatbots and the role of deep learning in conversational AI.
- **Readings:** Introduction sections from "Conversational AI: Chatbots, NLP, and Beyond" by Charlie Gerard.

Week 2: Deep Dive into Transformer Models
- Basics of transformer architecture and attention mechanisms.
- **Readings:** Relevant chapters from "GAN in Practice" by Mehdi Ghayoumi.

Week 3: Understanding ChatGPT
- Overview of the GPT architecture.
- ChatGPT's design and capabilities.
- **Assignment:** Explore the functionalities of ChatGPT through hands-on exercises.

Week 4: Training and Fine-tuning Models
- Data collection and preprocessing for chatbots.
- Transfer learning and fine-tuning techniques.
- **Lab:** Fine-tune a pre-trained conversational model on a new dataset.

Week 5: Challenges in Conversational AI
- Handling ambiguities and ensuring context-awareness.
- Limitations of current models.
- **Project:** Identify and propose solutions to a specific challenge in conversational AI.

Week 6: Ethical Considerations
- Bias and fairness in conversational AI.

- Ethical deployment and use of chatbots.
- **Readings:** Selected articles on ethics in AI from leading research institutions.

Week 7: Advanced Topics

- Multi-modal models (combining text, voice, and visuals).
- Future trends in conversational AI.
- **Assignment:** Research and present on a cutting-edge topic in conversational AI.

Week 8: Hands-on Project

- Design, train, and deploy a chatbot using ChatGPT or a similar model.
- **Project:** Begin the development of a chatbot tailored to a specific industry or use case.

Week 9-14: Continued Project Development and Iteration

- Ongoing work on the hands-on project with weekly milestones.
- Peer reviews and instructor feedback.
- **Readings:** Continue to engage with current research and articles to inform project development.

Week 15: Final Project Presentations and Course Wrap-Up

- Presentation of final chatbot projects.
- Group critiques and feedback sessions.
- Review of key concepts and techniques learned.
- Final exam preparation and course evaluations.

Q.   LABORATORY OUTLINE:

n/a