College of Science

AI and Quantum Computing: Social Impacts of Technology Convergence

Fall Semester 2021

COS 402-002 (CRN 85610) and COS 602-002 (CRN 85617)
MW 1:30pm-2:45pm Krug Hall 5/ONLINE (hybrid)
For a syllabus, email the instructor, Greg Viggiano at: gviggian@gmu.edu

COURSE SYLLABUS
Social Impacts of Technology Convergence: AI and Quantum Computing
COS 402-002 (CRN 85610) and COS 602-002 (CRN 85617)

Fall Semester 2021, Greg Viggiano, PhD
Meeting days and times: MW 1:30pm-2:45pm
Building and room: Krug Hall 5 / ONLINE (hybrid)
Office Hours: By appointment
Telephone: (703) 629-4734
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COURSE DESCRIPTION

This course begins by looking at the social impacts that have resulted from a few notable innovations and merged technologies. Technology convergences increase the potential for unintended effects leading to novel trends and super trajectories. Much like a digital Swiss Army knife, the smartphone is an over-used but good example of multidimensional convergence across many different uses and applications - from a communication device, to a micro computer, to scientific measurement tools, to entertainment and toys. The internet is another good example of an enabling technology that has facilitated many other convergent technologies.

Artificial Intelligence and quantum computing offers another research opportunity to investigate the anticipated macro social trends and impacts that will accompany its arrival. Using a form of complexity theory as a reference framework, this course examines how new technologies are adopted and diffused within global communities - not unlike epidemiological studies of viral infections. As new technologies become more ubiquitous and evolve [mutate], it is useful to consider how to avoid unintended effects, potential dependencies, and vulnerabilities.
Using a 10-year time horizon, this course focuses on AI and quantum computing as two converging technologies. Selected science fiction narratives provide instructive guidance about new technology trends and effects. The literature offers a range of prophetic ideas concerning applied uses of fictional technologies. These stories allow greater potential awareness of what may be waiting over the horizon and glimpses of how civilization might prepare for such disruptive arrivals.

Course goals and objectives: Upon completion of this class, students will gain a greater awareness of an emerging technology - the convergence of quantum computing and artificial intelligence and the anticipated impacts to social fabric, economic activity, and the policy/regulatory environment.

By becoming more aware of the expected shifts in the technology landscape, students will develop competencies to better navigate these changes that accompany disruptive technology introductions. The main value of this course is to prepare students to more effective deal with new environments created by these technologies.

Prerequisite Classes - none.

Reading List

1. Quantum AI: The Convergence of AI and Quantum Computing, an Anthology, Viggiano, ed.*****
2. Diffusion of Innovation, Rogers*****
3. Complexity Theory and the Social Sciences: An Introduction, Byrne*****
4. 2001: A Space Odyssey (screenplay), Clarke & Kubrick
5. Simply Complexity: A Clear Guide to Complexity Theory, Johnson
6. A Complexity Theory for Public Policy, Morçöl
7. About the Impact of Technology Upon Society, Mukhtar

***Required**

Additional short readings will be required and will be made available as we need them through the Blackboard site. There you will find a folder appropriately titled "Readings." These readings will take the form of original historical source materials (or their translations into English), either discussed in the course readings or during our class sessions.

Other readings will include original scholarly and professional journal articles (both historical and present day).

Items (past and present) that have made the news. A folder entitled "In the News" has been set up on Blackboard. There you will find short news items and videos. It is important that you are able to connect the habits of mind we will be enhancing throughout the semester to such things as items you may come across in your daily lives. You might also find these items to be useful for some of the assignments (e.g. the short paper and creative project) you will be completing this semester. As we develop a framework for critical thought and analysis, it is hoped that you will be able to apply and extend it beyond the classroom.

Grading and Course Requirements

Throughout the semester, you will have several opportunities to demonstrate your understanding and to achieve the learning outcomes, goals, and objectives. These include but are not limited to:

1. Reading assignments
2. Short quizzes
3. A variety of in class activities
4. Writing-based activities
5. Short essay assignment which will involve a critical analysis of reputable sources
6. Creative project activity and associated commentary
7. A midterm quiz
8. A comprehensive final exam that will utilize a variety of question types and an exam essay question