AMIS 3600H
Introduction to accounting information systems
Fall 2023
3:55-5:15 TR
285 GE

Professor D. Schroeder
Office: Fisher 424
2:00-3:00 TR
schroeder.9@fisher.osu.edu
phone: 292-6427

Description: Accounting information systems are subject to technological advances. This course explores foundations of information science including classical and quantum computation as well as causal inference. These topics are at the forefront of modern information science. Consequently, our studies are open-ended and necessarily incomplete.

Objectives: The course aims to build strong foundations for the study of accounting as an information science.

Textual materials: Suggested readings and example problems are posted on the course web page.
http://u.osu.edu/schroeder.9/amis-3600h/ and Carmen

Recommended but optional texts include
Cover and Thomas. *Elements of information theory*, Wiley, 1991.
Fellingham, *Accounting: An information science* (F).
Luenberger, *Information science*, Princeton University Press, 2006.
Nielsen and Chuang, *Quantum Information and Quantum Computation*, Cambridge University Press, 2000.
Pearl, Glymour, and Jewell, *Causal Inference in Statistics: A Primer*, Wiley & Sons, 2016.
Strang, *Introduction to Linear Algebra*, Wellesley-Cambridge Press, 2009.
Lloyd, *Programming the Universe: A quantum computer scientist takes on the cosmos*, Vintage Books, 2017.
Poundstone, *Fortune's Formula: The untold story of the scientific betting system that beat the casinos and Wall Street*, Hill and Wang, 2005.

Classroom approach: Students are expected to actively engage in discussion of topics with an emphasis on recognizing the intersection of the various topics. That is, we will attempt to reinforce commonalities across topics and not start from scratch with each topic. Each session tests our understanding and active participation is expected.

A two to four page, typed, double-spaced paper on the student's topic of choice related to information theory (for example, error correction, cryptography, quantum information) is due at the time of the in-class final exam.
The course concludes with a final written exam during the university exam period.

Evaluation:

Classroom participation, positive contribution to learning environment, quizzes, homework	80%
Final exam (paper 10%, in-class exam 10%)	20%

tentative outline:

week	Topic	Assignment/Reference
	Coding and entropy	
1	Introduction – Shannon entropy	Ralph's mutual information/ Cover and Thomas ch. 2,9; Luenberger ch. 2,5
1,2	Shannon's channel theorems	Ralph's channel/ Cover and Thomas ch. 5,8; Luenberger ch.3,5; Nielsen and Chuang ch. 12
2,3	von Neumann entropy	Ralph's density operator; Ralph's quantum mutual information Ralphs' teleportation; Ralph's inequality/ Nielsen and Chuang ch. 1,2; Schmidt decomposition and entanglement
3	introduction to quantum computing	Ralph's superdense coding; Ralph's quantum search/ Grover; Nielsen and Chuang ch. 2,6
4	Classical coding: error detection and correction	F 9-1,2; F 9-3,4,7,8,10/ Fellingham ch. 9; Luenberger ch. 6 Ralph's accounting code/ Fellingham ch. 3; Arya, Fellingham, Schroeder, and Young
5	Quantum coding: error detection and correction	Ralph's quantum error correction/ notes; Nielsen and Chuang ch. 10
6	Classical encryption: private key	F 10-1,3,4,6/ Fellingham ch. 10; Luenberger ch. 11,12
7	Classical encryption: public key	F10-5,8,10/ Fellingham ch. 10; Luenberger ch. 13,14
8	Classical encryption: elliptical curve cryptography	Ralph's elliptical curve cryptography/ notes; Luenberger ch. 13,14
9	Quantum factoring algorithm	Ralph's quantum factoring/ Shor; Nielsen and Chuang ch. 5
9-10	Quantum discrete log algorithm	Ralph's quantum discrete log/ Shor; Nielsen and Chuang ch. 5; Lin
10	Quantum cryptography	Ralph's quantum encryption/ Nielsen and Chuang ch. 12; Fellingham ch. 11

Session	Topic	Assignment/Reference
	Structural causal modeling (SCM)	
11	DAGs; Simpson's paradox; counterfactuals	Ralph's technology/ Pearl et al ch. 1,2, 4
11,12	Intervention and do-calculus	Ralph's back-door adjustment; Ralph's front-door adjustment/ Pearl et al ch. 3
13	Instrumental variable adjustment	Ralph's instrumental variables / Pearl et al, ch. 3
13	Berkson's paradox	Ralph's "kitchen sink" fallacy / Pearl et al ch. 3
14	Linear models and path coefficients	Ralph's path coefficients/ Pearl et al ch. 3
14	DAG construction and testing; Sampling selection bias	Ralph's DAG/Pearl et al ch. 1,2; Ralph's technology selection/ notes; Bareinboim, Tian, and Pearl

Final exam
Wednesday, 12/13/23
4:00-5:45 pm