

AI, Business, and Society

Course Syllabus (May 2022)

Prof. Kartik Hosanagar

Overview: The course provides an overview of AI and its role in business transformation. The purpose of this course is to improve understanding of AI, discuss the many ways in which AI is being used in the industry, and provide a strategic framework for how to bring AI to the center of digital transformation efforts. In terms of AI overview, we will go over a brief technical overview for students who are not actively immersed in AI (topics covered include Big Data, data warehousing, datamining, machine learning, etc). In terms of business applications, we will consider applications of AI in Media, Finance, Healthcare, Retail, and other industries. Finally, we will consider how AI can be used as a source of competitive advantage. We will conclude with a discussion of ethical challenges and a governance framework for AI. No prior technical background is assumed but some interest in (and exposure to) technology is helpful. Every effort is made to build most of the lectures from the basics.

The primary purpose is to help you develop managerial understanding of AI and its applications. This will necessarily involve “looking inside the hood” of AI systems. That said, the course is not meant to teach you how to be an ML engineer. While we might “look” at code in a session or two, you will not be coding in this course.

Textbook: [A Human’s Guide to Machine Intelligence](#) by Kartik Hosanagar

Pre-readings before start of the course:

1. A/B Testing Simulation Instructions
2. Book chapter readings: Many sessions have a reading that is usually a chapter from my book. I expect that you should be able to do these readings in an hour and will have ample time during our course (e.g. evenings) to keep up with readings. However, if you have other commitments outside of our classroom, I recommend that you try to finish the course readings in advance of the course. That will ensure you have your evenings for any other activities you may have planned.

Sessions

Please note that the entire course will be taught during the MBA opportunity week in May. There will up to 3 sessions in a day as follows.

May 2: 8.30-10 AND 10.15-11.45

May 3: 8.30-10 AND 10.15-11.45 AND 1.45-3.15

May 4: 8.30-10 AND 10.15-11.45 AND 1.45-3.15

May 5: 8.30-10 AND 10.15-11.45

May 6: 12.00-1.30 AND 1.45-3.15

Day	Session	Content	Readings/ Book Chapter
1	1	Start of Module 01: Intro to Big Data and AI	

		<p>In session 1 we will discuss the transformative potential of AI. Specifically, we will discuss AI's promise as a General-Purpose Technology and look at data to suggest that AI is likely to change most industries, thereby requiring organizational change on the part of companies as well. We will hear from guest speaker Jocelyn Goldfein of Zetta Venture Partners and will also begin to discuss the basics of Big Data and data infrastructure in preparation for taking a deeper dive into these topics in the next session. Students will walk away from this session with an understanding that a data explosion is occurring and that new tools like machine learning can be applied to this data to extract intelligence and automate decision-making. Finally, I will introduce a simulation on A/B testing that students will play as part of a later class session on reinforcement learning.</p> <p>Topics in session 1:</p> <ul style="list-style-type: none"> ● AI for Business Course Intro ● Is AI a General Purpose Technology? ● Basics of Big Data and data infrastructure ● Preview: Intro to A/B testing simulation ● Guest Speaker: Jim Manzi 	
1	2	<p>Session 2 will consist of a deep dive into Big Data. We will start with an overview of what Big Data is, how it is being generated, and why it matters. We will then go on to discuss some differences between traditional analytics and Big Data analytics, the general skillset required for Big Data analysis, and tools for working with Big Data. To this end, we will discuss tools for managing Big Data as well as tools for analyzing Big Data. With regards to managing Big Data, we will discuss data warehouses and will hear from speakers from Snowflake on this topic. Regarding analyzing Big Data, we will discuss data mining tools like clustering and association rule mining.</p> <p>Topics in session 2:</p> <ul style="list-style-type: none"> ● Big Data Overview ● Big Data Analysis ● Data Infrastructure ● Data Mining 	
2	3	<p>Start of Module 02: Machine Learning</p> <p>In session 3 we will discuss Artificial Intelligence and Machine Learning in greater depth. We will cover what AI is, types of AI, a brief history of AI, and expert systems as an early approach to building AI. We will then discuss machine learning, a newer approach to AI that addresses the limitations of expert systems. Our discussion of machine learning will cover the three types of ML (supervised learning, unsupervised learning, and reinforcement learning) as well as factors that influence accuracy in ML systems. We will discuss several specific ML methods in depth (logistic regression, decision trees, random forests, and neural networks) and introduce model selection.</p> <p>Topics in session 3:</p> <ul style="list-style-type: none"> ● Artificial Intelligence Overview ● Machine Learning Overview + Types of ML ● Accuracy of ML models ● Specific ML Methods: A Deep Dive ● Model Selection and Validation 	Chap 04, 05 of textbook

		<ul style="list-style-type: none"> ● Quiz 01 (covers sessions 1 & 2) 	
2	4	<p>This session will be largely focused on practicing the A/B testing simulation, in which students will be testing different variants of a fictional ecommerce webpage. Students will work with their teams to formulate strategies for the A/B testing tournament. Additional details about the simulation and the tournament mode are provided in the student instructions posted on Canvas. At the end of this session, teams should have finalized their strategies for the in-class tournament in the next session.</p>	
2	5	<p>We will run the simulation in tournament mode. After experiencing manual A/B testing in the simulation, we will then discuss the reinforcement learning concepts of exploration and exploitation, as well as discuss how multi-armed bandits, the type of reinforcement learning algorithm used to automate A/B testing, balances these two concepts. Students will experience and understand some of the benefits and drawbacks of both manual decision-making and AI-driven decision-making in the context of A/B testing.</p> <p>Topics in session 6:</p> <ul style="list-style-type: none"> ● AI Simulation Game (come prepared to class with your strategy) ● Reinforcement Learning ● Multi-Armed Bandits (MABs) 	
3	6	<p>We will discuss challenges associated with model training, such as overfitting, in detail. We will also discuss validation strategies such as split training and testing, k-fold cross validation, and iterative cross validation. Additionally, we will look at a sample dataset and ML code (in Python) to understand how data preparation, model setup, and validation works in practice. The goal of this session is not necessarily to learn coding but instead to help students understand what the application of ML in practice looks like. Students will also appreciate how data preparation and interpretation of results are often more time consuming than coding of any ML model.</p> <p>Topics in session 4:</p> <ul style="list-style-type: none"> ● Quiz 02 (covers sessions 3, 4 & 5) ● ML in practice ● Intro to Google Colab and Jupyter Notebook (Run code live) 	Neural networks (20 minutes)
3	7	<p>In this session, we will discuss ML Ops. Specifically, we will cover the practices and tools of traditional Dev Ops and how ML Ops differs from these. For example, we will discuss some of the unique challenges associated with ML Ops, especially with regards to testing and performance monitoring. We will also discuss existing tools for ML Ops as well as the concept of model interpretability as part of the ML Ops workflow. I'll also intro you to several WYSWYG tools for ML that you may find helpful as non-data scientists who might be users of ML tools in your careers</p> <p>Topics in session 5:</p> <ul style="list-style-type: none"> ● ML Ops ● AutoML (Google cloud) ● Teachable Machines ● TensorFlow Playground 	

3	8	<p>ML Lab session: In this session, you'll practice some of the ideas we discussed in the prior class. No coding knowledge is required. In fact, we will not be coding in this session. You'll learn to use simple tools (with a graphical interface) meant for non-data-scientists to use ML.</p>	
4	9	<p>Start of Module 03: Business Applications</p> <p>This session will concentrate on how AI augments personalization on the web, and will cover types of recommender systems and how they work, the impact of personalization on markets, and challenges associated with personalization systems. We will cover content-based recommenders, collaborative filters, and hybrid recommender systems in depth, and we will use several well-known music streaming services to illustrate how these various recommender systems are used in practice as well as the differences between them. Students will also come away with an understanding that personalization goes beyond product recommendations, instead encompassing customer interactions more broadly. Time permitting, we will also discuss Autonomous Vehicles as another application of AI.</p> <p>Topics in session:</p> <ul style="list-style-type: none"> ● Recommender Systems ● Impact of recommenders on markets ● Other forms of personalization on the web ● Challenges with personalization ● Time permitting: Autonomous Vehicles ● Quiz 03 (covers sessions 6,7,8) 	<p>Chap 03 of textbook</p>
4	10	<p>We will continue our discussion of business applications of AI by looking at applications in finance. We will discuss in detail how machine learning has improved fraud detection, with a particular focus on how supervised learning is applied in this area. We will also talk about other applications of AI in finance such as identity verification & authentication, loan & insurance underwriting, predicting customer churn, etc., and will hear from Carleigh Jaques, SVP at Visa.</p> <p>Topics in session 8:</p> <ul style="list-style-type: none"> ● ML in Finance: Fraud Detection ● ML in Finance: Additional applications 	
5	11	<p>Start of Module 04: AI Strategy and Governance</p> <p>Session 10 will be the first of two class sessions on AI Strategy and Governance. Students will walk away with an understanding that, to create an edge with AI, companies need to not only use AI, but create the right strategic frameworks and organizational processes around AI. To this end, we will begin by discussing how AI can drive business transformation, with a particular focus on the idea that transformative technologies like AI are often difficult to apply initially, but companies that persevere tend to benefit. We will then move into discussing how companies can apply AI more effectively by taking a portfolio approach to AI projects. We will also discuss how the democratization of machine learning is lowering barriers to AI use from a technical standpoint. With regards to organizational structure, we will discuss five specific organizational strategies that can help companies generate value from AI. We will once again hear from Apoorv Saxena, Head of AI at JPMorgan, on these topics.</p> <p>Topics in session 10:</p>	<p>HBR Article</p>

		<ul style="list-style-type: none"> ● AI-Driven Business Transformation ● Developing a Portfolio of AI Projects ● Lowering Barriers for AI Use ● AI in the Organization Structure 	
5	12	<p>In session 11 we will continue our discussion around AI Strategy and Governance, focusing on the risks that AI technologies bring and how certain governance guidelines can help manage those risks. Specifically, students will come away with an understanding of how algorithms can make discriminatory decisions, a serious social risk. We will also discuss how social risks can lead to additional risks for firms, such as reputational, legal, and regulatory risks. We will discuss how providing some user control and calibrated transparency, as well as implementing audits, can all help to manage these risks.</p> <p>Topics in session 11:</p> <ul style="list-style-type: none"> ● Risks with AI ● AI Governance ● Trends in AI ● Course Takeaways ● Quiz 04 (covers sessions 9,10, 11, 12) 	Chapter 10 of textbook

Grading

1. In-class quizzes: 20+20+20+20= 80 points
2. AI simulation game (1-page writeup + in-class performance) = 20 points
3. Participation (attendance + keeping up with readings) is a necessary for a Pass grade independent of the numerical grades in the above components