# Course Overview (subject to change)

**Unit 0 – Hello World**

Texts:

* *Computing Machinery and Intelligence,* by Alan Turing

Objectives:

* Understand different techniques for search space exploration.
* Learn to detect a computer impersonating a human.
* Consider the difficulty of pin-pointing the source of intelligence.
* Discuss ways that chat bots can help and hurt learning.

Essential questions:

* What types of problems can be represented as a search for a global maximum?
* What signals do we use to identify intelligence?
* What is the role of AI in the classroom?

Formative Assessments:

* Reading check-ins
* In-class group work

Summative Assessments:

* In-class discussion

**Unit 1 – Programming Bootcamp**

Texts:

* *Is Abstraction the Key to Computing,* by Jeff Kramer
* *The Essence of Software,* by Daniel Jackson

Objectives:

* Refresh previously learned programming skills.
* Develop debugging techniques to quickly identify issues.
* Utilize git to save work and collaborate with classmates.
* Learn the importance of unit testing for documentation and speed of development.
* Appreciate the utility of using types to reduce errors.

Essential questions:

* What are the best practices to use when working on a software project?

Formative Assessments:

* Skills assessment
* Programming problem sets
* In-class group work

Summative Assessments:

* Programming projects

**Unit 2 – Introduction to Data Science**

Texts:

* *Computational and Inferential Thinking,* by Ani Adhikari, John DeNero, and David Wagner

Objectives:

* Understand how to run simple statistical experiments on a computer.
* Learn how to utilize a simple data presentation library.
* Practice pulling out knowledge from a dataset.
* Experiment with different parameters to understand how they affect the problem.
* Create a lab report that is able to justify conclusions reached during exploration.

Essential questions:

* How can we use the power of computers to run better experiments?
* What is the best way to represent data to make it easy to understand?

Formative Assessments:

* Programming problem sets
* In-class group work

Summative Assessments:

* Programming projects

**Unit 3 – Lists and Sets and Maps Oh My!**

Texts:

* *Learn Python the Hard Way,* by Zed Shaw

Objectives:

* Learn about built in python data structures such as sets, maps, and lists.
* Create a rudimentary text completion bot.
* Experiment with the bot to understand the effect of different data sources.

Essential questions:

* What situations are best served by the use of sets, maps, and lists?

Formative Assessments:

* Programming problem sets
* In-class group work

Summative Assessments:

* Programming projects

**Unit 4 – Cognition and Computing**

Texts:

* *Allegory of the Cave,* by Plato
* *Discourse on the Method,* by Renee Descartes
* *What is it like to be a bat,* by Thomas Nagel
* *What Computers Still Can’t Do,* by Hubert L. Dreyfus
* *Consciousness Explained,* by Daniel Dennett

Objectives:

* Learn important historical moments in the attempts to understand cognition.
* Analyze materialist, dualist, and panpsychist understandings of consciousness.
* Create an argument for which model you find most persuasive.
* Identify areas of culture that have been affected by these debates.

Essential questions:

* How has the notion of consciousness evolved through time?
* What are the differences between a human mind and a computer?

Formative Assessments:

* Reading check-ins
* In-glass group work

Summative Assessments:

* In-class discussion
* In-class essay

**Unit 5 – Forest for the Trees**

Objectives:

* Learn how to create and traverse a tree data structure.
* Learn how to display a tree data structure so it is easily understood.
* Represent simple games using a tree.
* Create an implementation of the decision tree algorithm.
* Analyze a series of data sets using a decision tree.
* Utilize techniques to prevent overfitting of data.
* Create a lab report that is able to justify conclusions reached during exploration.

Essential questions:

* How are trees useful for representing decisions?
* What kind of data is best represented within a tree?
* What techniques can be used to prevent overfitting of data and why are they important?

Formative Assessments:

* Programming problem sets
* In-class group work

Summative Assessments:

* Programming projects

**Unit 6 – Hey Bayes Bayes**

Objectives:

* Understand conditional probability.
* Implement a Bayesian classifier.
* Use the Bayesian classifier to answer a variety of sample problems.
* Create a lab report that is able to justify conclusions reached during exploration.

Essential questions:

* In what circumstances can we use the past to predict the future?
* What types of data are amenable to machine learning?

Formative Assessments:

* Programming problem sets
* In-class group work

Summative Assessments:

* Programming projects

**Unit 7 – AI In Society**

Texts:

* *ChatGPT is a Blurry JPEG of the Web,* by Ted Chiang
* *The Trial,* by Franz Kafka
* *A Hacker Manifesto,* by McKenzie Wark

Objectives:

* Understand where data comes from and how it is utilized within the modern world.
* Identify entities that have a natural advantage in capturing data.
* Articulate the value of data in isolation and in aggregate.
* Identify areas where humans have turned over decision making to AI.
* Discuss how data controls the quality of any learning process.
* Explore datasets that are encoded with pre-existing biases and their effects on society.

Essential questions:

* What is the value of data?
* How can societies best utilize data sources to produce just outcomes?

Formative Assessments:

* Reading check-ins
* In-glass group work

Summative Assessments:

* In-class discussion
* In-class presentation

**Unit 8 – Evolutionary Algorithms**

Texts:

* *The Gene,* by Siddhartha Mukherjee

Objectives:

* Articulate the three key components of any evolutionary algorithm.
* Appreciate how the evolutionary process can be applied to multiple domains.
* Create a generic skeleton for solving problems via an evolutionary algorithm.
* Alter fitness functions to apply same basic techniques to multiple problems.
* Visualize how small changes can lead to solving difficult problems.
* Understand what a metaheuristic is.
* Create a lab report that is able to justify conclusions reached during exploration.

Essential questions:

* What outcomes within our world can be attributed to an evolutionary process?
* How can problems be modeled to take advantage of the evolutionary process?

Formative Assessments:

* Programming problem sets
* In-class group work

Summative Assessments:

* In-class discussion
* Programming projects

**Unit 9 – Emergence**

Texts:

* *Darwin’s Cathedral,* by David Wilson
* *War and Peace,* by Leo Tolstoy

Objectives:

* Learn to utilize a gaming library to visualize certain emergent behaviors.
* Appreciate how simple rules can lead to complex behaviors.
* Create various emergent systems.
* Discuss how levels of abstraction can be utilized to bridge the gap between simple individual actions and complex systems.

Essential questions:

* What are the underlying properties of an emergent behavior?
* Is consciousness an emergent system?

Formative Assessments:

* Programming problem sets
* In-class group work

Summative Assessments:

* In-class discussion
* Programming projects

**Unit 10 – Neural Networks**

Texts:

* *A Sociological Study of the Official History of the Perceptrons Controversy,* by Mikel Olazaran

Objectives:

* Create a perceptron.
* Visualize what a perceptron is capable of deciding.
* Understand why back propagation is necessary for training a neural network.
* Use existing neural network libraries to create and train a multi-layered network.
* Create a lab report that is able to justify conclusions reached during exploration.
* Articulate the major research movements within AI.

Essential questions:

* Why have neural networks become the “go to” for the most ambitious AI projects?
* What factors determine if an idea receives attention within the scientific community?

Formative Assessments:

* Programming problem sets
* In-class group work

Summative Assessments:

* In-class discussion
* Programming projects

**Unit 11 – Application of Knowledge**

Texts:

* *Oh the Places You’ll Go,* by Theodore Geisel

Objectives:

* Create a research question that is of interest to you.
* Identify data sources that will best help answer research question.
* Apply pre-existing knowledge to create tools to analyze data set.
* Extract knowledge from data and present it.
* Create a lab report justifying conclusions and explaining the research process.
* Cite the sources and researchers who led to final project.
* Present findings in front of class.

Essential questions:

* What questions are important to me?
* What resources and techniques will allow me to create knowledge to answer these questions?
* What biases within my analyses do I have to check for?

Formative Assessments:

* 2-minute check-in presentations
* Research check-ins

Summative Assessments:

* Research project
* In-class presentation