

# Assignment 1

Fundamentals, principles, and values

**Version:** 1.1

**Due Date:** Jan. 27, 2023, 11:59 PM

**Submission:** Assignment box on myCourses

## Objective

The objective of this assignment is to put to use your understanding of the fundamental concepts covered in the first two weeks of class. This includes the fundamental concepts from ethics, values, and AI. Working on this assignment should also give you confidence whether you have the right background to continue to succeed in this course. If you are taking a machine learning course already, working on this assignment will help accelerate your learning. If you are having a hard time coding in python to complete the assignment, you are likely missing prerequisite skills/knowledge needed to take this course.

NOTE: This assignment is to be completed independently.

## Resources

We recommend that you use all the material from the lectures and tutorials on ethical theories and values for answering questions in part 1. The material from lecture 2 and the tutorial 2 will be useful for part 2 of this assignment. You can also refer to the following resources for completing part 2 if you have any issues.

Relevant python libraries and resources:

- NumPy: <https://numpy.org/doc/stable/index.html>
- Matplotlib: <https://matplotlib.org/>
- Pandas: <https://pandas.pydata.org/docs/reference/api/pandas.DataFrame.html>
- Scikit Learn: <https://scikit-learn.org/stable/index.html>

Here are some tutorials that you might find useful:

- Introduction to NumPy: <https://www.youtube.com/watch?v=QUT1VHiLmml>
- Introduction to matplotlib: <https://www.youtube.com/watch?v=a9UrKTVeEZA>
- 3-hour introduction to Scikit-learn: [https://www.youtube.com/watch?v=pqNCD\\_5r0IU](https://www.youtube.com/watch?v=pqNCD_5r0IU)
- 1.5 hr introduction to Scikit-learn: <https://www.youtube.com/watch?v=M9ltm95JzL0>

# Instructions

## Part 1: Ethical dilemma case study

Read the scenario below and respond to the questions.

### Case study:

This case study is adapted from Markkula Center for Applied Ethics at Santa Clara University's collection of [ethics case studies](#).

#### **The "Goodbye Fears Monster"**

You might know (or remember) that some little kids find it difficult to fall asleep at night because of various fears that prey on them in the quieter, darker pre-sleep environment. The "Goodbye Fears Monster," a new toy currently under development by the Metell toy company, is designed to respond to those fears. The furry, teddy-bear-like "Goodbye Fears Monster" (we'll refer to it as "GFM" for short) is soft, roly-poly, and comes in a variety of colors; what makes it unique, however, are its interactive features. The toy is designed to "listen" and respond to a child who speaks to it.

When a fearful child is about to go to sleep, he or she is supposed to press GFM's belly button (which is, actually, a button); that action turns on the toy's microphone (which is hidden by its fur). The child is then encouraged to tell the "monster" all of his or her fears. Once the child stops speaking, the monster replies, "I will eat all of those fears! Nom nom nom. There. They're gone. Are you worried about anything else?" The process is supposed to repeat until the child says he or she has no more worries to detail. At that point, GFM gently replies, "Well, then, now we can close our eyes and go to sleep in peace"—and turns off the microphone.

The child's statements are recorded, and all of the recordings are made available to the child's parents (they are sent directly to the child's parents' phones, via a companion app).

Marketing materials that accompany GFM tell prospective customers that the interactive toy will allow young children to express fears that they might not otherwise disclose to anyone; reassured by their fears being "eaten" by the friendly toy, children might sleep better (which, of course, would allow parents to sleep better, too); the recordings will give parents new insights into their child's thinking.

The Metell company also promises to share the recordings (at no cost) with child psychology researchers, in the hope that the data collected will promote the development of new therapies or other methods to alleviate common childhood fears.

As part of the promotion of this new (rather expensive) toy, the toy makers propose to distribute free GFMs to children living in homeless shelters throughout the San Francisco Bay Area.

**Instructions:** Using the ethical theories, ethical decision-making model, and value sensitive design process discussed in the lectures and tutorials answer the following questions for the above ethical dilemma case study.

1. **[DE]** Who are the direct and indirect stakeholders for this case study?
2. **[DE]** What are some potential embedded values in the GFM?
3. **[DE]** Identify three potential value tensions and describe why they might occur. What are the potential impacts of these value tensions on the various stakeholders?
4. **[PA][EE]** From a utilitarian perspective, can you justify the proposal of the toy makers to distribute free GFMs to children living in homeless shelters? Elaborate on why you can or cannot justify this proposal and what are the potential implications of this decision.
5. **[PA][EE]** From a deontological perspective, can you justify the Metell company's marketing strategy? Elaborate on why you can or cannot justify their strategy and what are the potential implications of this decision.
6. **[PA][EE]** From a virtue ethics perspective, what do you think of the Metell company's decision to give the data from GFM with child psychology researchers?

## Part 2: Coding exercise

**Instructions:** Use the latest version of Python and relevant libraries for completing the following steps. *For Winter 2023 offering of this class, we ask you to use Python version 3.11.1, scikit-learn 1.2, matplotlib 3.6.0, NumPy 1.24.0 and Pandas 1.5.2.*

[PA – Problem Analysis], [DE – Design] and [EE – Ethics and Equity] are the graduate attributes covered by each step.

The aim of this section is to ensure that you can

1. Download the [heart disease modified dataset from myCourses](#). This dataset is a modified version of the [heart dataset](#) available on Kaggle.
2. **[PA]** Perform basic statistical analysis on the dataset to learn more about the distribution of the classes and properties of the features. Create 1-2 visualizations that show key properties of this dataset using python libraries such as matplotlib.
3. **[DE]** Using the Scikit learn package, develop a binary classifier to predict the likelihood of heart disease for a given patient. Report on at least one learning algorithm that you used for this classifier and report on the cross validation accuracy. You can choose to use simple supervised learning methods such as linear regression or test out some unsupervised learning algorithms. However, we are not looking for complex algorithms. We just want to make sure that you can successfully implement and explain a simple binary classifier for the purposes of this course.
4. You code should include:
  1. Download the data and input into numpy objects.

2. **[PA]** Perform basic statistical analysis on the data using python packages such as NumPy.
  3. **[PA]** Create 1-2 visualizations of the data using python packages such matplotlib.
  4. **[DE]** Use Scikit and implement at least one learning algorithm to create a binary classifier.
  5. **[DE]** Calculate the prediction accuracy of the classifier and create the confusion matrix to report on recall and precision. Elaborate on what this information communicates about the classifier you have created.
  6. **[EE]** Comment your code thoroughly so that it is understandable for any viewer. The comments should explain your thought process and methods.
5. You will not need to write a report for this section of the assignment. However, your code must include a readme file describing the structure and any instructions for running it.

## Deliverables

You should prepare a report (as a .PDF file) containing your response to the above mentioned parts. You should also prepare a .py or .ipynb file containing the code you've produced to complete Part 2 of the assignment and an accompanying readme file. You should submit all three files (report, code and readme file) in the same assignment box in myCourses.

## Grading

Rubric for the assignment can be found in the assignment box on myCourses