

# Ethics Module

## Data Science and Machine Learning at Scale

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# Course Constraints & Course Description

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## Constraints

1. Time Constraint - 1 Day Module
2. Needs to flow with the rest of the course and build on concepts already embedded in the course
3. Outcome is realizable steps/actions

## Description

The class centers around running machine learning algorithms at scale. That is, on distributed systems and in large quantities where the adverse outcomes are sometimes difficult to see. Students discover first hand the tradeoffs of different distributed paradigms and learn to debug machine learning applications running distributed systems.

# Learning Objectives

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1. Recall facts
2. Explain the case study from multiple perspectives
3. Infer what went wrong
4. Generate alternative actions
5. Apply learning to a new scenario
6. Execute plan of action

# Ethics Module Overview

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- A case study based module that promotes active learning and discussion
- Multiple opportunities for full class discussion as well as small group discussion
- Module is designed to build upon itself and develop a student's ability to assess and evaluate an ethical situation
- Culminates with a real world based assignment - write an email to your boss discussing an ethical issue

# 23andMe and Genetic Data

# Breakout Room 1 - 10 Minutes

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*There are many groups with a stake in the 23AndMe Business and other similar companies. For this first break out room you will analyze the ethicality from the standpoint of one of the groups.*

- What argument can be made in support of your group and their involvement in this case study?
- What argument can be made against your group and their involvement in this case study?
- Link: <Insert Discussion Board Link for Class>

**What actions need to be taken?**

# Class Discussion or Optional Second Breakout Room

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*Now that we have made inferences about what should or should not have been done, we can put ourselves in the scenario and generate alternative actions that would have resulted in less harm.*

- How would you approach this problem? Is there a way to emphasize the positive aspects of the case study and also reduce the negatives?
- Provide a few sentences about how your group brainstormed the actionable items.
- Link: <Insert Discussion Board Link for Class>



# Breakout Room 3 - 10 Minutes

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*Consider the new scenario presented as you answer the following questions. You may find it useful to progress through the scenario in a similar manner to our progression through the case study.*

- What are some of the problems that exist with potential move by BioNano? What are some consequences that might initially be unforeseen? Are they positive, negative, or both?
- What ethical issues are at play here? What steps could be taken to minimize one or more of them? Where in the pipeline would this need to be addressed? Come up with a few actionable items and justify them.
- How might the upper leadership of BioNano react to your actions or decisions? Are there risks involved with your actions?
- Link: <Insert Discussion Board Link for Class>

# Email Assignment

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*After careful consideration of the situation at BioNano, you decide to write an email to the CEO expressing your concerns about the direction the company is taking. How you develop your email and the recommendations you make is up to you, but you must provide clear guidance on how the company should move forward. Additionally, you should support your point of view with data. The email should be professional and respectful as the CEO is your boss.*

# Vocabulary

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- Relate the issue to the company's goals
  - Government, Military - Mission
  - Business - Mission Statement, Product Requirement
- “Acting ethically is good for the business”
  - Frame this issue in terminology the target audience is receptive to...the language they speak
- What should the company value? How to value it?
  - Even a loss function design in an algorithm illustrates “what we value”, design and test it carefully
- Ethical stress testing should not be feel like code comments that are tacked on at the end, but more like UX/UI which all would agree is highly crucial to success

# Additional Data Provided

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Sex	Condition	Individuals in Study	Radiation BioMarkers
Male	Diabetes	5,959	0.00000000000005
	High Blood Pressure	6,444	0.00000000000009
Female	Diabetes	2,799	0.00000000000002
	High Blood Pressure	2,506	0.00000000000009
	Pregnant	160	0.00000000000003

\*\*Say anything less than or equal to 0.00000000000009 is considered safe by the FDA\*\*

Questions?