



ELMED219

Thursday Jan. 6th, 2022

Lab 0: Introduction to some theory and tools of machine learning



Alexander S. Lundervold (HVL)



How can a machine learn?



Iris Virginica



Iris Setosa



Iris Virginica



Iris Setosa



Iris Versicolor



Iris Setosa



Iris Virginica



Iris Virginica



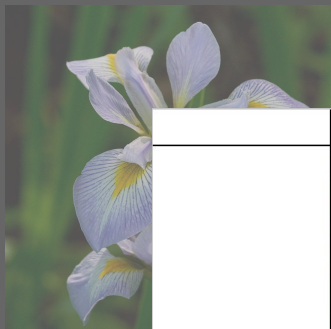
Iris Setosa



Iris Versicolor



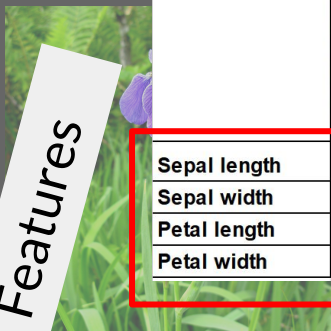
Iris Setosa



Iris V



inica



Iris Setosa






Iris Versicolor



Iris Setosa

Features

	Iris Virginia	Iris Setosa	Iris Versicolor
			
Sepal length			
Sepal width			
Petal length			
Petal width			



Iris Virginica



Iris Versicolor



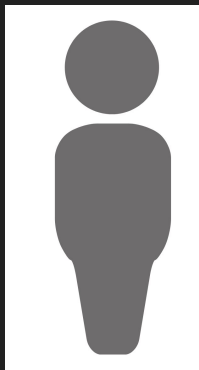
Iris Setosa



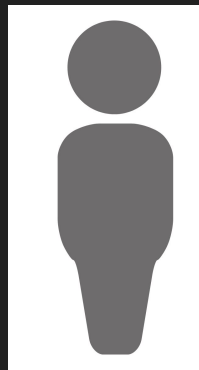
Iris Versicolor



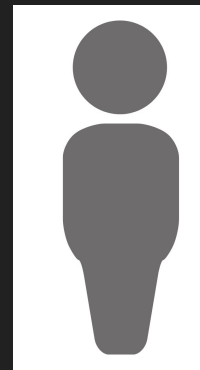
Iris Setosa



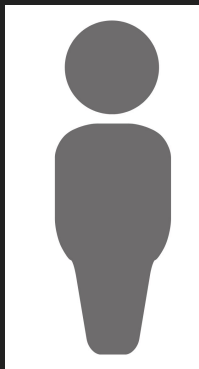
Diabetes



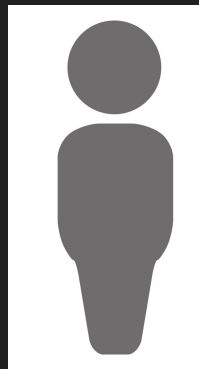
No diabetes



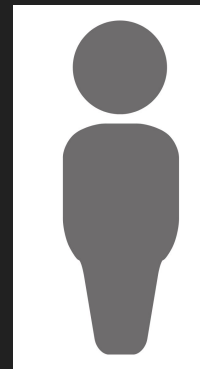
No diabetes



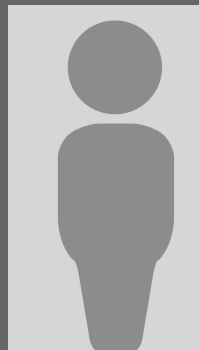
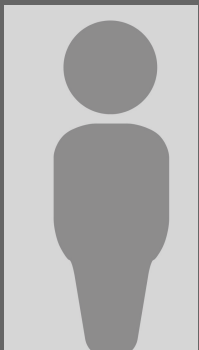
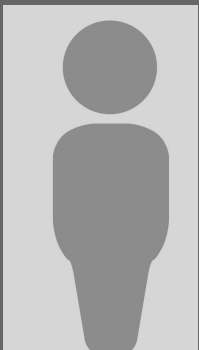
No diabetes



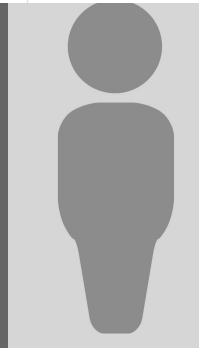
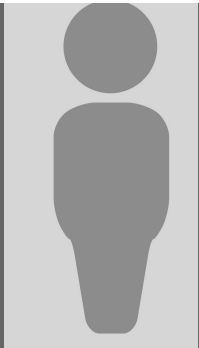
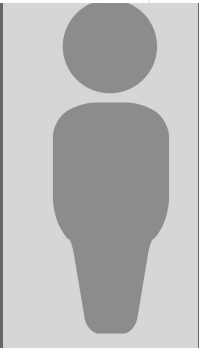
No diabetes



Diabetes



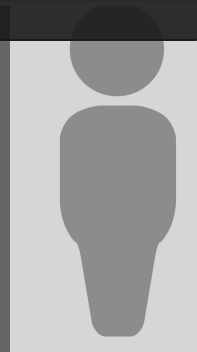
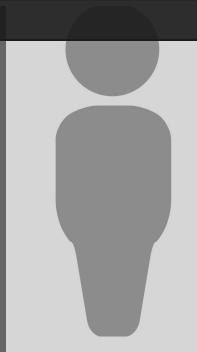
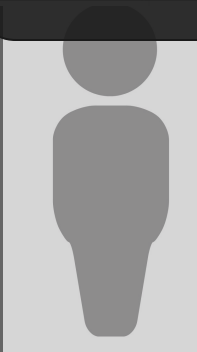
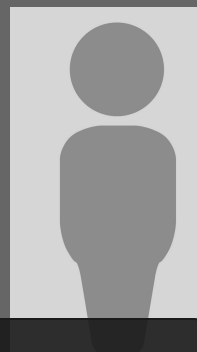
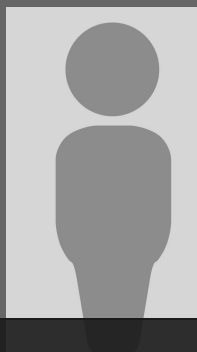
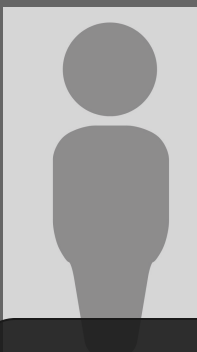
Patient ID	Age	BMI	Plasma glucose	Diastolic blood pressure	Insulin	...
1	50	33.6	148	72	0	...
2	31	26.6	85	66	0	...
3	21	28.1	89	66	94	...
4



No diabetes

No diabetes

Diabetes



Age

BMI

Plasma glucose

Diastolic blood pressure

Insulin

...

31

26.6

85

66

0

...

21

28.1

...

66

94

...

...

...

...

...

...

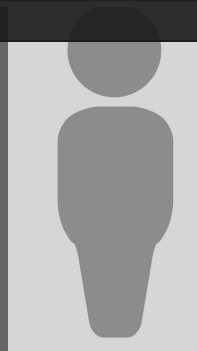
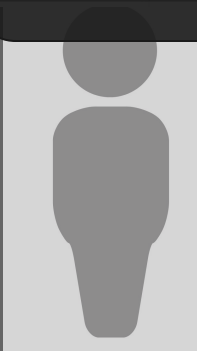
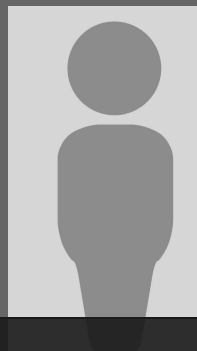
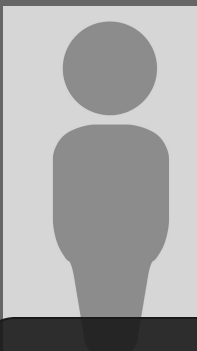
...

No diabetes

No diabetes

Diabetes

ML models learn from *features / representations* of data



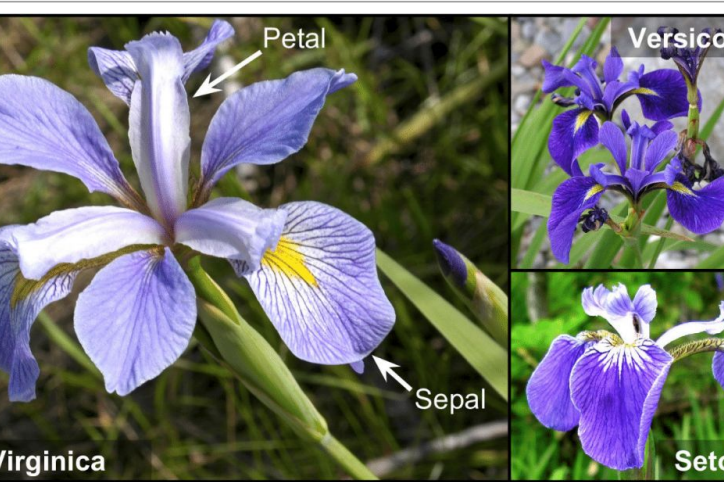
ML models learn from **features / representations** of data

Patient ID	Age	BMI	Plasma glucose	Diastolic blood pressure	Insulin	...
1						...
2	31	26.6	85	66	0	...
3	21	29.1		66	94	...
4						...

No diabetes

No diabetes

Diabetes

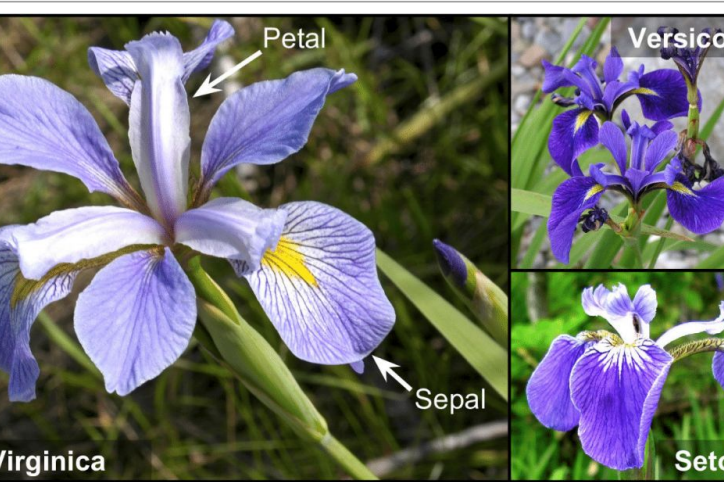


1-22. Flowers of three iris plant species¹⁶

Machine learning

Two (very) simple examples





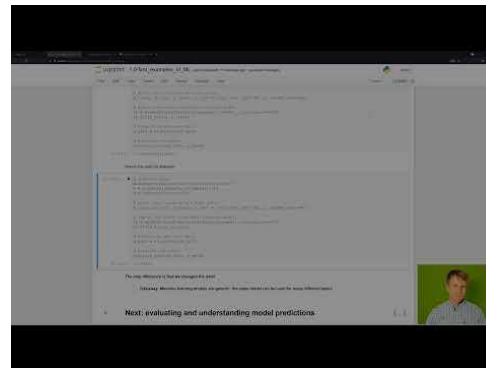
1-22. Flowers of three iris plant species¹⁶



Machine learning

Two (very) simple examples

See also



What is machine learning?


Function approximation

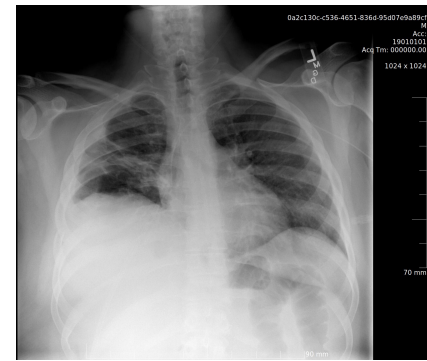
$$y \approx f(x; \theta)$$

Function approximation

$$y \approx f(x; \theta)$$

an image

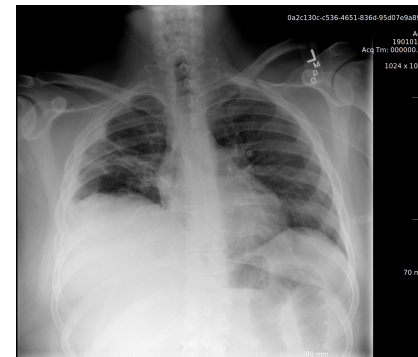
A thin black arrow originates from the text 'an image' and points diagonally down and to the left, terminating at the variable x within the function $f(x; \theta)$ in the equation above.



Function approximation

$$y \approx f(x; \theta)$$

an image



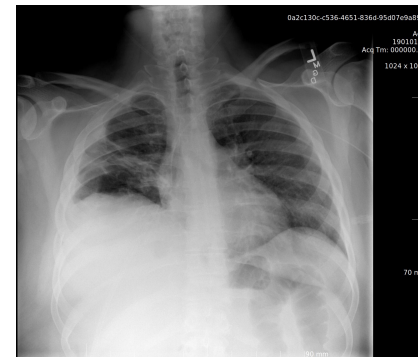
Function approximation

$$y \approx f(x; \theta)$$

what's in the image →

← an image

Opacity



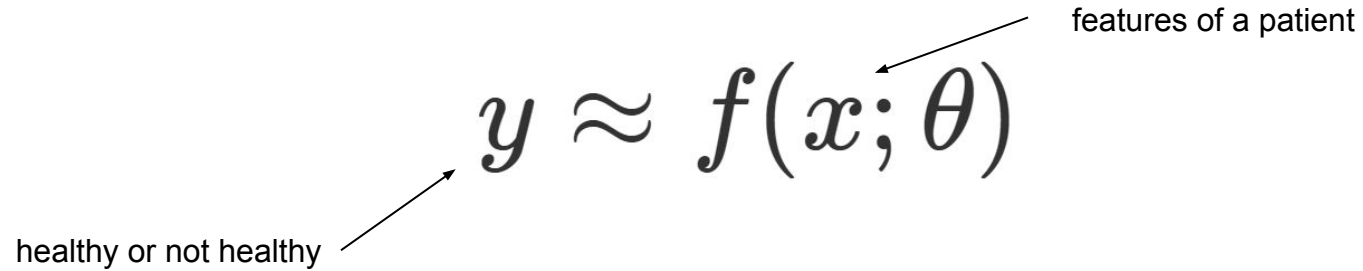
Function approximation

$$y \approx f(x; \theta)$$

what's in the image →

← an image

Function approximation



The diagram illustrates the function approximation equation $y \approx f(x; \theta)$. It includes two annotations with arrows: one pointing to y labeled "healthy or not healthy" and another pointing to x labeled "features of a patient".

$$y \approx f(x; \theta)$$

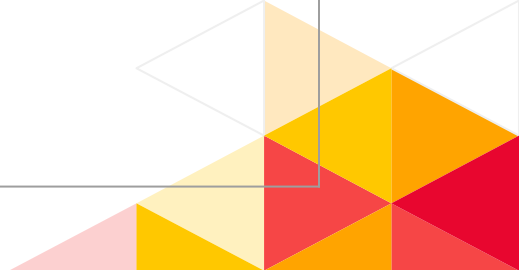
healthy or not healthy

features of a patient



Some ingredients

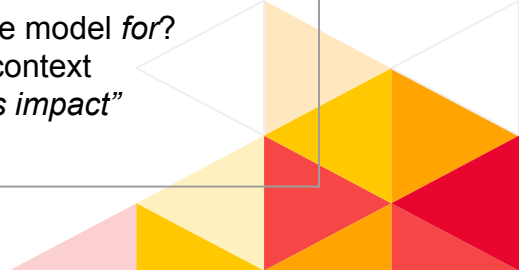
Data	Labels / annotations	Training data
Trained model	Measure of success	Purpose...





Some ingredients

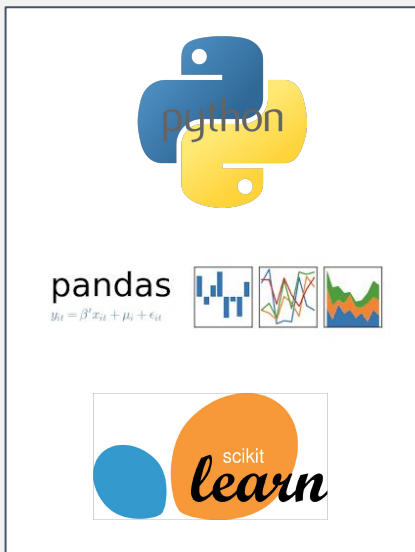
<p>Data</p> <p>Feature vectors (think of the flowers) Images Speech</p>	<p>Labels / annotations</p> <p>{cat, dog, horse} {cancer, not-cancer} {coalfish, pollock} {diabetes, no diabetes}</p>	<p>Training data</p> <p>Pairs {(data, label)} Input to ML model</p>
<p>Trained model</p> <p>A function sample \rightarrow label</p>	<p>Measure of success</p> <p>Is it doing a good job? Accuracy, loss, ... Used as a <i>feedback signal</i></p>	<p>Purpose...</p> <p>What's the model <i>for</i>? Broader context <i>"Business impact"</i></p>



How do you *do* machine learning these days?

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Machine learning

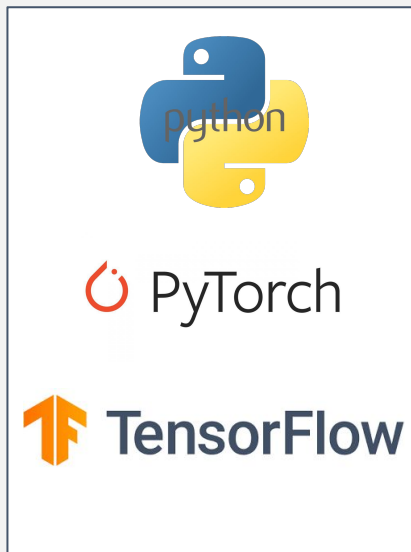


How do you *do* machine learning these days?

Machine learning



Deep learning

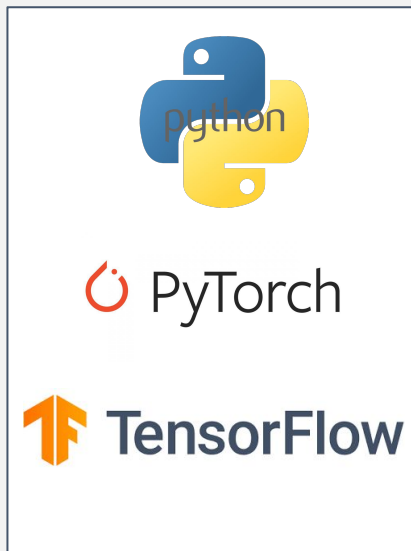


How do you *do* machine learning these days?

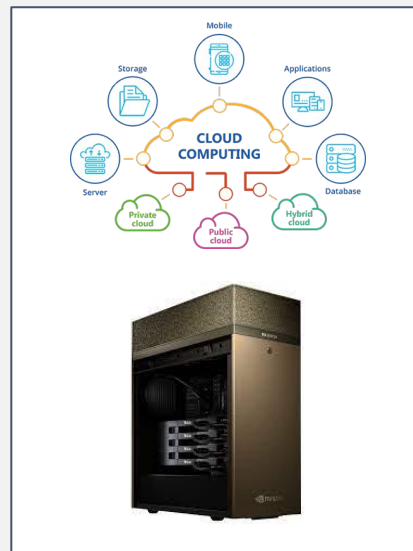
Machine learning



Deep learning

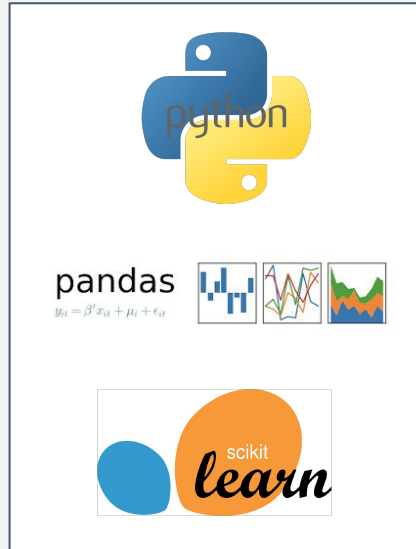


Processing / compute

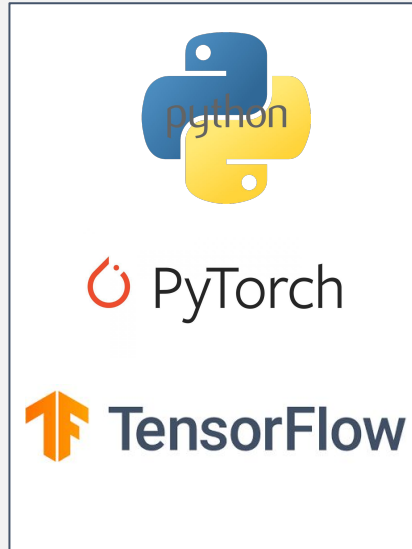


How do you *do* machine learning these days?

Machine learning



Deep learning

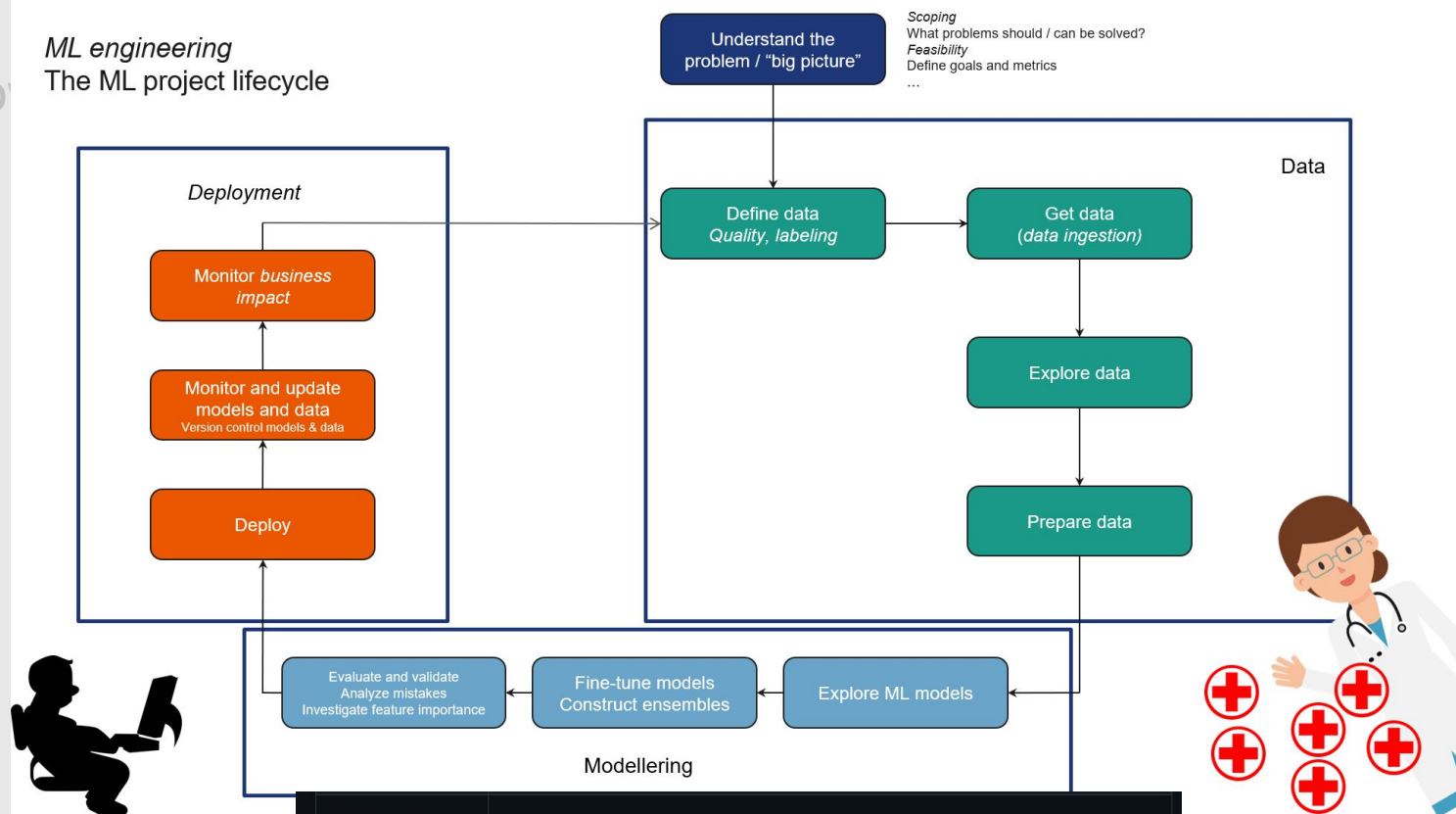


Processing / compute



ML engineering

The ML project lifecycle



Tue, Jan 11

10:15-11:00

LAB 1: Medical health records and natural language processing

Alexander Selvikvåg Lundervold

12:15-13:00

LAB 2: The machine learning project lifecycle

Alexander Selvikvåg Lundervold

**Further
exploration of the
basics of ML**

Further exploration of the basics of ML



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INTERACTIVE COURSE

Supervised Learning with scikit-learn

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Course Description

Machine learning is the field that teaches machines and computers to learn from existing data to make predictions on new data: Will a tumor be benign or malignant? Which of your customers will take their business elsewhere? Is a particular email spam? In this course, you'll learn how to use Python to perform supervised learning, an essential component of machine learning. You'll learn how to build predictive models, tune their parameters, and determine how well they will perform with unseen data—all while using real world datasets. You'll be using scikit-learn, one of the most popular and user-friendly machine learning libraries for Python.

1 Classification FREE

50%

In this chapter, you will be introduced to classification problems and learn how to solve them using supervised learning techniques. And you'll apply what you learn to a political dataset, where you classifi

This course is part of these tracks:

Data Science for Everyone

Machine Learning for Everyone

Data Scientist with Python

Machine Learning Fundamentals with Python

Machine Learning Scientist with Python