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Google AI | Explore ML

Deep Learning Beginner Track

BITS Pilani Goa Campus

Lecture - 1
Learning Problem and Data

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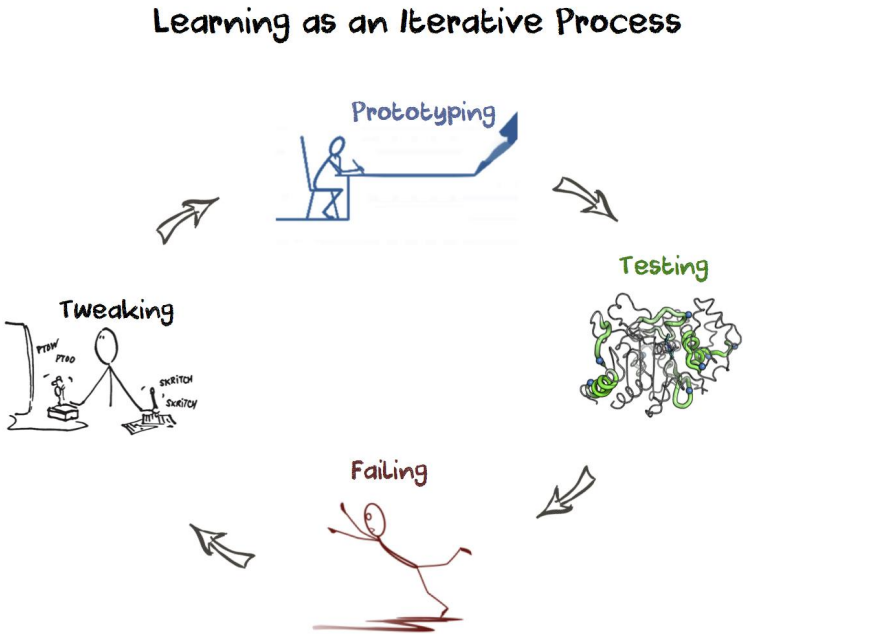
What is Learning?

Learning is any process by which a system improves performance from experience.



What is Machine Learning?

Machine Learning is the study of algorithms that improves their performance P, at task T, with experience E.

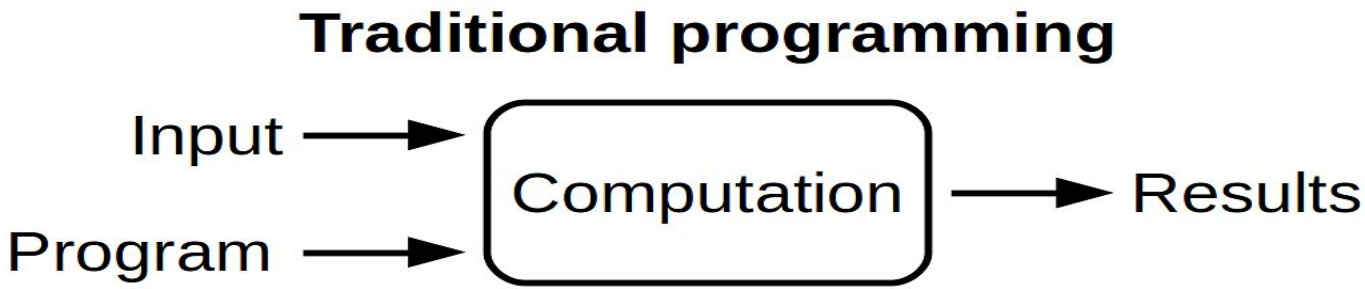
Example:

- T : Differentiate/classify images of cars and dogs.
- E : Many images with labels.
- P : Metric of classification(percentage of correctly classified images)

How is ML different from Programming?

```
def f(x):
    y = 2*x+1
    return y


y = f(x=2)
```

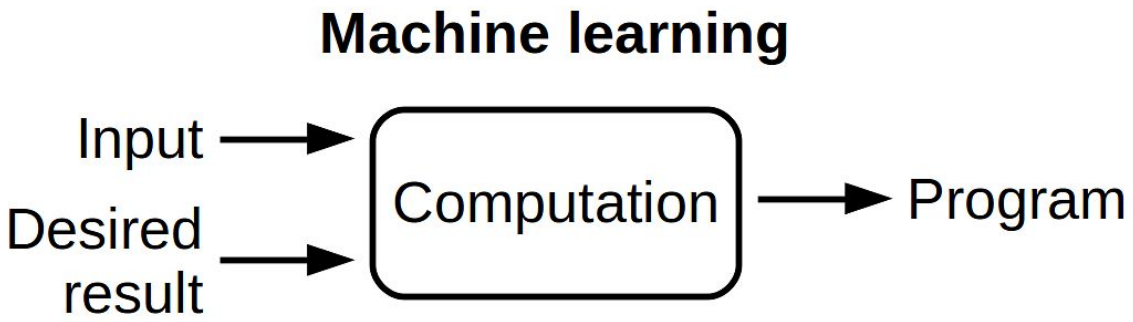


Source

Machine Learning

```
def ML(x, y):
    # do something
    # and find y = f(x)
    return f

f = ML(x,y)
```

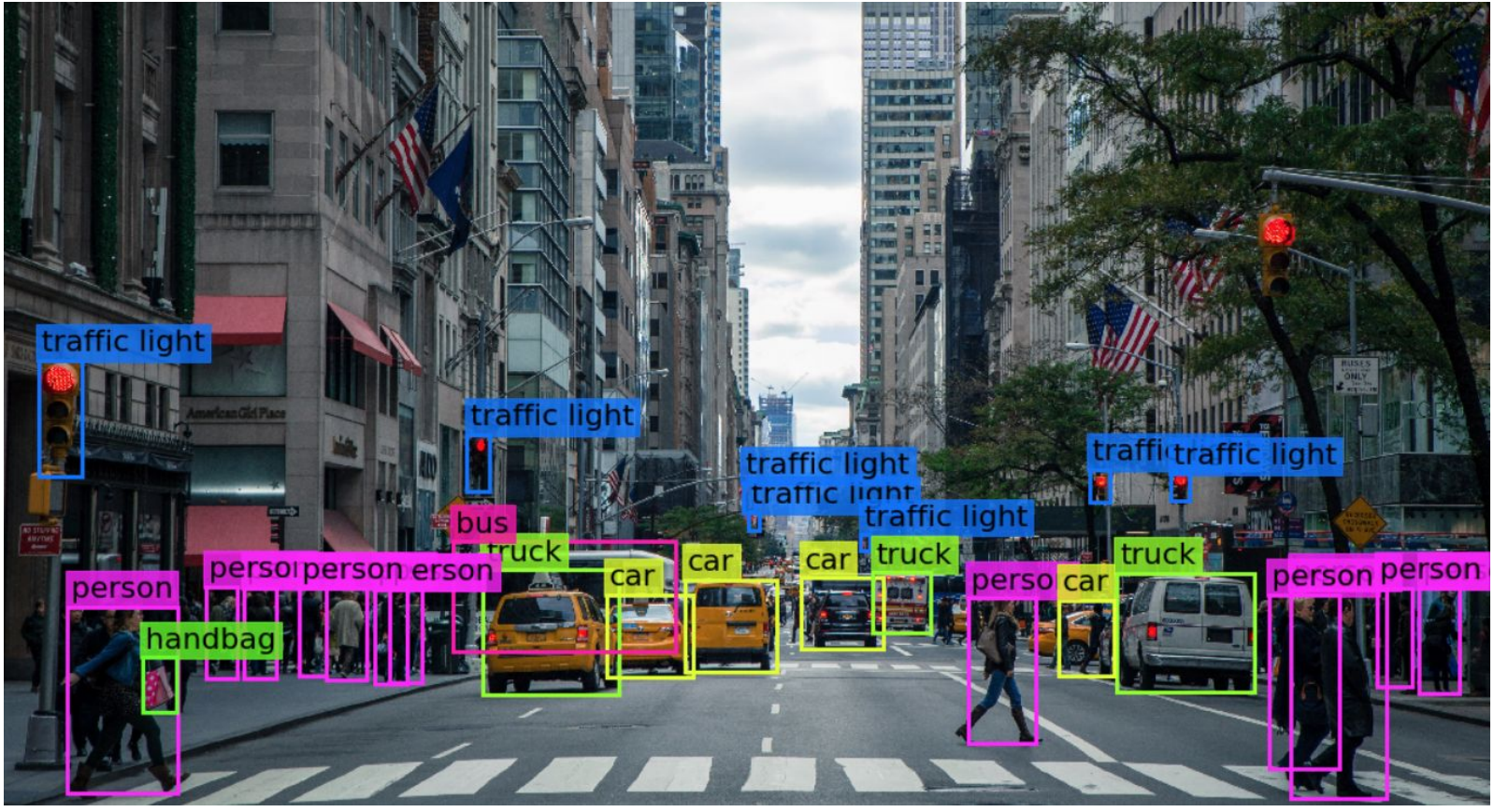


Where is Machine Learning used?

Almost everywhere!

Applications are endless, slides won’t be enough to talk about every applications.

Autonomous Vehicles (Cars, Underwater, Air)



Speech Recognition, Conversational Agents

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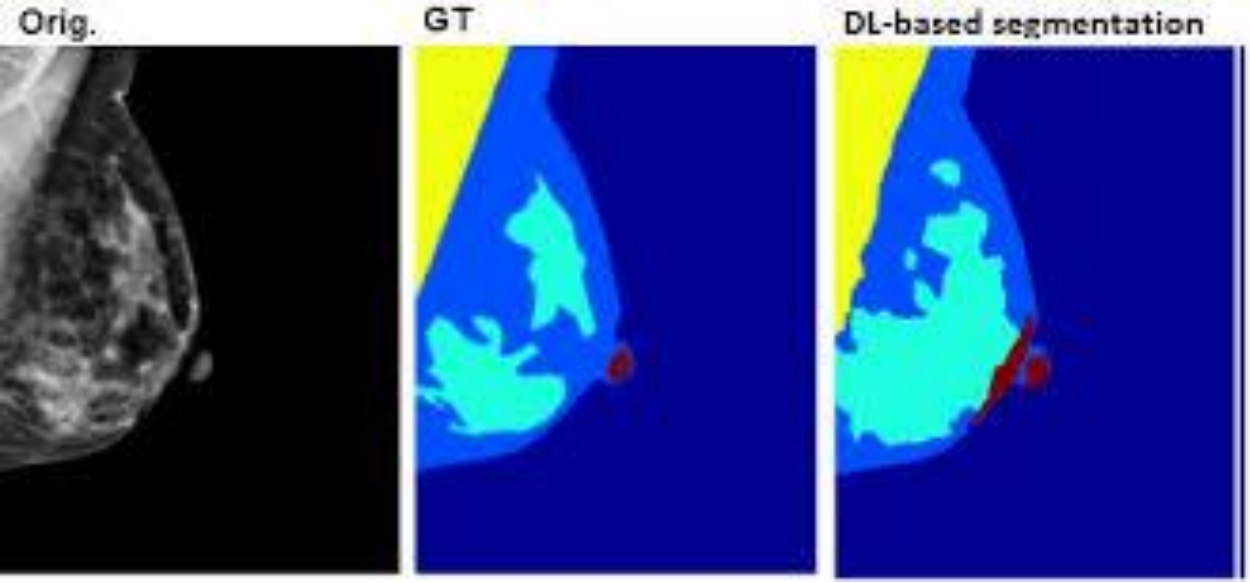
Medical Diagnosis



Machine learning makes the diagnosis of many diseases cheaper, faster and more accurate than it used to be.

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So can we use machine learning everywhere?

- Some simple tasks doesn’t need Machine learning like addition, counting, ..., etc.
- No Machine learning without Experience E. (X, y) are needed to get f: X-> y. So if you can’t get the data, then ML cannot help you.

Framing the Learning Task - 1

You have an email in your inbox, frame a learning task for a ML model to classify your email as spam or not.

- T : Classify email as Spam or Not Spam.
- P : Percentage of emails correctly classified.
- E : Lots of emails with labels(Spam or Not Spam)

Framing the Learning Task - 2

Frame a ML task for Stock Prediction. Given past 20 days stock values, predict the next day stock price.

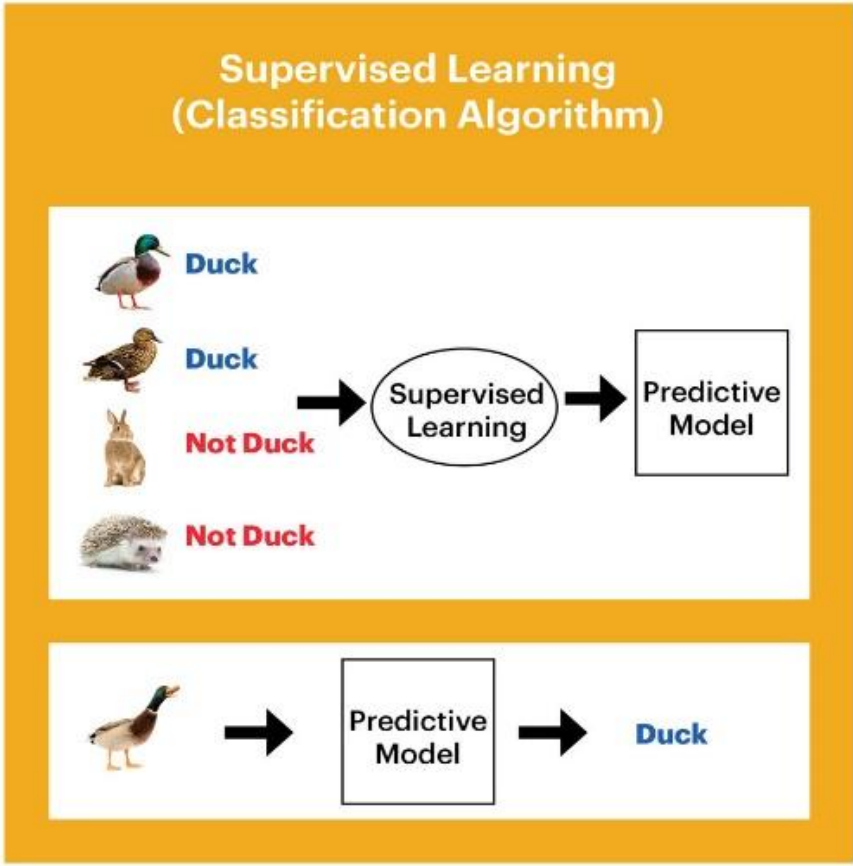
- T : Predict Stock Price at T+1 time
- P : How close if the predicted price to True price.
- E : Sets of stock prices with past 20 days price and the next day price.

Types of Learning:

1. Supervised Learning
2. Unsupervised Learning
3. Semi-supervised Learning
4. Reinforcement Learning
5. Some new type of learning may be added soon, at this rate of research in AI.

Supervised Learning

- Given Data X and Target y
- Find relation y = f(X)



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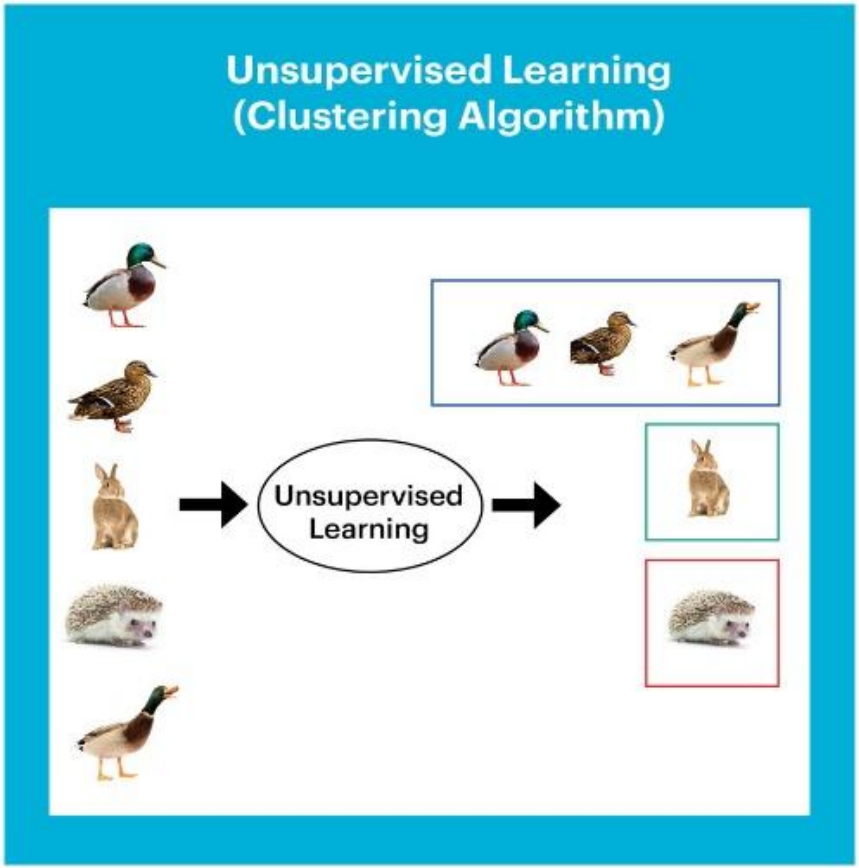
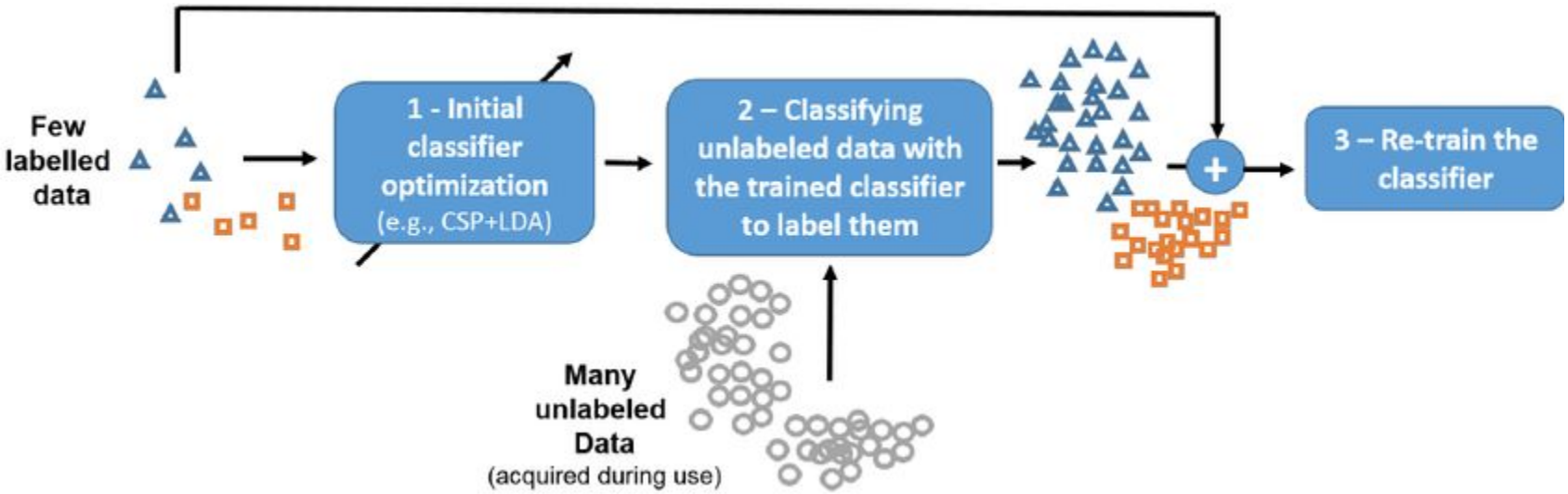
Unsupervised Learning

Training Data X without the Target y.



Semi-supervised Learning

Training Data X with few target y.



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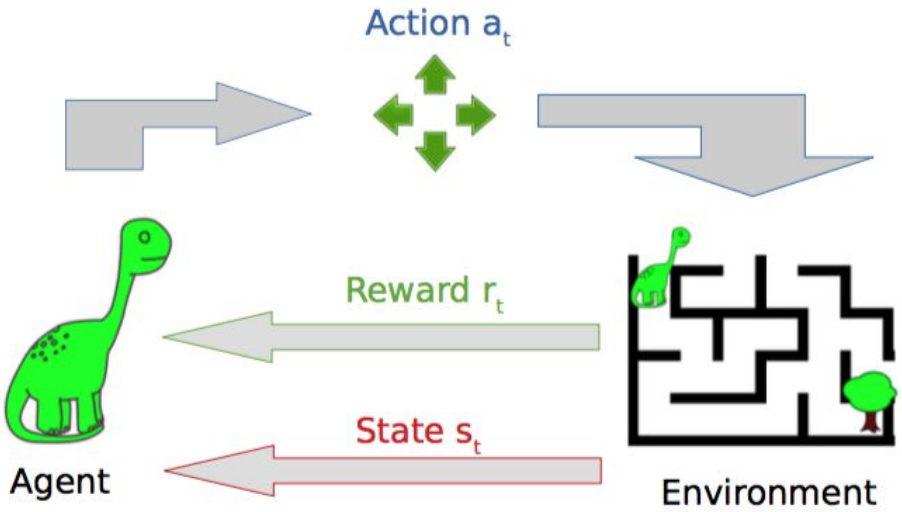
Reinforcement Learning

Agent gets rewards from sequence of best actions.



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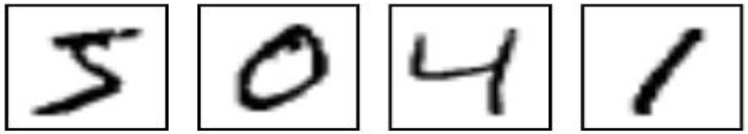
Learning System

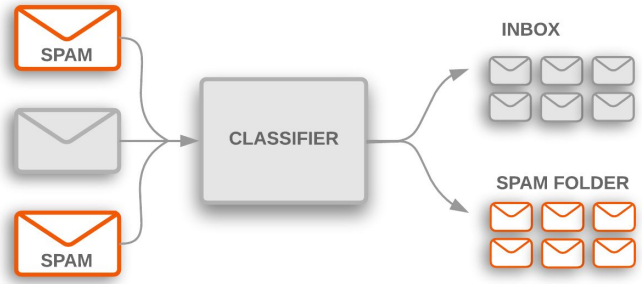
- Choose a training experience or training data.
- Choose the target to learn.
- Representation of training data and target.
- Learning algorithm to infer/predict the target from data.

Learning System Example - Handwritten Digits Recognition



- Training data (X) = Images of handwritten digits of all 10 classes.
- Target (y) = {0, 1, 2, 3, 4, 5, 6, 7, 8, 9} respectively.
- Representation of X(each example) = array or tensor of shape (28, 28, 1).
- Representation of y(each example) = array of shape (1,1) from one of {0, 1, 2, 3, 4, 5, 6, 7, 8, 9}.

Learning System Example - Email Spam Classification



- Training data (X) = Text Emails of both spam and not spam
- Target (y) = {0,1} respectively.
- Representation of X(each example) = array or tensor of shape (28, 28, 1).
- Representation of y(each example) = array of shape (1,1) from one of {0, 1, 2, 3, 4, 5, 6, 7, 8, 9}.

Source

Thank You!