ML for Absolute Beginners- Level 1

Machine Learning for Absolute Beginners

- Countless growing amounts of practical applications of ML
- The big players in the market - google, amazon, FB, Microsoft are investing a huge amount of funding on going AI research initiatives.
- Most of the large enterprise companies are building AI teams to better utilize their growing amount of data. as part of the digital strategy of many a large organizations AI is becoming a top priority direction
- Some countries like china,usa,russia already developed a dedicated strategy for AI those countries identified AI as a major technology in the upcoming future.
- AI is perceived as a better way to handle many challenging and complex tasks and overall help to make progress in multiple domains.
- For eg, AI can be used to quickly develop new important medicine or to improve road safety by enabling self driving cars.
- It is used to improve the interface between humans and all kinds of electronic devices.
- AI will have positive as well as negative impact on society like many other techs.

AI

- AI was founded long time ago as an academic discipline back in 1956 with complex intellectual tasks that are performed by humans on a daily basis can be also performed by machines.
- Those machines can mimic or simulate human cognitive functions such as learning and complex problem solving.
- A computer can perform many complex calculations while checking a very large space of options and strategies.
- Such kind of program can easily win many professional chess players so it will be considered as AI entity.
- Two main downsides of this approach. the approach of trying to mimic complex human thinking by creating a huge amount of explicit rules.
- The first one is that someone needs to think and program all the game logic and strategies into the program which can be very hard work
- The second downside is that it will be as good as it was initially programmed.
- The missing part of AI is the flexibility to learn, to adapt.

Classical Programming

- In classical or traditional programming, the input for the computer is first of all a set of rules what to do per each case. Itis the whole concept of programming.
- The second important input is the data is representing something.
- In chess game, the input data will be the move just performed by the other player. now based on the predefined programming rules the provided data will be analyzed and we will get some answer, some decision.
- When the task is very complex and thing are changing the program will become very complex and also very hard to maintain.

Machine Learning

- If the computer will win or lose a specific game by performing a group of steps , it can learn from that experience like a human player.
- It will create a new set of rules that will help to win the next game and keep improving all the time.
- it is a completely new approach - a new state of mind.
- It will extract patterns from the provided data and establish automatically some level of knowledge or rules that can be used to perform a specific task.
- This process is called "training" ,practically speaking during the training or learning phase, the ML black box will have two input streams, the data and the answers about the provided data.
- In our example it will be a large group of pictures as the data and per each picture, the identified object, is that a dog or a cat. This is called labeling the data. Those are the expected answers.
- The ML black box will digest this information which is a process called "training", and finally it will output a set of mathematical transformation rules to identify if a new picture is a cat or a dog.
- Those mathematical transformation rules are encapsulated together to something that is called a trained model. This is the output of the machine learning during the learning process. And finally this trained model will be used to classify if a new unseen picture is a dog or a cat.
- Those machines are basically learning from the data without being programmed by a pre-set of rules. In addition, and this is a key thing to remember.
- We can use the ongoing new data stream that is coming into the machine learning black box to adapt the knowledge inside that box so it can handle a dynamic environment, learning new things, all of that without opening or changing a single line of code in the program.

Deep Learning

- In machine learning we are not using small medium or large brains to describe the capacity of a trained model.
- It is actually described using the concept of layers. A layer is the basic building block of deep learning.
- A single layer is like a data transformation phase and you can have several layers that are connected
- to each others, so the output from one layer can be the input to another layer. So each layer receives an input transform it with a set of mathematical functions and then it will pass those values to the next layer and then it will propagated until reaching the final layer.
- If we put very small amounts of layers inside the ML system like one or two, it is called shallow learning.
- The learning algorithm will catch a relatively small amount of patterns while learning from the data which can be more than enough for a specific use case. shallow learning will be fast making it an attractive option in more simple use cases.
- On the other hand, if we put more hidden layers in our machine learning box, in our model, there is a chance to collect more knowledge, more patterns from the data.
- This is called deep learning, and it is referring to the simple fact that more layers are used inside to represent the patterns, the knowledge.

- The depth of the model is basically the number of layers contributing to the model. Those layers in deep learning are also called neural networks as they in some level inspired by biological neural networks as we have humans and animal.
- Deep learning is probably the most exciting field under machine learning because it is helping to handle much more complex use cases with larger data set to digest.
- There are also downsides to consider when using deep learning. Deep learning requires the use of more complex algorithms to train and a model. And because of that also much more computing resources compared to shallow learning.
- Hardware is a common bottleneck when handling the training of a complex deep learning model.
- There are also public cloud providers like Amazon and Google that provides AI cloud services to train a deep learning models so you don't have to purchase the hardware by yourself.
- Artificial intelligence is like the umbrella concept of machines that can perform complex intellectual tasks that are usually performed only by humans.
- Those machines can mimic or simulate human cognitive functions. Inside the AI circle and as part of the evolution of AI, a sub-field evolved which is called machine learning.
- Machine learning is adding the missing part, the important self-learning capability to machines.
- Using machine learning we can now handle much more complex scenarios while learning from the data. Instead of using rules based programming, we let the machines learn from the data.
- The next thing is the amount of knowledge we would like the machines to learn.
- Sometimes we will have use cases that are all based on shallow learning and some more complex use cases will be based on deep learning. So deep learning is basically a sub-field of machine learning. Which options to select while approaching some specific task is the job of a data scientist.

Applied vs Generalized AI

- The existing industry implementation of machine learning is focused on performing very narrow tasks.
- This is the input and this is the output, meaning each ML use case is used to accomplish a single specific task.
- Those kinds of AI use cases are called "Weak AI" or also called "Applied AI" as they are focused on
- narrow tasks that can actually be applied in practical applications.
- On the other hand, machine learning is basically just some simulation in computer memory and the knowledge is stored using mathematical functions and parameters.
- We are not creating and storing information as the complex neural network structure in our brain.
- It is extremely complex and almost impossible today to create an AI machine that will perform multiple tasks that are coordinated with each other like the human brain.
- This is called "Generalized AI" or also called "Strong AI" meaning the intelligence of a machine that can understand and learn almost any intellectual task that a human being can learn to perform.
- AI is focused on Applied AI, the narrow tasks of machine learning that are feasible and can provide some tangible business value.

- So 99.999% percent of all AI use cases you will encounter in the future will be related to applied AI.

Why Now?

- The hardware is a bottleneck when handling large data sets. As you know inside any computer there is a model called the CPU, Central Processing Unit that is doing most of the calculations.
- Most of the heavy graphics video games will not run so smoothly while using just a generic CPU. They need something else which is called GPU, Graphics Processing Unit. This is a dedicated high-performance chip to handle fast graphics data manipulation.
- Probably you have such kind of GPU own your laptop as they already became a standard feature in many computers.
- Now what is the relation to machine learning?
- Well, one of the most common methods to train and run a machine learning system is called deep learning. This method requires a lot of computing horsepower and with a big surprise .
- The GPU technology which was initially developed to be used for video games is now evolved into a new market use case meaning a machine learning to train machine learning.
- Now with the help of powerful new GPU chips the training time is reduced, making the process much faster and more affordable. Giants like NIVIDA and Intel and many others are investing unbelievable R&D resources to try to lead this domain while developing a dedicated AI hardware.
- Based on the evolving ecosystem of cloud computing, there is also an alternative to train an ML model.
- Instead of purchasing expensive hardware setup to train models, we can rent computing power directly over the cloud.
- Public cloud players like Google, Microsoft and Amazon are providing cloud-based services to train ML systems and this approach is a great alternative for small to medium players that can easily utilize the latest AI hardware without a buying entity.
- The last thing I would like to mention is the evolving development frameworks.
- There is a growing amount of high-level programming languages that are helping to create machine learning programs while utilizing a piece of code being developed by someone else. In the programming language, it is called "libraries".
- There are also new types of AI frameworks that are helping to manage the lifecycle of training models handling versions of models.
- The software industry in that perspective is transformed into more high-level programming. Things are becoming easier to develop and maintain which will help to make those advanced technologies more accessible.

Introduction to Machine Learning

Black box Metaphor

- Any machine learning solution is supposed to perform a specific task like predicting the price of real estate property or classify the type of object in a picture or maybe the ability to decide the next action in a chess game.
- Think about an ML system that can classify if the incoming e-mails are spam or not spam, meaning spam detector.
- We will have a complex email solution that is doing many things and inside that solution will be some ML classifier as a small module that is working with other modules in this larger email system.
- On one side, we feed that box input data meaning emails there is a brain representing the knowledge encapsulated inside that is taking the input and produce the output.

Features and Labels

- A single feature represent a specific input variable.
- The features that can be used as input to such ML system can be the size, number of bedrooms, street, area, overall condition and so on.
- Another example will be an e-mail spam detector and in that case the features of such ML system can be the content of the e-mail like the sender's address, the time and the hour of the day the e-mail was generated, a number of spammy words like "free" "money" and so one.
- Mathematically the list of input features will be represented as a vector with the size of N like x1, x2, x3 until Xn. In this training but it is important to mention that selecting the right features is a critical step in the process, something that is called feature selection.
- It is the thing we would like to predict or classify using the system after we trained that system. A label will be the price of real estate property as we just talked about, the identified object in a picture like this is a dog, that's a cat.
- Mathematically the label will be presented as y as a simple math equation, y equal to the function of x. Now we can describe the meaning of examples which is another key term.
- An example is a single instance of data represented by the letter x.
- There are two types of examples, labeled examples, and unlabeled examples. A labeled example includes the features which is the "x" and also the label related to such features which is "y"
- A large group of labeled examples can be used as a training dataset to train a model. If I will summarize, we have features as input to the machine learning system, a label as the expected output.
- If we have a group of data instances that are already labeled then they can be used as examples to train a model which is called a training dataset.

Training a Model

- A training data set is a large group of labeled examples. A machine-learning system is going to learn patterns inside the training data set and stored that knowledge in something that is called a model.
- This model is supposed to define as close as possible the relationship between features and the target label. In a common type of machine learning method called "supervised learning" the way to create this kind of model is based on analyzing a large group of labeled examples.

- Once we have trained our model with those labeled examples, we can use that trained model to predict the label on unlabeled examples.
- When looking at the lifecycle of a model in a machine learning system, we have two main phases the "training phase" also called the "learning phase" which means creating the model.
- The main idea is to utilize or use some learning algorithms that will build the model using the training data set.
- So the next phase or the next stage of a model is called "inference". In machine learning inference means applying the trained model in an actual machine learning system working in a production environment for making ongoing predictions.
- It is also important to mention that this inference represents a specific snapshot of the trained model.
- In many practical machine learning use cases, the system will keep training new and better models all the time using new data and in some time interval it will replace an existing inference with a new one.
- The inference stage which is the actual prediction or classification is done on the device level. Another option is to perform the inference stage in the centralized data center.

Aiming for Generalization

- Training a model is not an easy task.
- The challenge is to make the model more generic, making sure it is performing well on unseen data.
- Optimization -It's a process of adjusting a model, step by step to get the best performance on the training data set.
- Generalization- the objective of the machine learning system is to be able to make good prediction on data it has never seen before.
- A well-generalized model is a model where the patterned learned from the examples provided in the training data set can be successfully used also on new unseen data instances. That's the whole objective of any machine learning solution, to make a good prediction or new data not on the training data set.
- there are two main challenges : Those challenges are called "under-fitting" and "over-fitting".
- under-fitting - refers to a situation that the trained model is not working well on the training data and of course cannot generalize to new data. The trained model didn't capture the underlying structure of the data.
- what are the main reasons for under-fitting.
- The first one is that the model is probably too simple and we need to build a more complex model that can better learn the underlying structure of the data.
- The second reason for under-fitting is that the training data set is not good enough.
- On the other hand, under-fitting is also a standard transition phase of any training model.
- During the training process, the learning algorithm will build and adjust the model while performing a certain number of iterations. At the beginning of training, the model will under-fit the training data because it is just started to model the relevant patterns and in each learning iteration the model performance should improve, again and again
- After reaching some optimum point when the algorithm is running over the data set, the model testing performance will start to degrade. Which means the model is starting to over-

fit the training data learning patterns that are too specific to the training data and will be irrelevant to new data.

- Over-fitting is a very common situation when training models. It means that the trained model we created performs very well on the training data but it does not generalized well to new data. The model is not performing well on new data.
- Over-fitting which is a more complex problem is when the training model we created perform very well on the training data but it does not generalize well to new data. The model is not performing well on new data.
- It will be a large sample size that will resemble as good as possible the true distribution of the data.
- This is the key issue to remember. The training data should represent the distribution of the data as much as possible. Otherwise, it will just over fit the training data.
- The next reason it can be also too complex model. The objective of a model is to fit the data well but at the same time fit the data as simple as possible.

How can we discover such problems? How can we trust that the model will also make a good job or new data?

- Maybe it is over-fitting the training data set and it's not generalized well to new data.
- The answer is that we need to test the model performance on a separate data set to check and validate that our model is working well on new data. It is called the test data set.

Classification of ML Systems

The Degree of Supervision

- The process of learning or training which is a core concept in machine learning comes in different flavours different types of learning algorithms.
- It's a spectrum of options. Those options can be classified or grouped into the following three main categories.
- We have supervised learning, unsupervised learning and reinforcement learning.
- The selection of the most relevant category and then the best algorithm to perform the job will be based on the required objective.

Supervised Learning

- The name supervised learning originates from the idea that training a machine while using this type of approach is similar to how humans are learning under the supervision of a teacher.
- In supervised learning, we train the machines by providing them a set of examples, each provided example is a pair consisting of an input object and the desired output value for that object, It's called label data set.
- The fact that both the input and output values are known, qualify the data set as labeled. The label data means some input data is already tagged with the correct output.
- Practically speaking, in some use cases, it is the biggest challenge to get such labeled data. But this is the core prerequisite in supervised learning.
- As some preparation step, I also analyzed the list of pictures and removed some of them from the data set. Maybe some pictures are missing a label. Maybe some of them are not so clear and maybe some of them are by mistake related to different type of animal or maybe some pictures are coming with different resolutions that I need to normalize them to the same resolution baseline. It is called "cleaning the data" and practically speaking in some cases this process would require substantial time and effort.
- Finally, when the data is ready, cleaned and normalized, a supervised learning algorithm will analyze the training data set while trying to decode the relationships between input and output. What kind of patterns can be found to transform the input into output while looking at all provided examples. It's like the concept of reverse engineering, the algorithm will search what kind of steps are needed to reach from the input and output. And finally, it will produce a trained model that can be used for mapping new input into predicted output.
- "X" is the input into the machine which can be a group of values as we talked about they can also be called "features". "Y" is the output of that machine, the target value.
- The functions with the input x is basically some mathematical transformation function or mapping function discovered by the algorithm doing the training process. Machines are very good at optimizing functions under some constraints.
- The learning algorithm will use the labeled data set to find the optimal parameters for that transformation function.
- The aim or target of a supervised learning algorithm is to find the best mapping function, "f", that will be used to map the input variable X with the output valuable y based on the training data.
- There are two very typical tasks that are performed using supervised learning, the first one is called classification and the second one is called regression.

Classification

- Think about an e-mail service.
- How the system can identify which email is a spam or a regular legitimate email? This is a classical use case of classification. The machine learning solution to be implemented in such email service should automatically classify if a new email is a spam or not. We can't even imagine our life today without using such features in any e-mail system, this type of classification is also called binary classification meaning only two options,two classes.
- During the training phase, the classification algorithm will be given labeled data points with e-mails that are both spam and not spam. Using this information it will create a model with a mapping function, moving from X to Y. Then when provided with an unseen new email the model will use this mapping function to determine whether or not the e-mail is spam.
- We can build a binary classifier or multi-class classifier using shallow learning or using deep learning algorithms. one of the common classification algorithms under the shallow learning category is **called Support Vector Machines (SVM).**
- SVM - support vector machine is an algorithm to create such type of classifier as points in space that are mapped into separate domains.
- One feature is the weight, and another one is the height. In addition, each person can be classified as a "male" or a "female". So this is a binary classification task. Now, that group of data points can be placed in two dimensional space. x1 and x2. The weight and height like you can see here.
- It is better to find a line that represents the largest separation or margin between those classes. The job of the Support Vector Machine algorithm is to search for this optimal line or better call it hyper plane, because in two dimensions it's a line and it's going to be a plane in three dimensions.
- In our example, this line should break those points into two groups, two classes and it is basically a simple math formula. It will find a line that has the maximum margin, meaning the maximum distance between data points of both classes.

Regression

- It is a very straightforward method to predict a continuous number based on historical data.
- A price is an example of a continuous number. A continuous number can be an age of a person or product weight, some score in an exam, income of a person, annual company revenue and many more. On the other hand, gender is not really a continuous number, it's a group of possible options like a female or male. So we will handle it using classification as we saw earlier. To be able to predict a continuous number, one of the most relevant types of algorithms is based on regression.
- Regression is a set of statistical methods for estimating the strength of the relationship between a dependent variable and one or more independent variables. Such relationships can be linear or nonlinear. The most common form of regression analysis is linear regression but there are also different types of regression algorithms for example logistic regression and polynomial regression.
- Linear regression algorithms learns a model which is a linear combination of features coming from the input examples, there is a depended variable labeled Y which we would like to predict and independent group of variables labeled x1, x2 and so forth. These are the predictors. Y is basically a function of X variables and the regression model is a linear approximation of these functions.

- The algorithm will search for the best fit linear line for finding "w" and "b", where "w" is the slope of the line describing how strong is the linear relationship between X and Y and "b" is the intersection with the Y axe describing the error in that model.

Now, how the algorithm will know that this is the best line?

Well, it is using something that is called "cost function". It will take any available point and measure the distance between the actual point that we have in the data set and the points over the line. The line that the algorithm created as a model. The distance represents the error in the model. In linear regression, the cost function is called MSE, which is basically the average of squared errors between the predicted values and the actual values. So the goal is to reduce this error of course but taking into account not just one point, we need to take into account all available points in the training dataset.

UnSupervised Learning

- the vast majority of available data in many application, in many industry use cases is usually unlabeled. We know the input feature X but we don't have the labels Y to train our model.
- unlabeled - buy a labeled dataset or label it manually
- Unsupervised learning is learning without a teacher supervising the learning process. The goal is to identify automatically meaningful patterns in unlabeled data
- Unsupervised learning is used for two main fundamental tasks and the first one is called clustering and the second one is called dimension reduction.
- Clustering is about summarizing and grouping similar instances together into clusters. It is helping to find a small number of attributes that will represent the patterns in the data and by doing that uncover the underlying structure of the data set. Clustering as a method is widely used for the search engines, customer segmentation methods, image segmentation, simple data analysis and more.
- The second type of task is called dimension reduction which is about reducing the complexity of the input data. This method under unsupervised learning is sometimes used to pre-process the input data and compress it before feeding into a supervised learning algorithm.

Clustering

- Clustering is the task of identifying similar instances with shared attributes in a data set and group them together into clusters, grouping a set of objects in such a way that objects in the same group are more similar to each other than those in other groups.
- The output of the algorithm will be a set of labels assigning each data point to one of the identified clusters.
- So after clustering, each cluster is assigned a unique number called this cluster-ID and each data point or instance will be assigned to one cluster-ID.
- Customer segmentation - A clustering algorithm can identify subsegments of the whole market where a particular type of product is very successful in helping to design a focused market message to that specific segment.
- Another interesting use case is called anomaly detection or outlier detection. For example, the scenario that you need to detect defects in a manufacturing process of some product. So that will be all kinds of sensors that are measuring different physical characteristics of the products. And then you can run such clustering algorithms to find data points that are too far from the centre of a specific cluster.

- **Semi-supervised learning** - This is a method that is sitting between supervised learning and unsupervised learning. The idea here is that we can run a clustering algorithm on an unlabeled data set that will create few clusters as labels okay like cluster number one number two etc. Then I will get a very small amount of clusters that I can manually label like this cluster is red, this cluster is blue, this cluster is green or whatever criteria that I would like to use. And then I can propagate those labels to all the instances in the same cluster. And now suddenly I have labeled data set that can be used for training a model in supervised learning

Dimension Reduction

- While using some classification or prediction algorithm, one big challenge to handle is the number of input features that the algorithm needs to analyze.
- More features, more dimensions will require much more processing time, more computing resources like memory, storage, networking and sometimes many of those features are correlated to each other and therefore redundant for the algorithm.
- They can be used for reducing the number of variables under consideration helping to simplify the data without losing too much information. This is a common pre-processing step for prediction and classification tasks.

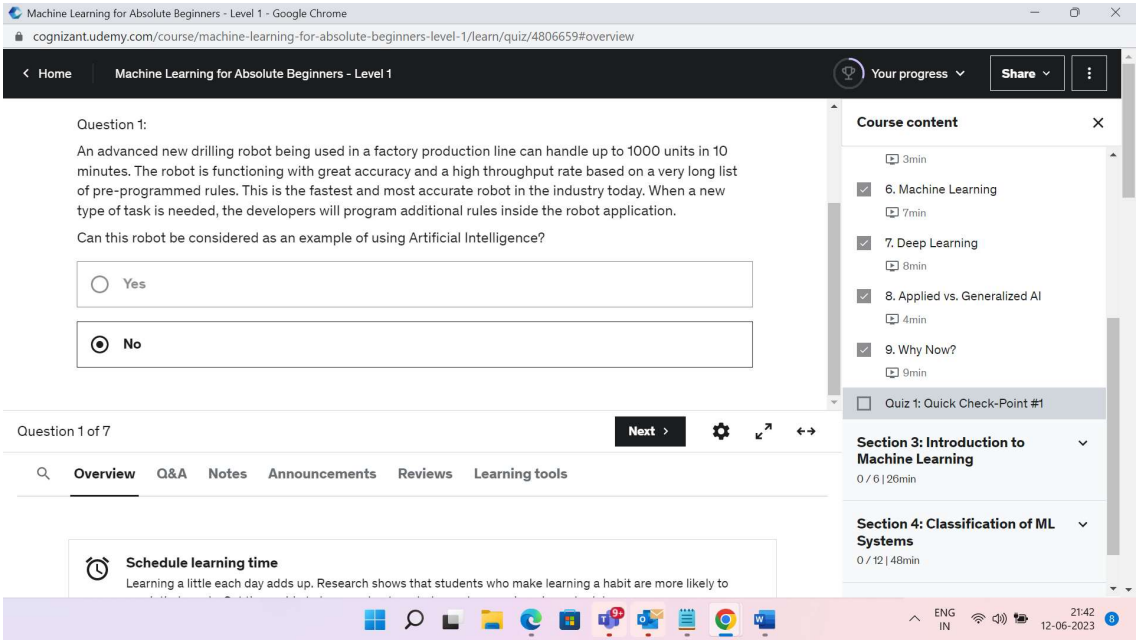
Reinforcement Learning

- it is completely different approach compared to supervised or unsupervised learning. In reinforcement learning we are not using a group of labeled or unlabeled examples as input to train and model.
- This method is used as a framework for decision making tasks based on goals. It can be used to perform a complex objective while performing multiple sequences of actions.
- It is widely used in building AI system for playing all kind of computer games while trying to achieve superhuman performance. It is used for teaching robots to perform tasks in dynamic environment or building real time recommendation system for web sites and much more.
- It is a dynamic environment. To make it even more complicated, sometimes the results of actions are delayed. We decided to play a game in some strategy and only later during the game we will know if we have done a good decision or not. The feedback is delayed and it is sometimes difficult to understand which actions lead to which outcome of multiple steps. This type of task that involves some level of bi-directional interaction between the machine and the environment is not easily fitting into what we talked so far under supervised or unsupervised learning.
- The concept of reinforcement learning is very similar to the way humans and other animals are learning and some of the algorithms being used using reinforcement learning were inspired by biological learning systems.
- We learned during our life are based on such a continuous feedback loop, based on actual experience. Think about how you learned to drive a car. We can't learn how to drive only by reading a user guide.

Decision Making Agent

- Reinforcement learning is a method being used to let machines learn how to behave based on interaction with the environment while focusing on some end goal. We need to define this end goal like winning a chess game. But we don't need to tell the machines which actions to take, those machines must discover which action will help to achieve the goal.

- The visual way to describe a system that is using reinforcement learning is by using two building blocks, a learning agent which represents the machine and the outside environment.
- This learning agent must be able to sense the state of the environment to some level and be able to make actions that can influence the state of the environment.
- To be clear, this agent is not necessarily a physically fully functional robot or something like that, the agent can be some subcomponent in a larger system or some software module. As part of a sequence of interactions, the agent will decide which actions to perform on the environment.
- Those actions will, of course, change the state of the environment and then the new state will be translated to some numerical reward value that will be used as a feedback signal to the agent. The idea is that this reward signal is helping the agent to navigate and understand which actions will help to achieve the goal.
- This is like a feedback loop, helping the agent to learn from its own experience and then select the next best strategy to get the most reward overtime.
- Reinforcement learning is building a prediction model by gaining feedback from a random trial and error and leveraging the cumulative insight that it was collected from previous interactions.
- Reinforcement learning is used in applications that the machine must make a sequence of decisions and those decisions are coming with positive or negative consequences that is collected as a feedback. The feedback going back to the agent is used to learn from the experience and basically get better and better in each iteration. The cumulative knowledge on how to achieve a specific goal is reinforced again and again by experience.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Question 1:
An advanced new drilling robot being used in a factory production line can handle up to 1000 units in 10 minutes. The robot is functioning with great accuracy and a high throughput rate based on a very long list of pre-programmed rules. This is the fastest and most accurate robot in the industry today. When a new type of task is needed, the developers will program additional rules inside the robot application.
Can this robot be considered as an example of using Artificial Intelligence?
Yes
No
Question 1 of 7
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Overview
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Notes
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Reviews
Learning tools
Schedule learning time
Learning a little each day adds up. Research shows that students who make learning a habit are more likely to
Course content
3min
6. Machine Learning
7min
7. Deep Learning
8min
8. Applied vs. Generalized AI
4min
9. Why Now?
9min
Quiz 1: Quick Check-Point #1
Section 3: Introduction to Machine Learning
0 / 6 | 26min
Section 4: Classification of ML Systems
0 / 12 | 48min
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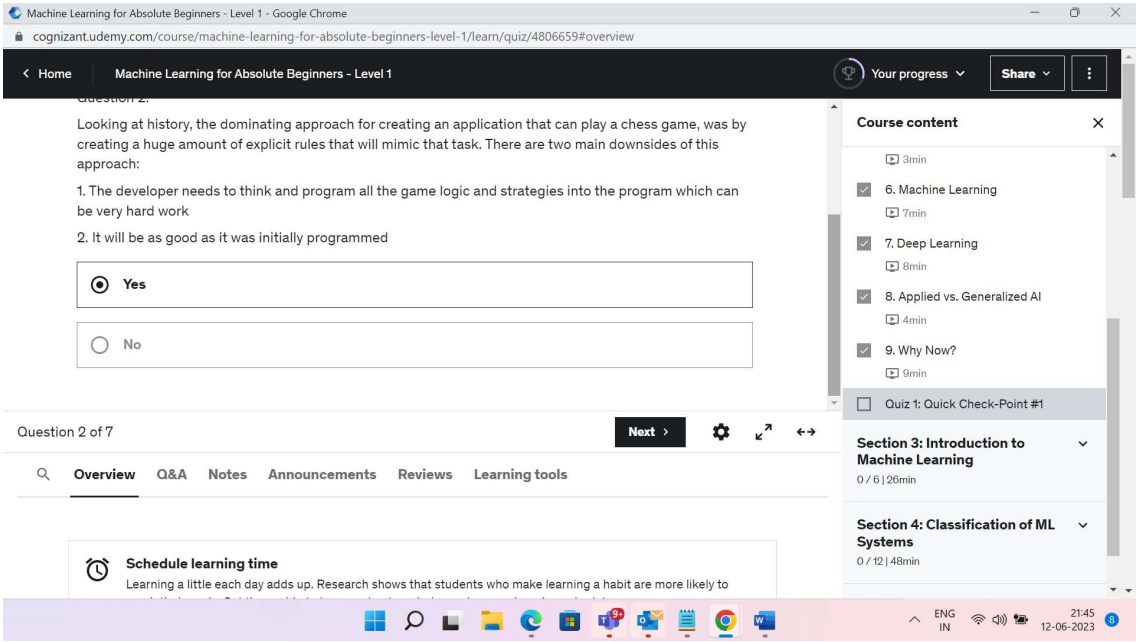
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Looking at history, the dominating approach for creating an application that can play a chess game, was by creating a huge amount of explicit rules that will mimic that task. There are two main downsides of this approach:
1. The developer needs to think and program all the game logic and strategies into the program which can be very hard work
2. It will be as good as it was initially programmed
Yes
No
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Learning tools
Schedule learning time
Learning a little each day adds up. Research shows that students who make learning a habit are more likely to
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6. Machine Learning
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7. Deep Learning
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9. Why Now?
9min
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Section 3: Introduction to Machine Learning
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Section 4: Classification of ML Systems
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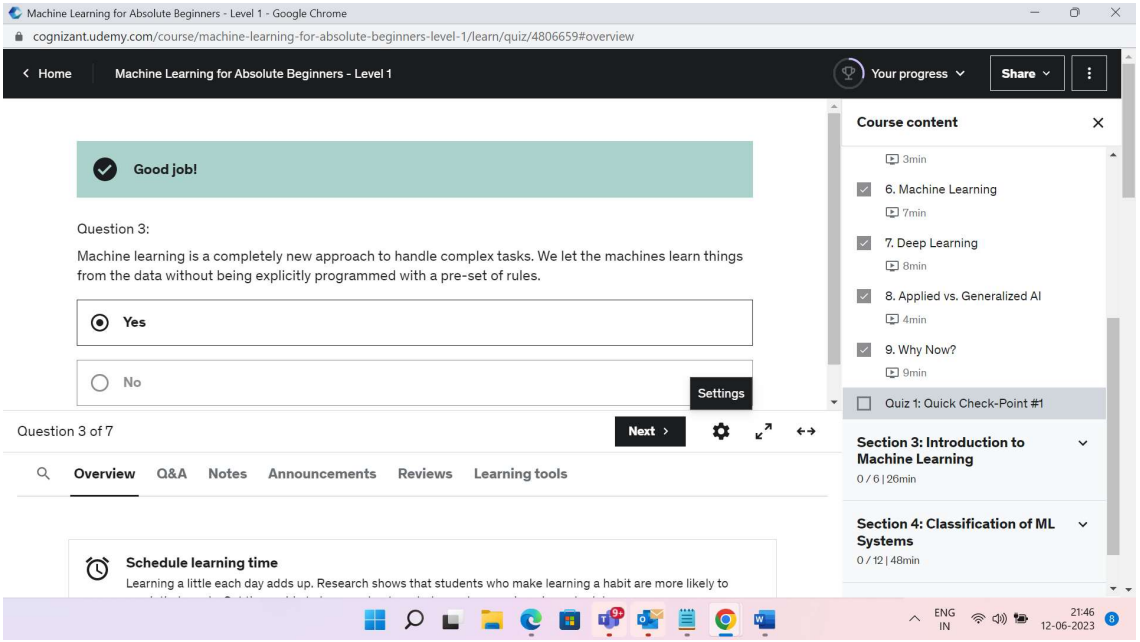
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Good job!
Question 3:
Machine learning is a completely new approach to handle complex tasks. We let the machines learn things from the data without being explicitly programmed with a pre-set of rules.
Yes
No
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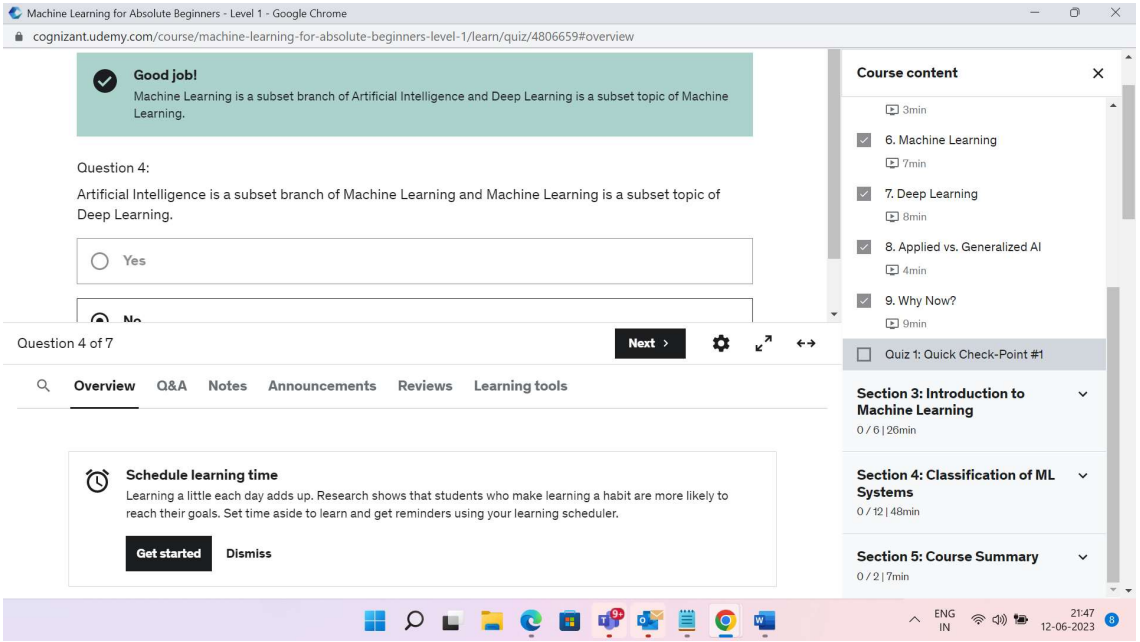
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Good job!
Machine Learning is a subset branch of Artificial Intelligence and Deep Learning is a subset topic of Machine Learning.
Question 4:
Artificial Intelligence is a subset branch of Machine Learning and Machine Learning is a subset topic of Deep Learning.
Yes
No
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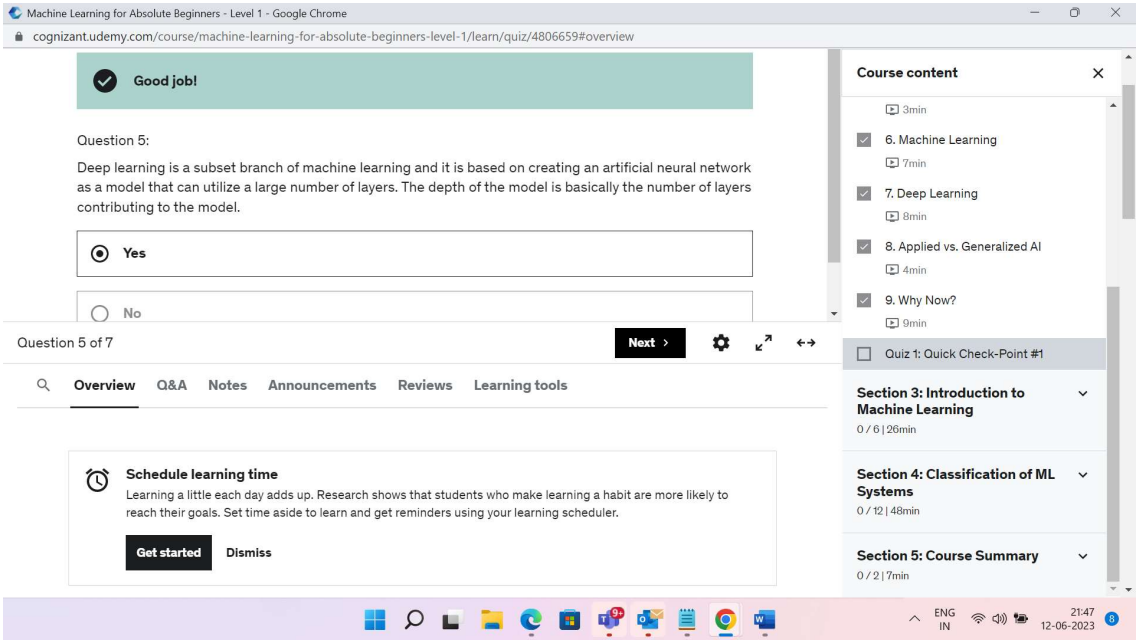
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Good job!
Question 5:
Deep learning is a subset branch of machine learning and it is based on creating an artificial neural network as a model that can utilize a large number of layers. The depth of the model is basically the number of layers contributing to the model.
Yes
No
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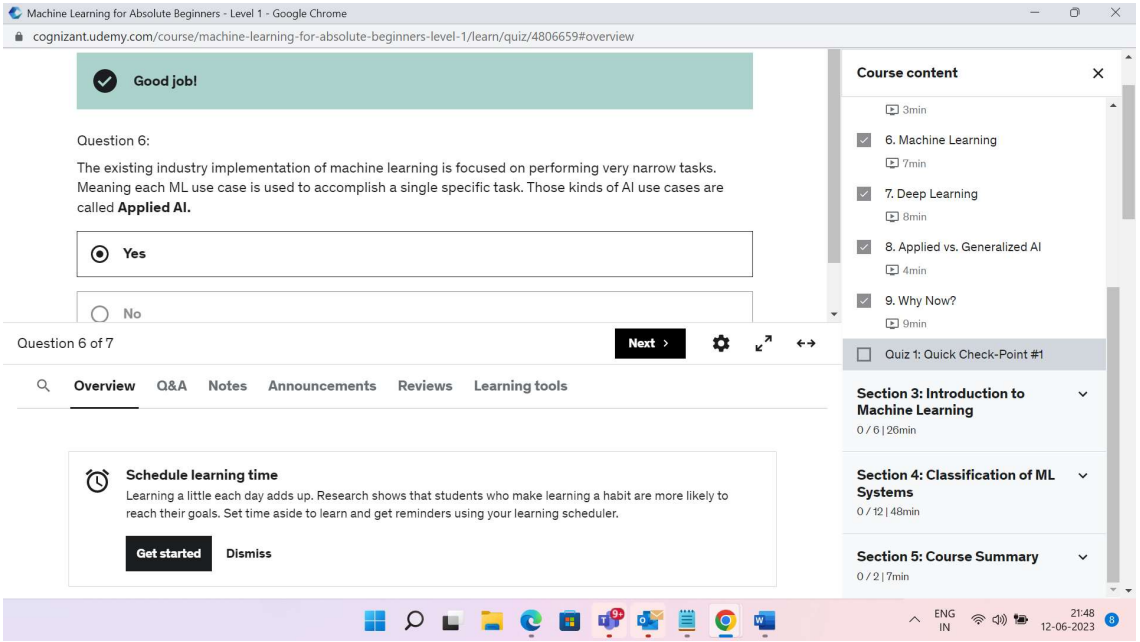
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Good job!
Question 6:
The existing industry implementation of machine learning is focused on performing very narrow tasks. Meaning each ML use case is used to accomplish a single specific task. Those kinds of AI use cases are called Applied AI.
Yes
No
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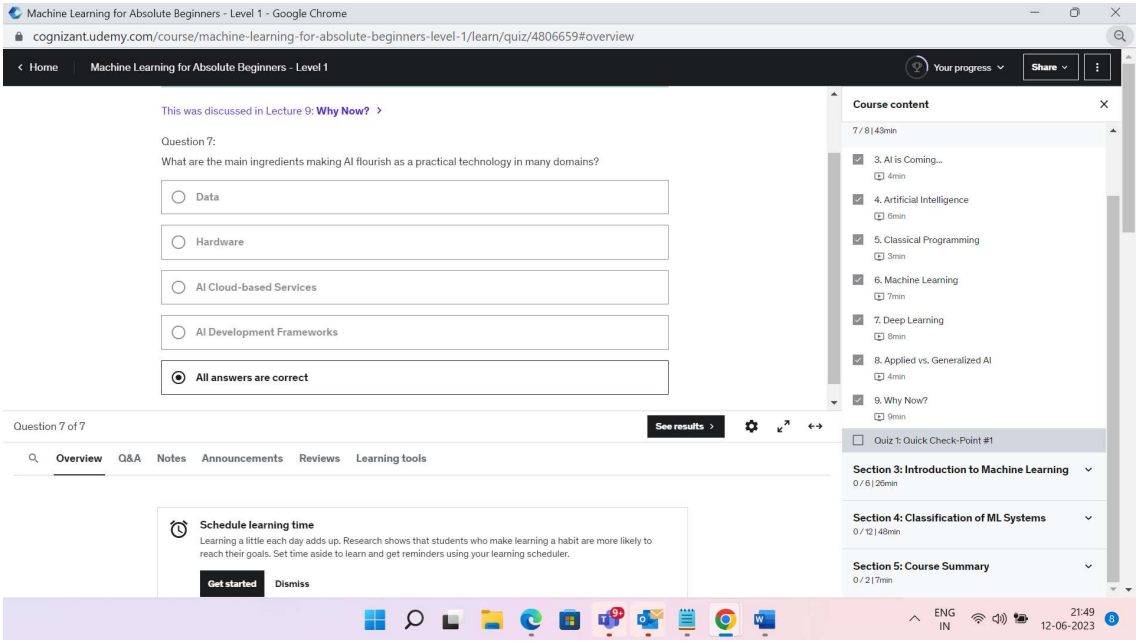
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This was discussed in Lecture 9: Why Now?
Question 7:
What are the main ingredients making AI flourish as a practical technology in many domains?
Data
Hardware
AI Cloud-based Services
AI Development Frameworks
All answers are correct
Question 7 of 7
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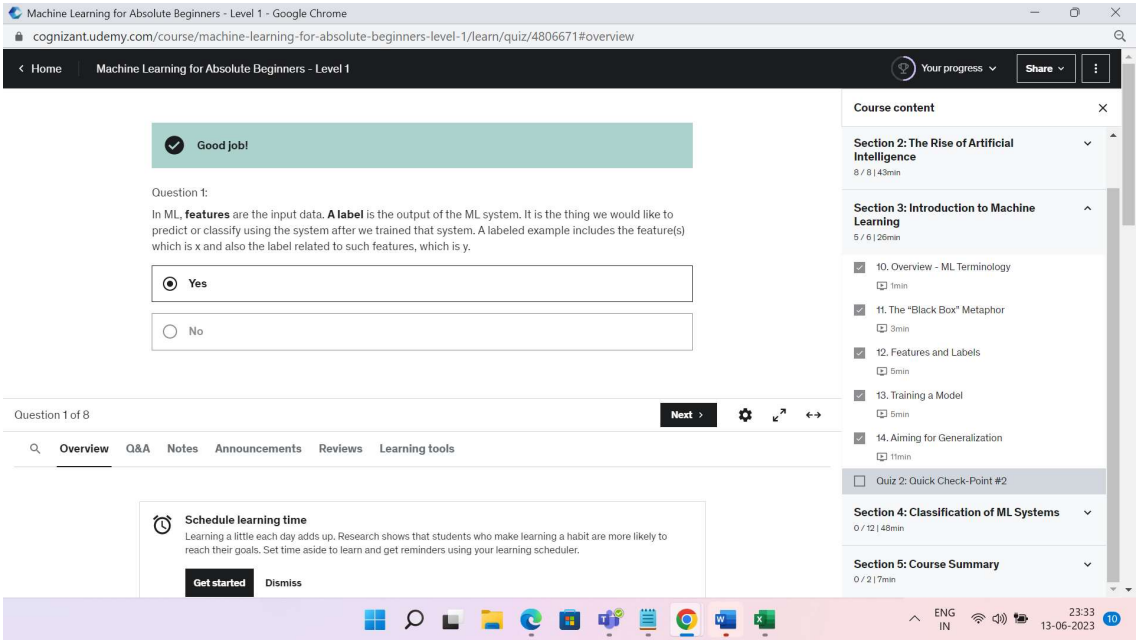
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Good job!
Question 1:
In ML, features are the input data. A label is the output of the ML system. It is the thing we would like to predict or classify using the system after we trained that system. A labeled example includes the feature(s) which is x and also the label related to such features, which is y.
Yes
No
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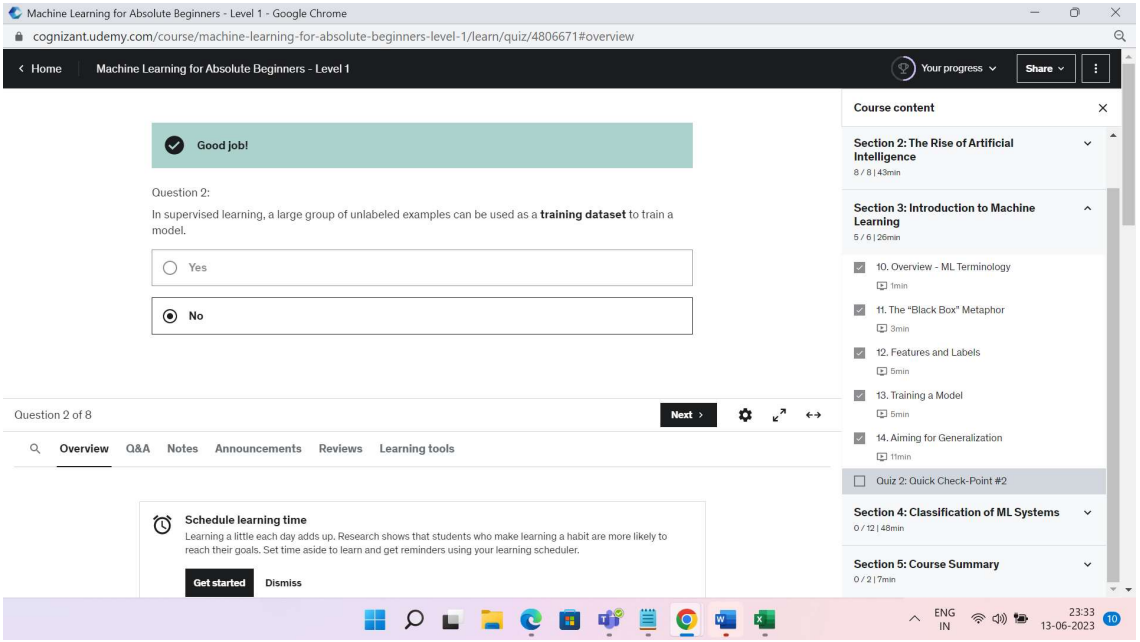
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Good job!
Question 2:
In supervised learning, a large group of unlabeled examples can be used as a training dataset to train a model.
Yes
No
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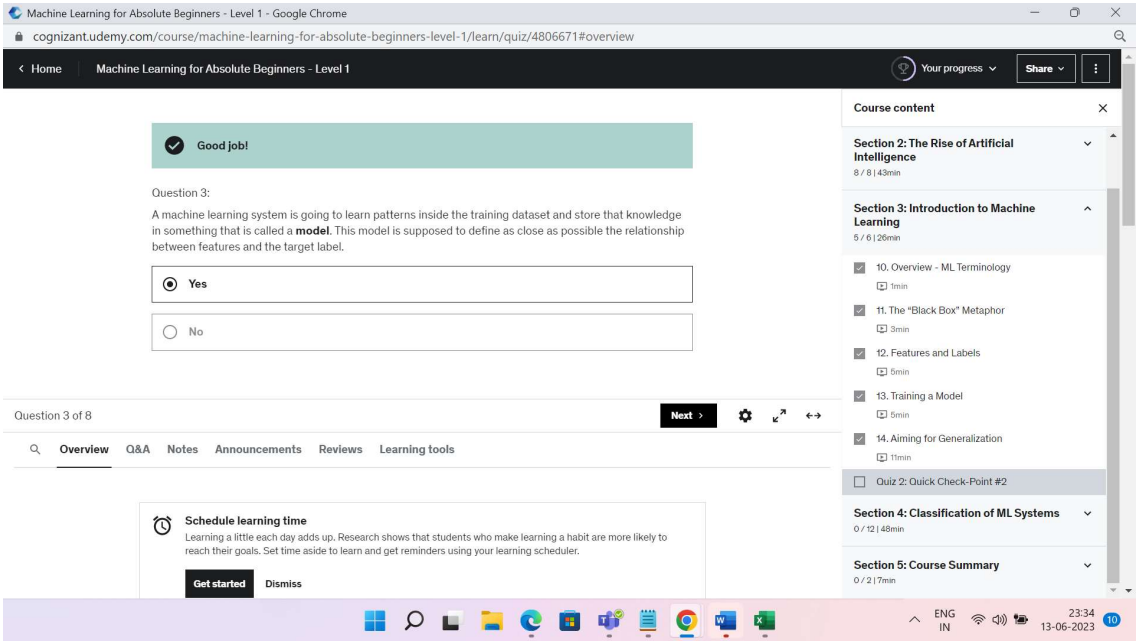
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Good job!
Question 3:
A machine learning system is going to learn patterns inside the training dataset and store that knowledge in something that is called a model. This model is supposed to define as close as possible the relationship between features and the target label.
Yes
No
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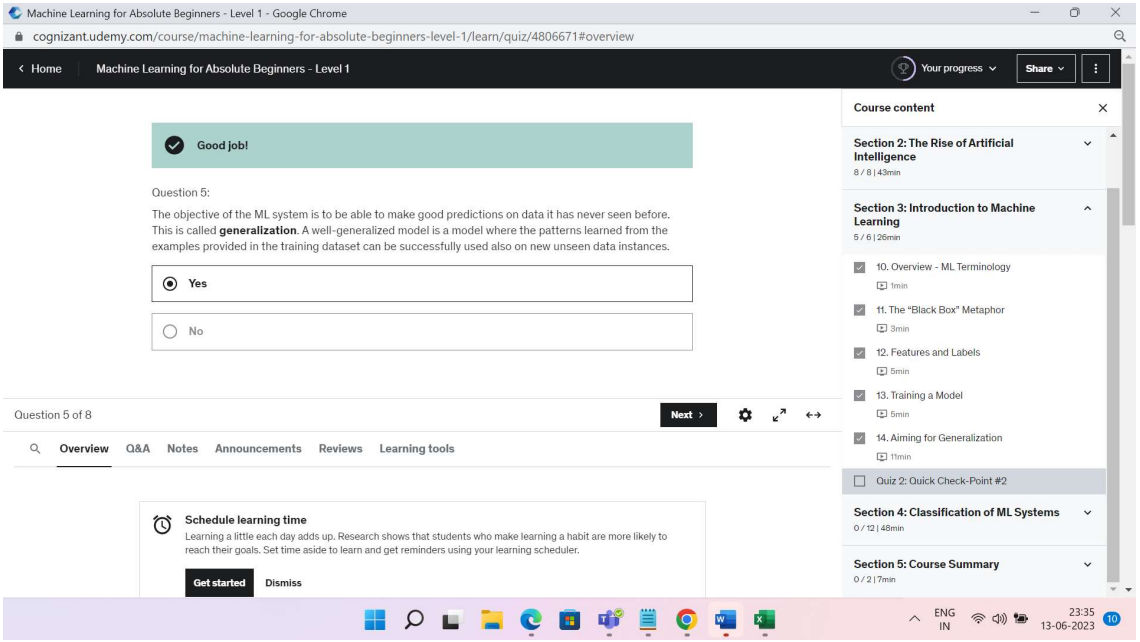
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Good job!
Question 5:
The objective of the ML system is to be able to make good predictions on data it has never seen before. This is called generalization. A well-generalized model is a model where the patterns learned from the examples provided in the training dataset can be successfully used also on new unseen data instances.
Yes
No
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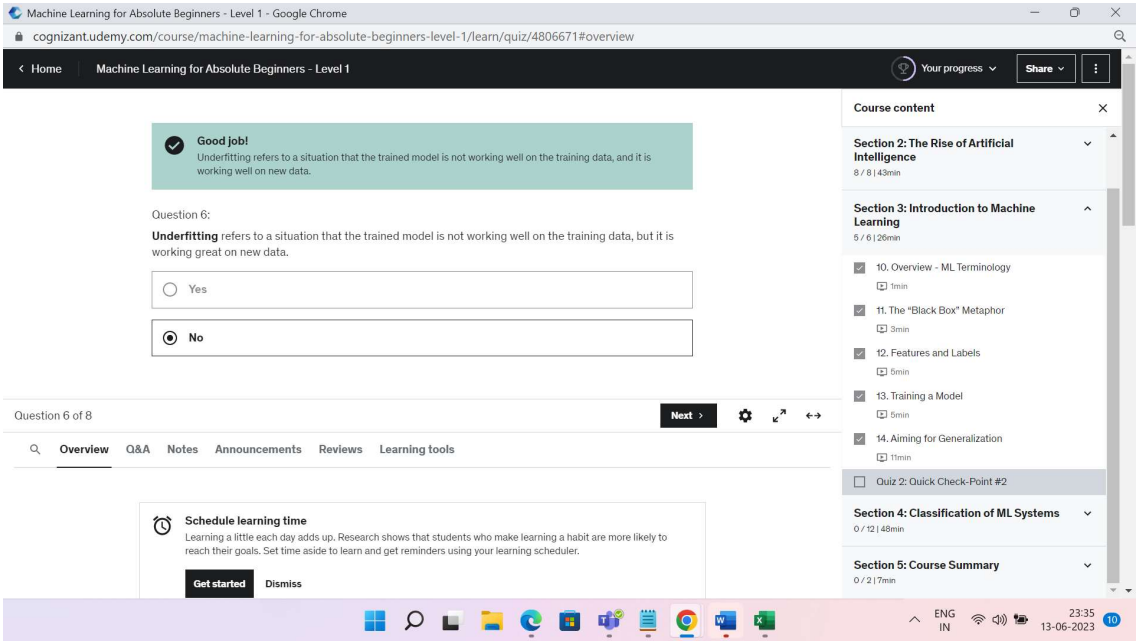
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Good job!
Underfitting refers to a situation that the trained model is not working well on the training data, and it is working well on new data.
Question 6:
Underfitting refers to a situation that the trained model is not working well on the training data, but it is working great on new data.
Yes
No
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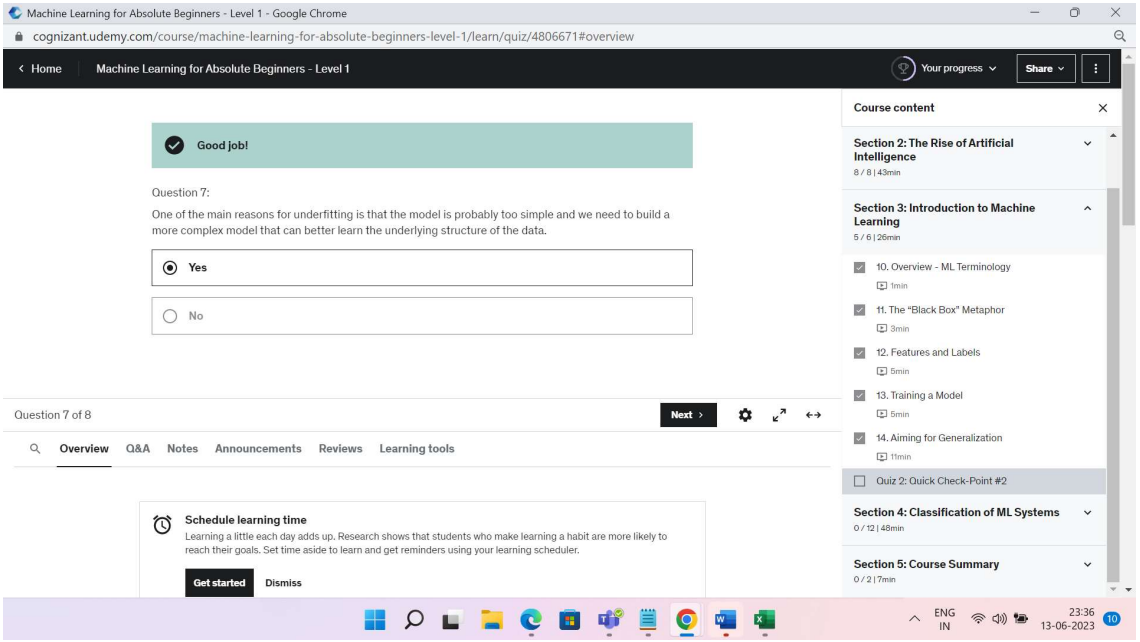
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Good job!
Question 7:
One of the main reasons for underfitting is that the model is probably too simple and we need to build a more complex model that can better learn the underlying structure of the data.
Yes
No
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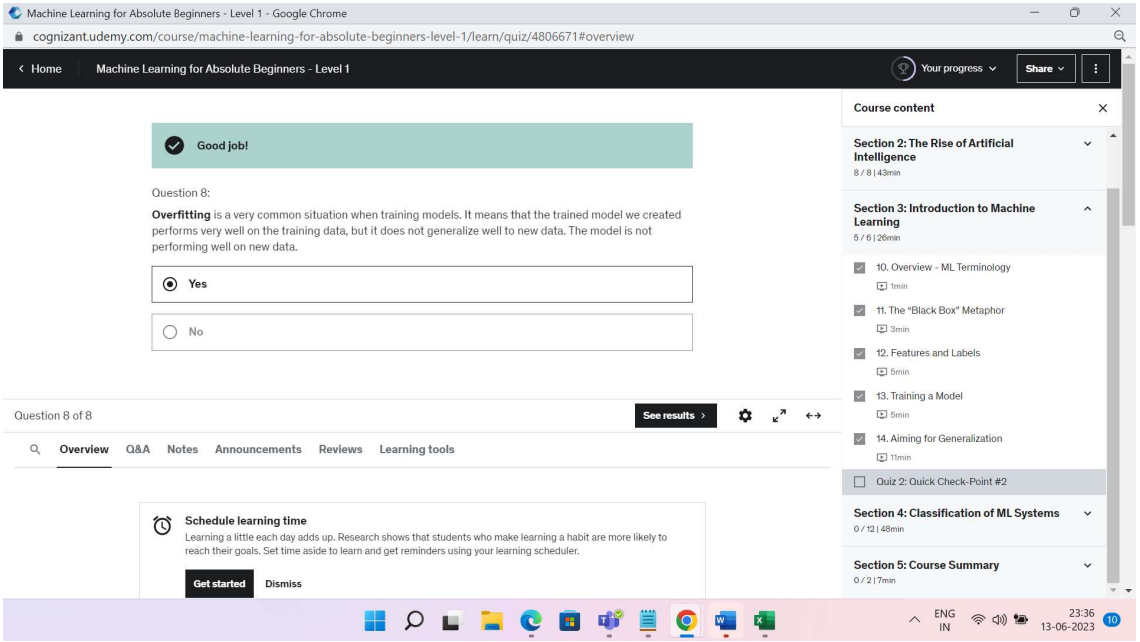
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Good job!
Question 8:
Overfitting is a very common situation when training models. It means that the trained model we created performs very well on the training data, but it does not generalize well to new data. The model is not performing well on new data.
Yes
No
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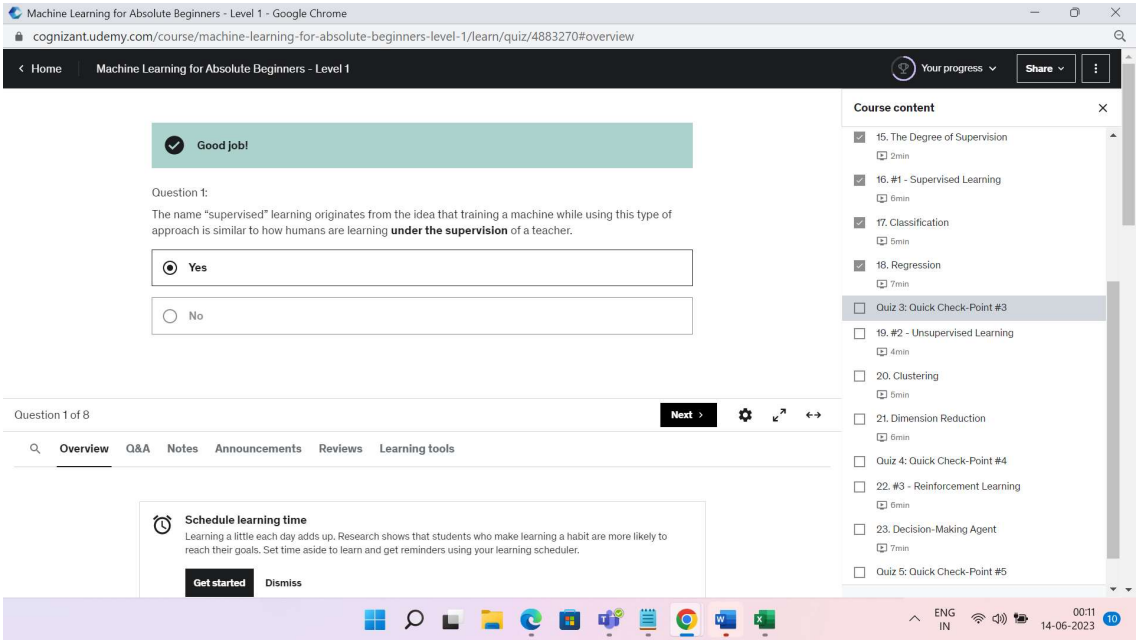
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Good job!
Question 1:
The name "supervised" learning originates from the idea that training a machine while using this type of approach is similar to how humans are learning under the supervision of a teacher.
Yes
No
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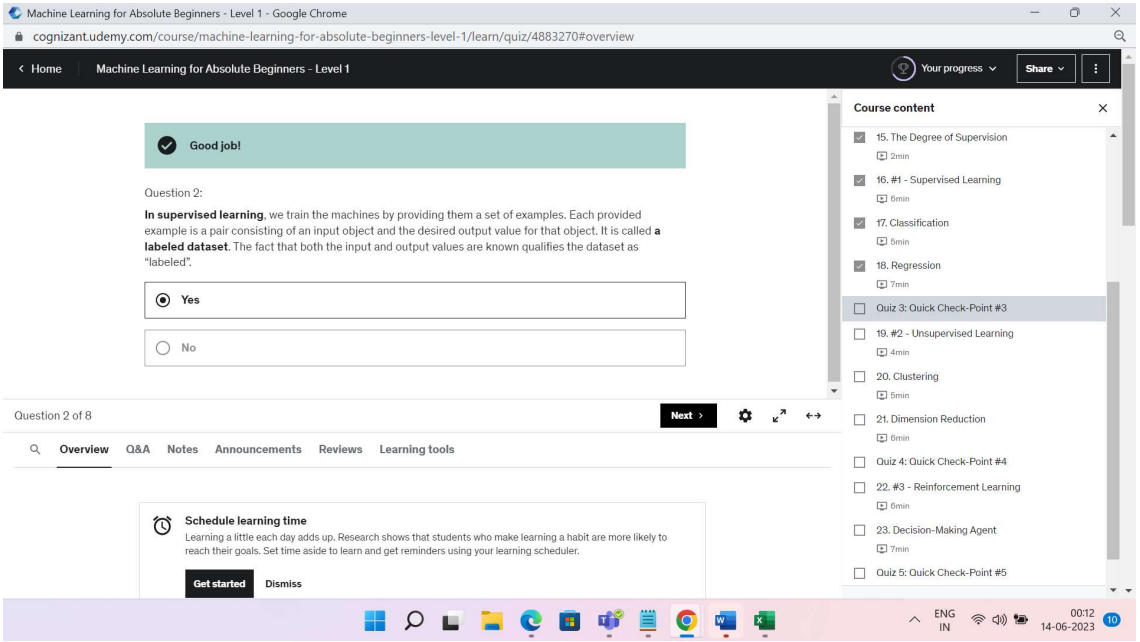
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Good job!
Question 2:
In supervised learning, we train the machines by providing them a set of examples. Each provided example is a pair consisting of an input object and the desired output value for that object. It is called a labeled dataset. The fact that both the input and output values are known qualifies the dataset as "labeled".
Yes
No
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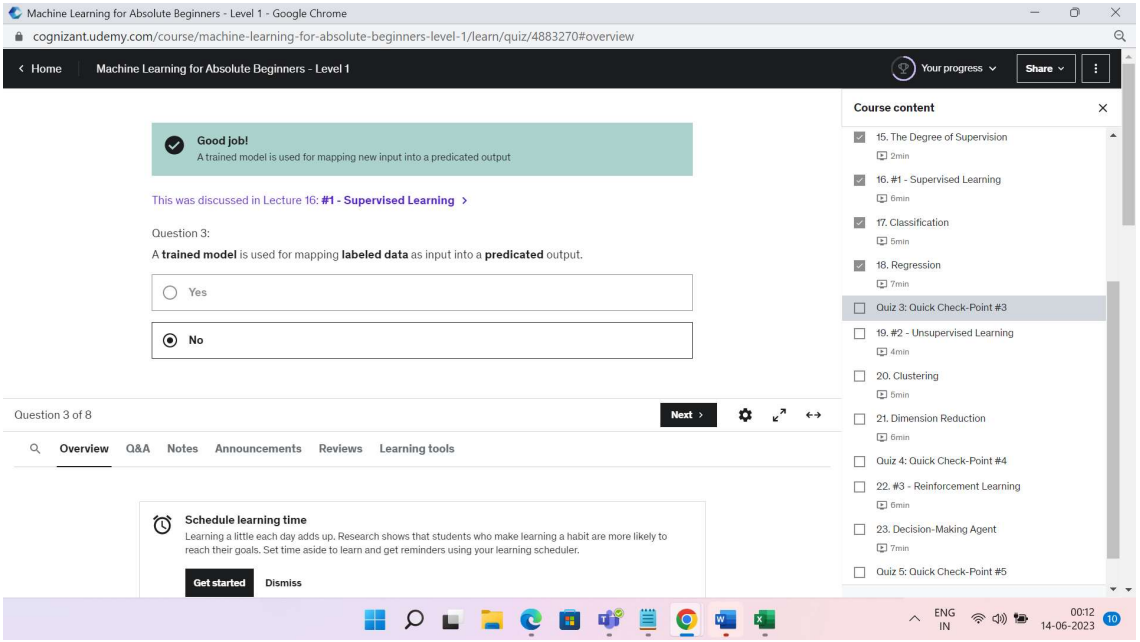
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Good job!
A trained model is used for mapping new input into a predicated output
This was discussed in Lecture 16: #1 - Supervised Learning
Question 3:
A trained model is used for mapping labeled data as input into a predicated output.
Yes
No
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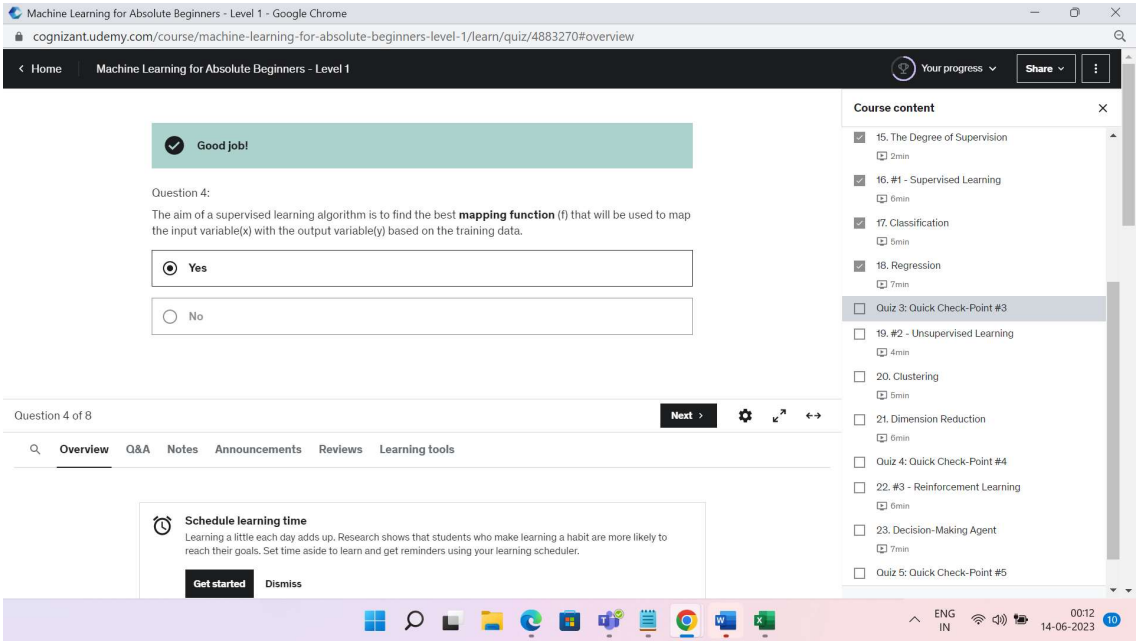
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Good job!
Question 4:
The aim of a supervised learning algorithm is to find the best mapping function (f) that will be used to map the input variable(x) with the output variable(y) based on the training data.
Yes
No
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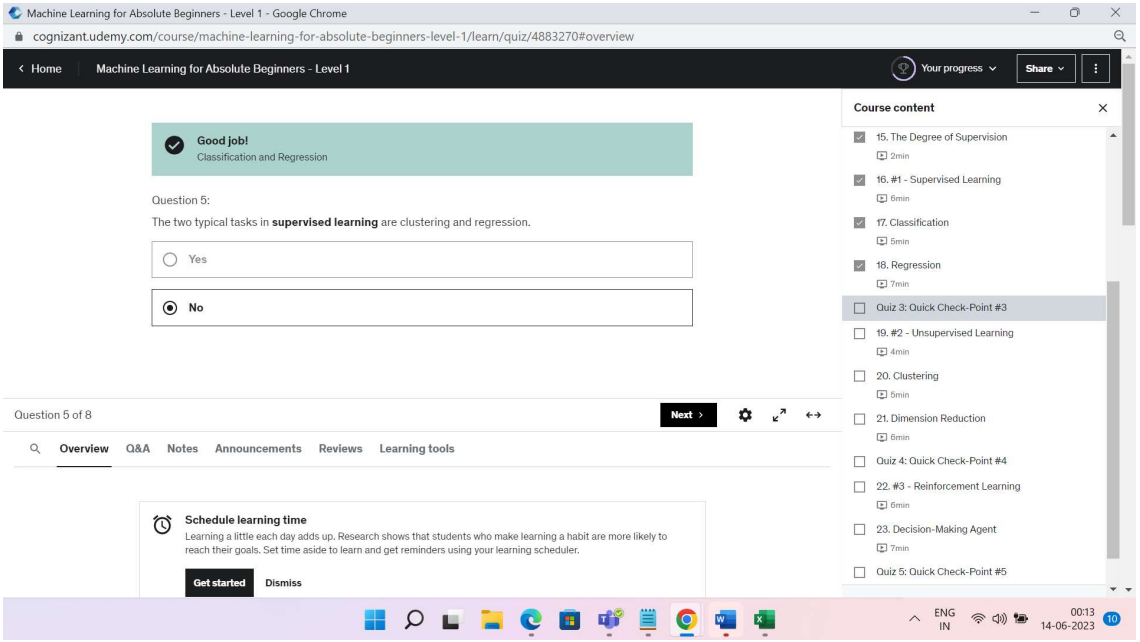
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Good job!
Classification and Regression
Question 5:
The two typical tasks in supervised learning are clustering and regression.
Yes
No
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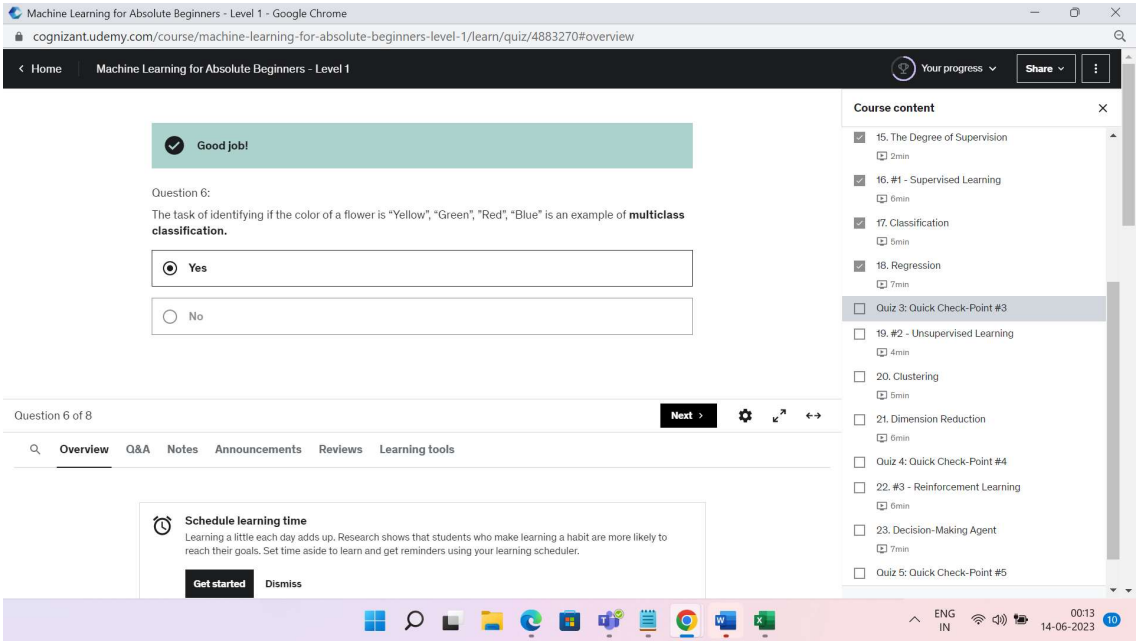
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Question 6:
The task of identifying if the color of a flower is "Yellow", "Green", "Red", "Blue" is an example of multiclass classification.
Yes
No
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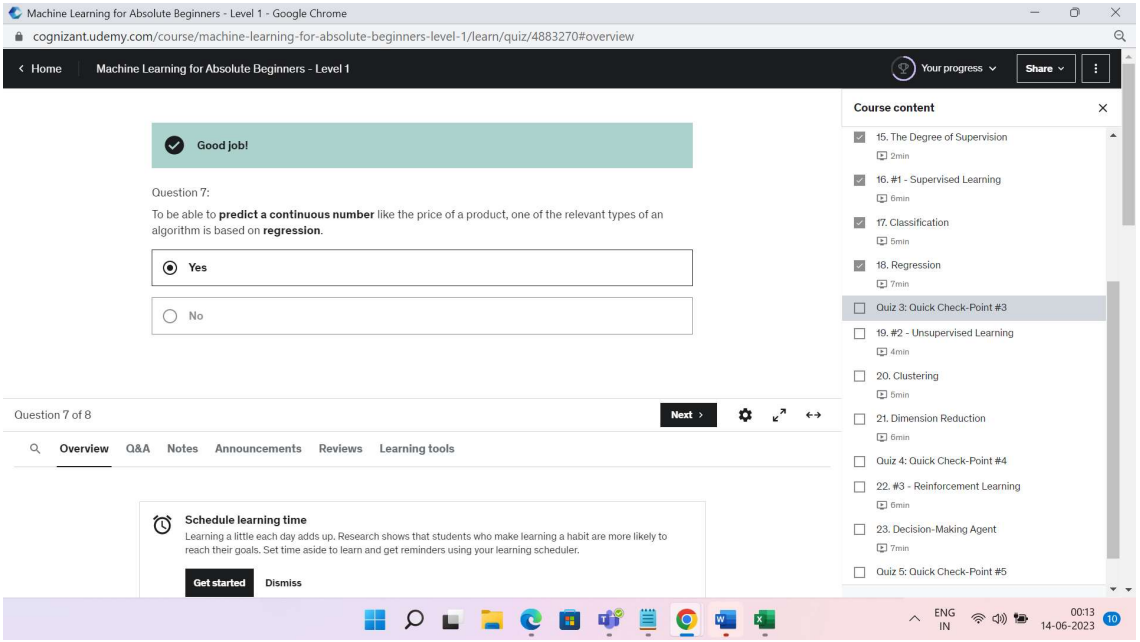
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Question 7:
To be able to predict a continuous number like the price of a product, one of the relevant types of an algorithm is based on regression.
Yes
No
Question 7 of 8
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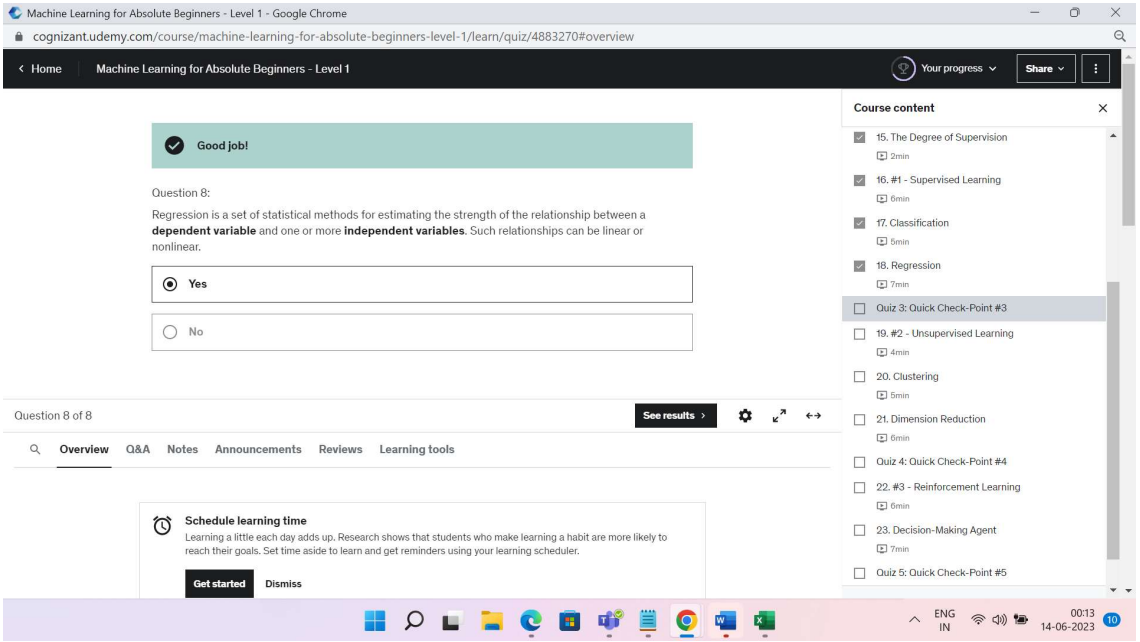
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Good job!
Question 8:
Regression is a set of statistical methods for estimating the strength of the relationship between a dependent variable and one or more independent variables. Such relationships can be linear or nonlinear.
Yes
No
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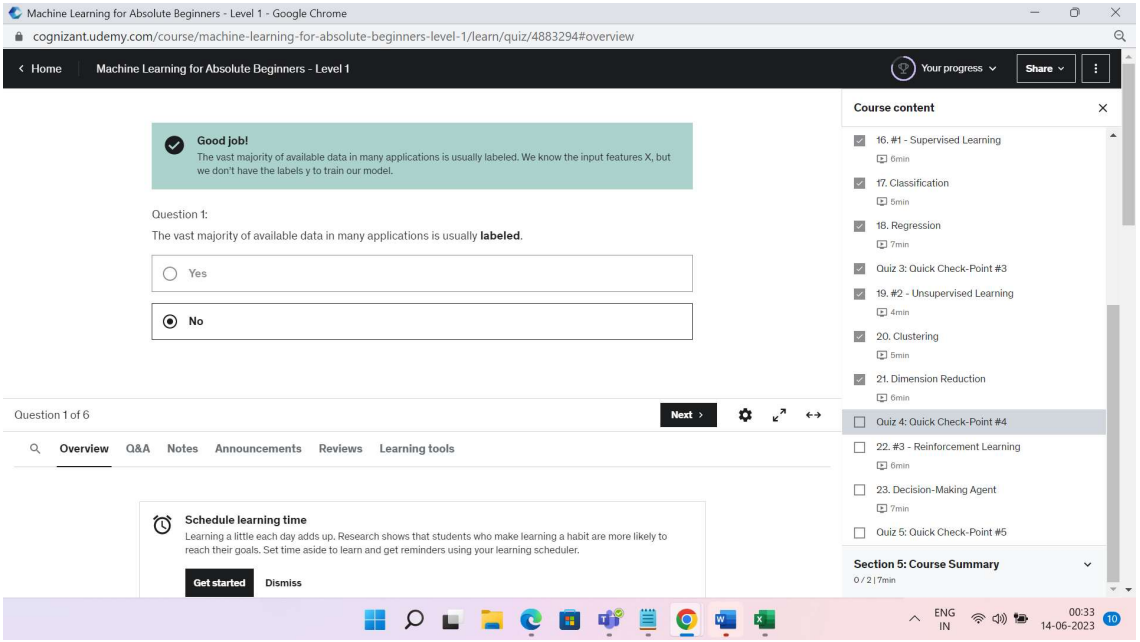
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Good job!
The vast majority of available data in many applications is usually labeled. We know the input features X, but we don't have the labels y to train our model.
Question 1:
The vast majority of available data in many applications is usually labeled.
Yes
No
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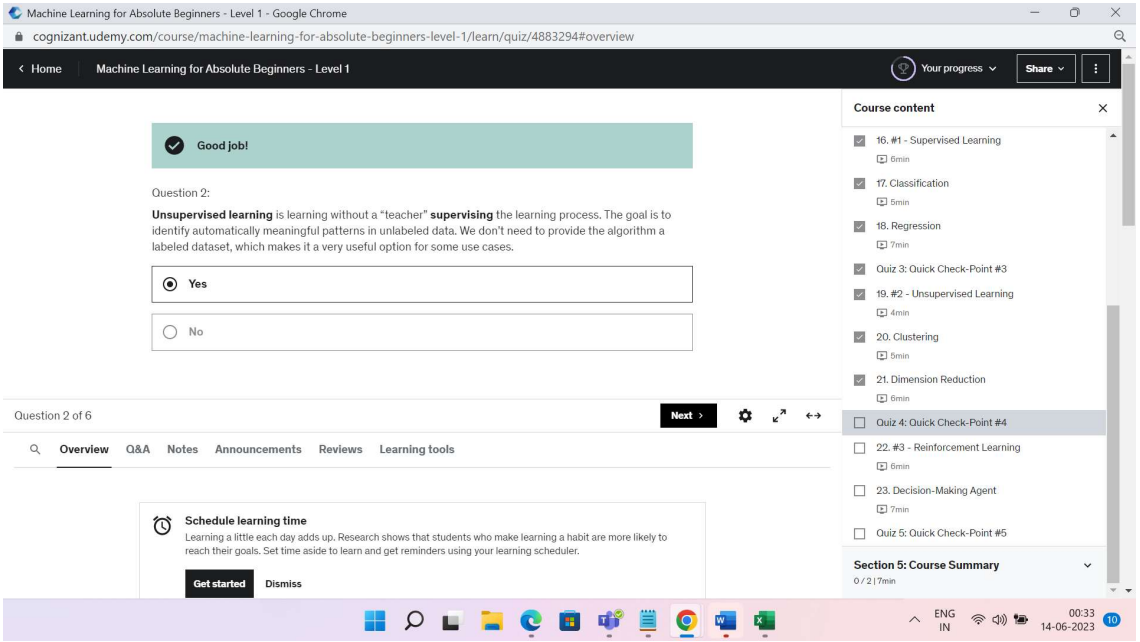
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Good job!
Question 2:
Unsupervised learning is learning without a "teacher" supervising the learning process. The goal is to identify automatically meaningful patterns in unlabeled data. We don't need to provide the algorithm a labeled dataset, which makes it a very useful option for some use cases.
Yes
No
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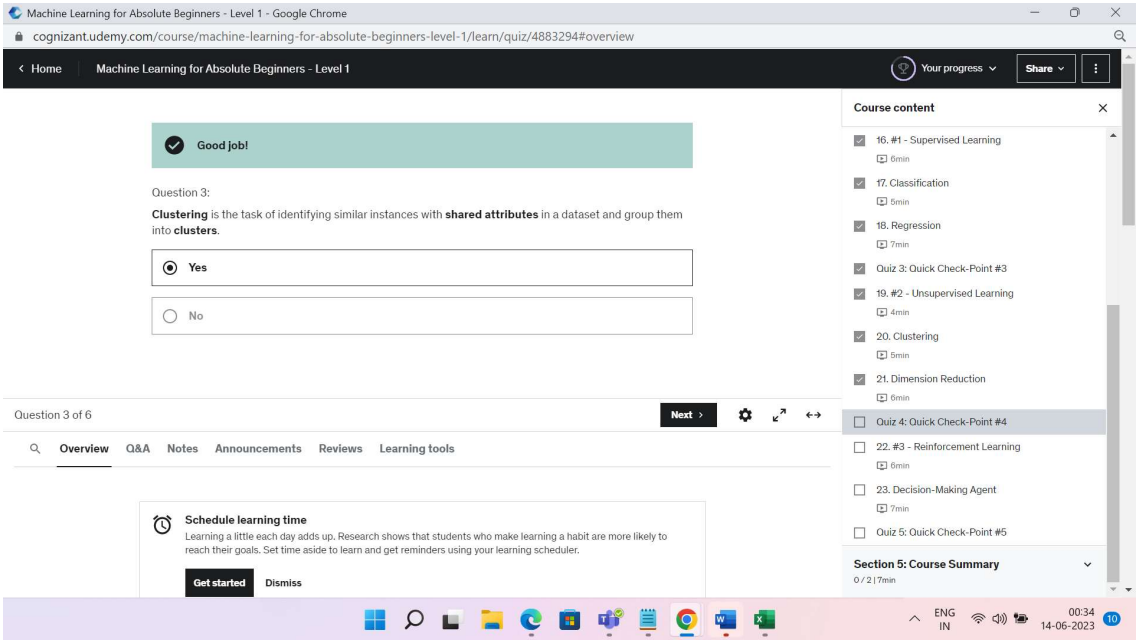
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Question 3:
Clustering is the task of identifying similar instances with shared attributes in a dataset and group them into clusters.
Yes
No
Question 3 of 6
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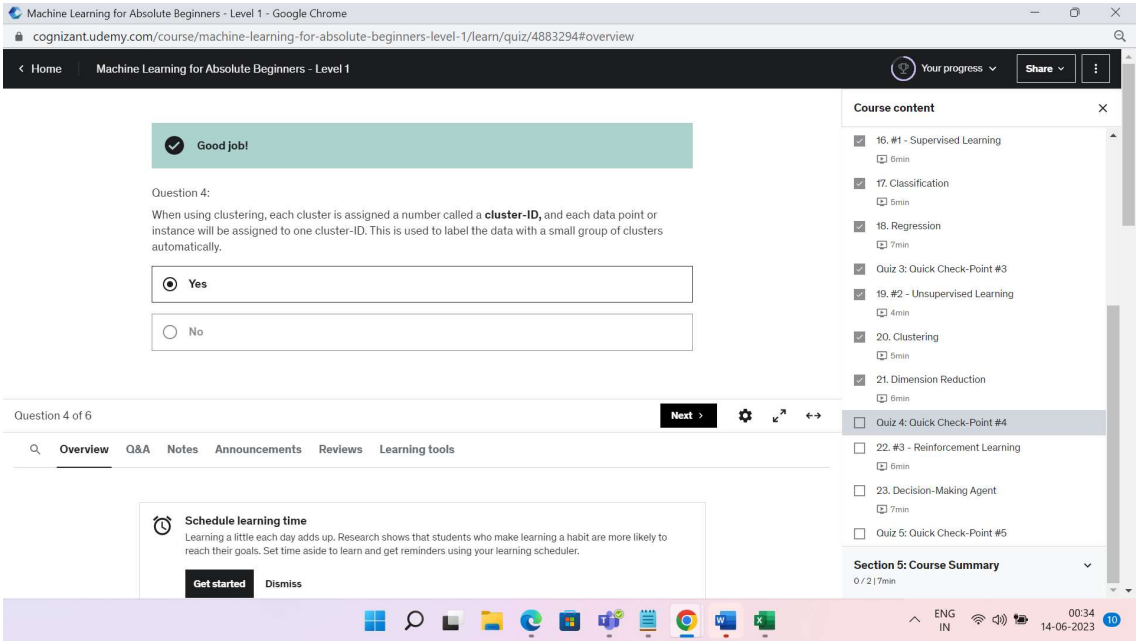
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Good job!
Question 4:
When using clustering, each cluster is assigned a number called a cluster-ID, and each data point or instance will be assigned to one cluster-ID. This is used to label the data with a small group of clusters automatically.
Yes
No
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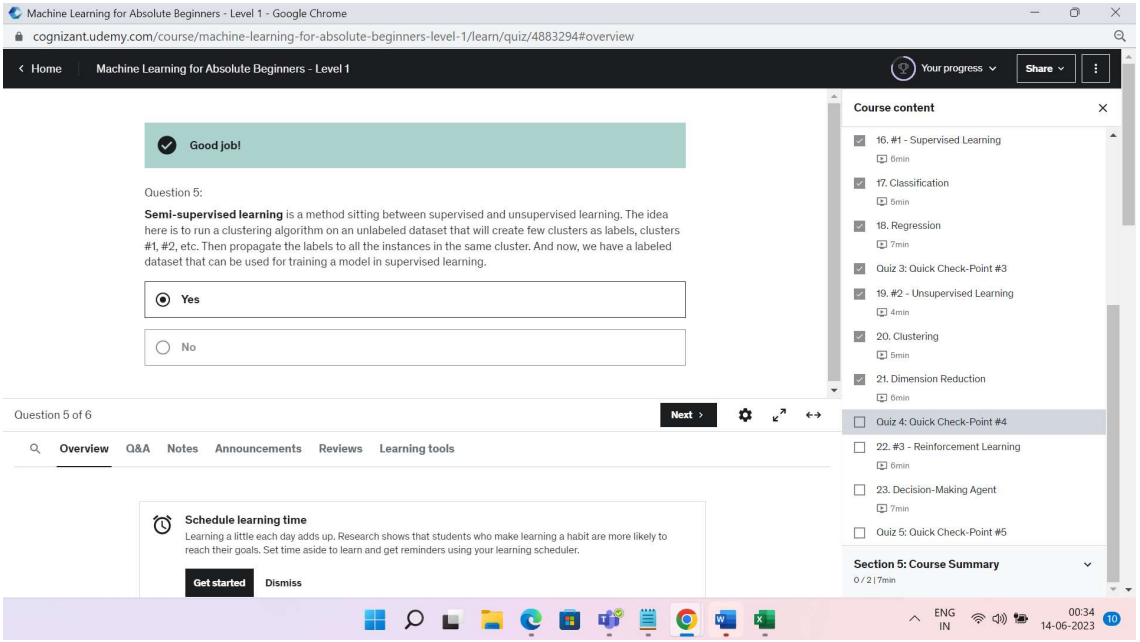
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Good job!
Question 5:
Semi-supervised learning is a method sitting between supervised and unsupervised learning. The idea here is to run a clustering algorithm on an unlabeled dataset that will create few clusters as labels, clusters #1, #2, etc. Then propagate the labels to all the instances in the same cluster. And now, we have a labeled dataset that can be used for training a model in supervised learning.
Yes
No
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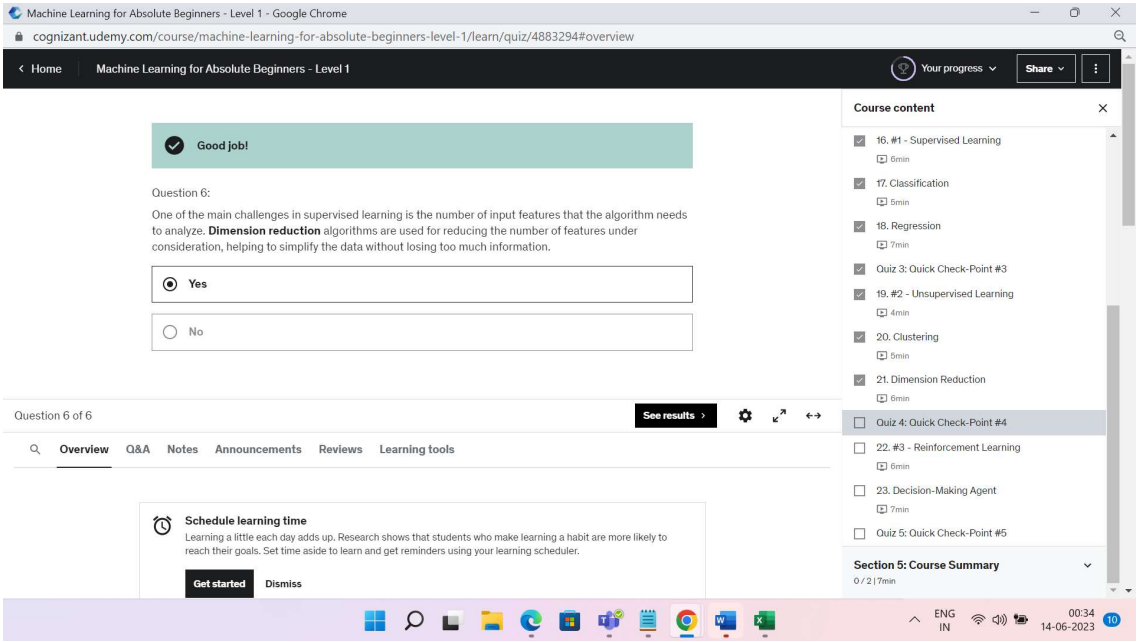
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Good job!
Question 6:
One of the main challenges in supervised learning is the number of input features that the algorithm needs to analyze. Dimension reduction algorithms are used for reducing the number of features under consideration, helping to simplify the data without losing too much information.
Yes
No
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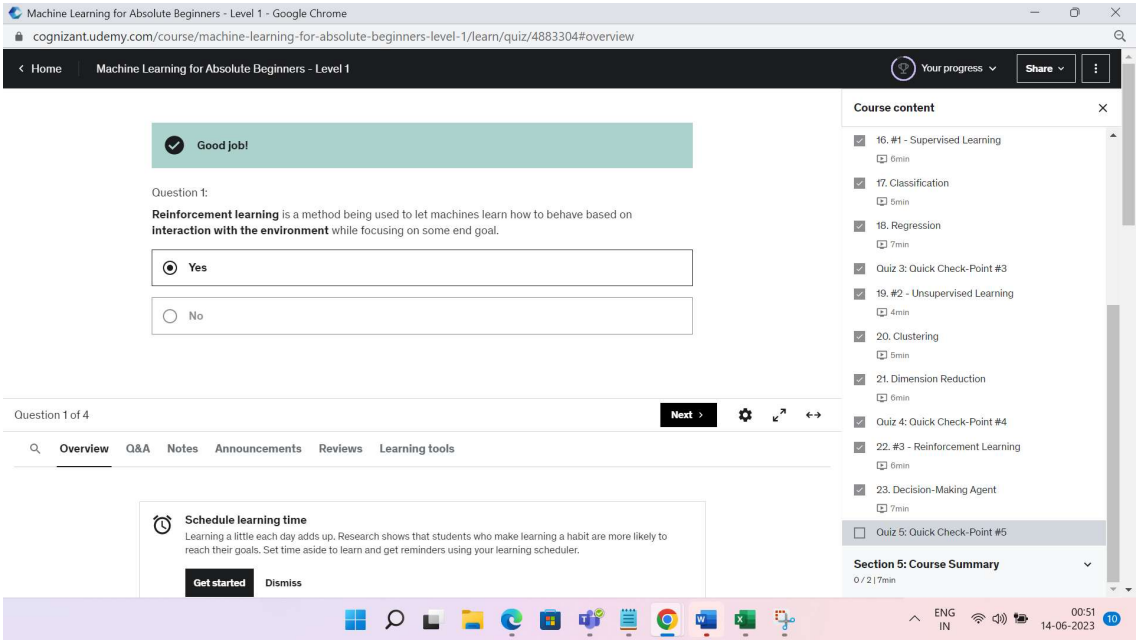
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Question 1:
Reinforcement learning is a method being used to let machines learn how to behave based on interaction with the environment while focusing on some end goal.
Yes
No
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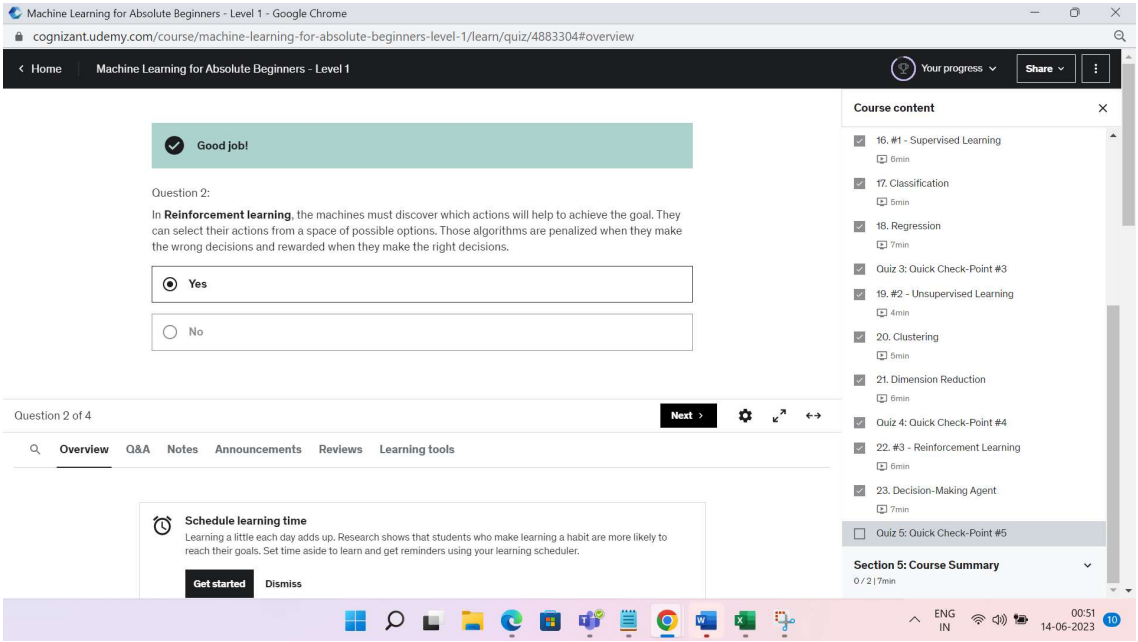
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Question 2:
In Reinforcement learning, the machines must discover which actions will help to achieve the goal. They can select their actions from a space of possible options. Those algorithms are penalized when they make the wrong decisions and rewarded when they make the right decisions.
Yes
No
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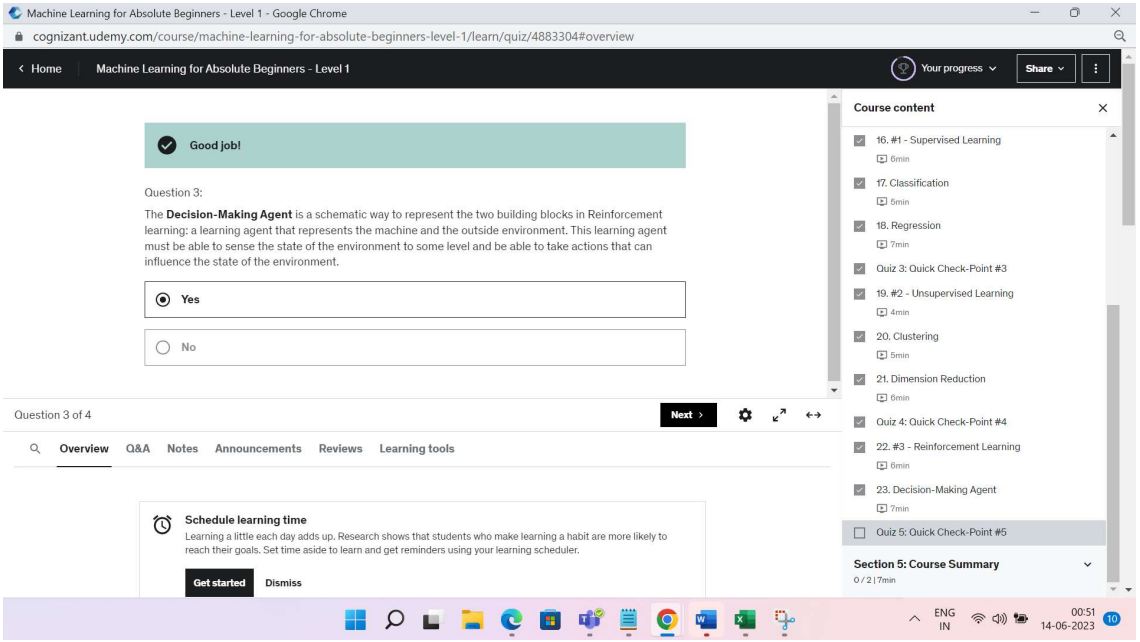
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Good job!
Question 3:
The Decision-Making Agent is a schematic way to represent the two building blocks in Reinforcement learning: a learning agent that represents the machine and the outside environment. This learning agent must be able to sense the state of the environment to some level and be able to take actions that can influence the state of the environment.
Yes
No
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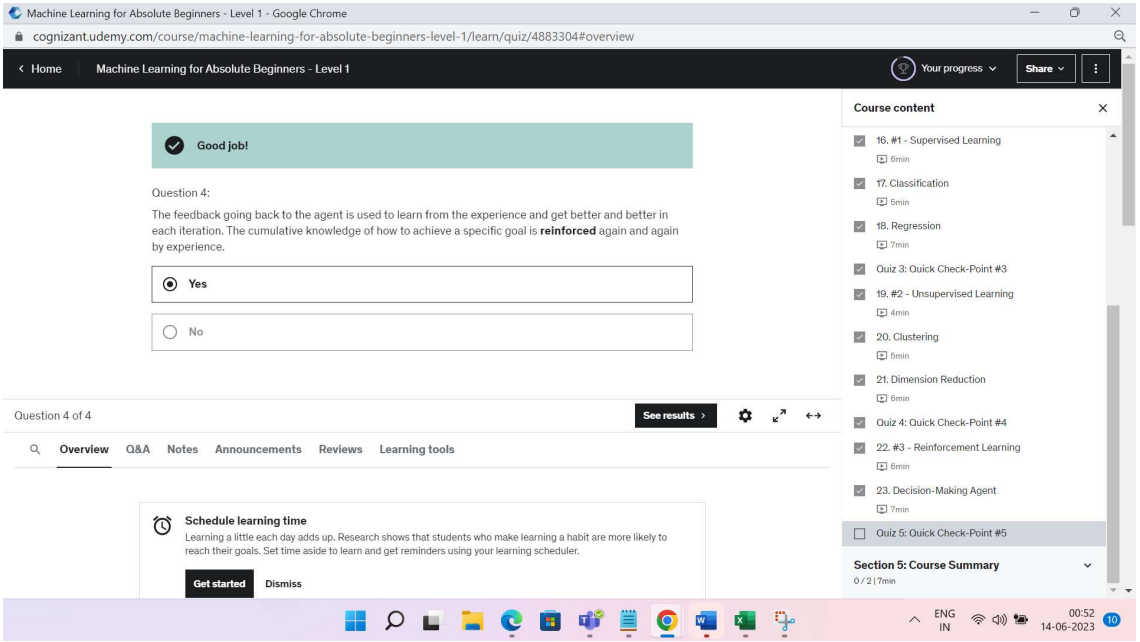
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Good job!
Question 4:
The feedback going back to the agent is used to learn from the experience and get better and better in each iteration. The cumulative knowledge of how to achieve a specific goal is reinforced again and again by experience.
Yes
No
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