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Artificial Intelligence 001

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Assignment 10

1. Consider the problem faced by an infant learning to speak and understand a language. Explain how this process fits into the general learning model. Describe the percepts and actions of the infant, and the types of learning the infant must do. Describe the subfunctions the infant is trying to learn in terms of inputs and outputs, and available example data.

Speaking could be one of the hardest things to learn. An infant can easily make noises from their mouth but it takes quite a long time to speak a language. However, they learn to understand a language before they even start to speak. Speaking a certain language requires moving the lips, tongue, and vocal chords in a particular way to make a understandable sound and hence, to speak. The environment for this process includes the idea of a language (what sounds to produce, what combinations of movement to make, etc.), humans, and events. Sensors are hand, ears and eyes. The communication words are the critics for the process of speaking a language. The learning element includes both positive and negative reinforcement. Infants mimic what they see and it also contributes as a learning element. The language itself is the performance standard for the speaking process. Effectors are tongue, mouth. lips and vocal chord.

An infant observes the surrounding environment that includes people talking. They see how the lips move and listen to the sounds being produced. They also observe and understand what sounds are frequently produced during certain events and how they learn to say the word in similar events. They try to match the sound being made in order to “critic” themselves and make their speech sound clearer. First, they learn words and then they learn to combine the words and speak the language fluently. An infant must learn how to move their tongues and vocal box to create a particular sound and to speak.

Infants get reinforced while learning to speak a language. They are taught to speak by an elder person with various techniques, the common one being calling out the same word or phrase repeatedly until the infant copies them. Once they are able to say the word or the phrase, the elder person gives them a hug and/or claps that reinforces the child to learn speaking even more.

2. Repeat Exercise 1 for the case of learning to play your favorite sport (or some other sport with which you are familiar). Is this supervised learning or reinforcement learning?

Learning to play tennis is an interesting sport and is quite easy one. The environment for this case will be tennis ground (net and lines), tennis racquets, tennis balls, and players (opponents). The players can observe their environment through their eyes. Eyes are the main and the only sensors to read the environment. The performance standard for the sports would be the score bagged by the player themself. If they make a shot and cross the ball over the net to the other half-court and within the boundary-lines, they have made a valid shot. If the ball does not cross the net or bounces outside of the boundary-lines of the other half-court then they lose and the opponents receive the point for this play. Basically, not losing a point will act as the most significant critic for this scenario. If they are in a class or playing with a coach, they get necessary feedback to improve their moves and make a valid shot.

The learning element includes hitting the ball with the racquet and force with which the ball is hit, while the performance element includes muscle memory, speed of the ball, and shot accuracy. The problem generator is the opponent player. The shot made by the opponent player is the deciding factor based on which the learning agent should act upon. The speed of the ball can be very fast, so the learning agent must be very quick to react. Similarly, the direction of the ball should be accounted for and the movement should be based primarily on the direction of the arriving ball.

Finally, the effectors are the players’ arms, legs, waist, and racquet. The learning agent can change their position by moving their legs. They can hit an arriving ball by moving their arms holding the racquet. The waist helps them to insert the targeted power to direct the outgoing ball. Players often rely on their muscle memory while hitting the ball to make a precise shot. For players playing on their own, this process is going to be a reinforcement learning. They are going to take risks and try various shots and realise what are the shots that can lead them to points or where they should stand in order to not miss a arriving ball. In case of a training, it is going to be supervised learning because the coach will be instructing what to do and how to do. Depending on these two scenarios, it can be either reinforcement learning or supervised learning.