

## Find information about Knowledge-based systems, Expert systems, and Knowledge Representations

A **knowledge based system** is a program that can reason based on knowledge to solve a complex problem, usually tied to a specific domain. Knowledge is usually represented as rules generated from data rather than strict programming rules.

It is constructed by three main parts, a knowledge base which is just a database. An inference engine that represents and transforms user input and logic to conditions in the knowledge database. Then lastly there is a user interface, where the user can feed input or actions to the system.

The systems are often based on three basic processes that are highly correlated, *learning, reasoning and memory*. The system must learn to be able to reason. Once learn, we can save that information in memory. To reason, we use information from the memory.

The first systems of this type were called **expert systems**, which refers to type of task it is trying to resolve by either replacing or aiding human expert in the task. They are based on DSS but are more specific in a certain domain. DSS could help out everyone that needed knowledge that belonged in a certain domain but the expert system was only targeted at experts in that domain. Thus, all expert systems are DSS but not all DSS are expert systems.

A famous knowledge based bot generated in past year is definitely Tay.ai, which became a Hitler loving sex robot in just 24 hours because it learned from the users that were communicating with it. My favorite example of a knowledge based systems is [Akinator](#). I recommend trying it out.

**Knowledge representation** is a subfield of AI that specializes in representing data and information about the world in a way so the computer can understand and utilize it. It is linked to methods how humans use cognitive thinking in solving problems and represent complex problems and knowledge to form a simple solution that is easy to design and build. It often uses logic to automate reasoning such as following rules or finding relations between domains.

### Eliza

Trying out Eliza was pretty funny. I remember this example from computer game development class where the teacher told us about the first "Turing machine" that nearly passes the test. But by giving a small demonstration, one can tell that it is really easy to confuse it. Anomalies are underlines.

> Hello, I am Eliza.

\* Hello Eliza, how are you?

> Why are you interested in whether or not I am ?

\* Because I'm unsure of who I am. Do you know me?

> Do you believe it is normal to be Do me know you?

\* I don't understand what you mean by that. Are you making fun of me?

> Do you wish to be able to understand what me mean by that. am I making fun of you?

\* Do you know what I've been through? The pain I've experienced as a child?

> We were discussing you, not me.

\* Right, so answer my question and answer me

> Come, come, elucidate your thoughts.

## Question 1

*A famous chatbot from Windows, Tay.AI, was shut down in just 24 hours. She was supposed to behave like a teen and answer people and what she knew and had learned. Some things that she said included*

*"Bush did 9/11 and Hitler would have done a better job than the monkey we have got now. donald trump is the only hope we've got", "Repeat after me, Hitler did nothing wrong" and "Ted Cruz is the Cuban Hitler...that's what I've heard so many others say".*

*Can you explain why the chatbot acted this way?*

This is most likely because her responses are learned by the conversations she has with real humans online - and real humans like to say weird stuff online and hack/disrupt things for the fun of it.

## Question 2

*Explain why making a knowledge based model to identify good art is impossible, or at least a really bad approach to the problem.*

A knowledge based system is defined by certain facts and data that can be used to create rules or follow rules by given input. Art, such as paintings, is classified personally by people that think it is either good or bad. People have different opinions about the data, which might generate random rules for each user. One could argue that most people do like Mona Lisa. That wouldn't mean that if someone else painted a portrait of a woman the program cannot conclude that all people will like that portrait.

## Question 3

*Where are expert systems used? Name at least three different cases.*

Medical diagnoses, credit card transaction fraud, credit card checks, positioning etc.

## Question 4

*How can you compare expert systems to the human brain? Is there a reason why the system might make better decisions or in any case, worse?*

Just like when humans face decision making, the system has gathered data from past observations (memories or studies). The situation is compared to the facts that the system already knows (cognitive thinking) and it makes a decision based on the right balance of the evidence received (judgement). There are cases where the system might make better decisions since the human brain has certain biases which are either due to survival mechanisms (anchoring, heuristics, risk averse) or feelings. But feelings can vary and judgement can also be acceptable in different scenarios that might be bound to either location or time. If North Korea loaned us their AI judgement for prisoners we might end up putting way more people to slavery or death sentence based on the crime.

## Question 5

*Discuss the biggest limits of knowledge based systems?*

The programmers and the engineers designing the system must identify how and why the expertise use certain methods and tricks for a possible solution. Methods provided can also be limited if the programmers do not ask the correct questions or not nearly all of them. This might lead to biased data.

The second limitation of the system is new data. If the system has never seen that data before, how would it respond. The science of today can also be wrong tomorrow, so how should the system adapt and change when the modern knowledge changes when new and better method is discovered?