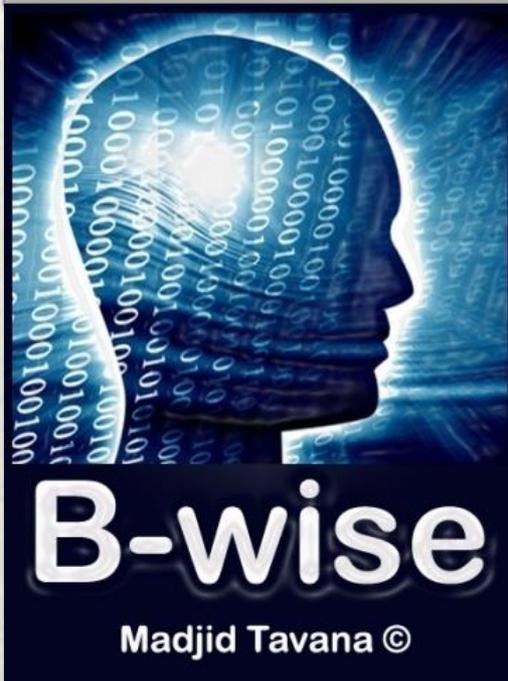


# Knowledge Engineering and Expert Systems B-wise Applications



- **College Hill Tavern**
- **Police Academy**
- **Corleone Family**
- **La Boutique**
- **Gateway Computers**
- **Exelon Nuclear Power Plant**
- **Kennedy Memorial Hospital**



# College Hill Tabern

College Hill Tavern is a university pub. The Dean of Students has received numerous phone calls from the Chief of Police citing traffic violations given to students driving home from the local establishments. The university has decided to develop an expert system to assist the bouncers in admitting students into College Hill Tavern when alcohol is being served. In order to gain entry into the bar, students must present a valid drivers license with photo. It is the bouncers duty to determine whether the license is valid. If the license is valid, the student is allowed entry. If the drivers license is not valid, backup identification such as school ID is required. If the student has no backup identification, bouncers do not allow the student to enter. If the student provides backup ID, the bouncer must make sure the student is not on the student watch list for attempting to use false identification. If the student is not on the watch list, entry is allowed. If the student is on the watch list and is trying to use false identification, the bouncer is instructed to confiscate the ID and inform the Dean of Students. If the student is on the watch list but is not trying to use false identification, entry is still denied.

# College Hill Tavern Conditions and Actions



# College Hill Tavern Decision tree



John Timber, Lafayette's Chief of Police has approved a plan to develop an expert system for the police academy to train police officers on procedures they need to follow when pulling over a driver for speeding. According to the current policy, if the driver has a valid driver's license, he/she should be issued a speeding ticket. If the driver does not have a valid driver's license, the officer must check to see if an arrest warrant has been issued. If the driver does have a warrant, he/she should be arrested. If the driver does not have a warrant, the officer should determine whether the driver is intoxicated. If there is no suspicion of intoxication, the officer should issue a speeding ticket. If there is any suspicion of intoxication, the driver is given a breathalyzer test. If the test is positive, the driver should be arrested. If the test is negative, the driver's car insurance is checked. If the car insurance is valid, a speeding ticket should be issued. If the driver does not have valid car insurance, the officer should impound the car and issue a speeding ticket. Develop an expert system with B-wise for the police academy.

# Police Academy Conditions and Actions

# Police Academy Decision Tree





The Corleone family, a mafia family for over 70 years, controls all of the businesses in south Philadelphia. Anthony Corleone, the son of the Godfather, has graduated college and recently joined the business. His father has made him head of the henchmen. Unfortunately, for Anthony the henchmen are not very bright. They are continuously killing people when they should only be roughing them up or roughing them up when they should be killing them.

Anthony wants to implement an expert system to guide his henchmen. According to the Godfather, if an individual is cooperating with the family, then smile menacingly and flex your muscles. If the individual is not cooperating, then the henchman should determine if they owe money. If they do not owe money, beat them up and let them go. If they owe, money, the henchman should determine if they stole from the organization. If they stole from the organization, Tommy “the torture machine” should be called for a tortured death.

If they did not steal from the organization, the henchman should determine if they witnessed an indiscretion/crime. If they are a witness, the henchman should determine if they will tell the police about the incident. If they will tell, Tommy “the Torture machine” should be called for tortured death. If they will not tell, they should be given a quick death. If they are not a witness to an indiscretion, then the henchman should determine if they have insulted the Godfather. If they have insulted him, then break their legs. If they have not offended the Godfather, then just beat them up and let them go.

# Corleone Family Conditions and Actions

# Corleone Family Decision Tree





La Boutique is a successful, up scale retail clothing store for young women. Despite La's success and distinguished clientele, management is becoming increasingly concerned about the upswing in merchandise returns. After tracking the dollar volume of returns for the last three months, it was recognized that most of the merchandise comes back to the store without a tag, with obvious signs of usage and, in many cases, long after purchase. The likelihood of reselling this merchandise is minimal. For this reason, La Boutique's management has decided to implement a store policy that cashiers must follow when merchandise is returned:

A cashier must ask for the original receipt. If there is no receipt, the return will not be accepted. If customer has the original receipt, the cashier should check the date. If the return is after 30 days of original purchase, the return will not be accepted. If the return takes place within 30 days of purchase, cashier must check if merchandise has the original tag attached.

If the tag is attached, cashier must then check the current selling price of the merchandise. If the item is currently on sale, the customer will receive a refund equal to the current price of the merchandise; and if merchandise is not on sale, customer receives a refund of the original purchase price.

# La Boutique

If merchandise has no tag attached, cashier must ask if customer has kept the tag. If customer has kept the tag, cashier must check the merchandise condition. If the merchandise is in good condition, cashier must check the current selling price of the merchandise: if it is currently on sale, customer will receive a store credit equal to the current price; and if merchandise is not on sale, customer will receive a store credit equal to the original purchase price. If merchandise is in poor condition or does not have the original tags, no return is allowed.

Help La Boutique's management design an expert system that instructs cashiers in all the stores how to proceed when a customer returns merchandise.

# La Boutique

## Conditions and Actions

# La Boutique

## Decision Tree



# La Boutique

## Alternative Decision Tree



# La Boutique

## Alternative Decision Tree





Gateway Computers wants to extend credit to their customers. Management feels that extending credit will not only increase sales, but also give customers more opportunity to purchase higher-end computers. They would like to use an expert system to ensure consistent credit decisions. The chief financial officer of Gateway has decided to bear minimal risk, by extending credit to customers with a favorable credit history and an annual income of \$85,000 or more. Those with unfavorable credit and an annual income of less than \$85,000 are denied credit. Customers with favorable credit and less than \$85,000 annual income are extended credit if they have a down payment of 20% or more, and denied credit if the down payment is less than 20%. Customers with an unfavorable credit history are denied credit if their annual income is \$85,000 or more and their employment history is less than 3 years. If these customers have been employed for 3 years or more, the decision to extend credit will depend on the down payment. If they can make a 20% or more down payment, their credit is approved. If not, it is denied. Develop an expert system with B-wis for Gateway.

# Gateway Computers

## Conditions and Actions

# Gateway Computers

## Initial Decision Table



# Gateway Computers Simplified Decision Table



# Gateway Computers

## Decision Tree





Glenn Glower has worked at the Exelon nuclear power plant since 1979. He was transferred from three mile island after “the big one”, because of his extensive experience in plant operations. Glenn started out as a plutonium inspector, but constant rashes and a nasty cough forced him to move on. His many positions have given him a wealth of knowledge...you name it, he did it. From core sweeper to “hot” water storage superintendent, Glenn has done it all.

The Exelon nuclear plant is located smack in the middle of a metropolitan center. Our brilliant nuclear scientists of the early 70's realized that this of course reduces the cost of power distribution. But the plant is old, and management has noticed small cracks in the cooling water transfer pipes, not to mention there have been a lot of dead birds found in the parking lot. They need an expert to act in the newly created position, Catastrophe Aversion Coordinator.

# Exelon Power Plant



As catastrophe aversion coordinator, Glenn is in charge of the plant's operational status. From his seat in the control room, Glenn must make decisions quickly and definitively. But, years of exposure to nuclear radiation has left him at a disadvantage. Management believes an expert system can help Glenn figure out what to do, almost mindlessly in case of a nuclear disaster.

A team of experts gathered to develop the new system at the plant. The system should let Glenn know if the plant is running OK or not. If there is no general alarm, he can continue to supply power to the grid, making oodles of money for the utility. Upon general alarm, he must check the core temperature. The core temperature must remain at 213° F. If the temperature reaches 214° F or more, he should activate primary cooling water pumps. If the primary pump fails, he must activate back-up pumps.

# Exelon Power Plant

If the back-up pump starts, he must reset and restart the system monitor loop which always clears previous alarms. If the back-up pump fails, he must initiate evacuation, as a core breach is eminent. If the primary cooling pump starts, he must recheck the temperature. If the temperature is OK, he must reset and restart the system monitor loop. If the temperature is still high, he must check the fire alarm. If the fire alarm is activated, he must dispatch personnel. If the fire alarm is Ok, he resets and restarts the system loop monitor. If the general alarm is activated but the temperature is less than 214°, the problem must be with the core water level, so he must check the level sensor. If the level is OK, he resets and restarts the system loop monitor. If the level is low, he must activate make-up water pumps. If they operate, he resets and restarts. If the make-up pumps fail, he must activate the back-up make-up water pumps. If they work, he resets and restarts. If not, he must initiate the evacuation plan, saving countless lives and becoming a local hero. But, a meltdown will negatively impact local property values, which will undoubtedly remain very low for the next few hundred thousand years.



# Exelon Power Plant Conditions and Actions



# Exelon Power Plant Decision Tree



The number of lawsuits at the Kennedy Memorial Hospital had been increasing significantly each year for the past three years. This had caused the president of the hospital considerable consternation. He hired a consulting firm to look into this. The firm had found that the number of cases of incorrectly diagnosed acute appendicitis had been on the rise during the same time that these lawsuits were increasing. It was their recommendation that a strict system of diagnostic protocols should be put in place in the Emergency Room to help the house officers make better decisions in their diagnostic workup, and theoretically cut down on the number of people who were misdiagnosed and sent home to develop ruptured appendicitis. After a series of interviews with staff specialist, the consultants developed the following paradigm to be followed in all patients with abdominal pain.

If a female presents with abdominal pain, her temperature should be taken. Next, the patient should be examined for right lower quadrant (RLQ) pain. Those with no fever and no RLQ Pain, will receive a blood test to determine if their white blood cell (WBC) count is elevated or not. An elevated count, is suggestive of acute appendicitis. If the patient's WBC count is normal, she will be discharged home with instruction to return to the ER if any fever, worsening abdominal pain, or vomiting develops. If the WBC count is elevated, the patient will be admitted to the hospital and receive an emergency CT scan of the abdomen and pelvis. If the CT scan is positive for appendicitis, she will be taken to the OR for appendectomy. If the CT is negative, she will be observed in the hospital for the next twenty four hours to determine the course of her disease. Patients with no fever and RLQ pain must be sent for WBC count. If the WBC count is normal, the patient will be scheduled for an outpatient ultrasound within twenty four hours to rule out any other significant female pathology. If the WBC count is high, the patient will be scheduled for emergency CT scan. If the CT scan is positive for appendicitis, she will be taken to the OR for appendectomy. If the CT is negative, she will be observed in the hospital for the next twenty four hours to determine the course of her disease.

# Kennedy Memorial Hospital

Patients with fever should be examined for RLQ pain followed by a blood test for WBC count. Those with fever, RLQ pain and a high WBC count, will be taken to the OR for emergency appendectomy. Those with a normal WBC count are sent for CT scan. If the CT scan is positive for appendicitis, patient will be taken to the OR for appendectomy. If the CT is negative, she will be observed in the hospital for the next twenty four hours to determine the course of her disease. If the female patient has fever, with no RLQ pain and a normal WBC count, she will be discharged home with instructions to return to the ER if any fever, worsening abdominal pain, or vomiting develops. Those with high WBC count, are sent for a CT scan. If the CT scan is positive for appendicitis, they will be taken to the OR for appendectomy. If the CT is negative, they should be observed in the hospital for the next twenty four hours to determine the course of their disease.

For male patients, the temperature should be taken to determine if the patient has fever or not. The abdomen shall then be examined in all patients for RLQ pain. Male patients with no fever and no RLQ pain are discharged with instructions to return to the ER if any fever, worsening abdominal pain, or vomiting develops. Those with no fever and RLQ pain are sent for an emergency CT scan. If the CT scan is positive for acute appendicitis, the patient will be taken to the OR for emergency appendectomy. If the Ct scan is negative, a WBC count will be ordered. If the count is high, the patient will be observed in the hospital for the next twenty four hours to determine the course of his disease. If the count is normal, he should be discharged with instructions to return to the ER if any fever, worsening abdominal pain, or vomiting develops. Male patients with fever and RLQ pain are taken to the OR for emergency appendectomy. Those with fever and no RLQ pain are observed in the hospital for the next twenty four hours to determine the course of their disease.“

Develop an expert system with B-wise in an attempt to standardize the diagnostic protocol for acute appendicitis at Kennedy Memorial Hospital.

**Kennedy Memorial  
Hospital  
Decision Tree**