DECISION TREE

MADE BY:-

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What is a decision tree ?

A decision tree is a decision support tool that uses a tree-like graph or model of decisions and their possible consequences, including chance event outcomes, resource costs, and utility. It is one way to display an algorithm.

USES OF DECISION TREE

DECISION TREES ARE COMMONLY USED IN OPERATIONS RESEARCH, SPECIFICALLY IN DECISION ANALYSIS, TO HELP IDENTIFY A STRATEGY MOST LIKELY TO REACH A GOAL. ANOTHER USE OF DECISION TREES IS AS A DESCRIPTIVE MEANS FOR CALCULATING CONDITIONAL PROBABILITIES.

ADVANTAGES OF DECISION TREE

ARE SIMPLE TO UNDERSTAND AND INTERPRET:-

PEOPLE ARE ABLE TO UNDERSTAND DECISION TREE MODELS AFTER A BRIEF EXPLANATION.

HAVE VALUE EVEN WITH LITTLE HARD DATA:-

IMPORTANT INSIGHTS CAN BE GENERATED BASED ON EXPERTS DESCRIBING A SITUATION (ITS ALTERNATIVES, PROBABILITIES, AND COSTS) AND THEIR PREFERENCES FOR OUTCOMES.

Terminologies:

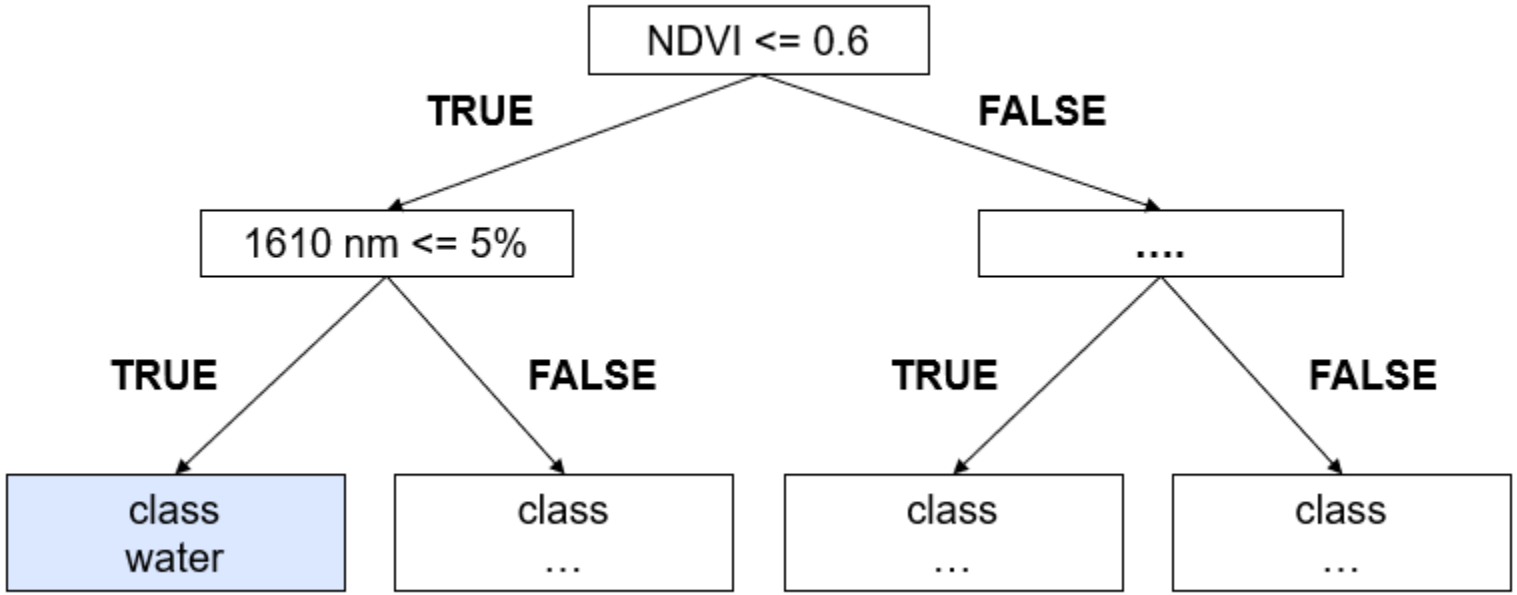
ROOT NODES **– IT IS THE NODE PRESENT AT THE BEGINNING OF A DECISION TREE FROM THIS NODE THE POPULATION STARTS DIVIDING ACCORDING TO VARIOUS FEATURES.**

DECISION NODES **– THE NODES WE GET AFTER SPLITTING THE ROOT NODES ARE CALLED DECISION NODE**

LEAF NODES **– THE NODES WHERE FURTHER SPLITTING IS NOT POSSIBLE ARE CALLED LEAF NODES OR TERMINAL NODES**

SUB-TREE **– JUST LIKE A SMALL PORTION OF A GRAPH IS CALLED SUB-GRAPH SIMILARLY A SUB-SECTION OF THIS DECISION TREE IS CALLED SUB-TREE.**

Decision Tree



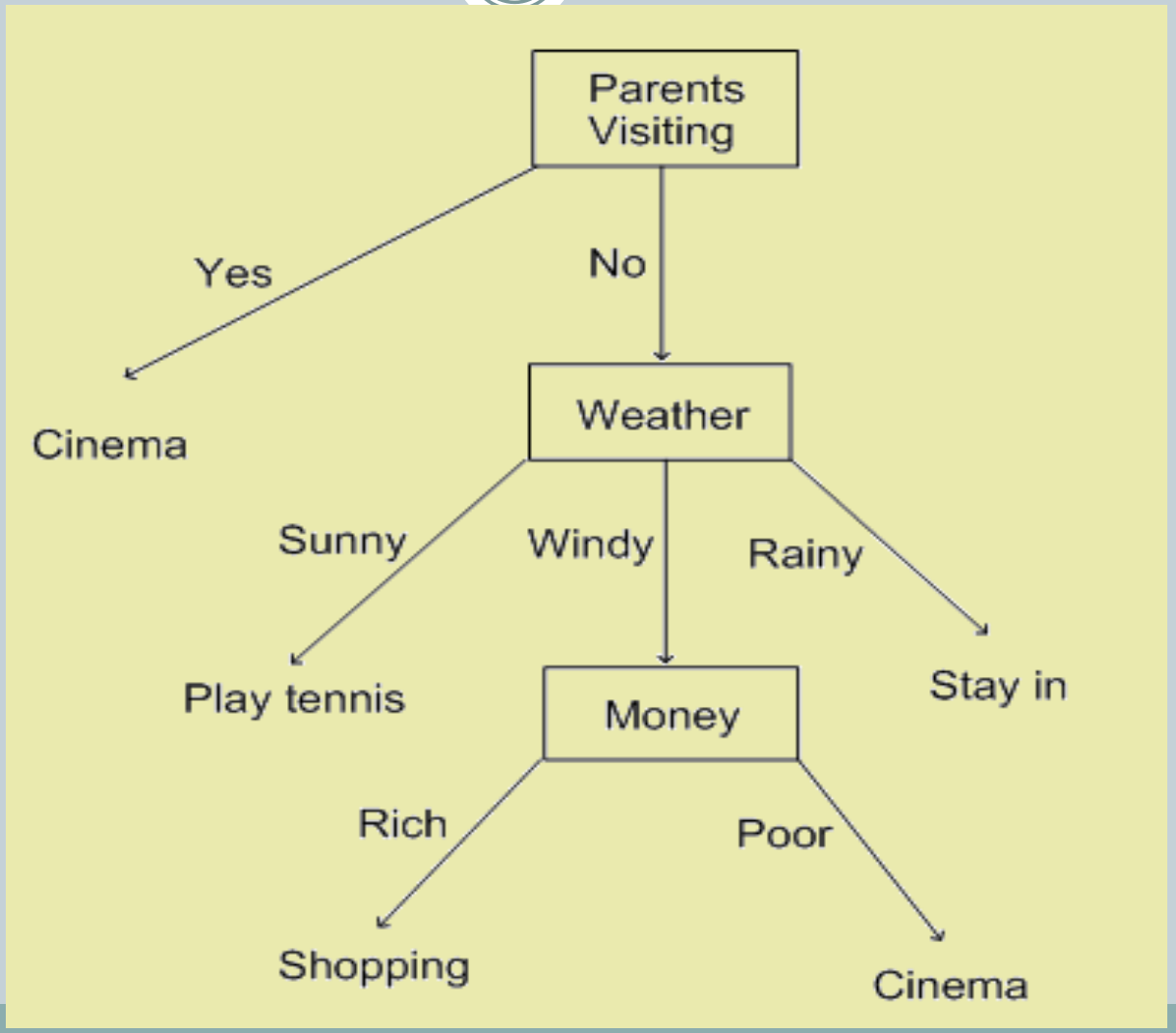
Explanation:

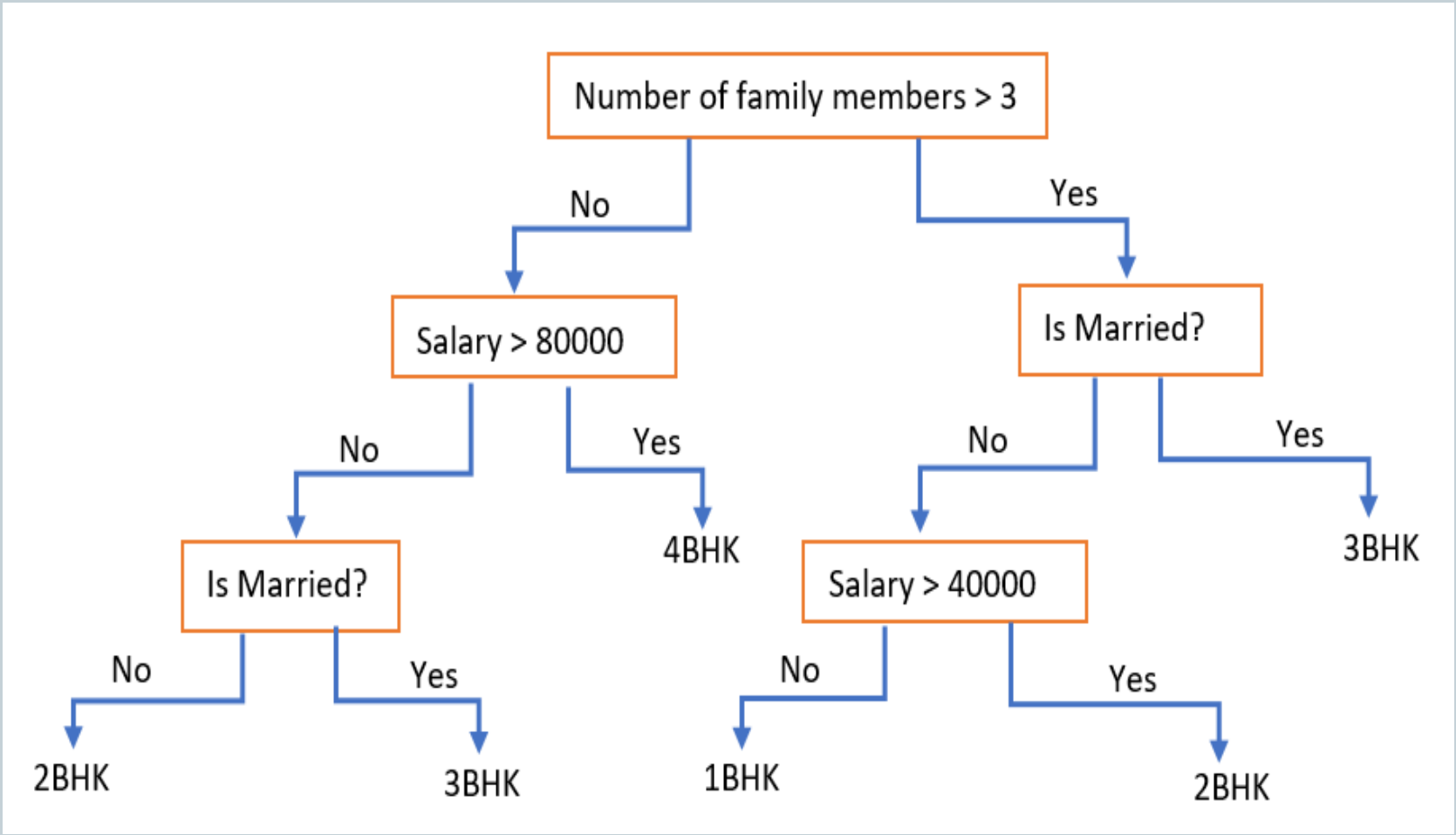
TAKE A LOOK AT THE ABOVE DT AS AN EXAMPLE, STARTING AT THE TOP. THE BOXES ARE REFERRED TO AS 'NODES'. EACH NODE CONTAINS A BINARY CRITERION WHICH EVALUATES A STATEMENT TO EITHER TRUE OR FALSE. DEPENDING ON THE DECISION FOR A GIVEN DATA POINT, WE PROCEED TO THE NEXT NODE. DEPENDING ON THE CLASSES OF INTEREST AND THE SPECTRAL INFORMATION AVAILABLE, DTS CAN BECOME VERY COMPLEX.

EXAMPLE:-

- **Imagine you only ever do four things at the weekend: go shopping, watch a movie, play tennis or just stay in. What you do depends on three things: the weather (windy, rainy or sunny); how much money you have (rich or poor) and whether your parents are visiting. You say to your yourself: if my parents are visiting, we'll go to the cinema. If they're not visiting and it's sunny, then I'll play tennis, but if it's windy, and I'm rich, then I'll go shopping. If they're not visiting, it's windy and I'm poor, then I will go to the cinema. If they're not visiting and it's rainy, then I'll stay in.**

A suitable decision tree for the weekend decision choices would be as follows:-




Number of family members > 3
No
Yes
Salary > 80000
Is Married?
No
Yes
No
Yes
4BHK
Is Married?
Salary > 40000
3BHK
No
Yes
No
Yes
2BHK
3BHK
1BHK
2BHK

A decision tree showing the financial consequences of developing two products.

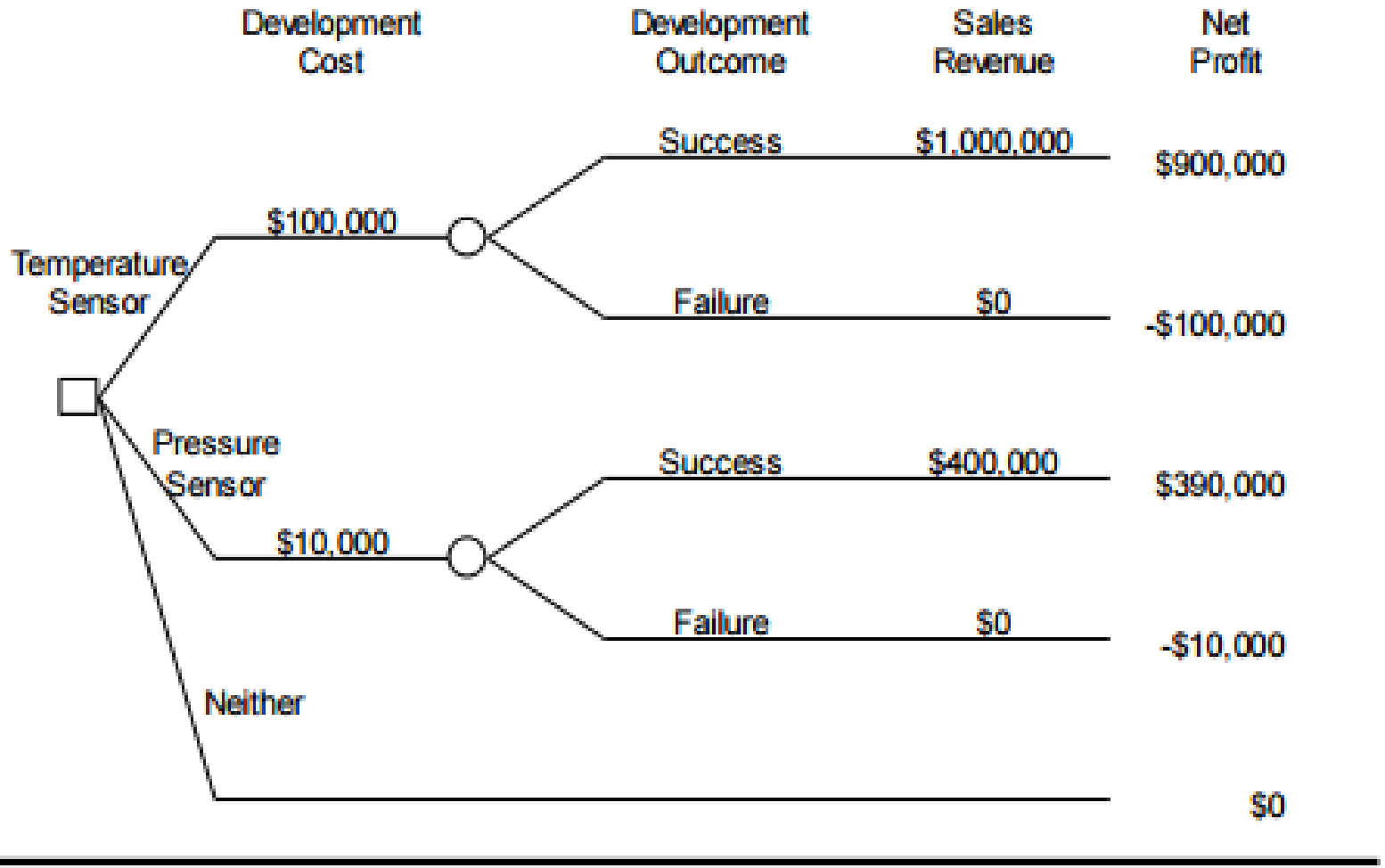


Figure 1.1 *Special Instrument Products decision*

The strengths of decision tree methods are:

- Decision trees are able to generate understandable rules.
- Decision trees are able to handle both continuous and categorical variables.
- A decision tree is easy to understand and interpret.
- Expert opinion and preferences can be included, as well as hard data.
- Can be used with other decision techniques.
- New scenarios can easily be added.

The weaknesses of decision tree methods :

- Decision trees are less appropriate for estimation tasks where the goal is to predict the value of a continuous attribute.
- If a decision tree is used for categorical variables with multiple levels, those variables with more levels will have more information gain.
- Calculations can quickly become very complex, although this is usually only a problem if the tree is being created by hand.

THANK YOU