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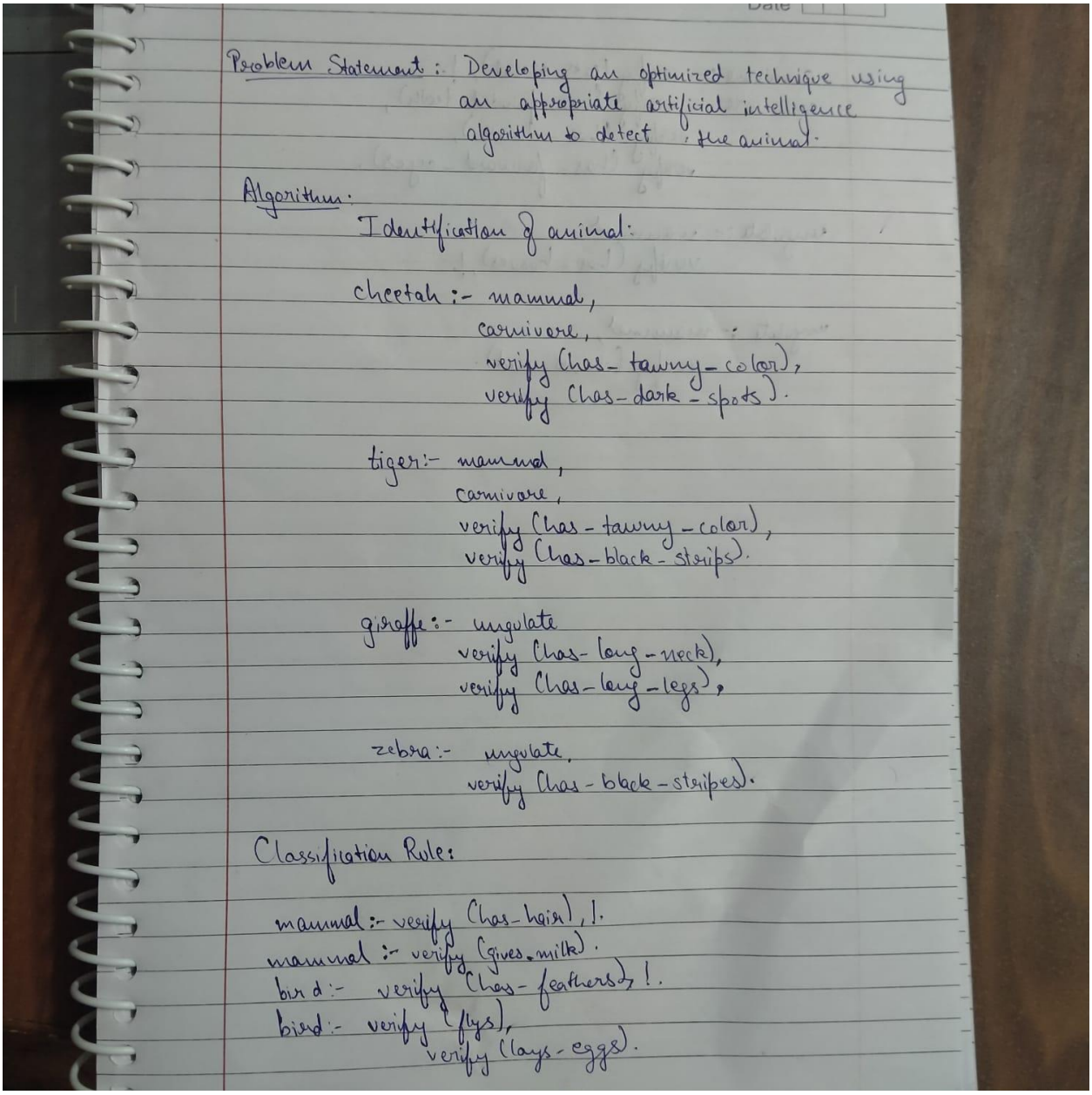
Aim: Implementation of Rule Based Inference



Problem Statement : Developing an optimized technique using an appropriate artificial intelligence algorithm to detect the animal.

Algorithm:

Identification of animal:

cheetah :- mammal,
carnivore,
verify (has - tawny - color),
verify (has - dark - spots).

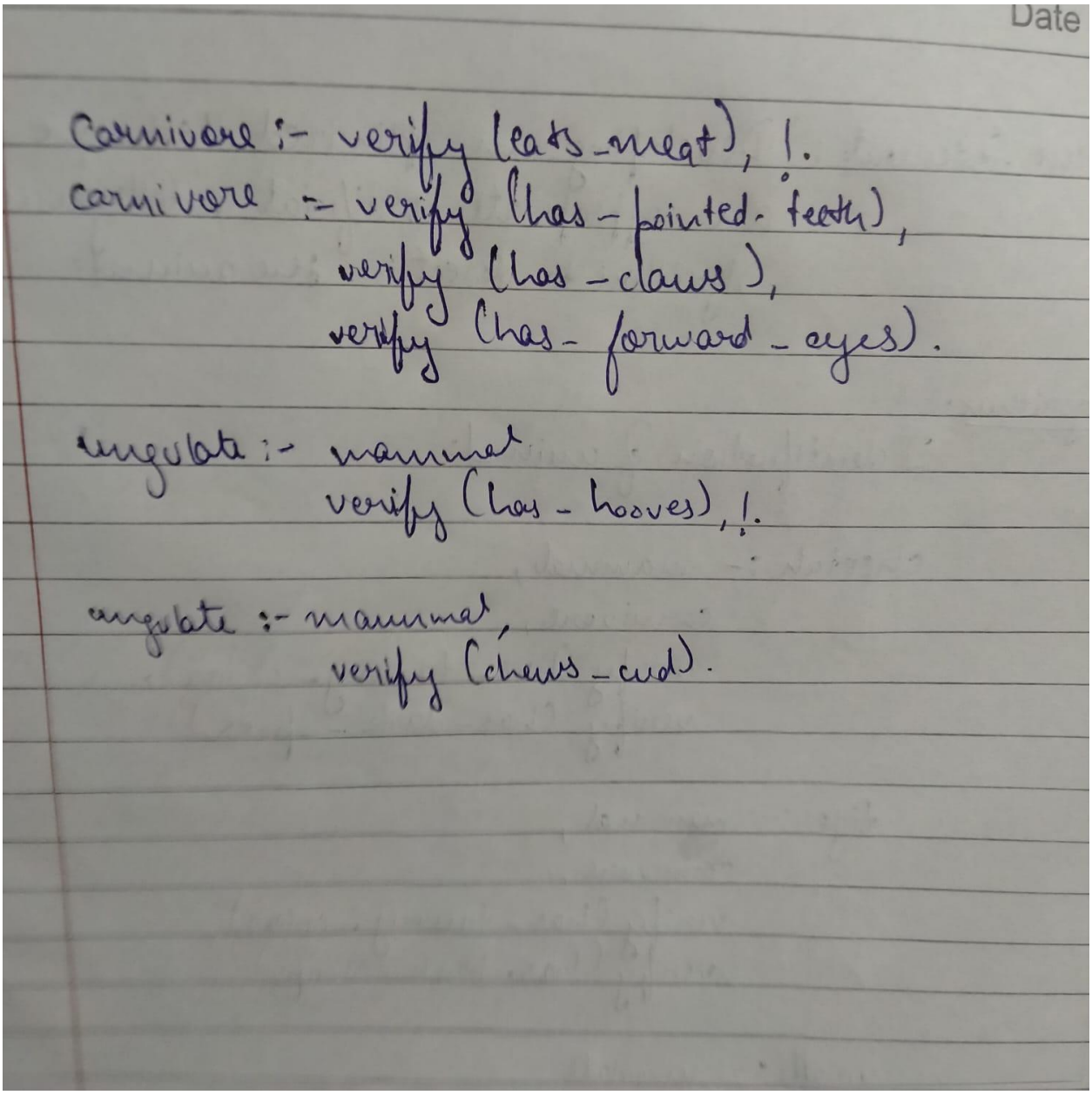
tiger :- mammal,
carnivore,
verify (has - tawny - color),
verify (has - black - stripes).

giraffe :- ungulate
verify (has - long - neck),
verify (has - long - legs),

zebra :- ungulate,
verify (has - black - stripes).

Classification Rule:

mammal :- verify (has - hair), !.
mammal :- verify (gives - milk).
bird :- verify (has - feathers), !.
bird :- verify (flys),
verify (lays - eggs).



Code:

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import sys


def definiteNoun(s):
  s = s.lower().strip()
  if s in ['a', 'e', 'i', 'o', 'u', 'y']:
    return "an " + s
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  else:
    return "a " + s

def removeArticle(s):
  "Remove the definite article 'a' or 'an' from a noun."
  s = s.lower().strip()
  if s[0:3] == "an ": return s[3:]
  if s[0:2] == "a ": return s[2:]
  return s

def makeQuestion(question, yes, no):
  return [question, yes, no]

def isQuestion(p):
  "Check if node is a question (with answers), or a plain answer."
  return type(p).__name__ == "list"

def askQuestion(question):
  print ("\r%s " % question,)
  return sys.stdin.readline().strip().lower()

def getAnswer(question):
  if isQuestion(question):
    return askQuestion(question[0])
  else:
    return askQuestion("Were you thinking about %s?" % definiteNoun(question))

def answeredYes(answer):
  if len(answer) > 0:
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    return answer.lower()[0] == "y"
  return False

def gameOver(message):
  global tries
  print ("")
  print ("\r%s" % message)
  print ("")

def playAgain():
  return answeredYes(askQuestion("Do you want to play again?"))

def correctGuess(message):
  global tries
  gameOver(message)

  if playAgain():
    print ("")
    tries = 0
    return Q
  else:
    sys.exit(0)

def nextQuestion(question, answer):
  global tries
  tries += 1

  if isQuestion(question):
    if answer:
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      return question[1]
    else:
      return question[2]
  else:
    if answer:
      return correctGuess("I knew it!")
    else:
      return makeNewQuestion(question)

def replaceAnswer(tree, find, replace):
  if not isQuestion(tree):
    if tree == find:
      return replace
    else:
      return tree
  else:
    return makeQuestion(tree[0],
      replaceAnswer(tree[1], find, replace),
      replaceAnswer(tree[2], find, replace))

def makeNewQuestion(wrongAnimal):
  global Q, tries

  correctAnimal = removeArticle(askQuestion("I give up.  What did you think about?"))

  newQuestion = askQuestion("Enter a question that would distinguish %s from %s:"
      % (definiteNoun(correctAnimal), definiteNoun(wrongAnimal))).capitalize()

  yesAnswer = answeredYes(askQuestion("If I asked you this question " +
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```
   "and you thought about %s, what would the correct answer be?" % definiteNoun(correctAnimal)))

 # Create new question node
 if yesAnswer:
   q = makeQuestion(newQuestion, correctAnimal, wrongAnimal)
 else:
   q = makeQuestion(newQuestion, wrongAnimal, correctAnimal)
 Q = replaceAnswer(Q, wrongAnimal, q)
 tries = 0
 return Q

def addNewQuestion(wrongAnimal, newques, correct):
   global Q
   q = makeQuestion(newques, correct, wrongAnimal)
   Q = replaceAnswer(Q, wrongAnimal, q)
   return Q

tries = 0
Q = (makeQuestion('Does it have fur?', 'Tiger', 'Penguin'))
q = addNewQuestion('Tiger', 'Does it have dark spots?', 'Leopard')
q = addNewQuestion('Leopard', 'Is it the fastest animal?', 'Cheetah')
q = addNewQuestion('Penguin', 'Can it fly?', 'Parrot')
q = Q

print ("Imagine an animal.  I will try to guess which one.")
print ("You are only allowed to answer YES or NO.")
print ("")

try:
```

```
  while True:
    ans = answeredYes(getAnswer(q))
    q = nextQuestion(q, ans)
except KeyboardInterrupt:
  sys.exit(0)
except Exception:
  sys.exit(1)
```

```
Imagine an animal.
Answer YES or NO.

('Does it have fur? ',)
NO
('Can it fly? ',)
YES
('Was the animal a parrot? ',)
YES

I knew it!

('Play again? ',)
```

```
Imagine an animal.
Answer YES or NO.

('Does it have fur? ',)
YES
('Does it have dark spots? ',)
YES
('Is it the fastest animal? ',)
NO
('Was the animal a leopard? ',)
YES

I knew it!
```

```
Imagine an animal.
Answer YES or NO.

('Does it have fur? ',)
YES
('Does it have dark spots? ',)
NO
('Was the animal a tiger? ',)
NO
('What did you think about? ',)
Leopard
('Enter a question that would distinguish a leopard from a tiger: ',)
it is larger than tiger
('If I asked you this question and you thought about a leopard, what would the correct answer be? ',)
Leopard
('Does it have fur? ',)
YES
('Does it have dark spots? ',)
YES
('Is it the fastest animal? ',)
NO
('Was the animal a leopard? ',)
YES

I knew it!
```

Result: Hence, the Implementation of rule based inference system is done successfully.