

Challenge April-2018

Up-Selling Rules



Up-selling is a popular selling technique. This challenge solicits different implementations of the following up-selling rules, which offer to a customer new products based on the customer's profile and a set of products that this customer already has:

Customer Profile		Customer Products		Customer Products		Offered Products		Set Comment
Is One Of	Bronze, Silver	Include	Product 1	Do Not Include	Product 2	Are	Product 2, Product 4, Product 5	
Is One Of	Bronze, Silver	Include	Product 1, Product 3	Do Not Include	Product 6, Product 7, Product 8	Are	Product 6, Product 7, Product 8	
Is One Of	Bronze, Silver	Include	Product 1, Product 2	Do Not Include	Product 6, Product 7, Product 8	Are	Product 9, Product 7, Product 8, Product 4, Product 5	
Is One Of	Gold	Include	Product 1	Do Not Include	Product 6, Product 7, Product 5	Are	Product 9, Product 7, Product 8, Product 4, Product 5, Product 10	Gold Package
Is One Of	Platinum	Include	Product 1, Product 2	Do Not Include	Product 6, Product 7, Product 5	Are	Product 9, Product 7, Product 8 with no annual fee, Product 4, Product 5 with no charge, Product 10	Platinum Package

You may use the following rules to define Customer Profile:

Combined Balance		Customer Profile	
Within	[500..2000)	Is	Bronze
Within	[2000..5000)	Is	Silver
Within	[5000..15000)	Is	Gold
Within	>= 15000	Is	Platinum

Implementation of the decision tables in DT5GL:

Table 0: define Customer Profile

```

If:
combined_balance < 500          | 0| 1| 2| 3| 4|
combined_balance < 2000       | Y| N| N| N| N|
combined_balance < 5000       | -| Y| N| N| N|
combined_balance < 15000      | -| -| Y| N| N|
Then:
customer_profile is undefined  | X| | | | |
customer_profile is bronze/silver | | X| X| | |
customer_profile is gold      | | | | X| |
customer_profile is platinum  | | | | | X|
# .....

```

Attribute: combined_balance

Askable_using: "What is the combined balance of the customer?"

Table 1: determine offer bronze/silver

```

If:
customer_profile is bronze/silver | Y| Y| Y| Y| Y| Y| Y| Y| N|
'includes product 1'             | Y| Y| Y| Y| Y| Y| Y| N| -|
'includes product 2'             | Y| Y| Y| Y| N| N| N| -| -|
'includes product 3'             | Y| Y| N| N| Y| Y| N| -| -|
'includes products 6, 7 or 8'    | Y| N| Y| N| Y| N| -| -| -|
Then:
Offer is Row1                     | | | | | X| | X| | |
Offer is Row1+2                   | | | | | | X| | | |
Offer is Row2+3                   | | X| | | | | | | |
Offer is Row3                     | | | | X| | | | | |
Offer is None                     | X| | X| | | | | X| |
# .....

```

Proposition: 'includes product 1'

Askable_using: "Includes product 1?"

Proposition: 'includes product 2'

Askable_using: "Includes product 2?"

Proposition: 'includes product 3'

Askable_using: "Includes product 3?"

Table 2: determine offer gold

```

If:
customer_profile is gold          | 0| 1| 2| 3|
'includes product 1'             | Y| Y| Y| N|
'includes products 5, 6 or 7'    | Y| N| -| -|
Then:
Offer is None                    | X| | X| |
Offer is Row4                    | | X| | |
'set comment gold package'       | | X| | |
# .....

```

Table 3: determine offer platinum

```

If:
customer_profile is platinum     | 0| 1| 2| 3| 4|
'includes product 1'             | Y| Y| Y| Y| N|
'includes product 2'             | Y| Y| N| -| -|
'includes products 5, 6 or 7'    | Y| N| -| -| -|
Then:
Offer is None                    | X| | X| X| |
Offer is Row5                    | | X| | | |
'set comment platinum package'   | | X| | | |
# .....

```

Table 4: determine offer undefined

```

If:
customer_profile is undefined    | 0| 1|
Then:
Offer is None                    | X| |
'set comment undefined customer profile' | X| |
# .....

```

Table 5: includes products 6, 7 or 8

If:	0 1 2 3
'includes product 6'	Y N N N
'includes product 7'	- Y N N
'includes product 8'	- - Y N
Then:	
'includes products 6, 7 or 8'	X X X
#	

Table 6: includes products 5, 6 or 7

If:	0 1 2 3
'includes product 5'	Y N N N
'includes product 6'	- Y N N
'includes product 7'	- - Y N
Then:	
'includes products 5, 6 or 7'	X X X
#	

Proposition: 'includes product 5'
Askable_using: "Includes product 5?"
Proposition: 'includes product 6'
Askable_using: "Includes product 6?"
Proposition: 'includes product 7'
Askable_using: "Includes product 7?"
Proposition: 'includes product 8'
Askable_using: "Includes product 8?"

GoalAttribute: Offer
Case: None
Print: "Nothing to offer"
Case: Row1
Print: "Offered products: Product 2,Product 4,Product 5 (Row 1)"
Case: Row1+2
Print: "Offered products: Product 2,Product 4,Product 5,Product 6,Product 7,Product 8 (Row 1+2)"
Case: Row2+3
Print: "Offered products: Product 4,Product 5,Product 6,Product 7,Product 8,Product 9 (Row 2+3)"
Case: Row3
Print: "Offered products: Product 4,Product 5,Product 7,Product 8,Product 9 (Row 3)"
Case: Row4
Print: "Offered products: Product 4,Product 5,Product 7,Product 8,Product 9,Product 10 (Row 4)"
Case: Row5
Print: "Offered products: Product 5(no charge),Product 7,Product 8(no annual fee),Product 9,Product 10 (Row 5)"

GoalProposition: 'set comment gold package'
Print: "Gold Package"
GoalProposition: 'set comment platinum package'
Print: "Platinum Package"
GoalProposition: 'set comment undefined customer profile'
Print: "Undefined customer profile: combined balance < 500"

Various testruns

Customer Profile		Customer Products		Customer Products		Offered Products		Set Comment
Is One Of	Bronze,Silver	Include	Product 1	Do Not Include	Product 2	Are	Product 2, Product 4, Product 5	
Is One Of	Bronze,Silver	Include	Product 1, Product 3	Do Not Include	Product 6, Product 7, Product 8	Are	Product 6, Product 7, Product 8	
Is One Of	Bronze,Silver	Include	Product 1, Product 2	Do Not Include	Product 6, Product 7, Product 8	Are	Product 9, Product 7, Product 8, Product 4, Product 5	
Is One Of	Gold	Include	Product 1	Do Not Include	Product 6, Product 7, Product 5	Are	Product 9, Product 7, Product 8, Product 4, Product 5, Product 10	Gold Package
Is One Of	Platinum	Include	Product 1, Product 2	Do Not Include	Product 6, Product 7, Product 5	Are	Product 9, Product 7, Product 8 with no annual fee, Product 4, Product 5 with no charge, Product 10	Platinum Package

Row 1:

```
"What is the combined balance of the customer?"
> 500

"Includes product 1? (y/n)? > y
"Includes product 2? (y/n)? > n
"Includes product 3? (y/n)? > n
"Offered products: Product 2,Product 4,Product 5 (Row 1)"
```

Row 1 + Row 2:

```
"What is the combined balance of the customer?"
> 4999

"Includes product 1? (y/n)? > y
"Includes product 2? (y/n)? > n
"Includes product 3? (y/n)? > y
"Includes product 6? (y/n)? > n
"Includes product 7? (y/n)? > n
"Includes product 8? (y/n)? > n
"Offered products: Product 2,Product 4,Product 5,Product 6,Product 7,Product 8 (Row 1+2)"
```

Row 1 + Row 2; Row 2 fails:

```
"What is the combined balance of the customer?"
> 1999

"Includes product 1? (y/n)? > y
"Includes product 2? (y/n)? > n
"Includes product 3? (y/n)? > y
"Includes product 6? (y/n)? > n
"Includes product 7? (y/n)? > y
"Offered products: Product 2,Product 4,Product 5 (Row 1)"
```

Row 3:

```
"What is the combined balance of the customer?"
> 2000

"Includes product 1? (y/n)? > y
"Includes product 2? (y/n)? > y
"Includes product 3? (y/n)? > n
"Includes product 6? (y/n)? > n
"Includes product 7? (y/n)? > n
"Includes product 8? (y/n)? > n
"Offered products: Product 4,Product 5,Product 7,Product 8,Product 9 (Row 3)"
```

Various testruns (continued)

Customer Profile		Customer Products		Customer Products		Offered Products		Set Comment
Is One Of	Bronze,Silver	Include	Product 1	Do Not Include	Product 2	Are	Product 2, Product 4, Product 5	
Is One Of	Bronze,Silver	Include	Product 1, Product 3	Do Not Include	Product 6, Product 7, Product 8	Are	Product 6, Product 7, Product 8	
Is One Of	Bronze,Silver	Include	Product 1, Product 2	Do Not Include	Product 6, Product 7, Product 8	Are	Product 9, Product 7, Product 8, Product 4, Product 5	
Is One Of	Gold	Include	Product 1	Do Not Include	Product 6, Product 7, Product 5	Are	Product 9, Product 7, Product 8, Product 4, Product 5, Product 10	Gold Package
Is One Of	Platinum	Include	Product 1, Product 2	Do Not Include	Product 6, Product 7, Product 5	Are	Product 9, Product 7, Product 8 with no annual fee, Product 4, Product 5 with no charge, Product 10	Platinum Package

Row 3 fails:

```
"What is the combined balance of the customer?"
> 3000
```

```
"Includes product 1? (y/n)? > y
"Includes product 2? (y/n)? > y
"Includes product 3? (y/n)? > n
"Includes product 6? (y/n)? > n
"Includes product 7? (y/n)? > n
"Includes product 8? (y/n)? > y
"Nothing to offer"
```

Row 2 + Row 3:

```
"What is the combined balance of the customer?"
> 4000
```

```
"Includes product 1? (y/n)? > y
"Includes product 2? (y/n)? > y
"Includes product 3? (y/n)? > y
"Includes product 6? (y/n)? > n
"Includes product 7? (y/n)? > n
"Includes product 8? (y/n)? > n
"Offered products: Product 4,Product 5,Product 6,Product 7,Product 8,Product 9 (Row 2+3)"
```

Row 5:

```
"What is the combined balance of the customer?"
> 15000
```

```
"Includes product 1? (y/n)? > y
"Includes product 2? (y/n)? > y
"Includes product 5? (y/n)? > n
"Includes product 6? (y/n)? > n
"Includes product 7? (y/n)? > n
"Offered products: Product 5(no charge),Product 7,Product 8(no annual fee),Product 9,Product 10 (Row 5)"
"Platinum Package"
```

Customer profile undefined:

```
"What is the combined balance of the customer?"
> 499
```

```
"Nothing to offer"
"Undefined customer profile: combined balance < 500"
```

Demo Goal-driven/Backward-chaining reasoning with condition subtables.

Row 3 (with trace=false):

```
"What is the combined balance of the customer?"
> 2000

"Includes product 1? (y/n)? > y
"Includes product 2? (y/n)? > y
"Includes product 3? (y/n)? > n
"Includes product 6? (y/n)? > n
"Includes product 7? (y/n)? > n
"Includes product 8? (y/n)? > n
"Offered products: Product 4,Product 5,Product 7,Product 8,Product 9 (Row 3)"
```

Row 3 (with trace=true):

```
PS C:\Users\Administrator\onedrive\pprogs> python uc.py
File to read...: up.txt
All decision tables checked and ok.

Prove (Offer is Row1)
  >> Conditions Table 1 Rule 4:
  Prove (customer_profile is bronze/silver)
  >> Conditions Table 0 Rule 1:
  "What is the combined balance of the customer?"
  > 2000

  >> Failed...
  >> Conditions Table 0 Rule 2:
  >> Succeed...
  Succeed
  "Includes product 1? (y/n)? > y
  "Includes product 2? (y/n)? > y
  >> Failed...
  >> Conditions Table 1 Rule 6:
  >> Failed...
Failed
Prove (Offer is Row1+2)
  >> Conditions Table 1 Rule 5:
  >> Failed...
Failed
Prove (Offer is Row2+3)
  >> Conditions Table 1 Rule 1:
  "Includes product 3? (y/n)? > n
  >> Failed...
Failed
Prove (Offer is Row3)
  >> Conditions Table 1 Rule 3:
  Prove ('includes products 6, 7 or 8')
  >> Conditions Table 5 Rule 0:
  "Includes product 6? (y/n)? > n
  >> Failed...
  >> Conditions Table 5 Rule 1:
  "Includes product 7? (y/n)? > n
  >> Failed...
  >> Conditions Table 5 Rule 2:
  "Includes product 8? (y/n)? > n
  >> Failed...
  Failed..
  >> Succeed...
"Offered products: Product 4,Product 5,Product 7,Product 8,Product 9 (Row 3)"
Succeed
Prove ('set comment gold package')
  >> Conditions Table 2 Rule 1:
  >> Failed...
Failed
Prove ('set comment platinum package')
  >> Conditions Table 3 Rule 1:
  >> Failed...
Failed
Prove ('set comment undefined customer profile')
  >> Conditions Table 4 Rule 0:
  >> Failed...
Failed
```