Project 3-1:Association Analysis

# Apriori

This association analysis iteratively reduces the minimum support until it finds the required number of rules with the given minimum confidence. The algorithm has an option to mine class association rules. Below is the result of application of this method to database. Note that it finds interesting rules with high confidence, e.g. if outlook is overcast then situation is good for play.

=== Run information ===

Scheme: weka.associations.Apriori -N 10 -T 0 -C 0.9 -D 0.05 -U 1.0 -M 0.1 -S -1.0 -c -1

Relation: weather.symbolic

Instances: 14

Attributes: 5

outlook

temperature

humidity

windy

play

=== Associator model (full training set) ===

Apriori

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Minimum support: 0.15 (2 instances)

Minimum metric <confidence>: 0.9

Number of cycles performed: 17

Generated sets of large itemsets:

Size of set of large itemsets L(1): 12

Size of set of large itemsets L(2): 47

Size of set of large itemsets L(3): 39

Size of set of large itemsets L(4): 6

Best rules found:

1. outlook=overcast 4 ==> play=yes 4 conf:(1)

2. temperature=cool 4 ==> humidity=normal 4 conf:(1)

3. humidity=normal windy=FALSE 4 ==> play=yes 4 conf:(1)

4. outlook=sunny play=no 3 ==> humidity=high 3 conf:(1)

5. outlook=sunny humidity=high 3 ==> play=no 3 conf:(1)

6. outlook=rainy play=yes 3 ==> windy=FALSE 3 conf:(1)

7. outlook=rainy windy=FALSE 3 ==> play=yes 3 conf:(1)

8. temperature=cool play=yes 3 ==> humidity=normal 3 conf:(1)

9. outlook=sunny temperature=hot 2 ==> humidity=high 2 conf:(1)

10. temperature=hot play=no 2 ==> outlook=sunny 2 conf:(1)

# Predictive Apriori

Class implementing the predictive apriori algorithm to mine association rules. It searches with an increasing support threshold for the best 'n' rules concerning a support-based corrected confidence value. Compared to Apriori association analysis, it finds many more rules, which includes the previous ones and adds news inferences of data.

=== Run information ===

Scheme: weka.associations.PredictiveApriori -N 100 -c -1

Relation: weather.symbolic

Instances: 14

Attributes: 5

outlook

temperature

humidity

windy

play

=== Associator model (full training set) ===

PredictiveApriori

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Best rules found:

1. outlook=overcast 4 ==> play=yes 4 acc:(0.95323)

2. temperature=cool 4 ==> humidity=normal 4 acc:(0.95323)

3. humidity=normal windy=FALSE 4 ==> play=yes 4 acc:(0.95323)

4. outlook=sunny humidity=high 3 ==> play=no 3 acc:(0.92093)

5. outlook=sunny play=no 3 ==> humidity=high 3 acc:(0.92093)

6. outlook=rainy windy=FALSE 3 ==> play=yes 3 acc:(0.92093)

7. outlook=rainy play=yes 3 ==> windy=FALSE 3 acc:(0.92093)

8. outlook=sunny temperature=hot 2 ==> humidity=high play=no 2 acc:(0.86233)

9. outlook=sunny humidity=normal 2 ==> play=yes 2 acc:(0.86233)

10. outlook=sunny play=yes 2 ==> humidity=normal 2 acc:(0.86233)

11. outlook=overcast temperature=hot 2 ==> windy=FALSE play=yes 2 acc:(0.86233)

12. outlook=overcast windy=FALSE 2 ==> temperature=hot play=yes 2 acc:(0.86233)

13. outlook=rainy humidity=high 2 ==> temperature=mild 2 acc:(0.86233)

14. outlook=rainy windy=TRUE 2 ==> play=no 2 acc:(0.86233)

15. outlook=rainy play=no 2 ==> windy=TRUE 2 acc:(0.86233)

16. temperature=hot play=yes 2 ==> outlook=overcast windy=FALSE 2 acc:(0.86233)

17. temperature=hot play=no 2 ==> outlook=sunny humidity=high 2 acc:(0.86233)

18. temperature=mild humidity=normal 2 ==> play=yes 2 acc:(0.86233)

19. temperature=mild play=no 2 ==> humidity=high 2 acc:(0.86233)

20. temperature=cool windy=FALSE 2 ==> humidity=normal play=yes 2 acc:(0.86233)

21. windy=FALSE play=no 2 ==> outlook=sunny humidity=high 2 acc:(0.86233)

22. temperature=mild windy=FALSE play=yes 2 ==> outlook=rainy 2 acc:(0.86233)

23. humidity=normal 7 ==> play=yes 6 acc:(0.69497)

24. play=no 5 ==> humidity=high 4 acc:(0.59096)

25. windy=FALSE 8 ==> play=yes 6 acc:(0.56435)

26. temperature=hot 4 ==> humidity=high 3 acc:(0.54473)

27. temperature=hot 4 ==> windy=FALSE 3 acc:(0.54473)

28. temperature=cool 4 ==> humidity=normal play=yes 3 acc:(0.54473)

29. humidity=high play=no 4 ==> outlook=sunny 3 acc:(0.54473)

30. play=yes 9 ==> humidity=normal 6 acc:(0.53808)

31. play=yes 9 ==> windy=FALSE 6 acc:(0.53808)

32. temperature=mild 6 ==> humidity=high 4 acc:(0.51949)

33. temperature=mild 6 ==> play=yes 4 acc:(0.51949)

34. outlook=sunny humidity=high 3 ==> windy=FALSE play=no 2 acc:(0.49529)

35. outlook=sunny humidity=high 3 ==> temperature=hot play=no 2 acc:(0.49529)

36. outlook=sunny windy=FALSE 3 ==> humidity=high play=no 2 acc:(0.49529)

37. outlook=sunny play=no 3 ==> humidity=high windy=FALSE 2 acc:(0.49529)

38. outlook=sunny play=no 3 ==> temperature=hot humidity=high 2 acc:(0.49529)

39. outlook=rainy temperature=mild 3 ==> windy=FALSE play=yes 2 acc:(0.49529)

40. outlook=rainy humidity=normal 3 ==> temperature=cool 2 acc:(0.49529)

41. outlook=rainy humidity=normal 3 ==> windy=FALSE play=yes 2 acc:(0.49529)

42. outlook=rainy windy=FALSE 3 ==> humidity=normal play=yes 2 acc:(0.49529)

43. outlook=rainy windy=FALSE 3 ==> temperature=mild play=yes 2 acc:(0.49529)

44. outlook=rainy play=yes 3 ==> temperature=mild windy=FALSE 2 acc:(0.49529)

45. outlook=rainy play=yes 3 ==> humidity=normal windy=FALSE 2 acc:(0.49529)

46. temperature=hot humidity=high 3 ==> outlook=sunny play=no 2 acc:(0.49529)

47. temperature=hot windy=FALSE 3 ==> outlook=overcast play=yes 2 acc:(0.49529)

48. temperature=mild windy=FALSE 3 ==> outlook=rainy play=yes 2 acc:(0.49529)

49. temperature=cool play=yes 3 ==> humidity=normal windy=FALSE 2 acc:(0.49529)

50. humidity=high windy=TRUE 3 ==> temperature=mild 2 acc:(0.49529)

51. humidity=high windy=TRUE 3 ==> play=no 2 acc:(0.49529)

52. humidity=high play=yes 3 ==> outlook=overcast 2 acc:(0.49529)

53. humidity=high play=yes 3 ==> temperature=mild 2 acc:(0.49529)

54. humidity=normal windy=TRUE 3 ==> temperature=cool 2 acc:(0.49529)

55. windy=TRUE play=yes 3 ==> outlook=overcast 2 acc:(0.49529)

56. windy=TRUE play=yes 3 ==> temperature=mild 2 acc:(0.49529)

57. windy=TRUE play=no 3 ==> outlook=rainy 2 acc:(0.49529)

58. humidity=high 7 ==> temperature=mild 4 acc:(0.49376)

59. humidity=high 7 ==> windy=FALSE 4 acc:(0.49376)

60. humidity=normal 7 ==> temperature=cool 4 acc:(0.49376)

61. humidity=normal 7 ==> windy=FALSE play=yes 4 acc:(0.49376)

62. outlook=sunny 5 ==> windy=FALSE 3 acc:(0.48941)

63. outlook=sunny 5 ==> humidity=high play=no 3 acc:(0.48941)

64. outlook=rainy 5 ==> temperature=mild 3 acc:(0.48941)

65. outlook=rainy 5 ==> humidity=normal 3 acc:(0.48941)

66. outlook=rainy 5 ==> windy=FALSE play=yes 3 acc:(0.48941)

67. play=no 5 ==> windy=TRUE 3 acc:(0.48941)

68. play=no 5 ==> outlook=sunny humidity=high 3 acc:(0.48941)

69. windy=FALSE 8 ==> humidity=high 4 acc:(0.46991)

70. windy=FALSE 8 ==> humidity=normal play=yes 4 acc:(0.46991)

71. temperature=mild 6 ==> outlook=rainy 3 acc:(0.46058)

72. temperature=mild 6 ==> windy=TRUE 3 acc:(0.46058)

73. windy=TRUE 6 ==> temperature=mild 3 acc:(0.46058)

74. windy=TRUE 6 ==> humidity=high 3 acc:(0.46058)

75. windy=FALSE play=yes 6 ==> outlook=rainy 3 acc:(0.46058)

76. outlook=overcast 4 ==> humidity=high play=yes 2 acc:(0.44678)

77. outlook=overcast 4 ==> temperature=hot windy=FALSE 2 acc:(0.44678)

78. temperature=hot 4 ==> outlook=overcast windy=FALSE 2 acc:(0.44678)

79. temperature=hot 4 ==> outlook=sunny humidity=high 2 acc:(0.44678)

80. temperature=cool 4 ==> humidity=normal windy=TRUE 2 acc:(0.44678)

81. temperature=cool 4 ==> outlook=rainy humidity=normal 2 acc:(0.44678)

82. outlook=overcast play=yes 4 ==> windy=TRUE 2 acc:(0.44678)

83. temperature=mild humidity=high 4 ==> play=no 2 acc:(0.44678)

84. temperature=mild play=yes 4 ==> outlook=rainy windy=FALSE 2 acc:(0.44678)

85. humidity=high play=no 4 ==> temperature=hot 2 acc:(0.44678)

86. humidity=normal windy=FALSE 4 ==> outlook=rainy 2 acc:(0.44678)

87. play=yes 9 ==> outlook=overcast 4 acc:(0.44601)

88. play=yes 9 ==> temperature=mild 4 acc:(0.44601)

89. play=yes 9 ==> humidity=normal windy=FALSE 4 acc:(0.44601)

90. humidity=high 7 ==> temperature=hot 3 acc:(0.43225)

91. humidity=high 7 ==> outlook=sunny play=no 3 acc:(0.43225)

92. humidity=normal 7 ==> outlook=rainy 3 acc:(0.43225)

93. humidity=normal 7 ==> windy=TRUE 3 acc:(0.43225)

94. humidity=normal 7 ==> temperature=cool play=yes 3 acc:(0.43225)

95. outlook=sunny 5 ==> temperature=mild 2 acc:(0.41235)

96. outlook=sunny 5 ==> temperature=hot humidity=high 2 acc:(0.41235)

97. outlook=rainy 5 ==> temperature=mild humidity=high 2 acc:(0.41235)

98. outlook=rainy 5 ==> temperature=mild windy=FALSE 2 acc:(0.41235)

99. play=no 5 ==> outlook=sunny temperature=hot 2 acc:(0.41235)

# Tertius

Finds rules according to confirmation measure (Tertius-type algorithm). Rules are meaningful, e.g. if the humidity is high and temperature is high, then condition is not appropriate for play.

=== Run information ===

Scheme: weka.associations.Tertius -K 10 -F 0.0 -N 1.0 -L 4 -G 0 -c 0 -I 0 -P 0

Relation: weather.symbolic

Instances: 14

Attributes: 5

outlook

temperature

humidity

windy

play

=== Associator model (full training set) ===

Tertius

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1. /\* 0.633754 0.071429 \*/ play = yes ==> humidity = normal or outlook = overcast

2. /\* 0.607625 0.000000 \*/ humidity = normal ==> temperature = cool or play = yes

3. /\* 0.607625 0.000000 \*/ temperature = cool ==> humidity = normal

4. /\* 0.594071 0.214286 \*/ humidity = normal ==> temperature = cool

5. /\* 0.590214 0.000000 \*/ humidity = high and outlook = sunny ==> play = no

6. /\* 0.555556 0.000000 \*/ play = no ==> windy = TRUE or outlook = sunny

7. /\* 0.486606 0.000000 \*/ play = no and outlook = sunny ==> humidity = high

8. /\* 0.486606 0.000000 \*/ humidity = normal ==> play = yes or outlook = rainy

9. /\* 0.469374 0.000000 \*/ outlook = overcast ==> play = yes

10. /\* 0.469374 0.000000 \*/ windy = FALSE and outlook = overcast ==> temperature = hot

11. /\* 0.469374 0.000000 \*/ outlook = overcast ==> temperature = hot or windy = TRUE

12. /\* 0.469374 0.000000 \*/ temperature = hot and play = yes ==> outlook = overcast

13. /\* 0.469374 0.000000 \*/ play = no ==> humidity = high or windy = TRUE

14. /\* 0.469374 0.000000 \*/ temperature = hot ==> play = no or outlook = overcast

15. /\* 0.469374 0.000000 \*/ temperature = hot ==> humidity = high or outlook = overcast

16. /\* 0.469374 0.000000 \*/ humidity = high and play = no ==> temperature = mild or outlook = sunny

17. /\* 0.469374 0.000000 \*/ temperature = mild and play = yes ==> windy = TRUE or outlook = rainy

18. /\* 0.469374 0.000000 \*/ outlook = sunny ==> temperature = cool or windy = TRUE or play = no

19. /\* 0.467119 0.357143 \*/ play = yes ==> outlook = overcast

20. /\* 0.458333 0.071429 \*/ play = yes ==> windy = FALSE or outlook = overcast

21. /\* 0.458333 0.071429 \*/ humidity = high and play = no ==> outlook = sunny

22. /\* 0.439100 0.071429 \*/ play = no ==> humidity = high

23. /\* 0.439100 0.071429 \*/ humidity = high ==> temperature = mild or play = no

24. /\* 0.439100 0.071429 \*/ humidity = high ==> temperature = mild or outlook = sunny

Number of hypotheses considered: 1724

Number of hypotheses explored: 689