

ภาคผนวก ข

การสร้างตัวแบบจำลองด้วยโปรแกรม WEKA 3.5.8

1. ผลการสร้างตัวแบบจำลอง Gas porosity ด้วย Classifier J48 Decision Tree

Run information

Scheme: weka.classifiers.trees.J48 -C 0.25 -M 2

Relation: Gas porosity-weka.filters.unsupervised.attribute.Remove-

R1,3,5,7,9,11,13,15,18-weka.filters.unsupervised.attribute.Remove-R1,4-5

Instances: 28305

Attributes: 6

Shot_Pressure Ranking

Shot_Retract_Ranking

Aluminium_Temp Ranking

Accumulator_pressure Ranking

Shot_velocity Ranking

Gas porosity

Test mode: 10-fold cross-validation

=== Classifier model (full training set) ===

J48 pruned tree

Aluminium_Temp Ranking = Medium

| Shot_Pressure Ranking = Medium

| | Shot_Retract_Ranking = Medium

| | | Shot_velocity Ranking = Medium

| | | | Accumulator_pressure Ranking = Medium: N (22440.0/1896.0)

| | | | Accumulator_pressure Ranking = High: N (723.0/46.0)

| | | | Accumulator_pressure Ranking = Low: Y (75.0)

| | | Shot_velocity Ranking = High: Y (66.0)

| | | Shot_velocity Ranking = Low: N (32.0/3.0)

| | Shot_Retract_Ranking = Low

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| | | Shot_velocity Ranking = Medium: N (376.0/38.0)
| | | Shot_velocity Ranking = High: Y (2.0)
| | | Shot_velocity Ranking = Low: N (0.0)
| | Shot_Retract_Ranking = High: Y (131.0)
| Shot_Pressure Ranking = Low: Y (845.0)
| Shot_Pressure Ranking = High
| | Shot_velocity Ranking = Medium
| | | Shot_Retract_Ranking = Medium: N (2377.0/201.0)
| | | Shot_Retract_Ranking = Low: N (39.0/1.0)
| | | Shot_Retract_Ranking = High: Y (10.0)
| | Shot_velocity Ranking = High: Y (27.0)
| | Shot_velocity Ranking = Low: N (0.0)
Aluminium_Temp Ranking = High: Y (741.0)
Aluminium_Temp Ranking = Low
| Shot_Pressure Ranking = Medium: N (381.0/28.0)
| Shot_Pressure Ranking = Low: Y (11.0)
| Shot_Pressure Ranking = High
| | Shot_velocity Ranking = Medium: N (27.0/2.0)
| | Shot_velocity Ranking = High: Y (2.0)
| | Shot_velocity Ranking = Low: N (0.0)
Number of Leaves :      21
Size of the tree :    31
Time taken to build model: 3.03 seconds

=== Stratified cross-validation ===

=== Summary ===
Correctly Classified Instances      26083      92.1498 %
Incorrectly Classified Instances    2222      7.8502 %
Kappa statistic                    0.5942
Mean absolute error                 0.1436

```

Root mean squared error 0.2682
 Relative absolute error 57.6703 %
 Root relative squared error 76.0074 %
 Total Number of Instances 28305

=== Detailed Accuracy By Class ===

TP Rate	FP Rate	Precision	Recall	F-Measure	ROC Area	Class
0.462	0	0.999	0.462	0.632	0.723	Y
1	0.538	0.916	1	0.956	0.723	N

=== Confusion Matrix ===

```

a   b  <-- classified as
    2  20 |   a = Y
2  24178 |   b = N

```

2 ผลการสร้างตัวแบบจำลอง Gas Porosity Defect ด้วย กฎการเชื่อมโยง

Associations.Apriori

ตัวแบบการเกิด Gas porosity Defect ด้วย Associations.Apriori

Run information (Car = False)

Best rules found

1. Aluminium_Temp Rang=Medium 27143 ==> Max.Shot_velocity=Medium
27010 conf:(1)
2. Shot_Retract_Ranking=Medium Aluminium_Temp Rang=Medium 26570
==> Max.Shot_velocity=Medium 26439 conf:(1)
3. Aluminium_Temp Rang=Medium Accumulator_pressure=Medium 26017
==> Max.Shot_velocity=Medium 25888 conf:(1)
4. Accumulator_pressure=Medium 27131 ==> Max.Shot_velocity=Medium
26987 conf:(0.99)
5. Shot_Retract_Ranking=Medium 27673 ==> Max.Shot_velocity=Medium
27525 conf:(0.99)
6. Shot_Retract_Ranking=Medium Accumulator_pressure=Medium 26534
==> Max.Shot_velocity=Medium 26392 conf:(0.99)

7. Aluminium_Temp Rang=Medium Accumulator_pressure=Medium 26017
 ==> Shot_Retract_Ranking=Medium 25476 conf:(0.98)

8. Aluminium_Temp Rang=Medium 27143 ==>
 Shot_Retract_Ranking=Medium 26570 conf:(0.98)

9. Aluminium_Temp Rang=Medium Max.Shot_velocity=Medium 27010 ==>
 Shot_Retract_Ranking=Medium 26439 conf:(0.98)

10. Accumulator_pressure=Medium 27131 ==>
 Shot_Retract_Ranking=Medium 26534 conf:(0.98)

3 ตัวแบบการเกิด Gas porosity Defect ด้วย Associations.Apriori ,
 Run information (Car = True)

Best rules found:

1. Shot_Pressure Ranking=Medium Shot_Retract_Ranking=Medium
 Aluminium_Temp Rang=Medium Accumulator_pressure=Medium
 Max.Shot_velocity=Medium 22440 ==> Gas posity=N 20544 conf:(0.92)

2. Shot_Pressure Ranking=Medium Shot_Retract_Ranking=Medium
 Aluminium_Temp Rang=Medium Max.Shot_velocity=Medium 23238 ==> Gas
 posity=N 21221 conf:(0.91)

3. Shot_Pressure Ranking=Medium Shot_Retract_Ranking=Medium
 Aluminium_Temp Rang=Medium Accumulator_pressure=Medium 22534 ==>
 Gas posity=N 20573 conf:(0.91)

4. Shot_Pressure Ranking=Medium Shot_Retract_Ranking=Medium
 Aluminium_Temp Rang=Medium 23336 ==> Gas posity=N 21250 conf:(0.91)

5. Shot_Pressure Ranking=Medium Aluminium_Temp Rang=Medium
 Accumulator_pressure=Medium Max.Shot_velocity=Medium 22923 ==> Gas
 posity=N 20873 conf:(0.91)

6. Shot_Pressure Ranking=Medium Aluminium_Temp Rang=Medium
 Accumulator_pressure=Medium 23019 ==> Gas posity=N 20902 conf:(0.91)

7. Shot_Pressure Ranking=Medium Aluminium_Temp Rang=Medium
 Max.Shot_velocity=Medium 23745 ==> Gas posity=N 21559 conf:(0.91)

8. Shot_Pressure Ranking=Medium Aluminium_Temp Rang=Medium 23845 ==>

Gas posity=N 21588 conf:(0.91)

4 ผลการสร้างตัวแบบจำลองการเกิด Flow Porosity Defect ด้วย Classifier J48

Decision Tree

=== Run information ===

Scheme: weka.classifiers.trees.J48 -C 0.25 -M 2

Relation: Flow Porosity master model-weka.filters.unsupervised.attribute.Remove-R1,3,5,7

Instances: 28305

Attributes: 5

Cycle_Time Ranking

Shot_Pressure Ranking

Aluminium_Temp Rang

Accumulator_pressure

Flow porosity

Test mode: 10-fold cross-validation

=== Classifier model (full training set) ===

J48 pruned tree

Aluminium_Temp Rang = Medium

| Shot_Pressure Ranking = Medium

| | Cycle_Time Ranking = Medium

| | | Accumulator_pressure = Medium: N (22192.0/2313.0)

| | | Accumulator_pressure = High: N (707.0/76.0)

| | | Accumulator_pressure = Low: Y (85.0)

| | Cycle_Time Ranking = Low: N (682.0/75.0)

| | Cycle_Time Ranking = High: Y (179.0)

| Shot_Pressure Ranking = Low: Y (845.0)

| Shot_Pressure Ranking = High

| | Cycle_Time Ranking = Medium: N (2373.0/244.0)

| | Cycle_Time Ranking = Low: N (58.0/4.0)

| | Cycle_Time Ranking = High: Y (22.0)

Aluminium_Temp Rang = Low: Y (421.0)

Aluminium_Temp Rang = High

| Shot_Pressure Ranking = Medium

| | Cycle_Time Ranking = Medium: N (608.0/57.0)

| | Cycle_Time Ranking = Low: N (13.0/1.0)

| | Cycle_Time Ranking = High: Y (3.0)

| Shot_Pressure Ranking = Low: Y (21.0)

| Shot_Pressure Ranking = High: N (96.0/17.0)

Number of Leaves : 15

Size of the tree : 22

Time taken to build model: 1.34 seconds

=== Stratified cross-validation ===

=== Summary ===

Correctly Classified Instances	25515	90.1431 %
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Incorrectly Classified Instances	2790	9.8569 %
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Kappa statistic	0.4882
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Mean absolute error	0.1765
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Root mean squared error	0.2972
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Relative absolute error	67.683 %
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Root relative squared error	82.3035 %
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Total Number of Instances	28305
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=== Detailed Accuracy By Class ===

TP Rate	FP Rate	Precision	Recall	F-Measure	ROC Area	Class
0.361	0	1	0.361	0.53	0.673	Y
1	0.639	0.896	1	0.945	0.673	N

=== Confusion Matrix ===

a b <-- classified as

1573 2790 | a = Y

0 23942 | b = N

5 สร้างตัวแบบจำลอง Flow Porosity Defect ด้วยกฎความเชื่อมโยง Associations.

Apriori

Run information Summary (Car = False)

Best rules found:

1. Accumulator_pressure=Medium 27131 ==> Cycle_Time Ranking=Medium 26174
conf:(0.96)
2. Aluminium_Temp Rang=Medium Accumulator_pressure=Medium 26017 ==>
Cycle_Time Ranking=Medium 25093 conf:(0.96)
3. Aluminium_Temp Rang=Medium 27143 ==> Cycle_Time Ranking=Medium 26173
conf:(0.96)
4. Accumulator_pressure=Medium 27131 ==> Aluminium_Temp Rang=Medium 26017
conf:(0.96)
5. Cycle_Time Ranking=Medium Aluminium_Temp Rang=Medium 26173 ==>
Accumulator_pressure=Medium 25093 conf:(0.96)
6. Cycle_Time Ranking=Medium Accumulator_pressure=Medium 26174 ==>
Aluminium_Temp Rang=Medium 25093 conf:(0.96)
7. Cycle_Time Ranking=Medium 27302 ==> Accumulator_pressure=Medium 26174
conf:(0.96)
8. Cycle_Time Ranking=Medium 27302 ==> Aluminium_Temp Rang=Medium 26173
conf:(0.96)
9. Aluminium_Temp Rang=Medium 27143 ==> Accumulator_pressure=Medium 26017
conf:(0.96)
10. Accumulator_pressure=Medium 27131 ==> Cycle_Time Ranking=Medium
Aluminium_Temp Rang=Medium 25093 conf:(0.92)

6 สร้างตัวแบบจำลอง Flow Porosity Defect ด้วยกฎความเชื่อมโยง Associations.

Apriori Run information Summary (Car = True)

Best rules found:

1. Cycle_Time Ranking=Medium Shot_Pressure Ranking=Medium Aluminium_Temp Rang=Medium Accumulator_pressure=Medium 22192 ==> Flow porosity=N 19879 conf:(0.9)
2. Cycle_Time Ranking=Medium Shot_Pressure Ranking=Medium Aluminium_Temp Rang=Medium 22984 ==> Flow porosity=N 20510 conf:(0.89)
3. Shot_Pressure Ranking=Medium Aluminium_Temp Rang=Medium Accumulator_pressure=Medium 23019 ==> Flow porosity=N 20457 conf:(0.89)
4. Shot_Pressure Ranking=Medium Aluminium_Temp Rang=Medium 23845 ==> Flow porosity=N 21117 conf:(0.89)
5. Cycle_Time Ranking=Medium Shot_Pressure Ranking=Medium Accumulator_pressure=Medium 23140 ==> Flow porosity=N 20413 conf:(0.88)
6. Cycle_Time Ranking=Medium Shot_Pressure Ranking=Medium 23963 ==> Flow porosity=N 21061 conf:(0.88)
7. Shot_Pressure Ranking=Medium Accumulator_pressure=Medium 23993 ==> Flow porosity=N 21003 conf:(0.88)
8. Shot_Pressure Ranking=Medium 24850 ==> Flow porosity=N 21680 conf:(0.87)
9. Cycle_Time Ranking=Medium Aluminium_Temp Rang=Medium Accumulator_pressure=Medium 25093 ==> Flow porosity=N 21793 conf:(0.87)
10. Cycle_Time Ranking=Medium Aluminium_Temp Rang=Medium 26173 ==> Flow porosity=N 22639 conf:(0.86)

7 ผลการสร้างตัวแบบจำลองการเกิด Cold Shot porosity ด้วย Classifier J48 Decision

Tree

= Run information ==

Scheme: weka.classifiers.trees.J48 -C 0.25 -M 2

Relation: ShotData master ver04-weka.filters.unsupervised.attribute.Remove-

R1,3,5,7,9,11,13,15,18-weka.filters.unsupervised.attribute.Remove-R2-3,7-8

Instances: 28305

Attributes: 5

Cycle_Time Ranking

Top_mold_temp Ranking

Lower_Mold_Temp Ranking

Aluminium_Temp Rang

Cold shot porosity

Test mode: 10-fold cross-validation

=== Classifier model (full training set) ===

J48 pruned tree

Aluminium_Temp Rang = Medium

| Lower_Mold_Temp Ranking = Medium

| | Cycle_Time Ranking = Medium

| | | Top_mold_temp Ranking = Low: Y (25.0)

| | | Top_mold_temp Ranking = Medium: N (25396.0/507.0)

| | | Top_mold_temp Ranking = High: N (274.0/6.0)

| | Cycle_Time Ranking = Low: N (752.0/19.0)

| | Cycle_Time Ranking = High: Y (201.0/62.0)

| Lower_Mold_Temp Ranking = Low: Y (68.0)

| Lower_Mold_Temp Ranking = High

| | Cycle_Time Ranking = Medium: N (411.0/10.0)

| | Cycle_Time Ranking = Low: N (11.0)

| | Cycle_Time Ranking = High: Y (5.0/1.0)

Aluminium_Temp Rang = High

| Lower_Mold_Temp Ranking = Medium

| | Cycle_Time Ranking = Medium: N (700.0/13.0)

| | Cycle_Time Ranking = Low: N (17.0)

| | Cycle_Time Ranking = High: Y (5.0/1.0)

| Lower_Mold_Temp Ranking = Low: Y (9.0)

| Lower_Mold_Temp Ranking = High: N (10.0)

Aluminium_Temp Rang = Low: Y (421.0)

Number of Leaves : 15

Size of the tree : 22

Time taken to build model: 0.89 seconds

=== Stratified cross-validation ===

=== Summary ===

Correctly Classified Instances	27680	97.7919 %
Incorrectly Classified Instances	625	2.2081 %
Kappa statistic	0.6693	
Mean absolute error	0.0418	
Root mean squared error	0.145	
Relative absolute error	50.5056 %	
Root relative squared error	71.2817 %	
Total Number of Instances	28305	

=== Detailed Accuracy By Class ===

TP Rate	FP Rate	Precision	Recall	F-Measure	ROC Area	Class
0.542	0.002	0.912	0.542	0.68	0.76	Y
0.998	0.458	0.98	0.998	0.989	0.76	N

=== Confusion Matrix ===

a b <-- classified as

664 561 | a = Y

64 27016 | b = N

8 สร้างตัวแบบจำลอง Cold Shot Porosity Defect ด้วยกฎความเชื่อมโยง Associations.

Apriori

Run information (Car = False)

Best rules found:

1. Cycle_Time Ranking=Medium Aluminium_Temp Rang=Medium 26173 ==> Cold shot porosity=N 25558 conf:(0.98)

2. Top_mold_temp Ranking=Medium Lower_Mold_Temp Ranking=Medium Aluminium_Temp Rang=Medium 26343 ==> Cold shot porosity=N 25678 conf:(0.97)

3. Lower_Mold_Temp Ranking=Medium Aluminium_Temp Rang=Medium 26648 ==> Cold shot porosity=N 25952 conf:(0.97)
4. Top_mold_temp Ranking=Medium Aluminium_Temp Rang=Medium 26835 ==> Cold shot porosity=N 26091 conf:(0.97)
5. Aluminium_Temp Rang=Medium 27143 ==> Cold shot porosity=N 26365 conf:(0.97)
6. Cycle_Time Ranking=Medium Top_mold_temp Ranking=Medium Lower_Mold_Temp Ranking=Medium 26473 ==> Cold shot porosity=N 25554 conf:(0.97)
7. Cycle_Time Ranking=Medium Lower_Mold_Temp Ranking=Medium 26800 ==> Cold shot porosity=N 25844 conf:(0.96)
8. Cycle_Time Ranking=Medium Top_mold_temp Ranking=Medium 26972 ==> Cold shot porosity=N 25965 conf:(0.96)
9. Cycle_Time Ranking=Medium 27302 ==> Cold shot porosity=N 26255 conf:(0.96)
10. Top_mold_temp Ranking=Medium Lower_Mold_Temp Ranking=Medium 27453 ==> Cold shot porosity=N 26361 conf:(0.96)

9. สร้างตัวแบบจำลอง Cold Shot Porosity Defect ด้วยกฎความเชื่อมโยง Associations.

Apriori Run information (Car = True)

Best rules found:

1. Cycle_Time Ranking=Medium Aluminium_Temp Rang=Medium 26173 ==> Cold shot porosity=N 25558 conf:(0.98)
2. Top_mold_temp Ranking=Medium Lower_Mold_Temp Ranking=Medium Aluminium_Temp Rang=Medium 26343 ==> Cold shot porosity=N 25678 conf:(0.97)
3. Lower_Mold_Temp Ranking=Medium Aluminium_Temp Rang=Medium 26648 ==> Cold shot porosity=N 25952 conf:(0.97)
4. Top_mold_temp Ranking=Medium Aluminium_Temp Rang=Medium 26835 ==> Cold shot porosity=N 26091 conf:(0.97)
5. Aluminium_Temp Rang=Medium 27143 ==> Cold shot porosity=N 26365 conf:(0.97)

6. Cycle_Time Ranking=Medium Top_mold_temp Ranking=Medium Lower_Mold_Temp Ranking=Medium 26473 ==> Cold shot porosity=N 25554 conf:(0.97)

7. Cycle_Time Ranking=Medium Lower_Mold_Temp Ranking=Medium 26800 ==> Cold shot porosity=N 25844 conf:(0.96)

8. Cycle_Time Ranking=Medium Top_mold_temp Ranking=Medium 26972 ==> Cold shot porosity=N 25965 conf:(0.96)

9. Cycle_Time Ranking=Medium 27302 ==> Cold shot porosity=N 26255 conf:(0.96)

10. Top_mold_temp Ranking=Medium Lower_Mold_Temp Ranking=Medium 27453 ==> Cold shot porosity=N 26361 conf:(0.96)

10. ผลการสร้างตัวแบบจำลอง Hot Crack porosity Defect ด้วย Classifier J48

Decision Tree

=== Run information ===

Scheme: weka.classifiers.trees.J48 -C 0.25 -M 2

Relation: Hot Crack porosity1-weka.filters.unsupervised.attribute.Remove-R1-7,9,11,13-16,18

Instances: 28305

Attributes: 4

Top_mold_temp Ranking

Lower_Mold_Temp Ranking

Aluminium_Temp Rang

Hot Crack Porosity

Test mode: 10-fold cross-validation

=== Classifier model (full training set) ===

J48 pruned tree

Aluminium_Temp Rang = High: Y (741.0/1.0)

Aluminium_Temp Rang = Medium

| Lower_Mold_Temp Ranking = Medium

| | Top_mold_temp Ranking = Medium: N (26343.0/1042.0)

| | Top_mold_temp Ranking = High: Y (280.0)

| | Top_mold_temp Ranking = Low: N (25.0)

| Lower_Mold_Temp Ranking = Low

| | Top_mold_temp Ranking = Medium: N (65.0/2.0)

| | Top_mold_temp Ranking = High: Y (2.0)

| | Top_mold_temp Ranking = Low: N (1.0)

| Lower_Mold_Temp Ranking = High: Y (427.0)

Aluminium_Temp Rang = Low

| Top_mold_temp Ranking = Medium

| | Lower_Mold_Temp Ranking = Medium: N (410.0/19.0)

| | Lower_Mold_Temp Ranking = Low: N (0.0)

| | Lower_Mold_Temp Ranking = High: Y (5.0)

| Top_mold_temp Ranking = High: Y (6.0)

| Top_mold_temp Ranking = Low: N (0.0)

Number of Leaves : 13

Size of the tree : 19

Time taken to build model: 0.28 seconds

=== Stratified cross-validation ===

=== Summary ===

Correctly Classified Instances	27239	96.2339 %
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Incorrectly Classified Instances	1066	3.7661 %
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Kappa statistic	0.7136
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Mean absolute error	0.0723
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Root mean squared error	0.1902
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Relative absolute error	44.5078 %
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Root relative squared error	66.748 %
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Total Number of Instances	28305
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=== Detailed Accuracy By Class ===

TP Rate	FP Rate	Precision	Recall	F-Measure	ROC Area	Class
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0.578  0      0.999  0.578  0.732  0.779  Y
1      0.422  0.96   1      0.98   0.779  N

```

=== Confusion Matrix ===

```
a  b  <-- classified as
```

```
1458 1065 |  a = Y
```

```
1 25781 |  b = N
```

11 ผลการสร้างตัวแบบ Hot Crack Porosity Defect ด้วยกฎความเชื่อมโยง

Associations.Apriori (Car = False)

=== 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: Hot Crack porosity1-weka.filters.unsupervised.attribute.Remove-R1-7,9,11,13-16,18

Instances: 28305

Attributes: 4

Top_mold_temp Ranking

Lower_Mold_Temp Ranking

Aluminium_Temp Rang

Hot Crack Porosity

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

Apriori

Minimum support: 0.9 (25474 instances)

Minimum metric <confidence>: 0.9

Number of cycles performed: 2

Generated sets of large itemsets:

Size of set of large itemsets L(1): 4

Size of set of large itemsets L(2): 5

Size of set of large itemsets L(3): 2

Best rules found: (Car = False)

1. Lower_Mold_Temp Ranking=Medium Hot Crack Porosity=N 25718 ==>
Top_mold_temp Ranking=Medium 25693 conf:(1)
2. Hot Crack Porosity=N 25782 ==> Top_mold_temp Ranking=Medium 25756
conf:(1)
3. Top_mold_temp Ranking=Medium Hot Crack Porosity=N 25756 ==>
Lower_Mold_Temp Ranking=Medium 25693 conf:(1)
4. Hot Crack Porosity=N 25782 ==> Lower_Mold_Temp Ranking=Medium 25718
conf:(1)
5. Hot Crack Porosity=N 25782 ==> Top_mold_temp Ranking=Medium
Lower_Mold_Temp Ranking=Medium 25693 conf:(1)
6. Aluminium_Temp Rang=Medium 27143 ==> Top_mold_temp Ranking=Medium
26835 conf:(0.99)
7. Lower_Mold_Temp Ranking=Medium Aluminium_Temp Rang=Medium 26648 ==>
Top_mold_temp Ranking=Medium 26343 conf:(0.99)
8. Lower_Mold_Temp Ranking=Medium 27786 ==> Top_mold_temp Ranking=Medium
27453 conf:(0.99)
9. Aluminium_Temp Rang=Medium 27143 ==> Lower_Mold_Temp Ranking=Medium
26648 conf:(0.98)
10. Top_mold_temp Ranking=Medium Aluminium_Temp Rang=Medium 26835 ==>
Lower_Mold_Temp Ranking=Medium 26343 conf:(0.98)

12 ผลการสร้างตัวแบบ Hot Crack Porosity Defect ด้วยกฎความเชื่อมโยง

Associations. Apriori (Car = True)

Best rules found:

1. Top_mold_temp Ranking=Medium Lower_Mold_Temp Ranking=Medium
Aluminium_Temp Rang=Medium 26343 ==> Hot Crack Porosity=N 25301 conf:(0.96)
2. Lower_Mold_Temp Ranking=Medium Aluminium_Temp Rang=Medium 26648 ==>
Hot Crack Porosity=N 25326 conf:(0.95)

3. Top_mold_temp Ranking=Medium Aluminium_Temp Rang=Medium 26835 ==> Hot Crack Porosity=N 25364 conf:(0.95)

4. Top_mold_temp Ranking=Medium Lower_Mold_Temp Ranking=Medium 27453 ==> Hot Crack Porosity=N 25693 conf:(0.94)

5. Aluminium_Temp Rang=Medium 27143 ==> Hot Crack Porosity=N 25390
conf:(0.94)

6. Lower_Mold_Temp Ranking=Medium 27786 ==> Hot Crack Porosity=N 25718
conf:(0.93)

7. Top_mold_temp Ranking=Medium 27969 ==> Hot Crack Porosity=N 25756
conf:(0.92)