

Original Data Set:

	p0	p1	p2	p3	p4	p5	p6	p7	p8	win
0	o	x	o	x	o	b	x	x	o	no-win
1	x	o	x	o	b	x	o	b	x	win
2	x	x	b	o	o	o	b	x	b	no-win
3	b	o	o	x	o	b	x	x	x	win
4	o	o	x	b	b	x	o	x	x	win
...
244	o	x	x	o	o	x	x	b	o	no-win
245	x	b	o	o	x	b	o	x	x	win
246	x	x	x	o	o	b	o	b	x	win
247	o	b	b	x	o	b	x	x	o	no-win
248	x	x	b	o	o	o	b	b	x	no-win

[249 rows x 10 columns]

--> Initiate tree...

parentEntropy:0.92612
Sum of infoGains: 0.23171
feature: p4

----- Decision Tree -----
Tree depth: 1
{ 'p4': { 'b': 'win', 'o': 'no-win', 'x': 'win' } }
Training set accuracy: 71.08434
Test accuracy: 52.52525

--> Initiate tree...

parentEntropy:0.92612
Sum of infoGains: 0.23171
feature: p4

parentEntropy:0.85418
Sum of infoGains: 0.45065
feature: p1

----- Decision Tree -----
Tree depth: 2
{ 'p4': { 'b': { 'p1': { 'b': 'win', 'o': 'win', 'x': 'no-win' } },
 'o': 'no-win',
 'x': 'win' } }
Training set accuracy: 71.08434
Test accuracy: 55.55556

--> Initiate tree...

parentEntropy:0.92612
Sum of infoGains: 0.23171
feature: p4

parentEntropy:0.85418
Sum of infoGains: 0.45065
feature: p1

parentEntropy:0.81128
Sum of infoGains: 1.55439
feature: p6

----- Decision Tree -----

Tree depth: 3
{ 'p4': { 'b': { 'p1': { 'b': { 'p6': { 'b': 'win', 'o': 'no-win', 'x': 'win' } },
 'o': 'win',
 'x': 'no-win' } },
 'o': 'no-win',
 'x': 'win' } }

Training set accuracy: 71.48594
Test accuracy: 56.56566

--> Initiate tree...

parentEntropy:0.92612
Sum of infoGains: 0.23171
feature: p4

parentEntropy:0.85418
Sum of infoGains: 0.45065
feature: p1

parentEntropy:0.81128
Sum of infoGains: 1.55439
feature: p6

parentEntropy:0.91830
Sum of infoGains: 1.92481
feature: p3

----- Decision Tree -----

Tree depth: 4
{ 'p4': { 'b': { 'p1': { 'b': { 'p6': { 'b': 'win',
 'o': { 'p3': { 'b': 'no-win',
 'o': 'no-win',
 'x': 'win' } },
 'x': 'win' } },
 'o': 'win',
 'x': 'no-win' } },
 'o': 'no-win',
 'x': 'win' } }

Training set accuracy: 71.88755
Test accuracy: 56.56566

--> Initiate tree...

parentEntropy:0.92612
Sum of infoGains: 0.23171


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----- Decision Tree -----
Tree depth: 6
{'p4': {'b': {'p1': {'b': {'p6': {'b': 'win',
                                'o': {'p3': {'b': 'no-win',
                                                'o': 'no-win',
                                                'x': 'win'}}},
                                'x': 'win'}}},
        'o': {'p2': {'b': 'win',
                    'o': {'p0': {'b': 'win',
                                'o': 'no-win',
                                'x': 'win'}}},
                    'x': 'no-win'}}},
        'o': 'no-win',
        'x': 'win'}}
Training set accuracy: 73.09237
Test accuracy: 59.59596
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--> Initiate tree...

parentEntropy:0.92612
Sum of infoGains: 0.23171
feature: p4

parentEntropy:0.85418
Sum of infoGains: 0.45065
feature: p1

parentEntropy:0.81128
Sum of infoGains: 1.55439
feature: p6

parentEntropy:0.91830
Sum of infoGains: 1.92481
feature: p3

parentEntropy:0.59167
Sum of infoGains: 0.88011
feature: p2

parentEntropy:0.95443
Sum of infoGains: 2.17581
feature: p0

parentEntropy:1.00000
Sum of infoGains: 1.01796
feature: p0

```

```

----- Decision Tree -----
Tree depth: 7
{'p4': {'b': {'p1': {'b': {'p6': {'b': 'win',
                                'o': {'p3': {'b': 'no-win',
                                                'o': 'no-win',
                                                'x': 'win'}}},
                                'x': 'win'}}},
        'o': {'p2': {'b': 'win',
                    'o': {'p0': {'b': 'win',
                                'o': 'no-win',
                                'x': 'win'}}},
                    'x': 'no-win'}}},
        'o': 'no-win',
        'x': 'win'}}

```

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        'o': {'p2': {'b': 'win',
                    'o': {'p0': {'b': 'win',
                                'o': 'no-win',
                                'x': 'win'}}},
        'x': {'p0': {'b': 'no-win', 'o': 'no-win', 'x': 'win'}}}},
    'o': 'no-win',
    'x': 'win'}}

```

Training set accuracy: 74.69880

Test accuracy: 59.59596

--> Initiate tree...

parentEntropy:0.92612
Sum of infoGains: 0.23171
feature: p4

parentEntropy:0.85418
Sum of infoGains: 0.45065
feature: p1

parentEntropy:0.81128
Sum of infoGains: 1.55439
feature: p6

parentEntropy:0.91830
Sum of infoGains: 1.92481
feature: p3

parentEntropy:0.59167
Sum of infoGains: 0.88011
feature: p2

parentEntropy:0.95443
Sum of infoGains: 2.17581
feature: p0

parentEntropy:1.00000
Sum of infoGains: 1.01796
feature: p0

parentEntropy:0.72193
Sum of infoGains: 3.38059
feature: p2

----- Decision Tree -----

```

Tree depth: 8
{'p4': {'b': {'p1': {'b': {'p6': {'b': 'win',
                                'o': {'p3': {'b': 'no-win',
                                                'o': 'no-win',
                                                'x': 'win'}}},
                                'x': 'win'}}},
        'o': {'p2': {'b': 'win',
                    'o': {'p0': {'b': 'win',
                                'o': 'no-win',
                                'x': 'win'}}},
        'x': 'win'}}},

```

```

        'x': {'p0': {'b': 'no-win',
                    'o': {'p2': {'b': 'no-win',
                                'o': 'win',
                                'x': 'no-win'}}},
            'x': 'win'}}},

```

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    'o': 'no-win',
    'x': 'win'}}

```

Training set accuracy: 75.10040

Test accuracy: 59.59596

--> Initiate tree...

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parentEntropy:0.92612
Sum of infoGains: 0.23171
feature:  p4

```

```

parentEntropy:0.85418
Sum of infoGains: 0.45065
feature:  p1

```

```

parentEntropy:0.81128
Sum of infoGains: 1.55439
feature:  p6

```

```

parentEntropy:0.91830
Sum of infoGains: 1.92481
feature:  p3

```

```

parentEntropy:0.59167
Sum of infoGains: 0.88011
feature:  p2

```

```

parentEntropy:0.95443
Sum of infoGains: 2.17581
feature:  p0

```

```

parentEntropy:1.00000
Sum of infoGains: 1.01796
feature:  p0

```

```

parentEntropy:0.72193
Sum of infoGains: 3.38059
feature:  p2

```

```

parentEntropy:0.81128
Sum of infoGains: 1.62090
feature:  p2

```

----- Decision Tree -----

```

Tree depth:  9
{'p4': {'b': {'p1': {'b': {'p6': {'b': 'win',
                                'o': {'p3': {'b': 'no-win',
                                                'o': 'no-win',
                                                'x': 'win'}}},
                                'x': 'win'}}},
        'o': {'p2': {'b': 'win',
                    'o': {'p0': {'b': 'win',
                                'x': 'win'}}}}},

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'o': 'no-win',
'x': 'win'}}},
    'x': 'win'}}},
    'x': {'p0': {'b': 'no-win',
'o': {'p2': {'b': 'no-win',
'o': 'win',
'x': 'no-win'}}},
    'x': {'p2': {'b': 'no-win',
'o': 'no-win',
'x': 'win'}}}}}}},
'o': 'no-win',
'x': 'win'}}

```

Training set accuracy: 75.90361
 Test accuracy: 60.60606