**TUGAS UTS**

**MACHINE LEARNING**



**Oleh :**

**Muhammad Mirafuddin (F1B021136)**

**Muhammad Rafli (F1B021137)**

**Muh. Akmal Hidayatullah (F1B021132)**

**Alfan Satria Pratama(F1B020011)**

**TEKNIK ELEKTRO**

**FAKULTAS TEKNIK**

**UNIVERSITAS MATARAM**

**2025**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Date | Precipitation | Temp\_max | Temp\_min | Wind | Weather |
| 2012-01-01 | 0 | 12.8 | 5 | 4.7 | drizzle |
| 2012-01-02 | 10.9 | 10.6 | 2.8 | 4.5 | rain |
| 2012-01-03 | 0.8 | 11.7 | 7.2 | 2.3 | rain |
| 2012-01-04 | 20.3 | 12.2 | 5.6 | 4.7 | rain |
| 2012-01-05 | 1.3 | 8.9 | 2.8 | 6.1 | rain |
| 2012-01-06 | 2.5 | 4.4 | 2.2 | 2.2 | rain |
| 2012-01-07 | 0 | 7.2 | 2.8 | 2.3 | rain |
| 2012-01-08 | 0 | 10 | 2.8 | 2 | sun |
| 2012-01-09 | 4.3 | 9.4 | 5 | 3.4 | rain |
| 2012-01-10 | 1 | 6.1 | 0.6 | 3.4 | rain |
| 2012-01-11 | 0 | 6.1 | -1.1 | 5.1 | sun |
| 2012-01-12 | 0 | 6.1 | -1.7 | 1.9 | sun |
| 2012-01-13 | 0 | 5 | -2.8 | 1.3 | sun |
| 2012-01-14 | 4.1 | 4.4 | 0.6 | 5.3 | snow |
| 2012-01-15 | 5.3 | 1.1 | -3.3 | 3.2 | snow |

Formula Untuk Perhitungan Probabilitas Setiap Atribut:

***Drizzle* (1 hari)**

|  |  |
| --- | --- |
| * *Precipitation =* P(*precipitation* = 0 *| drizzle*) = * *Temp\_max* = P(*Temp\_max >* 10| drizzle) = | * *Temp\_min* = P(*Temp\_min >* 5 *| drizzle*) = * *Wind =* P(*wind > | snow*) = |

***Rain* (8 hari)**

|  |  |
| --- | --- |
| * *Precipitation =* P(*precipitation >* 0 *| rain*) = * *Precipitation* = P(*precipitation* = 0 *| rain*) = * *Temp\_max* = P(*Temp\_max* > 10 | *rain*) = * *Temp\_max =* P(*Temp\_max* 5-10 *| rain*) = | * *Temp\_min* = P(*Temp\_min* > 5 *| rain*) = * *Temp\_min* = P(*Temp\_min* 0-5 *| rain*) = * *Wind =* P(*wind* > 4*| rain*) = * *Wind =* P(*wind | rain*) = |

***Sun* (4 hari)**

|  |  |
| --- | --- |
| * *Precipitation =* P(*precipitation* = 0 *| sun*) = * *Temp\_max* = P(*Temp\_max* 5-10| *sun*) = * *Temp\_max =* P(*Temp\_max* > 10 *|sun*) = | * *Temp\_min* = P(*Temp\_min* < 0 *| sun*) = * *Temp\_min* = P(*Temp\_min* 0-5 *| sun*) = * *Wind =* P(*wind | sun*) = |

***Snow* (2 hari)**

|  |  |
| --- | --- |
| * *Precipitation =* P(*precipitation >* 0 *| snow*) = * *Temp\_max* = P(*Temp\_max <* 5| *snow*) = | * *Temp\_min* = P(*Temp\_min* < 0 *| snow*) = * *Wind =* P(*wind > | snow*) = * *Wind =* P(*wind | snow*) = |

**Tabel Probabalitas**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *Precipitation* | *Temp\_max* | *Temp\_min* | *Wind* | *Weather* |
|  | (High) | (High) | (High) | *Drizzle =* |
|  | (High) | (High) | (High) | *Rain =* |
|  | (High) | (High) | (High) | *Sun =* |
|  | (High) | (High) | (High) | *Snow =* |

**Uji coba data**

**Drizzle**

|  |
| --- |
| P(drizzle)×P(Precipitation = 0∣drizzle)×P(Temp\_max = High∣drizzle)×P(Temp\_min = High∣drizzle)×P(Wind = High∣drizzle)  ​ |

**Rain**

|  |
| --- |
| P(rain)×P(Precipitation = 0∣rain)×P(Temp\_max = High∣rain)×P(Temp\_min = High∣rain)×P(Wind = High∣rain) |

**Sun**

|  |
| --- |
| P(sun)×P(Precipitation = 0∣sun)×P(Temp\_max = High∣sun)×P(Temp\_min = High∣sun)×P(Wind = High∣sun)  ​ |

**Snow**

|  |
| --- |
| P(snow)×P(Precipitation = 0∣snow)×P(Temp\_max = High∣snow)×P(Temp\_min = High∣snow)×P(Wind = High∣snow) |

Proses Pembentukan *Node* akar

1. **Hitung Nilai Entropy**

Rumus *Entropy*:

*Entropy*(S)

adalah proporsi dari masing-masing kelas cuaca

* Jumlah total data = 15 hari
* Kategori *Weather* terdiri dari:
* Drizzle = 1 hari
* Rain = 8 hari
* Sun = 4 hari
* Snow = 2 hari

Hitung proporsi:

* Pdrizzle
* Prain
* Psun
* Psnow

Hitung Entropy:

*Entropy*(S)

− (0.0667⋅(−3.907)+0.5333⋅(−0.905)+0.2667⋅(−1.907)+0.1333⋅(−2.906))

−(−0.2606−0.4826−0.5087−0.3875)=1.6394

1. **Perhitungan Gain (Information Gain)**

Rumus :

Gain(A) = *Entropy*(S)

Gain median Precipitation =1.3

* data (drizzle, rain, rain, sun, sun, sun) = Entropy =1.459
* data (rain, rain, rain, rain, rain, sun, snow, snow) = Entropy =1.532

Gain =1.638 -

= 1.638 - (0.584+0.918 = 0.488

Gain median temp\_max = 22.5

* data (rain, rain, sun, sun, snow, drizzle, sun) = Entropy =1.556
* data (rain, rain, rain, snow, sun, sun, sun, rain) = Entropy =1.406

Gain =1.638 -

= 1.638 - (0.726+0.750)

= 1.638 – 1.476 = 0.162

Gain median temp\_min = 14.0

* data (rain, rain, snow, snow, sun, rain, drizzle, sun) = Entropy =1.503
* data (sun, sun, sun, rain, rain, sun) = Entropy =1.459

Gain =1.638 -

= 1.638 - (0.902+0.584)

= 1.638 – 1.486 = 0.152

Gain median temp\_min = 5.2

* data (sun, sun, sun, drizzle, rain, rain, snow, sun, sun, rain) = Entropy =1.485
* data (sun, sun, sun, rain, rain, sun) = Entropy =1.371

Gain =1.638 -

= 1.638 - (0.99+0.457)

= 1.638 – 1.447 = 0.191

1. **Perhitungan Splitinfo**

Rumus Splitinfo:

SplitInfo(A)

Splitinfo(Precipitation)

* data
* data

SplitInfo =

0.4

= (0.4 (1.322 + 0.6)

= 0.529 – 0.442) = 0.971

Splitinfo(Temp\_Max)

* data
* data

SplitInfo =

0.467

= (0.467 (1.009+0.533)

= 0.513 – 0.483) = 0.996

Splitinfo(Temp\_Min)

* data
* data

SplitInfo =

0.6

= (0.6 (0.737+0.4)

= 0.442 – 0.529)

= 0.971) 0.971

Splitinfo(Wind)

* data
* data

SplitInfo =

0.667

= (0.6 (0.585+0.333)

= 0.390 – 0.528)

1. **Perhitungan Gain Ratio**

Rumus :

GainRatio(A) =

* Gain Ratio (Precipitation)

Gain = 0.488

SplitInfo = 0.971

GainRatio =

* Gain Ratio (temp\_max)

Gain = 0.162

SplitInfo = 0.996

GainRatio =

* Gain Ratio (temp\_min)

Gain = 0.152

SplitInfo = 0.971

GainRatio =

* Gain Ratio (wind)

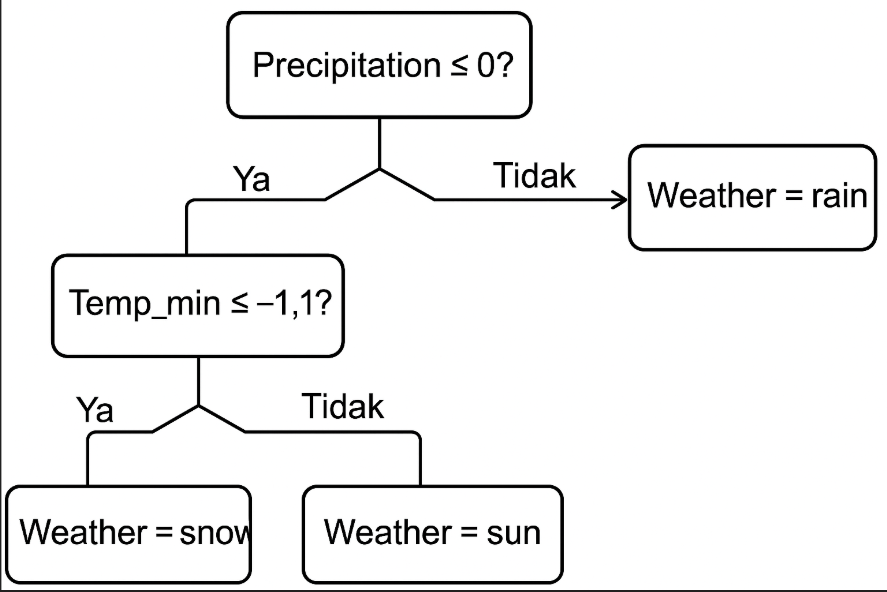
Gain = 0.191

SplitInfo = 0.918

GainRatio =

Tabel Hasil Akhir Gain Ratio

|  |  |  |  |
| --- | --- | --- | --- |
| Atribut | Gain | SplitInfo | Gain Ratio |
| Precipitation | 0.488 | 0.971 | 0.503 |
| temp\_max | 0.162 | 0.996 | 0.163 |
| temp\_min | 0.152 | 0.971 | 0.157 |
| wind | 0.191 | 0.918 | 0.208 |

**Pohon Keputusan**

Link google collab : Data Training dan Data Pengujian

https://drive.google.com/drive/folders/1NdGq0jO8dyuLHWCOCxRRediF0psRLgg-?usp=sharing