**Lecture 5: Naïve Bayes, Worked Example**

Take the following training dataset:

|  |  |  |  |
| --- | --- | --- | --- |
| **Type** | **capShape** | **odor** | **Gill** |
| edible | bell | Not distinctive | free |
| edible | convex | Not distinctive | free |
| edible | flat | almonds | attached |
| edible | convex | almonds | attached |
| edible | convex | almonds | decurrent |
| edible | bell | almonds | free |
| poisonous | flat | fishy | decurrent |
| poisonous | flat | fishy | notched |
| poisonous | convex | fishy | notched |
| poisonous | flat | Not distinctive | notched |

Worked Example:

Given a test row of:

|  |  |  |  |
| --- | --- | --- | --- |
| **Type** | **capShape** | **odor** | **gillColor** |
| ? | convex | almonds | free |

1. What is the likelihood that this mushroom is edible?

a) How likely is it that any mushroom is edible?

P(edible) = 6/10 = 0.6

b) How likely is it that an edible mushroom would have these attribute values?

P(capShape=convex | type=edible) = 3/6 = 0.5

P(odor=almonds | type=edible) = 4/6 = 0.66

P(Gill=free | type=edible) = 3/6 = 0.5

c) Multiplying the answers from a) and b) gives:

So P(Xtest | Type=edible) = 0.6 \* 0.5 \* 0.66 \* 0.5 = 0.099

2. What is the likelihood that this mushroom is poisonous?

a) How likely is it that any mushroom is poisonous?

P(poisonous) = 4/10 = 0.4

b) How likely is it that a poisonous mushroom would have these attribute values?

P(capShape=convex | type= poisonous) = 1/4 = 0.25

P(odor=almonds | type= poisonous) = 0/4 = 0

P(Gill=free | type= poisonous) = 0/4 = 0

c) Multiplying the answers from a) and b) gives:

So P(Xtest | Type= poisonous) = 0.4 \* 0.25 \* 0 \* 0 = 0

**Answers:**

The mushroom is edible.

Exercise:

Given a test row of:

|  |  |  |  |
| --- | --- | --- | --- |
| **Type** | **capShape** | **odor** | **gillColor** |
| ? | flat | Not distinctive | decurrent |

1. What is the likelihood that this mushroom is edible?

Should get:

0.00555 and 0.1875

2. What is the likelihood that this mushroom is poisonous?