**A: aji = P(Xt+1 = j | Xt = i )**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Xt | Xt+1** | **A** | **B** | **H** | **S** |
| **A** | **0.6** | **0.1** | **0.1** | **0.2** |
| **B** | **0.0** | **03** | **0.2** | **0.5** |
| **H** | **0.8** | **0.1** | **0.1** | **0.1** |
| **S** | **0.2** | **0.0** | **0.1** | **0.7** |

**pi = P( X1 = i ):**

|  |  |  |  |
| --- | --- | --- | --- |
| **A** | **B** | **H** | **S** |
| **0.5** | **0.0** | **0.0** | **0.5** |

**B: bik = P(Ot = k| Xt = i)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Xt | Ot** | **p** | **e** | **b** | **l** |
| **A** | **0.6** | **0.2** | **0.1** | **0.1** |
| **B** | **0.1** | **0.4** | **0.1** | **0.4** |
| **H** | **0.0** | **0.0** | **0.7** | **0.3** |
| **S** | **0.0** | **0.0** | **0.1** | **0.9** |

**Observations :**

**o1:4 = { b, p, l, e }**

**Find:**

**Most likely hidden state sequence:**

**Step 1: Initialize δ1(i)**

**O1 = \_\_\_\_\_**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | **\_\_\_** |  | **\_\_\_** |  | **\_\_\_** |
| **δ1(i)** | **=** | **\_\_\_** | **⊙** | **0.1** | **=** | **\_\_\_** |
|  |  | **0.0** |  | **\_\_\_** |  | **\_\_\_** |
|  |  | **\_\_\_** |  | **\_\_\_** |  | **\_\_\_** |

**O2 = \_\_\_\_\_**

**δ2 (i) = \_\_\_\_\_**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | **Max probability** | **Argmax state** |
| **max(** | **0.05** | **×** | **0.6** | **×** | **0.6** | **,** | **\_\_** | **×** | **\_\_** | **×** | **\_\_** | **,** | **\_\_** | **×** | **0.8** | **×** | **\_\_** | **,** | **\_\_** | **×** | **\_\_** | **×** | **0.6** | **)** |  | **\_\_\_** | **\_\_\_** |
| **max(** | **0.05** | **×** | **\_\_** | **×** | **\_\_** | **,** | **\_\_** | **×** | **\_\_** | **×** | **0.1** | **,** | **0.0** | **×** | **\_\_** | **×** | **\_\_** | **,** | **0.05** | **×** | **\_\_** | **×** | **\_\_** | **)** | **=** | **0.0005** | **\_\_\_** |
| **max(** | **\_\_\_** | **×** | **\_\_** | **×** | **\_\_** | **,** | **0.0** | **×** | **\_\_** | **×** | **\_\_** | **,** | **\_\_** | **×** | **\_\_** | **×** | **\_\_** | **,** | **0.05** | **×** | **\_\_** | **×** | **\_\_** | **)** |  | **\_\_\_** | **\_\_\_** |
| **max(** | **\_\_\_** | **×** | **\_\_** | **×** | **\_\_** | **,** | **\_\_** | **×** | **\_\_** | **×** | **\_\_** | **,** | **0.0** | **×** | **\_\_** | **×** | **\_\_** | **,** | **\_\_** | **×** | **0.7** | **×** | **\_\_** | **)** |  | **0** | **\_\_\_** |

**O3 = \_\_\_\_\_**

**δ3 (i) = \_\_\_\_\_**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | **Max probability** | **Argmax state** |
| **max(** | **0.018** | **×** | **\_\_** | **×** | **\_\_** | **,** | **\_\_** | **×** | **\_\_** | **×** | **0.1** | **,** | **\_\_** | **×** | **\_\_** | **×** | **0.1** | **,** | **\_\_** | **×** | **\_\_** | **×** | **0.1** | **)** |  | **\_\_\_** | **\_\_\_** |
| **max(** | **\_\_** | **×** | **\_\_** | **×** | **0.4** | **,** | **0.0005** | **×** | **\_\_** | **×** | **\_\_** | **,** | **\_\_** | **×** | **\_\_** | **×** | **\_\_** | **,** | **\_\_** | **×** | **0.0** | **×** | **\_\_** | **)** | **=** | **\_\_\_** | **\_\_\_** |
| **max(** | **\_\_\_** | **×** | **\_\_** | **×** | **\_\_** | **,** | **\_\_** | **×** | **\_\_** | **×** | **0.3** | **,** | **\_\_** | **×** | **\_\_** | **×** | **\_\_** | **,** | **\_\_** | **×** | **\_\_** | **×** | **0.3** | **)** |  | **\_\_\_** | **A** |
| **max(** | **\_\_\_** | **×** | **\_\_** | **×** | **\_\_** | **,** | **\_\_** | **×** | **0.5** | **×** | **\_\_** | **,** | **\_\_** | **×** | **\_\_** | **×** | **0.9** | **,** | **\_\_** | **×** | **\_\_** | **×** | **\_\_** | **)** |  | **\_\_\_** | **A** |

**O4 = \_\_\_\_\_**

**δ4 (i) = \_\_\_\_\_**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | **Max probability** | **Argmax state** |
| **max(** | **0.00108** | **×** | **\_\_** | **×** | **\_\_** | **,** | **\_\_** | **×** | **\_\_** | **×** | **0.2** | **,** | **0.00054** | **×** | **\_\_** | **×** | **\_\_** | **,** | **\_\_** | **×** | **\_\_** | **×** | **\_\_** | **)** |  | **\_\_\_** | **\_\_\_** |
| **max(** | **\_\_** | **×** | **\_\_** | **×** | **0.4** | **,** | **\_\_** | **×** | **\_\_** | **×** | **\_\_** | **,** | **\_\_** | **×** | **0.1** | **×** | **\_\_** | **,** | **\_\_** | **×** | **\_\_** | **×** | **\_\_** | **)** | **=** | **\_\_\_** | **\_\_\_** |
| **max(** | **\_\_\_** | **×** | **\_\_** | **×** | **\_\_** | **,** | **\_\_** | **×** | **\_\_** | **×** | **\_\_** | **,** | **\_\_** | **×** | **\_\_** | **×** | **0.0** | **,** | **\_\_** | **×** | **\_\_** | **×** | **\_\_** | **)** |  | **\_\_\_** | **\_\_\_** |
| **max(** | **\_\_\_** | **×** | **0.2** | **×** | **\_\_** | **,** | **\_\_** | **×** | **\_\_** | **×** | **\_\_** | **,** | **0.00054** | **×** | **\_\_** | **×** | **\_\_** | **,** | **0.00324** | **×** | **\_\_** | **×** | **\_\_** | **)** |  | **\_\_\_** | **\_\_\_** |

**States and deltas over time:**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **δ1 (i)** | **state** |  | **δ2 (i)** | **state** |  | **δ3 (i)** | **state** |  | **δ4 (i)** | **state** |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |

**Backtracking gives two answers:**

**= { , , , } and**

**= { , , , }**