FIT5186 Intelligent Systems

Week 12 Tutorial

Business Intelligence Modelling - Decision Trees

23. Johnstone & Johnstone (J&J) has developed a new type of hand lotion with a distinctive fragrance. Before distributing it nationally, J&J will test market the new product. The joint probability of a successful test market and high sales upon national distribution is 0.5. The joint probability of a successful test market and low sales nationally is 0.1. The joint probabilities of an unsuccessful test market and either high or low sales are both 0.2.
    a. Use this data to construct a joint probability table.
    b. What is the marginal probability of a successful test market?
    c. What is the conditional probability of high sales given a successful test market?
    d. What is the conditional probability of a successful test market given that the product is destined for high sales nationally?
24. Eagle Credit Union (ECU) has experienced a 10% default rate with its commercial loan customers (i.e., 90% of commercial loan customers pay back their loans). ECU has developed a statistical test to assist in predicting which commercial loan customers will default. The test assigns either a rating of "Approve" or "Reject" to each loan applicant. When applied to recent commercial loan customers who paid their loans, the test gave an "Approve" rating in 80% of the cases examined. When applied to recent commercial loan customers who defaulted, it gave a "Reject" rating in 70% of the cases examined.
    a. Use this data to construct a joint probability table.
    b. What is the conditional probability of a "Reject" rating given that the customer defaulted?
    c. What is the conditional probability of an "Approve" rating given that the customer defaulted?
    d. Suppose a new customer receives a "Reject" rating. If that customer gets the loan anyway, what is the probability of default?
25. From industry statistics, a credit card company knows that 0.8 of its potential card holders are good credit risks and 0.2 are bad credit risks. The company uses discriminant analysis to screen credit card applicants and determine which ones should receive credit cards. The company awards credit cards to 70% of those who apply. The company has found that of those awarded credit cards, 95% turn out to be good credit risks. What is the probability that an applicant who is a bad credit risk will be denied a credit card?

23. a. See file: Prb15_23.xls
    b. 0.600
    c. 0.833
    d. 0.714

| | Joint Probabilities | | |
|---|---|---|---|
| | High Demand | Low Demand | Total |
| Successful Response | 0.500 | 0.100 | 0.600 |
| Unsuccessful Response | 0.200 | 0.200 | 0.400 |
| Total | 0.700 | 0.300 | |
| | | | |
| | | | |
| | Conditional Probabilities | | |
| | For A Given Survey Response | | |
| | High Demand | Low Demand | |
| Successful Response | 0.833 | 0.167 | |
| Unsuccessful Response | 0.500 | 0.500 | |
| | | | |
| | | | |
| | Conditional Probabilities | | |
| | For A Given Demand Level | | |
| | High Demand | Low Demand | |
| Successful Response | 0.714 | 0.333 | |
| Unsuccessful Response | 0.286 | 0.667 | |

24. a. See file: Prb15_24.xls
    b. 0.70
    c. 0.30
    d. 0.28

| | Joint Probabilities | | |
|---|---|---|---|
| | Pay | Default | Total |
| Approve | 0.720 | 0.030 | 0.750 |
| Reject | 0.180 | 0.070 | 0.250 |
| Total | 0.900 | 0.100 | |
| | | | |
| | | | |
| | Conditional Probabilities | | |
| | For A Given Customer Type | | |
| | Pay | Default | |
| Approve | 0.800 | 0.300 | |
| Reject | 0.200 | 0.700 | |
| | | | |
| | | | |
| | Conditional Probabilities | | |
| | For A Given Approval Rating | | |
| | Pay | Default | |
| Approve | 0.960 | 0.040 | |
| Reject | 0.720 | 0.280 | |

25. The following joint probability table can be constructed using the information given and the definition of conditional probability:

| | Credit Risk | | |
|---|---|---|---|
| | Good | Bad | Marginal |
| Credit Awarded | 0.665 | 0.035 | 0.7 |
| Credit Denied | 0.135 | 0.165 | 0.3 |
| Marginal | 0.8 | 0.2 | |

P(Credit Denied | Bad Credit Risk) = 0.165/0.2 = 0.825.