

Mathematics for Computer Science, CM0167,
Example class, Week 9,
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1. A student either walks to university or goes by train. If one day he goes to university by train, then the probability that he goes by train the next day is $\frac{7}{10}$. If one day he walks to university then the probability the he goes by train the next day is $\frac{2}{5}$.
Given that he walks to university on a Tuesday, draw a probability tree diagram and hence find the probability that he will go to university by train on Thursday of that week.
2. Let A and B be two events such that $P(A) = \frac{1}{4}$ and $P(B) = \frac{2}{5}$ and $P(A \cap B) = \frac{1}{5}$.
 - (a) Calculate $P(A|B)$ and $P(A|B^c)$.
 - (b) Determine $P(A|B)P(B) + P(A|B^c)P(B^c)$ without any calculations. (Hint: Theorem of total probability)
3. *Simple Classification Example.* Three aircraft are known to fly out of an airport with the respective probabilities: Airbus A320, 0.5, Boeing 747, 0.4 and a Antonov AN124-100 Cargo plane, 0.1. The aircraft are know to take off with the following probabilities speeds: Airbus A320 speed greater than 300 mph, 0.7, Airbus A320 speed less than 300 mph, 0.3; Boeing 747 speed greater than 300 mph, 0.6, Boeing 747 speed less than 300 mph, 0.4; Antonov AN124-100 speed greater than 300 mph, 0.1, speed less than 300 mph, 0.9.
Given that a radar at the airports detects an aircraft with a speed of 350 mph what is probability it is an Airbus A320, Boeing 747 or a Antonov AN124-100?
4.
 - (a) An unfair coin is tossed 20 times. The probability that it lands on Heads is $\frac{1}{3}$. If X is defined as the number of tosses that result in Heads, what is the expectation of X .
 - (b) The same coin as above is tossed 20 times again. Jim gets 2 pounds if the coin results in Heads and loses 1 pound if it results in Tails. What is his expected net profit or net loss.
5. If you play a roulette game you can choose between the numbers $0, 1, \dots, 36$. If you bet on the right number you get your money back plus 5 times the money you have bet. What is your expected net profit or net loss?