NE529 – Risk assessment
Project 2 – Probability and statistics

Name

University of Idaho ▪ Idaho Falls Center for Higher Education
Nuclear Engineering and Industrial Management Department

email

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1 Russian roulette

(30)

What is the *probability of dying* for a six player Russian roulette game for a six chamber gun, but the chamber is *respun* after every attempt *if the shooter does not die.* Show when the probabilities converge, and where the 'best' seat is at the table.

2 Roll the dice

(30)

Derive and plot the discrete probability density function for two dice.

3 Poisson distribution

(30)

The Poisson distribution describes radioactive decay. It is a specific form of the binomial distribution. Derive the Poisson distribution from the binomial distribution. Derive the first and second (central) moments of the Poisson distribution. Briefly comment on their significance. Check out the Risk assessment OER for more information.

4 Spam filter

(50)

Design a spam filter based on Bayesian reasoning by devising a list of 10-15 words that would indicate a message is likely to be spam. Likely = 80% probability. See the OER for a starting example.

5 Weather forecasting

(30)

Marie is getting married tomorrow (*third time is a charm*), at an outdoor ceremony in the desert because reasons. In recent years, at the location of the ceremony, it has rained only 5 days each year. Unfortunately, the weatherman has predicted rain for tomorrow. When it actually rains, the weatherman had correctly forecast rain 90% of the time. When it did not rain, he incorrectly forecast rain 10% of the time. What is the probability that it will rain on the day of the wedding?

6 Slot machines

(30)

Late, late one night in a bar in Las Vegas you meet a guy who claims to know that in the casino at the Tropicana there are two sorts of slot machines: one that pays out 3% of the time, and one that pays out 25% of the time. The two types of machines are colored red and blue. The only problem is, the guy is so drunk he does not remember which is which. You go to the Tropicana to find out more. You find a red and a blue machine side by side. You toss a coin to decide which machine to try first; noting the outcome, you then put the coin into the red machine. It (red) does not pay out. How should you update your estimate of the probability that this (red) is the high payout machine? What if it had paid out - what would be your new estimate then? Consider how many times you would have to fail to get a payout from the red machine before saying you're 90% confident it is not the high payout machine.

Tables

Figures