

GAME - solutions

1. Buoyancy

Think of an Airbus A380 plane flying over your head. Do you feel the weight? No, because the pressure perturbation spreads out quickly. Therefore, with an open cage he should pass the bridge. However, if the container is sealed (don't worry the birds still have enough air to breath) he should be too heavy.

2. Boiling

We invert equation (54) of "thermodynamic Lecture Note" (invert the saturation pressure equation given also at bottom of your page) , supposing a height of 5200m or a pressure of approximately 500hPa, to obtain $T_{boil} \sim 81^\circ\text{C}$.

3. Medical test – What to think of rain forecast knowing how good a forecast model is

This is actually a good example of the Bayes' theorem. The work of Thomas Bayes (1701-61) only became known post-mortem, and his results were also independently discovered by Laplace.

The formula and results are explained in diagram below

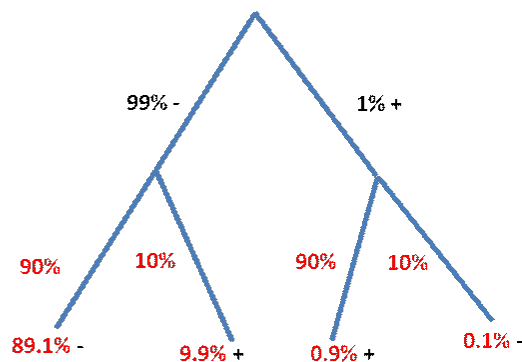
$$P(A|B) = \frac{P(B|A) * P(A)}{P(B)}$$

$$P(A|+) = \frac{0.9 * 0.01}{(0.9 * 0.01 + 0.99 * 0.1)} = 8.33\%$$

$P(A) = 1\% = 0.01$ =frequency of illness
(probability of weather event e.g. rain)

$P(B|A) = 90\% = 0.9$ =accuracy of the test
(a forecasted weather event when it actually occurred)

$P(B)$ =the frequency of positive tests, ie true positive tests (0.9% in our example) + false positive tests (9.9% in our example)



So for our patient the probability that he was actually ill was actually pretty low, this number would have gone up to 50% if the test was 99% accurate.