Problem Set 10: t-test

ADS2

Semester 1 2023/24

We expect this problem set to take around an hour to complete. But professors are sometimes wrong![citation missing]. If this or future problem sets are too long, please let us know, so we can adjust and plan accordingly.

Guinness Quality Control

In the lecture, we heard that the Student's *t*-distribution was devised to provide a statistical framework for assessing the quality of Guinness from taking small samples during the brewing process. The dark colour and characteristic taste of Guinness comes from roasting a portion of the barley, but each pint needs to contain at least 50 g barley. The file 'barley.txt' contains the weight of barley in 50 pints out of the total 2,000 pints brewed in one day.

1. Is the brewery adding enough barley?

2. Is the *t*-distribution an appropriate test to answer this question? Do these data meet the assumptions required?

3. The *t*-distribution is most useful when there are small sample sizes, but how small is small? Can you run a simulation to determine the power of the *t*-distribution as the number of pints sampled decreases? What is the minimum number of pints we need to sample to have 95% confidence that we could detect any real difference from the required 50 g?