Electronics and Computer Engineering, Mechatronics

Mathematics 4

Assignment 1: Hypothesis Testing

Instructions

This document contains the questions for your third assignment for Mathematics 4. All questions in this document refer to the data given in the Excel document 'Assignment3yr2015.xlsx'. The questions in this document refer to the individual worksheets in the Excel document.

A Note on Marking

Each one of the questions in this assignment involves a Hypothesis test. Marks within each question will be awarded for the following:

Making the correct decision on which statistical test to use.

Framing your Hypotheses, including proper conclusions.

Setting up your level of significance, critical value and the other parameters for the test.

Question 1

A manufacturer of breakfast cereal makes two claims concerning the weight of the packets they produce. The manufacturer claims that

The mean is 200g

The variance is $5g^2$.

To investigate the first claim, the weight of a sample of packets produced in a given shift was measured. The values found are listed in part (a) of worksheet 'Dataset1', with grams (g) as the unit of measurement. Use this data to investigate the claim (a), with an appropriate statistical test.

To investigate the second claim, the weight of a second sample of packets was measured. The values found are listed in part (b) of worksheet 'Dataset1', with grams (g) as the unit of measurement. Use this data to investigate the claim (b), with an appropriate statistical test.

Question 2

A study was carried out to determine whether the resistance of a control circuit in a machine are lower when the machine motor is running. To investigate this question, a set of the control circuits were tested as follows. Their resistance was measured while the machine motor was running for a certain period of time, and then again while the motor was

not running. The values found are listed in worksheet 'Dataset2', with kilo-Ohms as the unit of measurement.

Carry out an appropriate statistical test to determine whether the resistances have decreased.

Question 3

A study was carried out to determine the influence of a soil additive on the fruit yield of citrus plants, defined as the weight of fruit produced per plant at the end of the season. A set of citrus plants was gathered for this experiment. For each plant, the experimenter recorded the amount of additive used (in milligrams) and the corresponding weight of the fruit produced (in grams). This information is presented in the worksheet 'Dataset3' in the Excel document. Define X as the additive and Y as the yield.

Draw a scatterplot of your data set.

Carry out an appropriate statistical test to establish if there is a correlation between the amount of additive and the yield. State whether you should be using a one- or two-tailed test, from your observation of the scatterplot.

Calculate a linear equation to predict the yield Y as a function of X, commenting on how well this equation will perform.

Question 4

A study is being conducted to monitor how second-level students progress in education and how this is influenced by the economic position of their school. A randomly selected sample of 300 pupils who complete the Junior Cycle are identified; they are then categorised by their subsequent education outcome, Category A being little or no further education, to Category E the furthest level of education. The schools they attended are put in groups 1 to 3, with group 1 schools being the most economically disadvantaged, group 3 being the least disadvantaged. The numbers of pupils in each category of school with each type of educational outcome are given in the table in 'Dataset4' in the Excel document.

Carry out an appropriate statistical test to to determine whether the data supports a link between category of school and educational outcome.

Question 5

The ages of the people attending a particular film are shown in the frequency distribution given in 'Dataset5'.

Carry out an appropriate statistical test to to determine whether the data is normally distributed.

منتصرين بحق هذه الأسماء النورانيه ..هو الله الذي لا إله إلا هو لنرى كم مسلم سيعجبه هذا
هـــو ۞ الله ۞ الرحمن ۞ الرحيم ۞ الملك ۞ القدوس ۞ السلام ۞ المؤمن ۞ المهيمن
۞ العزيز ۞ الجبار ۞ المتكبر ۞ الخالق ۞ البارئ ۞ المصور ۞ الغفار ۞ القهار
۞ الوهاب ۞ الرزاق ۞ الفتاح ۞ العليم ۞ القابض ۞ الباسط ۞ الخافض ۞ الرافع
۞ المعز ۞ المذل ۞ السميع ۞ البصير ۞ الحكم ۞ العدل اللطيف ۞ الخبير ۞ الحليم
۞ العظيم ۞ الغفور ۞ الشكور ۞ العلي ۞ الكبير ۞ الحفيظ ۞ المقيت ۞ الحسيب ۞

الجليل ❁ الكريم ❁ الرقيب ❁ المجيب ❁ الواسع ❁ الحكيم ❁ الودود ❁ المجيد ❁ الباعث ❁ الشهيد ❁ الحق ❁ الوكيل ❁ القوي ❁ المتين ❁ الولي ❁ الحميد ❁ المحصي ❁ المبدئ ❁ المعيد ❁ المحيي ❁ المميت ❁ الحي ❁ القيوم ❁ الواجد ❁ الماجد ❁ الواحد ❁ الأحد ❁ الصمد ❁ القادر ❁ المقتدر ❁ المقدم ❁ المؤخر ❁ الأول ❁ الآخر ❁ الظاهر ❁ الباطن ❁ الوالي ❁ المتعالي ❁ البر ❁ التواب ❁ المنتقم ❁ العفو ❁ الرعوف ❁ مالك ❁ الملك ❁ ذو ❁ الجلال ❁ والإكرام ❁ المقسط ❁ الجامع ❁ الغني ❁ المغني ❁ المانع ❁ الضار ❁ النافع ❁ النور ❁ الهادي ❁ البديع ❁ الباقي ❁ الوارث ❁ الرشيد ❁ الصبور