Chapter 4

Formulation of Hypothesis

4.1 Formulation of the Problem

Traditionally, data systems have been built for the convenience of the data system itself, using primitives such as tables, columns, strings of text and rules. This is not the way anyone thinks about data in the real world, and this way of operating also constrains an IT-level manager to build and support data silos that are hard to access. Yet another barrier for the business user of information is that the concepts needed to solve real-world problems are often housed in multiple sources of data.

4.2 Hypothesis Decision

Suppose you are a researcher interested in the factors influencing paper grading by professors. You have a hunch (and/or previous research) might lead you to predict that papers that are software recommended are rated higher than papers that are handwritten. Research to date though, has only been correlational and thus little can be said in terms of a cause and effect relationship.

So you have 10 freshman students currently taking English as well as an introductory psychology course each write one paper. They should each provide two copies of their paper (one typed and one software recommended). Next, we enlist the aid of 20 instructors. We randomly assign 10 instructors to each of two groups. Each instructor in one group (the control group) will grade each of the 10 papers that are handwritten, while the second group (the experimental group) will grade the same papers that are typed.

Research

Does Software Recommendation a question paper influence the grade it receives?

1. Hypotheses
3. Assumptions
   a. The null hypothesis.
   b. Our subjects were chosen randomly from the population.
   c. Sampling distribution of the difference between means is normal in shape.
      In other words, the DV should be normally distributed in the population.
   d. The groups are independent.

4. There is homogeneity of variance. That is, the amount of variability in the DV is about equal in each of the groups. When the samples sizes are reasonably large and the number of subjects in each group is about equal, we do not have to worry about this too much because the t test is robust. This means that it is strong and can tolerate some violations of its assumptions.

Table 4.2 t-table shows degrees of freedom for selected perform the written & software recommended:
<table>
<thead>
<tr>
<th>Subj.(I/P)</th>
<th>Written (1)(I/P 1)</th>
<th>W2(O/ P 2)</th>
<th>Software Recommended (2)</th>
<th>T2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>81</td>
<td>6561</td>
<td>84</td>
<td>7056</td>
</tr>
<tr>
<td>2</td>
<td>81</td>
<td>6561</td>
<td>89</td>
<td>7921</td>
</tr>
<tr>
<td>3</td>
<td>79</td>
<td>6241</td>
<td>89</td>
<td>7921</td>
</tr>
<tr>
<td>4</td>
<td>80</td>
<td>6400</td>
<td>81</td>
<td>6561</td>
</tr>
<tr>
<td>5</td>
<td>84</td>
<td>7056</td>
<td>87</td>
<td>7569</td>
</tr>
<tr>
<td>6</td>
<td>87</td>
<td>7569</td>
<td>82</td>
<td>6724</td>
</tr>
<tr>
<td>7</td>
<td>75</td>
<td>5625</td>
<td>87</td>
<td>7569</td>
</tr>
<tr>
<td>8</td>
<td>83</td>
<td>6889</td>
<td>85</td>
<td>7225</td>
</tr>
<tr>
<td>9</td>
<td>88</td>
<td>7744</td>
<td>89</td>
<td>7921</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>83</td>
<td>6889</td>
<td></td>
</tr>
<tr>
<td></td>
<td>738</td>
<td>60,646</td>
<td>856</td>
<td>73,356</td>
</tr>
<tr>
<td>N</td>
<td>9</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>82.0</td>
<td></td>
<td>85.6</td>
<td></td>
</tr>
</tbody>
</table>
4. Decision Rules

Using alpha of .05 with a two-tailed test and df=N1+N2-2=10+9-2=17, we determine from the t table that the critical value is 2.110. Thus:

If $t_{obs} < -2.110$ or $t_{obs} > 2.110$, then reject H0.

If $t_{obs} > -2.110$ and $t_{obs} < 2.110$, then do not reject H0.

5. Computation

Since we are not interested in the differences between the scores of the 10 papers software evaluated of an instructor, we simply calculate the mean grade given by each instructor. Note that one of the instructors in the Written Group had to be excluded because their dog ate the papers they were supposed to grade. Thus, we then have 19 means.

To describe the data, we need to compute the means and variances for each of the two groups, that is:
Now the variances:

\[
\begin{align*}
    s_w^2 &= \frac{N \sum X^2 - (\sum X)^2}{N(N-1)} \\
    s_w^2 &= \frac{9 \times 60,646 - (738)^2}{9(9-1)} \\
    s_w^2 &= \frac{545,814 - 544,644}{9(8)} \\
    s_w^2 &= \frac{1,170}{72} = 16.25
\end{align*}
\]

And

\[
\begin{align*}
    s_r^2 &= \frac{N \sum X^2 - (\sum X)^2}{N(N-1)} \\
    s_r^2 &= \frac{10 \times 73,356 - (856)^2}{10(10-1)} \\
    s_r^2 &= \frac{733,560 - 732,736}{9(10)} \\
    s_r^2 &= \frac{824}{90} = 9.16
\end{align*}
\]

The inferential question is whether this difference between means is worth paying attention to. Thus we will use a between groups t test to answer this question.
Substituting the appropriate values gives:

\[
t = \frac{82.0 - 85.6}{\sqrt{\frac{(9-1)16.25 + (10-1)9.16}{9+10-2} \left( \frac{1}{9} + \frac{1}{10} \right)}}
\]

\[
= -3.6
\]

\[
= \frac{-3.6}{\sqrt{\frac{130 + 82.44}{17} \cdot 0.21}}
\]

\[
= \frac{-3.6}{\sqrt{\frac{212.44}{17} \cdot 0.21}} = \frac{-3.6}{\sqrt{\frac{212.44}{17} \cdot 0.21}} = -2.222
\]

Decision

Since -2.222 (tobs) < -2.110 (t crit) we reject H0 and asset the alternative. In other words, we conclude that Software Recommendation a paper improves the grading it receives. Notice that we have actually gone beyond the alternative hypothesis by specifying that the effect has a direction (Software Recommendation is good).
4.3 A concept on academics to illustrate the proposed method:

A. Steps involved in Semantic Performance Based Evaluation System

Steps:
The Uncertainty Algorithm
Step 1:- Question paper submission exactly as per the weightage in the module wise representation.
Step 2:- The concerned faculties who has given subject for making question paper, has to make as per
weightage & module based only.
Step 3:- If question paper\[w=weightage]\]
Case I : - W50 <= Module 1<=W100
Submit Option=Yes
Color 1 =Green =Perfect & Ready to Submit
Case II: - W20<= Module<= W50 ,Color2= Yellow=Moderate & Resubmit
Else
Case III: - W1<=Module<=W20 ,Color3=Red=Cancel & report
Message appears as “ change recommended “
Recheck Every Question
All  Ok
Then Submit

When the application starts, Admin will add Professor to the database and give login id and password to each Professor.
According to admin or Professor, the user authentication takes place.
After successful user authentication, the program asks for to evaluate the question paper submission,
assignment submission or objective performance based solution.
Weightage evaluation for question paper submission, plagiarism checking on assignment submission & marks
evaluation on objective exam is assessed.
5: User will evaluate the criterion for any of the selection and respond according to the fixed cases by entering Department, Semester, Subject, weight age and unit Number.

6: Then user has to click on one of the button to generate result. Test paper is generated in text (.txt) format.

B. Modules in Semantic performance based solution

Question Paper Submission:

As shown in Fig. 4.2 Modules are given below

1. Login Module
2. Administrator Module
3. Teacher Module

Fig. 4.3 (i) A Semantic Performance Based Evaluation System: Expanded View
Fig. 4.2 (ii) A Semantic Based Performance Evaluation System: Weightage on question paper
4.3.2 Working Module with Comparative Analysis

A Semantic Based Performance Evaluation systems use various software for their institutions developed a system solution which accept an input in type of number of questions from the admin and convert it into question paper format based on Bloom’s taxonomy. The advantage of generating questions based on Bloom's taxonomy enables to provide the questions that help to assess learning ability of the students. The proposed framework helps in question cohort using weight age implementations by deploying agents, the agents will perform various operations like intelligent document processing with information classification and question generation. Thus system may also be termed as a multi agent system. In Document processing tree tagger tool and building process is done to eliminate the human process. Information classification takes a list of keyword generated by Data dispensation and finds the Bloom's category of those words, by searching appropriate action verb in the repository which fits with the given keyword. Question generation module takes the output of Information classification as input to generate questions. The process is a model based approach, which fits the selected keywords in the question template according to the Bloom's levels.

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Distracters’ (or answer alternatives) for the keyword in the question sentence are chosen in the final stage. First two stage are not domain specific third stage is domain specific, because quality of distractor depends on domain so distractor will be selected on the basis of the key selected and through web, list of distractors will be generated and knowledge based distractor list will generated. And evaluation of the system is done manually through three phases:-
1) Evaluation of the selected sentence
2) Evaluation of selected keyword and
3) Evaluation of selected distracter. Automatic question generation on the basis of the discourse connectives (Manish Agarwal et. al, question generation system) divided into two modules syllabus and formation of question. Syllabus includes area related to institute necessity and formation of questions involves selecting the question according to the syllabus defined by the admin. Researcher concentrates on seven discourse connectives like because, since, although, as a result, for example and for instance on that basis Question type will be decided like if sentence consist since then question type would be Why. System has been evaluated for semantic and syntactic soundness of question by two evaluators.
4.3.3 Semantic performance based plagiarism checker:

Assures that contrasting other plagiarism systems, its major focus is additionally at associated characteristics rather than the form connected ones. However, this does not mean that it provides no response on recognized aspects, i.e., grammar and punctuation, in an essay, it includes scoring and feedback on grammar, style and technicalities as well (Landauer, Laham, & Foltz, 2000) pre-scored essays of other students, standard model essays and knowledge source materials.
No two humans can be found, no matter what languages they use and how similar thoughts they have, write exactly the same text. If proper referencing is abandoned, problems of plagiarism and intellectual property arise. The existence of academic dishonesty problems has led most, if not all, academic institutions and publishers to set regulations against the offence. Borrowed content of any form require directly or indirectly quoting, in-text referencing, and citing the original author in the list of references. Figure 4.3(iii) can be represented to display the plagiarism prevalent in the same.

Fig. 4.2 (iv) A Semantic Performance Based Evaluation System Online objective solution
4.4 Implemented Software

Semantic Performance Based Evaluation is using both Semantic character grouping and Named Entity detection tools to convert the input sentence into a semantic pattern. The question types considered here are set of WH-questions like who, when, where, why, and how is the basis of keywords. Then an outline similar segment is applied to select the best identical questions pattern for the test sentence. AQG Automated Question Generation (Bednarik L. and Kovacs L,2012)\textsuperscript{27}combines several discrete tools from very diverse of information technology, among other clustering and classification units. Researcher is going to use NLP (Natural Language Processing) for automatic question generation system (SheetalRakangor and Dr. Y. R. Ghodasara,2015)\textsuperscript{9}. Automatic Question Generation system called G-Ask (Ming Liu, Rafael A. Calvo and Vasile Rus,2012)\textsuperscript{28}, which generates particular questions as a form of guidance for student learning. For generating question Semantic Role Labeller and NER (Named Entity Recognizer)\textsuperscript{11} is used to identify whether its Christian name, Location or of Organization. Once Question sentence is prepared, and then procedures the similarity between the Question sentence and each sentence from the Question knowledge based. Sort the obtained similarity values from other sentences and Get three keywords from three different sentences as a distracter values. The result of research was nearly 145 parsed sentences, there were 109 considered better for the keywords obtained from them. Shuffling algorithm for Automatic Generator Question paper System (GQS) (Nur Shahidabt MohdJamail and Abu BakarMdSultan,2010)\textsuperscript{12}uses a arbitrary technique for organizing sets of exam paper. An implementation of an automatic examination paper generation system [8] uses lightweight J2EE tools based on B/S architecture to design an auto-generated paper management system. With this algorithm, the user needs to identify the subject, the question type and the difficulty level. From this input, the examination paper will be generated automatically. In Automatic Question Generation Using Software Agents for Technical Institutions [9], the focus is to take input in form of a text file from user which contains of the text upon which the user desires to fetch questions; the output is produced in form of a text file containing questions based on Bloom’s taxonomy.