Interactive Self-learning Exercises
(STAT3008 – Applied Regression Analysis)

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Supported by

Objective

- Self-learning - an efficient and beneficial way to learn
- Doing exercises - an essential way to learn mathematical and statistical concepts

- An interactive online platform
  - Interesting
  - Easy-access

Components

The platform

- implemented by PHP and JavaScript with a MySQL database
- consist of two components:
  - Student-side
    - Main page
    - Exercise page
    - Comment wall
  - Administrator-side
    - Summary statistics
    - Question review
    - Question establishment
    - Comment wall management

Student-side

- **Main page (www.sta.cuhk.edu.hk/cyyau/statmc/)**
  - which gives individual information
  - Score will be recorded automatically
  - Students do not need to download or register

Student-side

- **Exercise page**
  - The questions are in form of multiple-choice(4 choices)
  - Questions are classified into different chapters and different levels
  - Questions are drawn randomly according to a simple algorithm (Explain in next slide)
  - Question not finished will be selected again until student finished the question

Student-side

- **Exercise page - the algorithm to draw questions**
  - the algorithm is partly based on student's performance on different levels of questions and partly random
  - Initially, each level has same weight to be drawn (3 is used as the weight in the platform)
  - If a student answer a question of a certain level incorrectly, the weight of that level will increase by one
  - more likely to answer incorrectly, more likely to be drawn => practice more questions in those levels

Student-side

- **Exercise page - the algorithm to draw questions**
  - Example: a student answered 15 questions and 4 of them are incorrect

Level	1	2	3	4
Incorrect answer	0	1	1	2
Weight	3 (3+0)	4 (3+1)	4 (3+1)	5 (3+2)
Probability to be drawn	3/16=18.75%	4/16=25%	4/16=25%	5/16=31.25%

Student-side

- **Exercise page**
  - the mathematical formula (LaTex) can be displayed

Chapter: 2   -   Level: 2

For a "jump-regression" model,

$$E(Y|X) = \begin{cases} \alpha & \text{if } x < k \\ \beta & \text{if } x \geq k \end{cases} \qquad Var(Y|X) = \sigma^2$$

Assume k is known to be 3.1, for the following data,

X	1.1	2.0	3.0	3.9	4.6	5.9	7.2
Y	0.5	0.7	0.9	1.1	2.2	2.6	1.9

Calculate the corresponding estimates for α and β.

Your answer:

○ 1.95,0.7

○ 2.95,0.98

○ 0.7,1.95

○ 1.95,1.7

Submit

Your record

Student-side

- **Exercise page**
  - Explanation/Solution will be given if student's answer is incorrect
  - If necessary, students can be referred to the corresponding lecture notes or online resources through the hyperlink

Student-side

- **Exercise page**

Assume k is known to be 3.1, for the following data,

X	1.1	2.0	3.0	3.9	4.6	5.9	7.2
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Calculate the corresponding estimates for α and β.

Your answer:

○ 1.95,0.7

○ 2.95,0.98

○ 0.7,1.95

◉ 1.95,1.7

[Next]

Incorrect!
Answer: 0.7,1.95.

Hint: $\hat{\alpha} = \dfrac{\sum_{i=1}^{n} I(x_i < 3.1) y_i}{\sum_{i=1}^{n} I(x_i < 3.1)}$, and $\hat{\beta} = \dfrac{\sum_{i=1}^{n} I(x_i \geq 3.1) y_i}{\sum_{i=1}^{n} I(x_i \geq 3.1)}$.

Refer to Chapter 2 p.6

Your record

Student-side

- **Comment wall**
  - Students are encouraged to leave comments/opinions about the MC Game and the course on the comment wall
  - As a medium to collect students' opinions to improve the MC Game
  - This interactive platform can promote the communication between the instructor and students
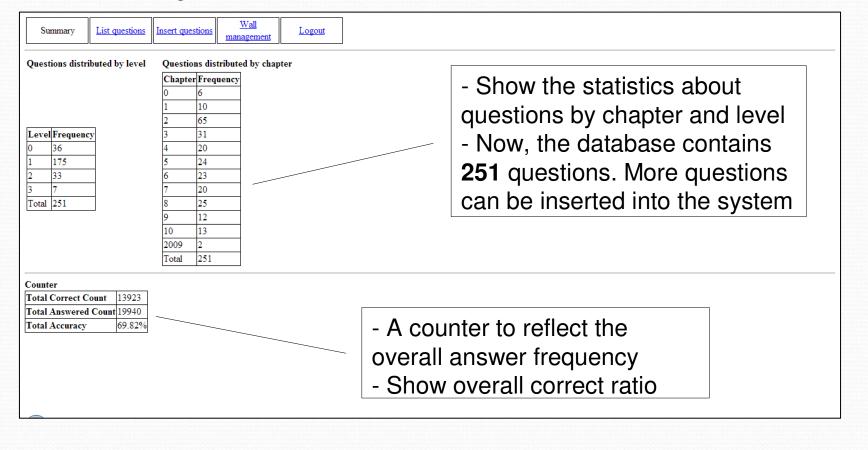 - Students do not need to register but need to know the passcode which is announced in the lecture

Student-side

- **Comment wall**

STAT 3008 - Applied Regression Analysis

Name: [ ] Passcode: [ ]

Eric:
I want more difficult exam
5 Dec, 2012 - 14:20:09

Yau:
Good luck to your exam!
5 Dec, 2012 - 13:13:04

Yau:
I think the problems are too easy
21 Nov, 2012 - 18:15:46

Administrator:
Welcome to this comment wall!
Please leave your comments about the MC game here!
Enjoy the game :)
18 Nov, 2012 - 19:51:10

Administrator-side

- **Administrator side**
  - Administrator/ Instructor/ Teaching assistant can login to the Administration system to manage the MC Game through Internet
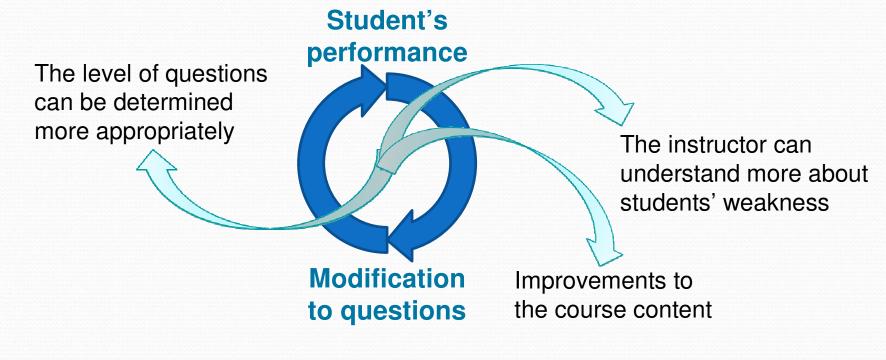
ID: [ ]

PW: [ ]

[Login]

Administrator-side

- **Summary statistics**

Summary	List questions	Insert questions	Wall management	Logout

Questions distributed by level   **Questions distributed by chapter**

Chapter	Frequency
0	6
1	10
2	65
3	31
4	20
5	24
6	23
7	20
8	25
9	12
10	13
2009	2
Total	251

Level	Frequency
0	36
1	175
2	33
3	7
Total	251

- Show the statistics about questions by chapter and level
- Now, the database contains **251** questions. More questions can be inserted into the system

Counter

Total Correct Count	13923
Total Answered Count	19940
Total Accuracy	69.82%

- A counter to reflect the overall answer frequency
- Show overall correct ratio

Administrator-side

- **Question review**
  - the existing questions can be edited
  - the instructor can access the students' performance on each question

Administrator-side

- **Question review**
  - Sustainable improvements to the MC Game, the instructor and the course

Student's performance

The level of questions can be determined more appropriately

The instructor can understand more about students' weakness

Modification to questions

Improvements to the course content

Administrator-side

- **Question establishment**
  - Questions can be created and inserted into the database in the this administrative system
  - More questions will be added by teaching assistant in the department even though the project ends
  - During editing the question, the LaTex code will be displayed into mathematical formula in the preview area => helpful in editing questions

Administrator-side

- **Question establishment**
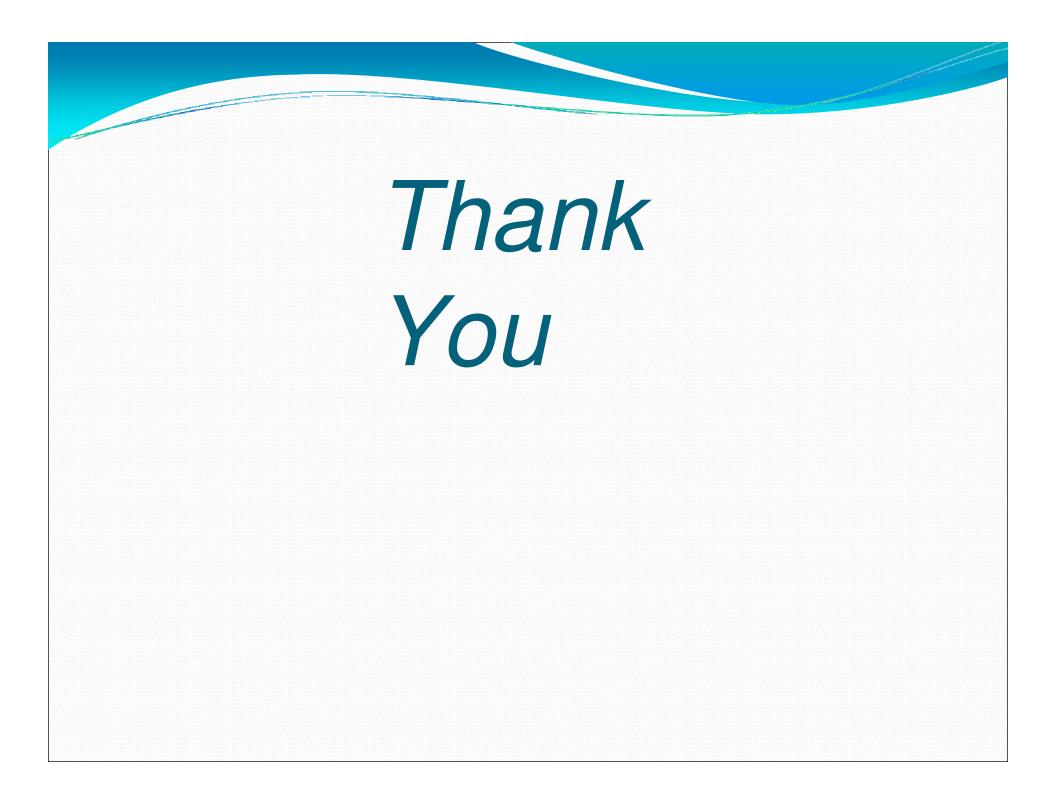

Instantaneous preview

Administrator-side

- **Comment wall management**
  - Administrator should have the full control of the public comment wall
  - Instructor/Administrator can change the passcode and decide whether messages should be checked first to display
  - Instructor/Administrator can remove or edit unsuitable comments

Administrator-side

- **Comment wall management**

Thank You

Unimplemented feature

- In the project plan, compulsory quizzes are included

- After considering the problems of fairness, quiz arrangement and information security, it may cause some unfair results

- The compulsory quizzes are not implemented in order to reduce the risk of unfair results