

# How to Use Moodle for Your JAIST Course

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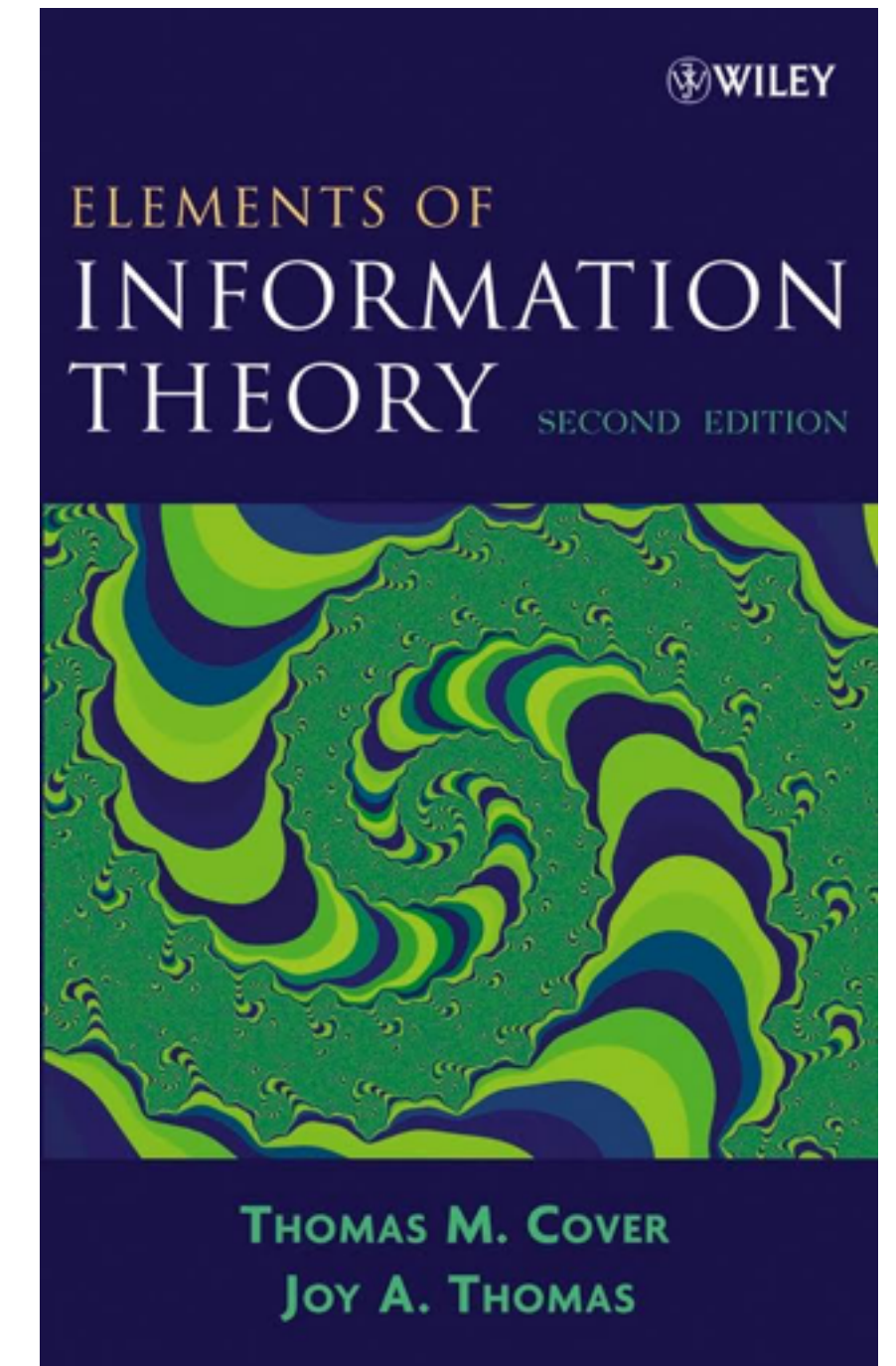
February 25, 2016



# Information Theory I232 at JAIST

Information theory is the mathematical fundamentals of information transmission and information storage.

- Graduate-level course
- Mathematical approach to important engineering problems
- Highly mathematical content, numerous theorems and proofs
- Prerequisites include basic probability theory and mathematical analysis



*Elements of  
Information Theory*  
by Cover and Thomas

# I232 Homework & Grading Policy

Course grade is based on the following, with weights:

## **Homework 30%**

- Weekly homework encourages study and student collaboration

## **Pop Quizzes 5%**

- paper-based quiz to support “flipped classroom”

## **Midterm Exam 15%**

## **Final Exam 50%**

**Put 1232 Online**

# Onlinification of I232: My Experience Using Moodle

I232 is a technical graduate-level course

- How to onlinify?

I used Moodle in 2013, 2014 and 2015.

- On-line component of a traditional course

**I want to tell you what I learned**

# Outline: Moodle Features in I232



Assignment Activity: uploading homework (reports)



Quiz Activity: online homework



Quiz Activity to support a “flipped classroom”



Page Resource



Grade Book



Discussion Forum

# Homework is 30% of the grade

**Philosophy** Homework assignments enable students to understand the material by solving concrete problems.

Types of homework problems:

- Numerical answer
- Analytic answer
- Proofs

Onlinification of homework problems:

- Some problems easily onlinified **Online Homework**
- Other problems cannot be **Paper-Based Homework**



# Assignment Activity

Paper-based homework (reports):

- Content: proofs, etc. not easily onlinified
- Students upload files



About 80% of students uploaded homework.

- Instructor sets upload deadline.
- Instructor/TA enters score in using Moodle

Benefits

- Entering score and feedback is fast
- Students scan and upload, keeping original vers



# Quiz Activity



- Design and build quizzes: multiple choice, numerical answer, true-false, etc.
- **Most useful part of Moodle**



Self-Study Quiz

use

two ways



Homework

- relatively simple questions
- no deadline
- Solutions provided immediately
- "free" do not count for grade
- number of attempts: unlimited

- more difficult
- deadline: end of each week
- Solutions provided after deadline
- number of attempts: two

# Numerical Answer

Let  $X$  be a ternary random variable with  $\mathcal{X} = \{1, 2, 3\}$  with probability distribution  $p_X(x)$ :

$$p_X(x) = \begin{cases} \frac{1}{2} & \text{if } x = 1 \\ \frac{1}{4} & \text{if } x = 2 \\ \frac{1}{4} & \text{if } x = 3 \end{cases}$$

Calculate  $H(X)$ .

Answer:



# Question with Analytic Answer

Evaluate the differential entropy

$H(X) = - \int p_X(x) \ln p_X(x)$  for questions 1-3

The exponential density,  $p_X(x) = \lambda e^{-\lambda x}$ ,  $x \geq 0$

Select one:

- ☐  $H(X) = \ln \lambda - 1$
- ☐  $H(X) = 1 - \lambda \ln \lambda$
- ☐  $H(X) = \lambda \ln \lambda - 1$
- ☐  $H(X) = 1 - \ln \lambda$

- Student must compute an integral
- Correct answer is an expression
- Use multiple choice
- Provide multiple “likely errors” as choices

# Correct Answer Optionally Shown

The exponential density,  $p_X(x) = \lambda e^{-\lambda x}$ ,  $x \geq 0$

Select one:

☐  $H(X) = \ln \lambda - 1$

☒  $H(X) = 1 - \ln \lambda$  ✓

☐  $H(X) = 1 - \lambda \ln \lambda$

☐  $H(X) = \lambda \ln \lambda - 1$

$$\begin{aligned} H(X) &= - \int_0^{\infty} \lambda e^{-\lambda x} \ln(\lambda e^{-\lambda x}) dx \\ H(X) &= - \ln \lambda \underbrace{\int_0^{\infty} \lambda e^{-\lambda x} dx}_{=1} + \lambda^2 \underbrace{\int_0^{\infty} x e^{-\lambda x} dx}_{=\frac{1}{\lambda^2}} \\ &= -\ln \lambda + 1 \end{aligned}$$

The correct answer is:  $H(X) = 1 - \ln \lambda$



# Question Edit Screen and LaTeX

Differential Entropy

Paragraph ▼

**B**

*I*

Evaluate the differential entropy  $H(X) = - \int p_X(x) \ln p_X(x)$  for questions 1-3

# L<sup>A</sup>T<sub>E</sub>X



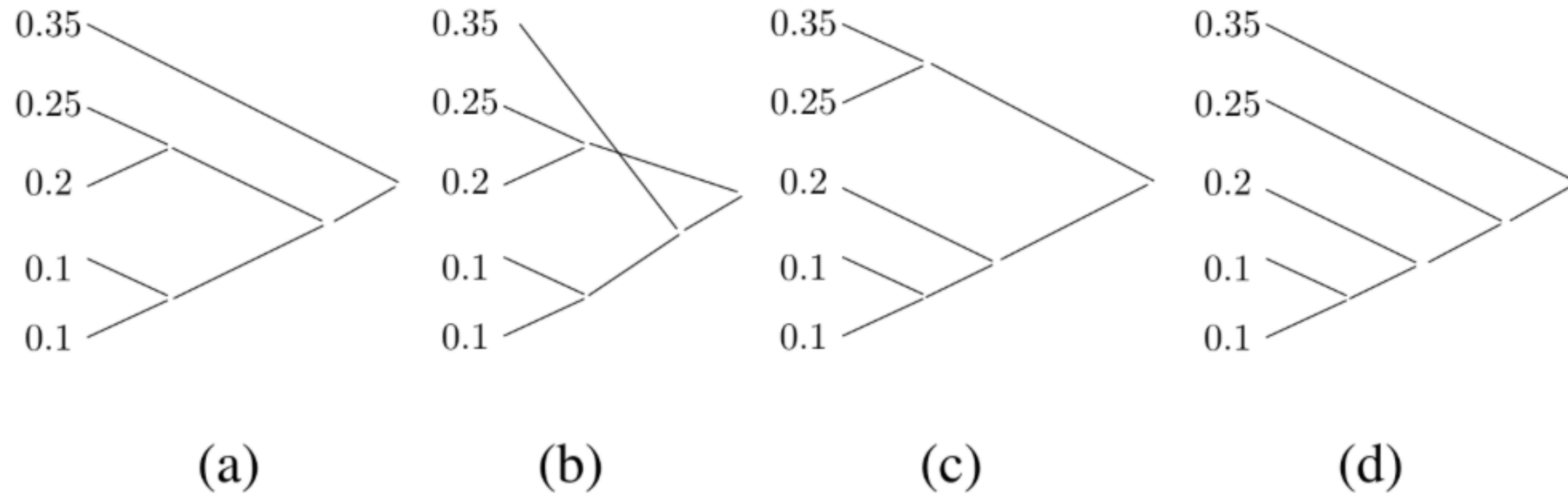
# Use LaTeX!

## Works reliably

Evaluate the differential entropy  $H(X) = - \int p_X(x) \ln p_X(x)$  for questions 1-3

# Answer is a Binary Tree

Consider a source with  $(p_1, p_2, p_3, p_4, p_5) = (0.35, 0.25, 0.2, 0.1, 0.1)$ .



Which is the tree for the corresponding Huffman code?

Select one:

☐ a)

☐ c)

☐ b)



# HTML & Moodle's Cloze Format

Can make more complicated questions.

- HTML table
- “Cloze” format  
{1:NUMERICAL:=0.5:0.001}

- Correct answer is a 3x3 numerical matrix →

Fano's inequality and exact value. Consider jointly distributed  $X, Y$  and an estimator  $g(y) = \hat{x}$  as given below. Let  $X, Y$  be jointly distributed as:

$$p_{XY}(x, y) = \begin{bmatrix} \frac{1}{6} & \frac{1}{12} & \frac{1}{12} \\ \frac{1}{12} & \frac{1}{6} & \frac{1}{12} \\ \frac{1}{12} & \frac{1}{12} & \frac{1}{6} \end{bmatrix}$$

where rows are  $\mathcal{X} = \{1, 2, 3\}$  and columns are  $\mathcal{Y} = \{a, b, c\}$ . Let the estimator  $g$  be given by:

$$g(y) = \begin{cases} 1 & y = a \\ 2 & y = b \\ 3 & y = c \end{cases}.$$

(a) With  $\hat{X} = g(Y)$ , find in matrix form

$$p_{X|\hat{X}}(x|\hat{x}) =$$

0.50001	0.25001	0.25001
0.25001	0.50001	0.25001
0.25001	0.25001	0.50001

# Answer is a Table

For each possible source sequence, find the codeword with lowest Hamming distortion, and find its distortion.

Source seq.	Codeword	Hamming Distortion
000	111	
001		2
010		
011		
100		
101		
110		
111		

- ✓
- 1/3
- 2/3
- 1
- 4/3
- 0
- 2



# Pop Quiz is 5% of the grade

**Philosophy** “Flipped Classroom” 反転授業:

- Students study new material **before** coming to lecture
- Students are better prepared for the lecture, discussion

**Implementation:**

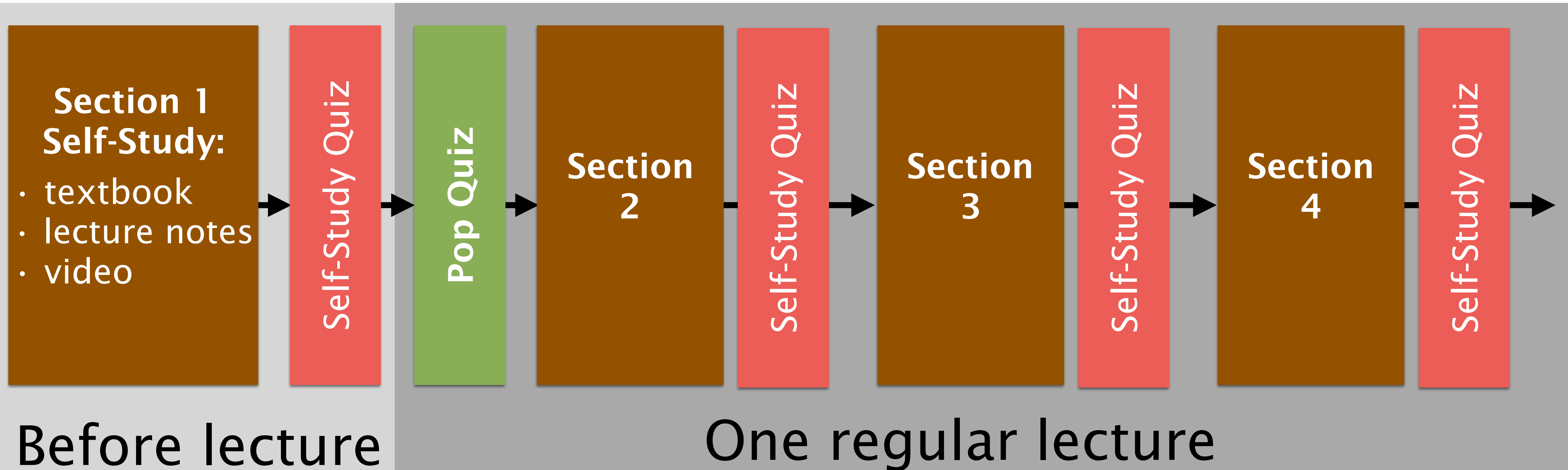
- At end of lecture, announce a reading list and/or videos
- Self-study quiz in Moodle

**Pop quiz** at the beginning of the next lecture:

- 5-minute, paper-based, similar to self-study quiz

# Partially “Flipped Classroom”

If one lecture has four sections, ...







Q1 This course used pop quizzes to encourage you to study one section before coming to class. What do you think about the pop quizzes, and how can they be improved?



Yes, I think it is good!

Good idea. It encourages us to use the lectures notes regularly

I think pop quizzes should be used everyday because we have to read the lecture notes and we more easily understand your lecture



# Page Resource

A page allows you to display arbitrary content

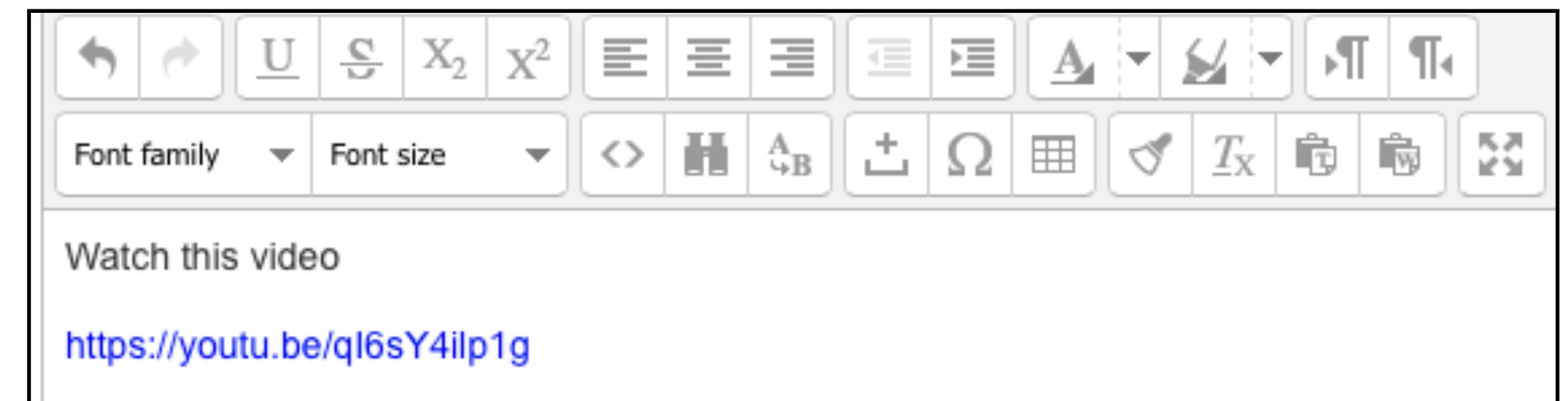
Edit with web-based text editor

Can embed YouTube, etc. videos

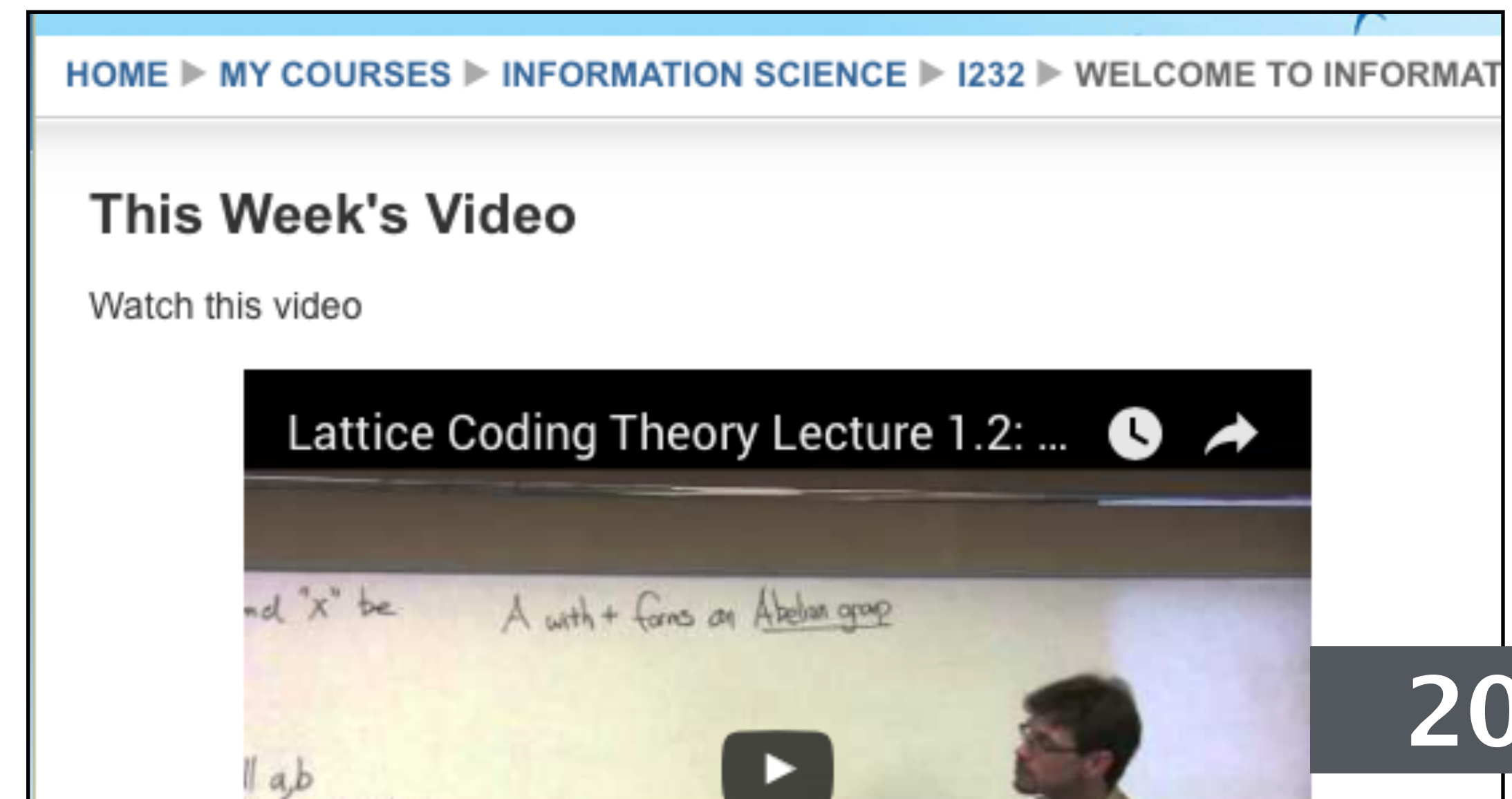
I232 used pages for:

- Syllabus
- Videos
- Info for pop quiz preparation
- Info for final exam preparation

You edit



Student sees





# Discussion Forum


Forum is a message board for students and teachers to exchange ideas:

- Instructor makes announcements
- Email is automatically sent

In addition:

- Students make a “self-introduction” to get familiar with the system. Creates a positive environment
- Students ask questions about homework, lecture
- All members can see all replies

In 2015, we had 44 postings.

 Homework 4, Question 6  
by JAIST Student - Tuesday, 22 December 2015, 3:37 PM

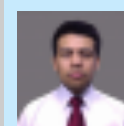
Dear Professor,

I have a question about Homework 4, Question 6.

I do not really understand what is the expected answer for question (a) : "Compute the entropy of  $X_i$ ". More precisely, I do not understand what is the meaning of 'i'.

Sincerely,


[Edit](#) | [Delete](#) | [Reply](#) | [Export to portfolio](#)

 Re: Homework 4, Question 6  
by Javier Cuatrecasas - Wednesday, 22 December 2015, 11:55 PM

Hi Valentin,

Hint: You have a set of 25 independent and identically distributed random variables ( $\mathbf{X}$ ), you just have to calculate the entropy of one of those random variables ( $X_i$ ) whose distribution is known.

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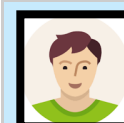
 Re: Homework 4, Question 6  
by Brian Kurko - Wednesday, 23 December 2015, 1:10 PM

Hi All,

I updated the text of the question to clarify.

-Brian

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 Re: Homework 4, Question 6  
by JAIST Student - Wednesday, 23 December 2015, 2:59 PM

Thank you for your answers!

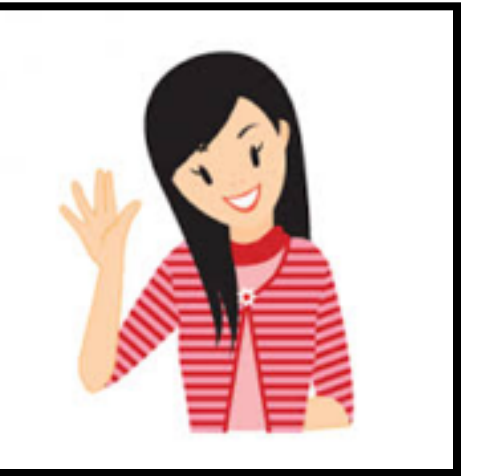
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I like ... the rapidity of the answers when we have a question and the interaction of the forum



... The discussion forum is also very nice because we sometimes do not know who to contact for help with the course/exercises (teaching assistant? professor?). It can be intimidating to send an email to the professor. It is good to put the questions on the forum that even other students can answer. [Edited]



As an instructor, the discussion forum is very useful





# Grade Book

Grade item	Grade	Range	Percentage
I232 Information Theory, 2015			
Homework			
✓ Homework 1	-	0-10	-
✓ Homework 2	-	0-10	-
✓ Homework 5	-	0-10	-
📄 Homework 6	-	0-10	-
Final Exam			
✎ Final Exam Problem 1	15.00	0-15	100.00 %
✎ Final Exam Problem 2	15.00	0-15	100.00 %
✎ Final Exam Problem 3	10.00	0-15	66.67 %
✎ Final Exam Problem 4	0.00	0-5	0.00 %
$\bar{x}$ Category total	40.00	0-50	80.00 %
$\bar{x}$ Course total	52.30	0-100	52.30 %



# Grade Book

- Students can see their scores during the course.
- Quiz scores appear automatically
- Instructor/TA manually enters scores for reports, exams
- Use “Grading Categories” with weights:
  - Homework 30%, Final Exam 50%, etc.
  - Moodle computes final total
  - Send the final total to Kyoumu. Easy!



# Summary So Far

Used Moodle for 3 years of Information Theory I232

Online component of a traditional course.

Most useful features:

- Quiz activity: supports on-line homework
- Quiz activity: self-study and “flipped classroom”
- Discussion Forum for efficient communication
- Uniform interface for distributing content

# Beyond Traditional Courses

- Is this open to the public?
  - This is a first step towards a large-scale class
  - YouTube videos are advertising for JAIST
- Short “taster” course for student recruitment
- Summer school course
- New courses, course development
- Use for external teaching at other universities.

In 2015, I taught at UNSRI in Indonesia

- Weekly lectures by teleconference
- Students used Moodle for lecture content, homework
- I visited in December and gave final exam to 13 students







**Q2** The School of Information Science is considering expanding the use of online learning management systems, to other courses. Professors teaching other courses want to know your opinion about this system.

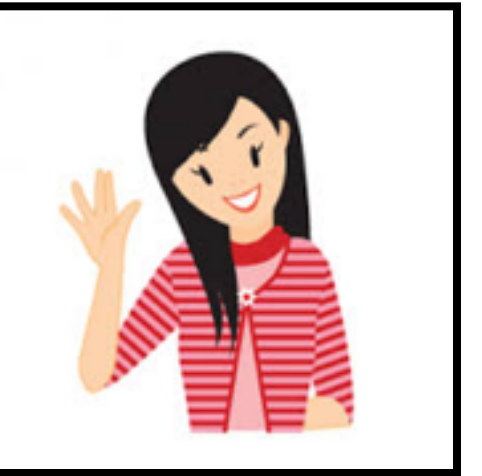


Online system is convenient

Yes, I think your on-line learning management system is very impressive. Comparing this system with other course's system, I think your system is the best



I think the online learning system is very practical, to have full lecture notes, some training, etc. It is interesting to be able to train on oneself.



It is convenient to check slides or lecture notes at any time I want.

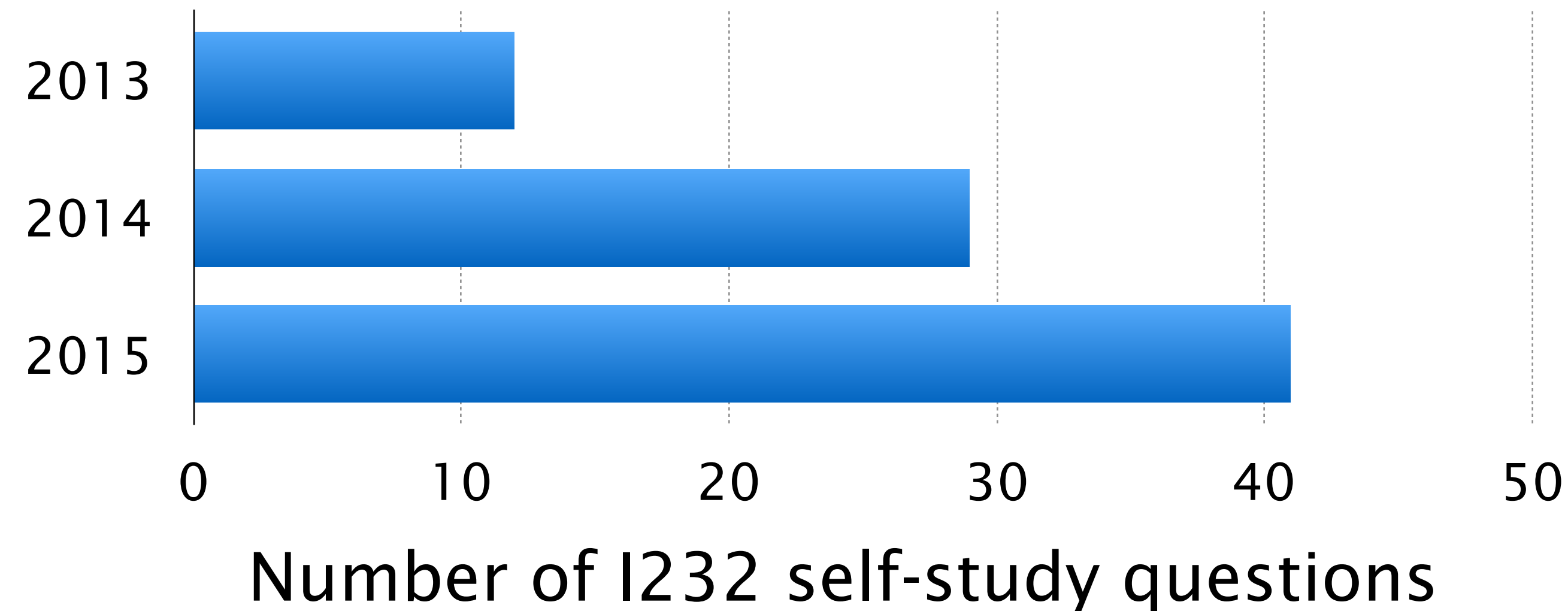
I think the on-line learning system is very practical...

I think it would be great if we can apply this system to other courses...

# Are You Ready to Get Started?

Easy for your 2016 course:

- Distribute PPT, PDF, etc.
- Discussion Forum
- Submit reports



For your 2017 course:

- Add a few quiz items
- Find a TA who likes web and HTML

For the future:

- Gradually add more quiz items. Learn “Question Bank”

# What We Can Provide

- An account on Moodle@JAIST
- A “sandbox” — try using Moodle
- Template course (now under construction)
  - ♦ See examples and edit yourself
- Tutorial at JAIST on using Moodle
  - ♦ Workshop?
  - ♦ Man-to-man in your office?

**<http://www.jaist.ac.jp/celeste/moodle/>**