

E-Learning in ITS

スラバヤ工科大学における eラーニング

- Since 2006, based on Moodle (<http://share.its.ac.id/>)
Moodleを用いて、2006年から行っている
(Sharable and Reusable E-learning (**SHARE-ITS**))
- Around 96 courses provided (6% of total courses in ITS)
約96コースが作られている (ITSの全部のコースの6%)
- Managed by P3AI (Center for education & Instructional activities development)
P3AI(教育・指導活動開発センター)で運営管理されている
- Content created and managed by Lecturers
コンテンツの作成と管理は教員によって行われている
- Problem occurred: Early 2009, it was attacked by virus and some contents was gone
問題発生: 2009年のはじめごろ, ウィルスに攻撃され, 一部のコンテンツが消えた
- Joint Research (KU & ITS): “Autograding system for short essay quizzes”
熊大とITSの共同研究: 短い記述形式の小テストのための自動採点システム

ITS



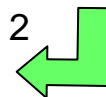
- Stand for *Institut Teknologi Sepuluh Nopember* (10 November Institute of Technology)
Institut Teknologi Sepuluh Nopember のこと。11月10日工科大学 = スラバヤ工科大学
- Located in **Surabaya**, East Java, Indonesia
インドネシアの東ジャワ地方のスラバヤにある。



Bali バリ

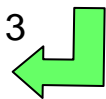


- Consist of 5 faculties & 2 polytechnic institutes (55 departments, 17.672 students & 1012 lecturers)
5学部と2つの科学技術専門学校からなる。(55学科, 17672人の学生, 1012人の教員)



<http://share.its.ac.id/>

The screenshot shows a Moodle course page titled "Membuat Assessment menggunakan Moodle". The page layout includes a navigation menu at the top with items like "Share ITS", "Mata Kuliah", "Layanan Mahasiswa", "Layanan Dosen", "Kuesioner", "Download", and "Tampilan". The main content area is divided into several sections: "People" (Participants), "Activities" (Chats, Forums, Quizzes, Resources), "Search Forums", "Administration" (Grades, Profile), and "My courses". The central "Topic outline" section lists course topics such as "Konsep Modul Kuis pada MOODLE" and "Membuat Quiz Body". Annotations with yellow boxes and blue arrows point to specific features: "Designed with different template" points to the top navigation bar; "Utilize Forum" points to the "Forums" link in the Activities section; "Pdf, text, web material content" points to a document icon in the topic outline; "Grading" points to the "Grades" link in the Administration section; "Event Agenda" points to the "Upcoming Events" section on the right; and "Event Agenda" also points to the "Upcoming Events" section on the right.



P3AI (Pusat Pengembangan Pendidikan & Aktivitas Instruksional / Center for education & Instructional activities development) 教育・指導活動開発センター

- Moodle administration

Moodleの管理

- Training for lecturers (7 times so far):

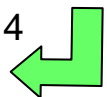
これまで7回の教員向け研修を実施:

- “How to manage courses using Moodle”

Moodleを用いたコースの管理運営方法

- Improve teaching quality of lecturers based on the assessment by students

学生による評価に基づいて、教員の教え方の質向上を図る

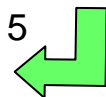


Lecturers

教員

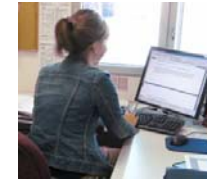


- Request the courses creation
コース作成の要望を出す
- Create content (ppt, web page, text) and put it to the Moodle
コンテンツ(PPT, ウェブページ, テキスト)を作り, Moodleに載せる
- Manage Forum & Discussion with [students](#)
フォーラム・ディスカッションの面倒を見る
- Grading
採点



Students

学生



- **Enroll & join to the course in Moodle**

Moodleのコースに登録して参加する

- **Attend to traditional style class**

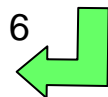
従来形式の授業にも出席する

- **Access SHARE-ITS** SHARE-ITSサイトにアクセス

- Reading and learning by themselves in the laboratory or at home 研究室や自宅で自習

- Do assignments and quizzes in Moodle Moodleの課題や小テストを行う

- Join to forum フォーラムに参加する



“Autograding System for Short Essay Quizzes”

短い記述形式の小テストのための自動採点システム

問題例 **Question:** Write the definition of the hardware?

正答例 **Correct answer:** Hardware is an equipment in computer system that physically visible and able to be touched

	各学生の答え	教員の採点	自動採点システムの採点	隔たり
Student	Student's answer	Score from Teacher	Score from Autograding System	Deviation
Student1	Hardware is electronic devices which have physical dimension.	6.00	5.81	0.19
Student2	Hardware is a comprehensive form of all physical parts of a computer.	6.00	6.84	0.84
Student3	Hardware is a device that contains physical components, for example mouse, cpu, monitor, and keyboard.	6.00	6.99	0.99
Student3	Hardware is a kind of computer's component which has physical form and can be seen by everyone.	9.00	7.27	1.73
Student4	Hardware is parts that construct a computer, a physical aspect of a computer, and devices that can be used for a computer.	8.00	7.61	0.39
Student5	Hardware is a computer component which can be seen physically, for example printer, mouse, cpu etc.	8,00	6,76	1,24

“Autograding System for Short Essays”

Input 1: Software is a general term for the various kinds of programs used to operate cor

Input 2: software is programs that run on a computer

Parser

Similarity Result

Result 1 - Syn & Sem Similarity

Value: 0.7403846

Result 2 - Syntactic Sim [Dao 2005]

Result 3 - WordNet Sem Sim [Dao 2006]

Value: 0.6173077

Autograding

Tokens 1: > # various # kinds # of # programs # used # to # operate # computers # and # related # devices

Tokens 2: software # is # programs # that # run # on # a # computer

Parsing 1: (TOP (S (NP (NN Software)) (VP (VBZ is) (NP (DT a) (JJ general) (NN term)) (PP (IN for) (NP (NP (DT the) (JJ various) (NNS kinds)) (PP (IN of) (NP (NP (NNS programs)) (VP (VBN used) (S (VP (TO to) (VP (VB operate) (NP (NP (NNS computers)) (CC and) (NP (VBN related) (NNS

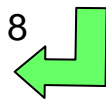
Parsing 2: (TOP (S (NP (NN software)) (VP (VBZ is) (NP (NP (NNS programs)) (SBAR (WHNP (WDT that)) (S (VP (VBP run) (PP (IN on) (NP (DT a) (NN computer))))))))))

Sentences

Score / grade

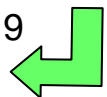
NP S VP

NP S VP

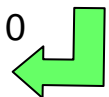
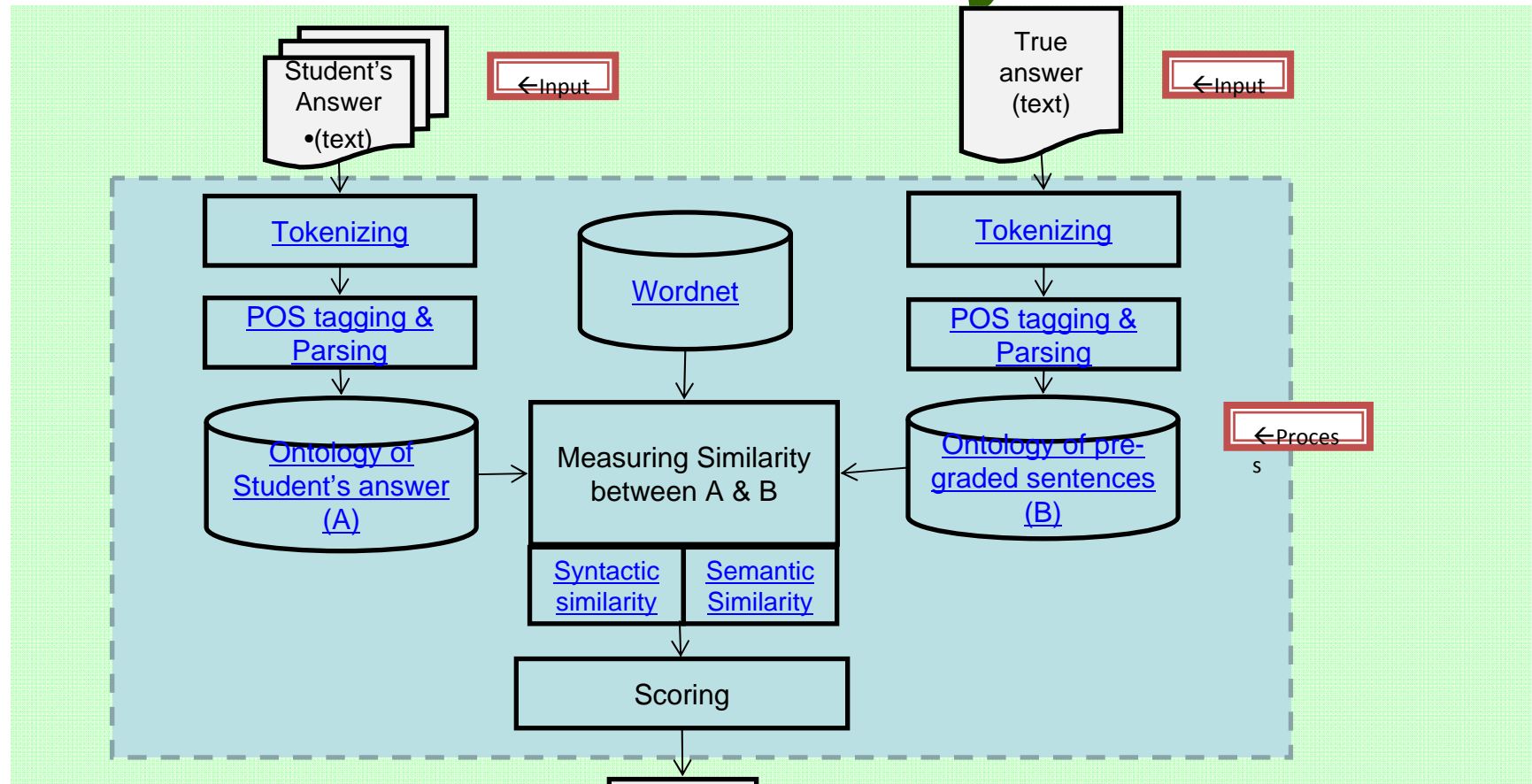


“Autograding System for Short Essays”

- **Purpose:** Calculate the similarity (syntactic and semantic similarity) between student's answer and correct answer automatically
- **Product :** Autograding system (Prototipe in C#)
- **Testing:**
 - Question: What is software ?
 - True answer : Software is a general term for the various kinds of programs used to operate computers and related devices
 - Students Answer : software is programs that run on a computer
 - Score :0.7403846
- **Future Work :**
 - Develop Web service based on this prototipe
 - Integrate Moodle & Autograding Web Service



“Autograding System for Short Essays”



Implementation of Autograding System

- **Tokenizing**
Breaking a sentence into several tokens
- **POS Tagging dan Parsing**
Identifying the structure of sentences
- **Measuring Similarity**
Calculating the similarity of sentences by using the Syntactic-Semantic similarity method & produce a matrix similarity
- **Scoring/Matching Average**
Calculate the final value of the similarity matrix using fast heuristic methods and Matching Average



Example-Tokenizing

- Tokenizing
- POS Tagging & Parsing
- Create Matrix Similarity
- Fast Heuristic
- Matching Average

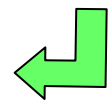
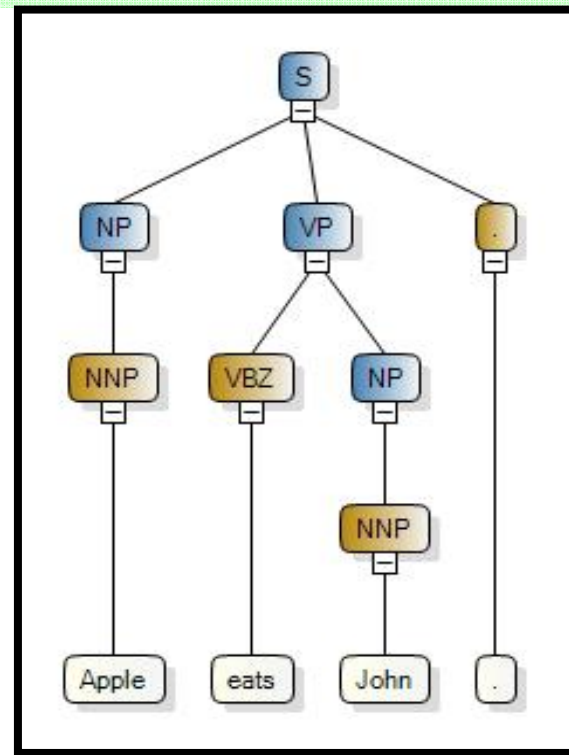
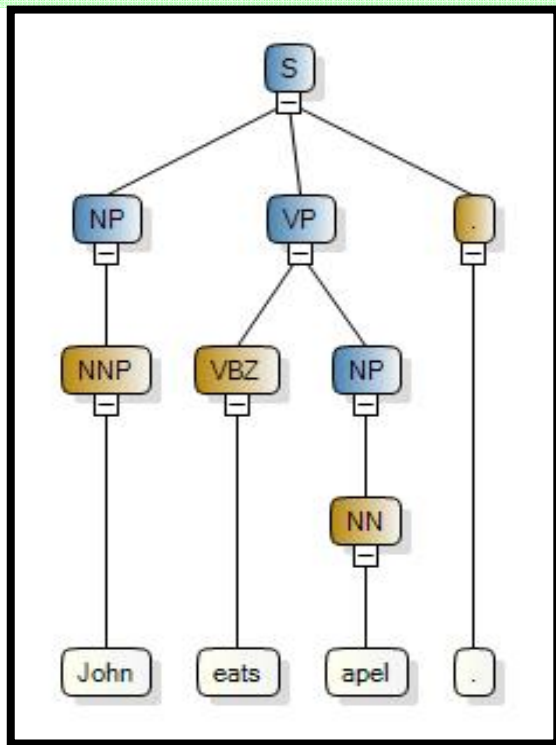
- String 1 = “John eats apple .”
- String 2 = “Apple eats John .”
- Tokenizing(String1) =
 {“John”, “eats”, “apple”, “.”}
- Tokenizing(String2) =
 {“Apple”, “eats”, “John”, “.”}



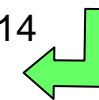
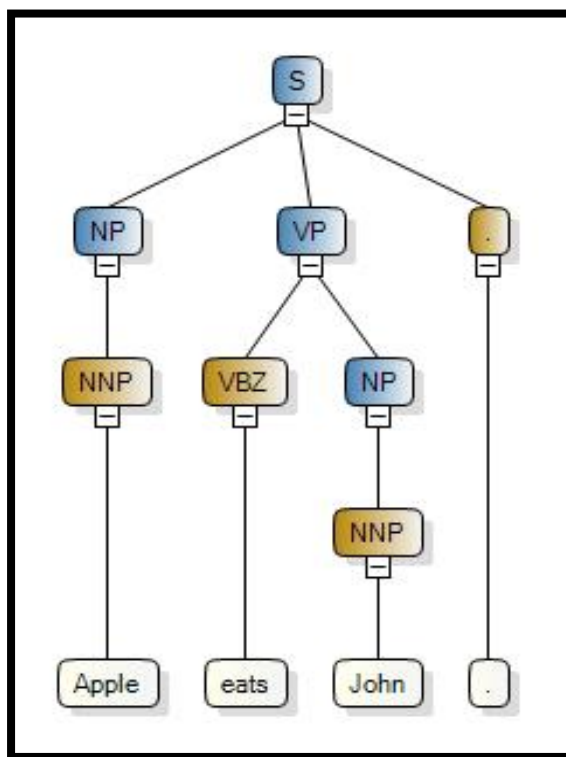
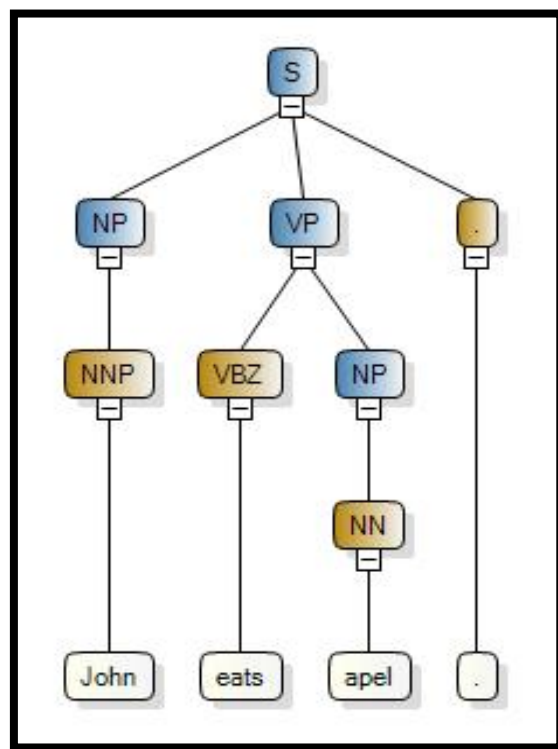
POS Tagging & Parsing

- Tokenizing(String1) = {"John", "eats", "apple", "."}
- Tokenizing(String2) = {"Apple", "eats", "John", "."}

- Tokenizing
- POS-Tagging & Parsing
- Create Matrix Similarity
- Fast Heuristic
- Matching Average

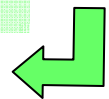
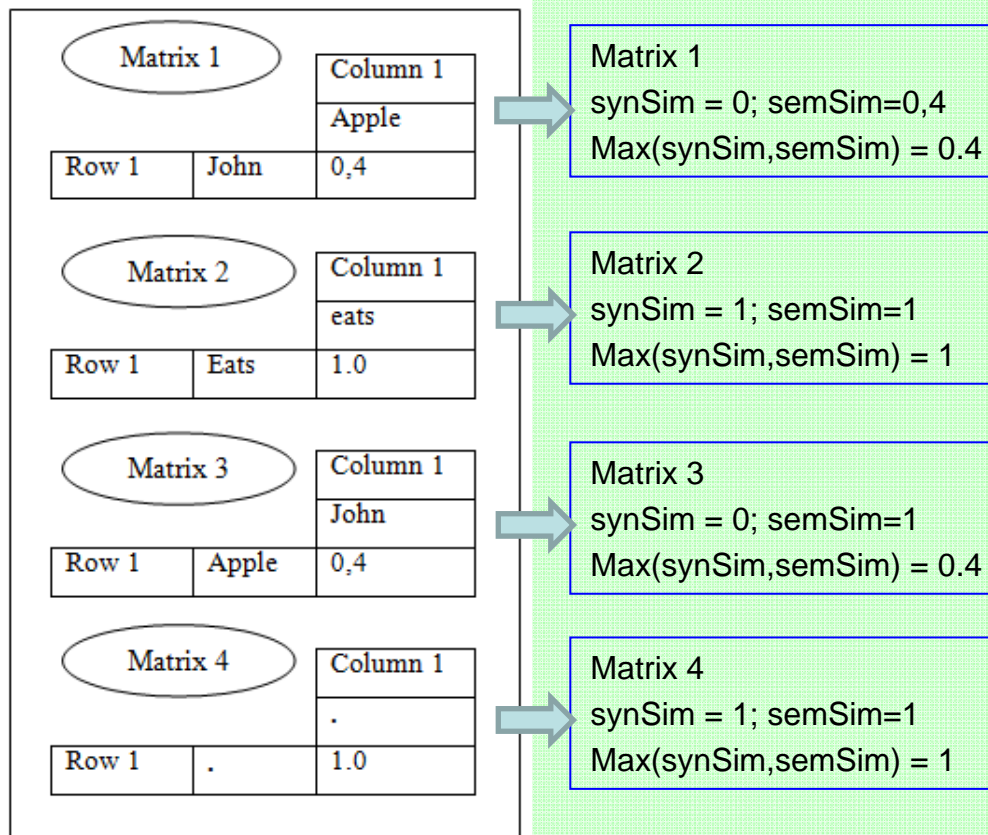


Ontology



- Tokenizing(String1) = {"John", "eats", "apple", "."}
- Tokenizing(String2) = {"Apple", "eats", "John", "."} → n token = 8

- Tokenizing
- POS-Tagging & Parsing
- Membuat Matrix Similarity
- Fast Heuristic
- Matching Average



Matching Average

- Tokenizing
- POS-Tagging & Parsing
- Create Matrix Similarity
- Fast Heuristic
- Matching Average

Fast Heuristic

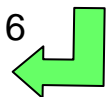
Matrix 1 = $2 \times 0.4 = 0.8$

Matrix 2 = $2 \times 1.0 = 2.0$

Matrix 3 = $2 \times 0.4 = 0.8$

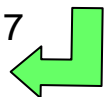
Matrix 4 = $2 \times 1.0 = 2.0$

$$\begin{aligned} \text{Matching Average} &= \frac{(|X1| \times \text{match}(X1)) + (|X2| \times \text{match}(X2)) + (\dots) + (|Xn| \times \text{match}(Xn))}{|X1| + |X2| + \dots + |Xn|} \\ &= \frac{(2 \times 0.4) + (2 \times 1) + (2 \times 0.4) + (2 \times 1)}{8} = 0.7 \end{aligned}$$



Syntactic Similarity

- **Syntactic similarity** : calculate the value of similarity between two strings based on the structure of the constituent letter string
- Using [Levenshtein Distance Algorithm](#) to
- Example :
 - SIT and SIT (**syn = 1**; sem=1)
 - SITTEN & KITTEN (**syn=0.83**, sem=0)
 - EAT & CONSUME (**syn=0**; sem=1)



Levenshtein Distance(LD) Algorithm

$$\text{Levenshtein Distance}(\text{str1}, \text{str2}) = 1 - \frac{\text{edit distance}}{\text{maxLength}(\text{str1}, \text{str2})}$$

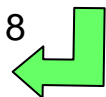
str1 = "Kitten" (length=6)

str2 = "Sitting" (length=7) → $\text{MaxLength}(\text{str1}, \text{str2}) = 7$

Calculate Edit Distance(ED) based on Edit Rule(ER):

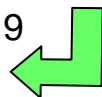
- Base string: Kitten
 - Sitten (ER1 → Substitution("K", "S"); (Kitten → Sitten))
 - Sittin (ER2 → Substitution("e", "i"); (Sitten → Sittin))
 - Sitting (ER3 → Insert("g"), last position); (Sittin → Sitting)
- ED = 3 (Total of ER)

$$\begin{aligned}\text{Levenshtein Distance}(\text{kitten}, \text{sitting}) &= 1 - (\text{ED} / \text{maxLength}(\text{str1}, \text{str2})) \\ &= 1 - (3 / 7) \\ &= 0.57\end{aligned}$$



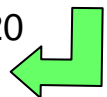
Semantic Similarity

- **Semantic Similarity**: the similarity of meaning between two words/sentences
- Utilize Wordnet database to calculate Semantic Similarity
- Example :
 - SIT and SIT (syn = 1; **sem=1**)
 - SITTEN & KITTEN (syn=0.83, **sem=0**)
 - EAT & CONSUME (syn=0; **sem=1**)



Wordnet

- WordNet is a lexical database for the English language.
- It groups English words into sets of synonyms called synsets,
- provides short, general definitions, and
- records the various semantic relations between these synonym sets.





THANK YOU

