edX Development

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Introduction

- EdX is a non-profit organization formed by collaboration of Harvard and MIT
- OpenEdX provides an open source platform for building MOOC (an online education system)
- We were working to develop MOOC system for iitb known as 'IITBombayX' using OpenEdX.
**edX Platform**

**Figure: edX Overview**
What is CMS?

- Course Management System
- It is the instructor side of the system where there is a provision for creating and managing courses using the MOOC system.
Features of CMS (Adding Videos)

Figure: Adding Videos
Features of CMS (Adding Videos)

Figure: Adding Videos
Features of CMS (Course Team)

Figure: Course Team
Features of CMS (Grading Policy)

![Grading Policy](image)

**Grading**

**Overall Grade Range**

Your overall grading scale for student final grades

- **Pass**: 50-100
- **Fail**: 0-50

**Grading Rules & Policies**

Deadlines, requirements, and logistics around grading student work

Grace Period on Deadline:

00:00

Leeway on due dates

**Figure**: Grading Policy
Features of CMS (Assignments)

Figure: Assignments
What is LMS?

- Learning Management System
- It is the student side of the system
- Students can register for courses according to their area of interest
- Graded and certified on successful course completion.
Features of LMS (Self Paced Learning)

Figure: Self Paced Learning
Features of LMS (Student Dashboard)

**Figure:** Student Dashboard
Discussions

Circuits and Electronics Discussion

Figure: Discussions
Django Cache System

- Robust Cache System
- Save Dynamic Pages
- Levels of cache granularity
Types of Caching

- Memcached
- Database Caching
- Filesystem Caching
- Local Memory Caching
Objective: To test different types of cache systems available in Django

Testing Tool: Jmeter

Parameters:

- Number of Users: 10
- Ramp-up Period: 20
- Loop Count: 5
## Results

<table>
<thead>
<tr>
<th>Type of Caching</th>
<th>Average Sample time (in ms)</th>
<th>Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Memory Caching</td>
<td>168</td>
<td>196</td>
</tr>
<tr>
<td>Memcached</td>
<td>93</td>
<td>8</td>
</tr>
<tr>
<td>Database Caching</td>
<td>136</td>
<td>32</td>
</tr>
<tr>
<td>Filesystem Caching</td>
<td>121</td>
<td>23</td>
</tr>
</tbody>
</table>

**Table: Results**

Memcached > Filesystem Caching > Database Caching > Local Memory Caching
edX uses two database systems:

- SQLite*(Relational Database): used to store the user-data
- MongoDB(Non Relational Database): used to store the courseware content

*for production environments MySQL is used.
Database

SQLite/MySQL

- Relational Database.
- Used to store the information about user profile, registration data, student enrollment, logs, test and grading.
- There are \((85+1)\) tables currently present in IITBombayX.
Database

![Categorization of relations](image)

**Figure:** Categorization of relations
Database

MongoDB

- NoSQL - Document based database (has collections and documents)
- Used to store the courseware content, course policies etc.
- Data is stored as a series of key value pairs which optimizes retrieval and appending of data.
- Two databases:
  - xcontent: stores filesystem content
  - xmodule: stores module definitions and metadata
Use of two different Databases:

Using MongoDB is a relatively new concept (previously architecture used XML based files). Since use of relational database for user-data predated the transition of content store so it was not migrated to NoSQL platform.[1]
edX-ORA

- edX-ORA is used for the assessment of open response problems on the edx platform.
- It has support for Peer Grading, Staff Grading and Machine Grading.
edX-ORA

Figure: edx-ORA
edX-ORA

- **AI Assessment**
  - In AI assessment, a computer algorithm scores student submissions.

- **Peer Assessment**
  - In Peer assessment each student gives one another scores and feedbacks. For this he first has to grade himself and then proceed for the calibration round, upon completion of which he can grade his peer with the help of provided rubrics.
xqueue

- It provides an interface to the LMS to interact with external grading system like ORA. [2]

Figure: xqueue interaction
The EASE module is used for machine learning based automated classification.

- Machine learning based automated classification can work on both free text and numeric values.[3]
Figure: model creation
EASE

Figure: training and prediction

Returns
results =
{'errors',
'success',
'cv_kappa',
'cv_mean_absolute_error',
'feature_ext',
'classifier',
'algorith',
'score', 'text',
'prompt'}
Time for DEMO

Demo of features:

1. Upload Video Directly through edX Studio
2. Popularity of Course (no. of students registered)
3. Course Search (on keyword)
4. Recommended Courses
Future Scope

- Refining search
- Course feedback and rating
- Improvement in AI grader
- Access control to staff (added by Instructor)
- User interface to provide programming assignments that will run in codejail
References

Thank You
Any Queries?