CHAPTER 8

APPENDICES

8.1 APPENDIX-A: SAMPLE SOURCE CODE

Main.py

```
from django.http import HttpResponse
from django.shortcuts import get_object_or_404, render, redirect
from django.contrib.auth.models import User
from django.contrib.auth import login,authenticate,logout
from django.contrib.auth.decorators import login_required
from django.contrib import messages
from .models import EvaluationResult, ExamSubmission,Exam
from .evaluation.ocr import generate_ocr
from .evaluation.extract_question_answerkey import question_answer_content
from .evaluation.preprocess_ocr import preprocess_ocr_question_wise
from .evaluation.evalution import evaluate_exam_with_ocr_to_json
from .evaluation.report import generate_report
from.evaluation.proper_json import parse_json_string
import json

def home(request):
    return render(request, 'home.html')

def signup_view(request):
    if request.method == "POST":
        username = request.POST['username']
        email = request.POST['email']
```

```
        password1 = request.POST['password1']
        password2 = request.POST['password2']

        if password1 != password2:
            messages.error(request, "Passwords do not match!")
            return redirect('signup')

        if User.objects.filter(username=username).exists():
            messages.error(request, "Username already taken!")
            return redirect('signup')

        if User.objects.filter(email=email).exists():
            messages.error(request, "Email is already in use!")
            return redirect('signup')

        user = User.objects.create_user(username=username, email=email,
password=password1)
        login(request, user)
        messages.success(request, "Account created successfully!")
        return redirect('login')

    return render(request, 'authentication/signup.html')

def login_view(request):
    if request.method == "POST":
        username = request.POST['username']
        password = request.POST['password']
```

```
        user = authenticate(request, username=username, password=password)

        if user is not None:
            login(request, user)
            messages.success(request, "Login successful!")
            return redirect('student_dashboard')
        else:
            messages.error(request, "Invalid username or password!")

    return render(request, 'authentication/login.html')

def student_dashboard(request):
    exams = ExamSubmission.objects.filter(student=request.user)
    return render(request, 'dashboard/student/student_dashboard.html', {'exams':
exams})

def logout_view(request):
    logout(request)
    messages.success(request, "Logged out successfully!")
    return redirect('login')

def student_exam_fill(request):
    if request.method == "POST":
        subject = request.POST.get("subject")
        exam_type = request.POST.get("exam_type")
        year = request.POST.get("year")
        staff_name = request.POST.get("staff_name")
```

```
        exam = Exam.objects.filter(year=year).first()
        if not exam:
            messages.error(request, "❌ No matching exam found. Please check the
details.")
            return redirect("student_exam_fill")  # Prevent saving if exam doesn't exist
        # Create a new submission linked to this exam
        submission = ExamSubmission.objects.create(
            exam=exam,  # Assigning the required exam field
            student=request.user,
            subject=subject,
    if request.method == "POST":
        subject = request.POST.get("subject")
        exam_type = request.POST.get("exam_type")
        year = request.POST.get("year")
        staff_name = request.POST.get("staff_name")            exam_type=exam_type,
            year=year,
            staff_name=staff_name,
        )
        messages.success(request, "✅ Exam submission successful!")
        return redirect("student_dashboard")
    return render(request, "dashboard/student/exam_fill.html")
def teacher_login(request):
    if request.method == "POST":
        username = request.POST["username"]
        password = request.POST["password"]
        user = authenticate(request, username=username, password=password)
```

```
        if user is not None:
            if user.is_superuser:  # Allow only superusers
                login(request, user)
                messages.success(request, "Welcome, Teacher!")
                return redirect("teacher_dashboard")  # Redirect to teacher dashboard
            else:
                messages.error(request, "Access Denied! Only teachers (superusers) can
log in.")
        else:
            messages.error(request, "Invalid Username or Password!")
    return render(request, "dashboard/teacher/teacher_login.html")

@login_required
def teacher_dashboard(request):
    if not request.user.is_superuser:
        return redirect("home")  # Redirect unauthorized users

    exams = Exam.objects.all().order_by("-id")  # Fetch all exams
    return render(request, "dashboard/teacher/teacher_dashboard.html", {"exams":
exams})

@login_required
def create_exam(request):
    if not request.user.is_superuser:
        messages.error(request, "❌ Unauthorized access!")
        return redirect("home")
```

```
        question_paper = request.FILES.get("question_paper")
        answer_key = request.FILES.get("answer_key")
        if not all([subject, exam_type, year, staff_name, question_paper,
answer_key]):
            messages.error(request, "⚠ All fields are required!")
            return redirect("create_exam")
        Exam.objects.create(
            subject=subject,
            exam_type=exam_type,
            year=year,
            staff_name=staff_name,
            question_paper=question_paper,
            answer_key=answer_key
        )

        messages.success(request, "✅ Exam successfully created!")
        return redirect("teacher_dashboard")
    return render(request, "dashboard/teacher/create_exam.html")

@login_required
def view_submissions(request, exam_id):
    exam = get_object_or_404(Exam, id=exam_id)
    submissions = ExamSubmission.objects.filter(year=exam.year)
    if request.method == "POST":
        for submission in submissions:
```

```
            file_field_name = f"answer_sheet_{submission.id}"
            if file_field_name in request.FILES:
                if submission.answer_sheet:
                    messages.warning(request, f"⚠ Answer sheet for
{submission.student.username} already uploaded.")
                else:
                    submission.answer_sheet = request.FILES[file_field_name]
                    submission.save()
                    messages.success(request, f"✅ Answer sheet uploaded for
{submission.student.username}.")
        return redirect('view_submissions', exam_id=exam.id)
    return render(request, "dashboard/teacher/view_submissions.html", {"exam":
exam, "submissions": submissions})
def evaluate_submission_view(request, submission_id):
    submission = get_object_or_404(ExamSubmission, id=submission_id)
    return render(request, 'dashboard/teacher/evaluate_submission.html', {
        'submission': submission,
        'formatted_report': formatted_report,
        'total_score': total_score,
        'max_score': max_score
    })     evaluation = EvaluationResult.objects.filter(submission=submission).first()

    if evaluation:
        messages.info(request, "This submission has already been evaluated.")
        formatted_report = parse_json_string(evaluation.formatted_report)
```

```
        total_score = evaluation.total_score
        max_score = evaluation.max_score
    else:
        #OCR text from uploaded answer sheet
        ocr_text = generate_ocr(submission.answer_sheet.path)

    # Extract question paper and answer key
        question_paper_text =
question_answer_content(submission.exam.question_paper.path)
        answer_key_text =
question_answer_content(submission.exam.answer_key.path)

        # Preprocess OCR text to align with question numbers
        structured_ocr_text = preprocess_ocr_question_wise(ocr_text,
question_paper_text)

        # Evaluate answers using Gemini API
        evaluation_result_json =
evaluate_exam_with_ocr_to_json(structured_ocr_text, answer_key_text)
        formatted_report = generate_report(evaluation_result_json)
        formatted_report = parse_json_string(formatted_report)
        print(formatted_report)
        total_score = formatted_report["summary"]["user_total_score"]
        max_score =  formatted_report["summary"]["total_possible_score"]
        evaluation = EvaluationResult.objects.create(
            submission=submission,
            evaluated_by=request.user,
```

```
            formatted_report=json.dumps(formatted_report),
            total_score=total_score,
            max_score=max_score,
        )
        submission.is_graded = True
        submission.save()
        messages.success(request, "Evaluation completed successfully!")
def view_results(request,exam_id):
    submission = get_object_or_404(ExamSubmission, id=exam_id)

    # Check if the submission is already evaluated
    evaluation = EvaluationResult.objects.filter(submission=submission).first()
    if evaluation:
        messages.info(request, "This submission has already been evaluated.")
        formatted_report = parse_json_string(evaluation.formatted_report)
        total_score = evaluation.total_score
        max_score = evaluation.max_score
    return render(request, 'dashboard/teacher/evaluate_submission.html', {
        'submission': submission,
        'formatted_report': formatted_report,
        'total_score': total_score,
        'max_score': max_score
    })
```

Urls.py

```
from django.contrib import admin
from django.urls import path
```

```
from app import views
from django.conf import settings
from django.conf.urls.static import static

urlpatterns = [
    path("admin/", admin.site.urls),
    path('', views.home, name='home'),
    path('signup/', views.signup_view, name='signup'),
    path('login/', views.login_view, name='login'),
    path('logout/', views.logout_view, name='logout'),
    path('student_dashboard/', views.student_dashboard,
name='student_dashboard'),
    path('view-results/<int:exam_id>/', views.view_results, name='view_results'),
    path('student_exam_fill/', views.student_exam_fill, name='student_exam_fill'),
    path('teacher-login/', views.teacher_login, name='teacher_login'),
    path('teacher-dashboard/', views.teacher_dashboard, name='teacher_dashboard'),
    path('create-exam/', views.create_exam, name='create_exam'),
    path('view-submissions/<int:exam_id>/', views.view_submissions,
name='view_submissions'),
    path('evaluate/<int:submission_id>/', views.evaluate_submission_view,
name='evaluate_submission'),
]+ static(settings.MEDIA_URL,document_root=settings.MEDIA_ROOT)

urlpatterns+=
static(settings.STATIC_URL,document_root=settings.STATIC_ROOT)
```

Models.py

```
from django.db import models
from django.contrib.auth.models import User

class Exam(models.Model):
    YEAR_CHOICES = [
        (1, "First Year"),
        (2, "Second Year"),
        (3, "Third Year"),
        (4, "Fourth Year"),
    ]

    EXAM_TYPE_CHOICES = [
        ("CAT1", "CAT 1"),
        ("CAT2", "CAT 2"),
    ]

    subject = models.CharField(max_length=255)
    exam_type = models.CharField(max_length=4,
choices=EXAM_TYPE_CHOICES, default="CAT1")
    year = models.IntegerField(choices=YEAR_CHOICES)
    staff_name = models.CharField(max_length=255)
    question_paper = models.FileField(upload_to='question_papers/')
    answer_key = models.FileField(upload_to='answer_keys/')
    created_at = models.DateTimeField(auto_now_add=True)

    def __str__(self):
```

```
        return f"{self.subject} - {dict(self.YEAR_CHOICES).get(self.year,
'Unknown')} - {self.get_exam_type_display()}"

class ExamSubmission(models.Model):
    EXAM_TYPES = [
        ('CAT1', 'CAT 1'),
        ('CAT2', 'CAT 2'),
    ]

    YEARS = [
        (1, "First Year"),
        (2, "Second Year"),
        (3, "Third Year"),
        (4, "Fourth Year"),
    ]

    exam = models.ForeignKey(Exam, on_delete=models.CASCADE)  # Remove
null=True, blank=True
    student = models.ForeignKey(User, on_delete=models.CASCADE)
    subject = models.CharField(max_length=100)
    exam_type = models.CharField(max_length=10, choices=EXAM_TYPES)
    year = models.CharField(max_length=1, choices=YEARS)
    staff_name = models.CharField(max_length=100)
    answer_sheet = models.FileField(upload_to='answer_sheets/', null=True,
blank=True)
    is_graded = models.BooleanField(default=False)
```

```
    def __str__(self):
        return f"{self.subject} - {self.exam_type} ({self.get_year_display()})"

class EvaluationResult(models.Model):
    submission = models.OneToOneField(
        ExamSubmission,
        on_delete=models.CASCADE,
        related_name="evaluation"
    )
    evaluated_by = models.ForeignKey(
        User,
        on_delete=models.SET_NULL,
        null=True,
        blank=True,
        related_name="evaluations"
    )
    formatted_report = models.TextField()  # Stores only the human-readable report
    total_score = models.FloatField(default=0.0)
    max_score = models.FloatField(default=0.0)
    created_at = models.DateTimeField(auto_now_add=True)

    def __str__(self):
        exam_subject = self.submission.exam.subject if self.submission.exam else
"Unknown Exam"
        return f"Evaluation for {self.submission.student.username} {exam_subject}"
```

Admin.py

```
from django.contrib import admin
from .models import EvaluationResult,Exam
admin.site.register(EvaluationResult)
admin.site.register(Exam)
```

Student-dashboard.html

```
{% extends 'base.html' %}

{% block content %}
<div class="container mt-5">
   <div class="card shadow-lg p-4">
      <h2 class="text-center text-primary fw-bold">Welcome, {{
request.user.username }}!</h2>
      <hr>

      <div class="d-flex justify-content-between align-items-center mb-4">
         <h3 class="text-secondary fw-semibold">📄 Your Submitted Exams</h3>
         <a href="{% url 'student_exam_fill' %}" class="btn btn-success btn-lg
shadow-sm">
            + Fill Exam Details
         </a>
      </div>

      {% if exams %}
      <div class="table-responsive">
```

```
<table class="table table-hover table-bordered text-center align-middle">
  <thead class="table-dark">
    <tr>
      <th>📚 Subject</th>
      <th>📝 Exam Type</th>
      <th>🎓 Year</th>
      <th>👩‍🏫 Staff Name</th>
      <th>📊 Status</th>
      <th>🔍 Actions</th>
    </tr>
  </thead>
  <tbody>
    {% for exam in exams %}
    <tr>
      <td class="fw-bold">{{ exam.subject }}</td>
      <td>{{ exam.get_exam_type_display }}</td>
      <td>{{ exam.get_year_display }}</td>
      <td>{{ exam.staff_name }}</td>
      <td>
        {% if exam.is_graded %}
          <span class="badge bg-success px-3 py-2">Graded</span>
        {% else %}
          <span class="badge bg-warning text-dark px-3 py-
2">Pending</span>
        {% endif %}
      </td>
```

```
                <td>
                    {% if exam.is_graded %}
                        <a href="{% url 'view_results' exam.id %}" class="btn btn-primary btn-sm shadow-sm">
                            View Results
                        </a>
                    {% else %}
                        <button class="btn btn-secondary btn-sm shadow-sm" disabled>Awaiting Grading</button>
                    {% endif %}
                </td>
            </tr>
            {% endfor %}
        </tbody>
    </table>
</div>
{% else %}
<div class="alert alert-info text-center">
    <p class="mb-0">🚀 No exams submitted yet. Start by filling out your first exam!</p>
</div>
{% endif %}

<div class="text-center mt-4">
    <a href="{% url 'logout' %}" class="btn btn-danger btn-lg px-4 shadow-sm">🚪 Logout</a>
```

```
        </div>
    </div>
</div>

<style>
    body {
        background-color: #f8f8fa;
    }
    .card {
        border-radius: 12px;
        border: none;
        box-shadow: 0 4px 10px rgba(0, 0, 0, 0.1);
    }
    .table th {
        background-color: #212528;
        color: white;
    }
    .table td {
        vertical-align: middle;
    }
    .btn {
        border-radius: 8px;
    }
    .btn-success {
        background-color: #28a745;
    }
</style>
```

```
{% endblock %}
```

Teacher-dashboard.html

```
{% extends 'base.html' %}

{% block content %}
<div class="container-fluid">
  <div class="row">
    <!-- Sidebar -->
    <nav class="col-md-3 col-lg-2 d-md-block bg-dark sidebar vh-100 p-3">
      <h4 class="text-white text-center">📚 Teacher Panel</h4>
      <hr class="text-white">
      <ul class="nav flex-column">
        <li class="nav-item">
          <a class="nav-link text-white" href="{% url 'teacher_dashboard' %}">
Dashboard</a>
        </li>
        <li class="nav-item">
          <a class="nav-link text-white" href="{% url 'create_exam' %}">✏️
Create Exam</a>
        </li>
        <li class="nav-item">
          <a class="nav-link text-white" href="{% url 'logout' %}"> Logout</a>
        </li>
      </ul>
    </nav>
```

```
    <!-- Main Content -->
    <main class="col-md-8 ms-sm-auto col-lg-10 px-md-4 mt-4">
        <div class="d-flex justify-content-between align-items-center">
            <h2 class="text-primary">👩‍🎓 Welcome, {{ request.user.username }}</h2>
            <a href="{% url 'create_exam' %}" class="btn btn-success btn-lg shadow-sm">
                + Create Exam
            </a>
        </div>
        <hr>

        <h3 class="text-secondary">📄 Created Exams</h3>
        {% if exams %}
            <div class="table-responsive">
                <table class="table table-hover table-bordered text-center">
                    <thead class="table-dark">
                        <tr>
                            <th>Subject</th>
                            <th>Exam Type</th>
                            <th>Year</th>
                            <th>Actions</th>
                        </tr>
                    </thead>
                    <tbody>
                        {% for exam in exams %}
```

```
                        <tr>
                            <td class="fw-bold">{{ exam.subject }}</td>
                            <td>{{ exam.get_exam_type_display }}</td>
                            <td>{{ exam.get_year_display }}</td>
                            <td>
  <a href="{% url 'view_submissions' exam.id %}" class="btn btn-primary btn-
sm">
                                    View Submissions
                                </a>
                            </td>
                        </tr>
                    {% endfor %}
                </tbody>
            </table>
        </div>
    {% else %}
        <div class="alert alert-info text-center">
            <p class="mb-0">No exams created yet.</p>
        </div>
    {% endif %}
  </main>
 </div>
</div>

<style>
 /* Sidebar Styling */
 .sidebar {
```

```
        height: 100vh;
        position: fixed;
        left: 0;
        top: 0;
        width: 250px;
    }

    /* Adjust main content */
    main {
        margin-left: 260px;
    }

    /* Button Styling */
    .btn-sm {
        font-size: 0.8rem;
    }

    /* Responsive Design */
    @media (max-width: 768px) {
        .sidebar {
            position: relative;
            height: auto;
            width: 100%
    }
</style>
{% endblock %}
```

8.2 APPENDIX-B: DEMO SCREENSHOTS

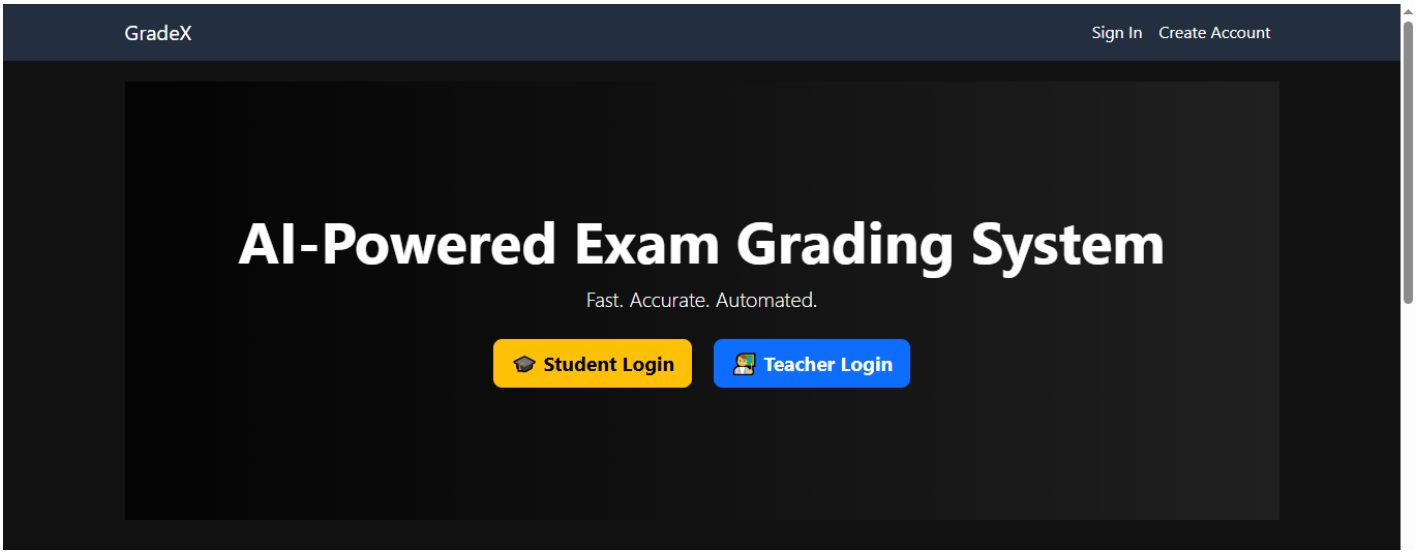

Fig: 8.1 GradeX Website

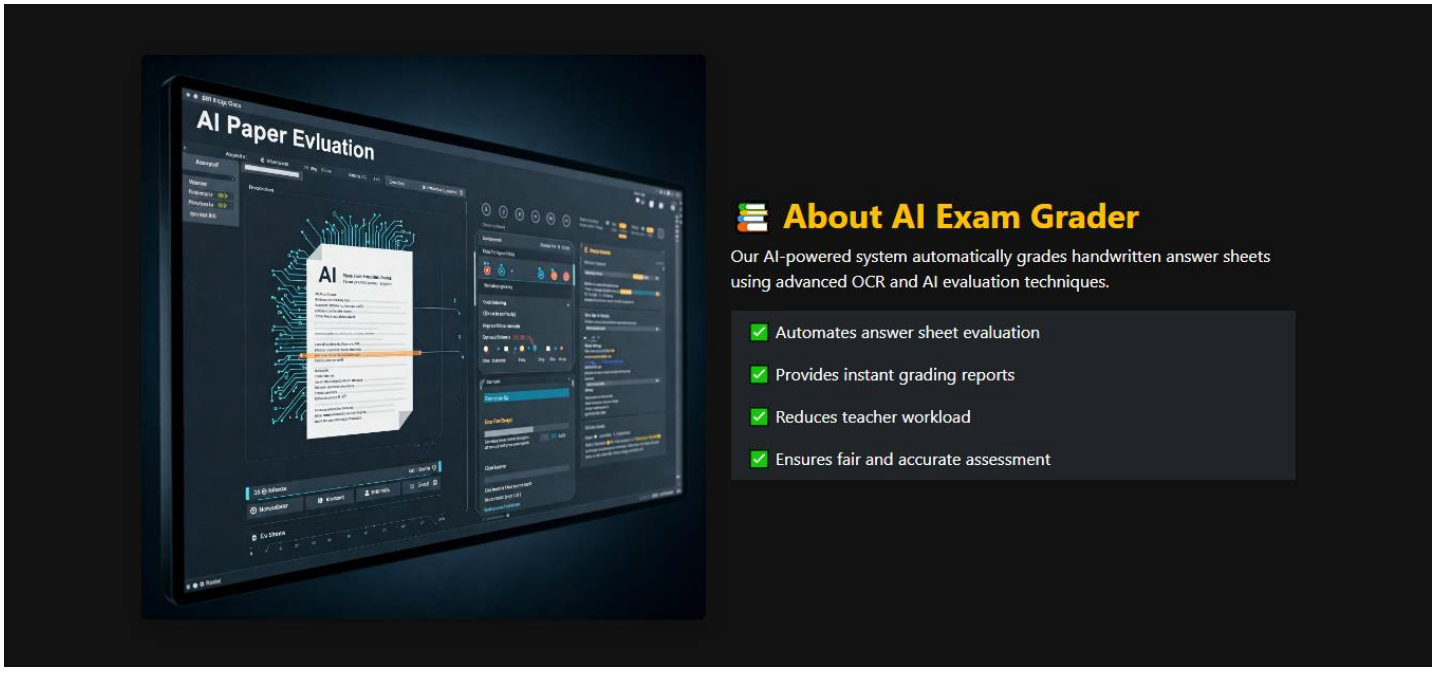

Fig: 8.2 GradeX Information

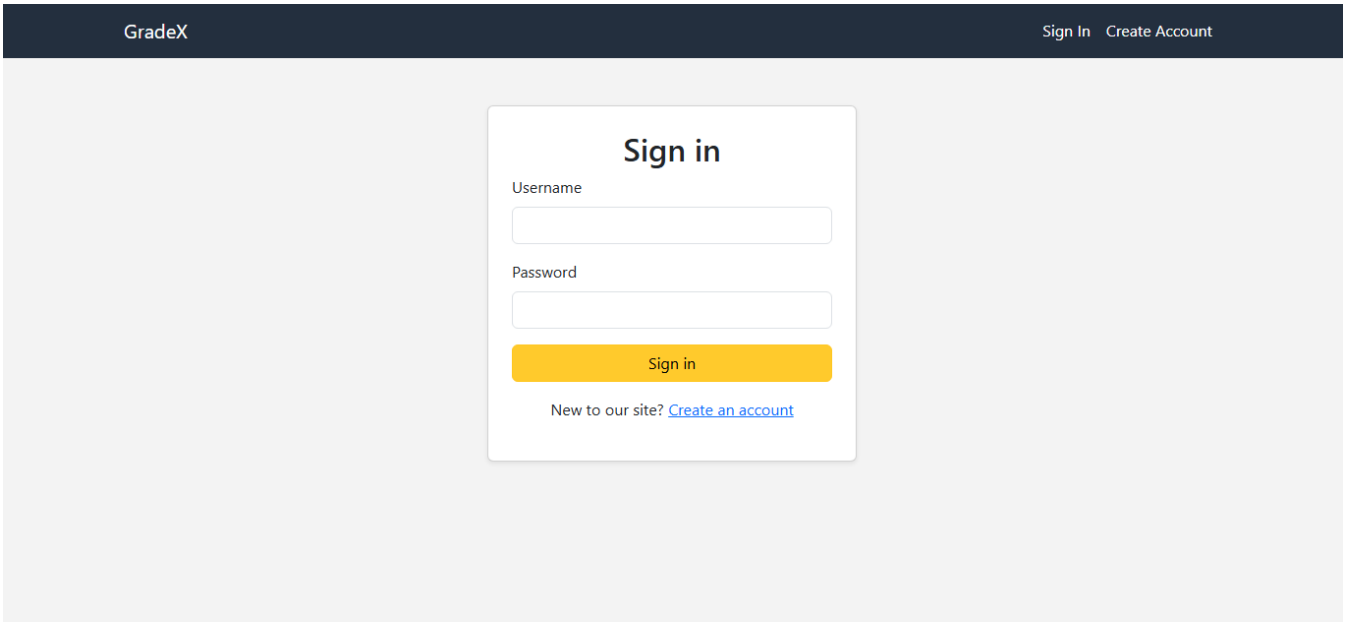

Fig: 8.3 Gradex Student Signin

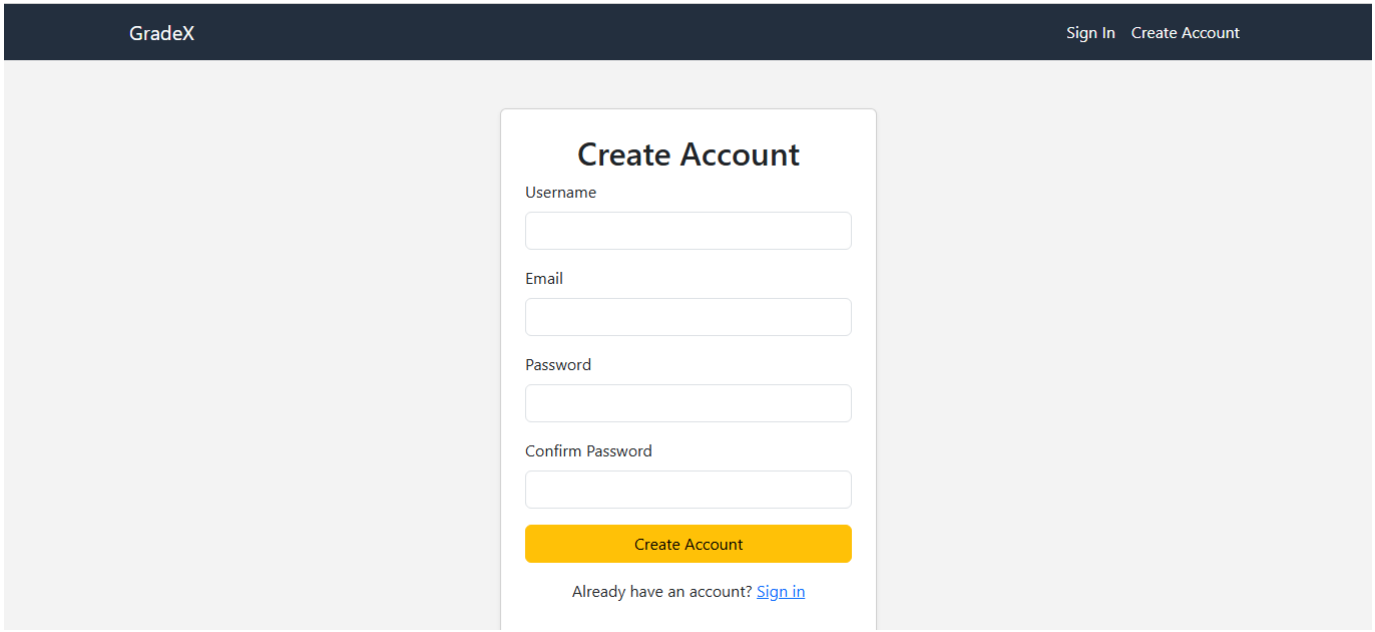

Fig: 8.4 Gradex Student Sign up

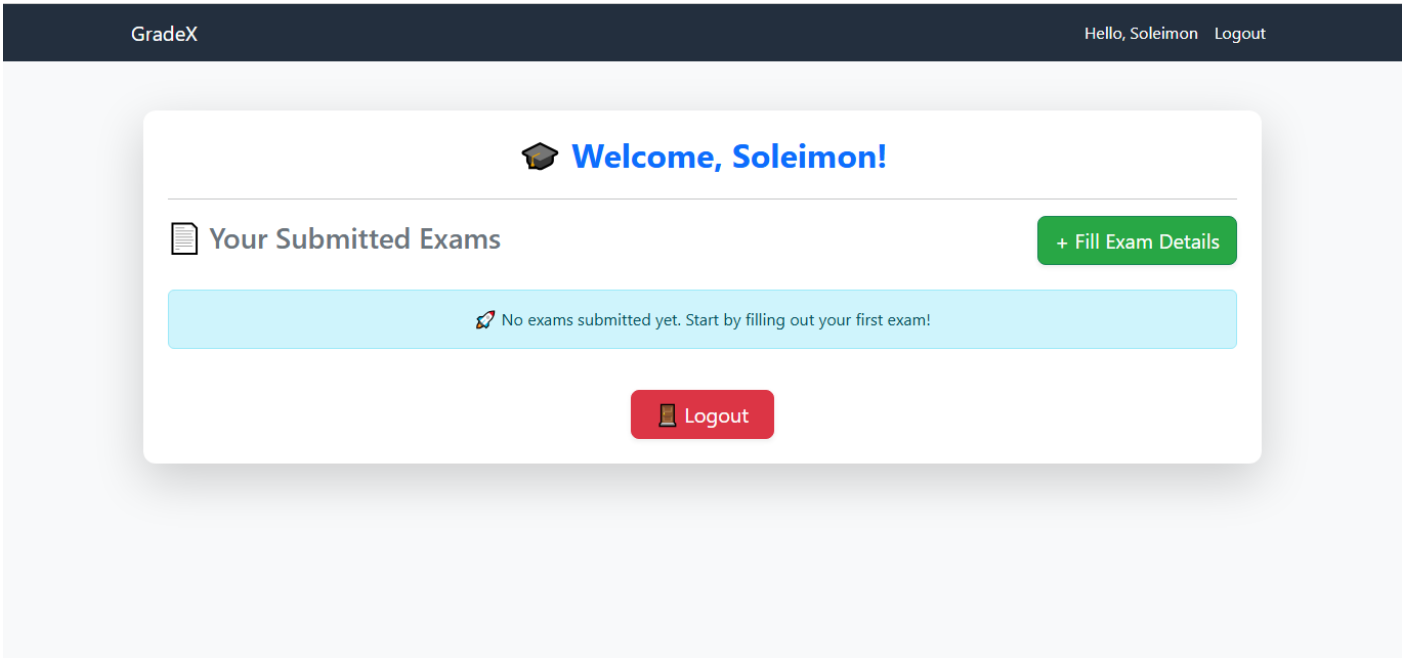

Fig: 8.5 Gradex Student Dashboard

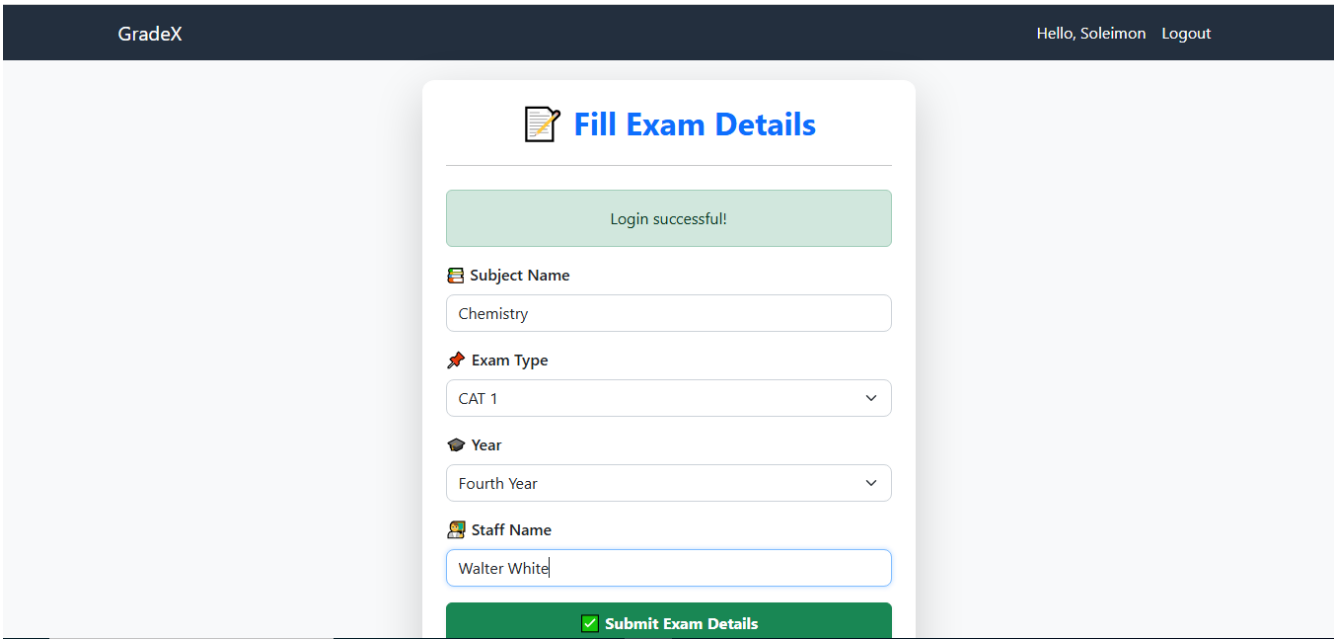

Fig: 8.6 Gradex Student Exam Fill

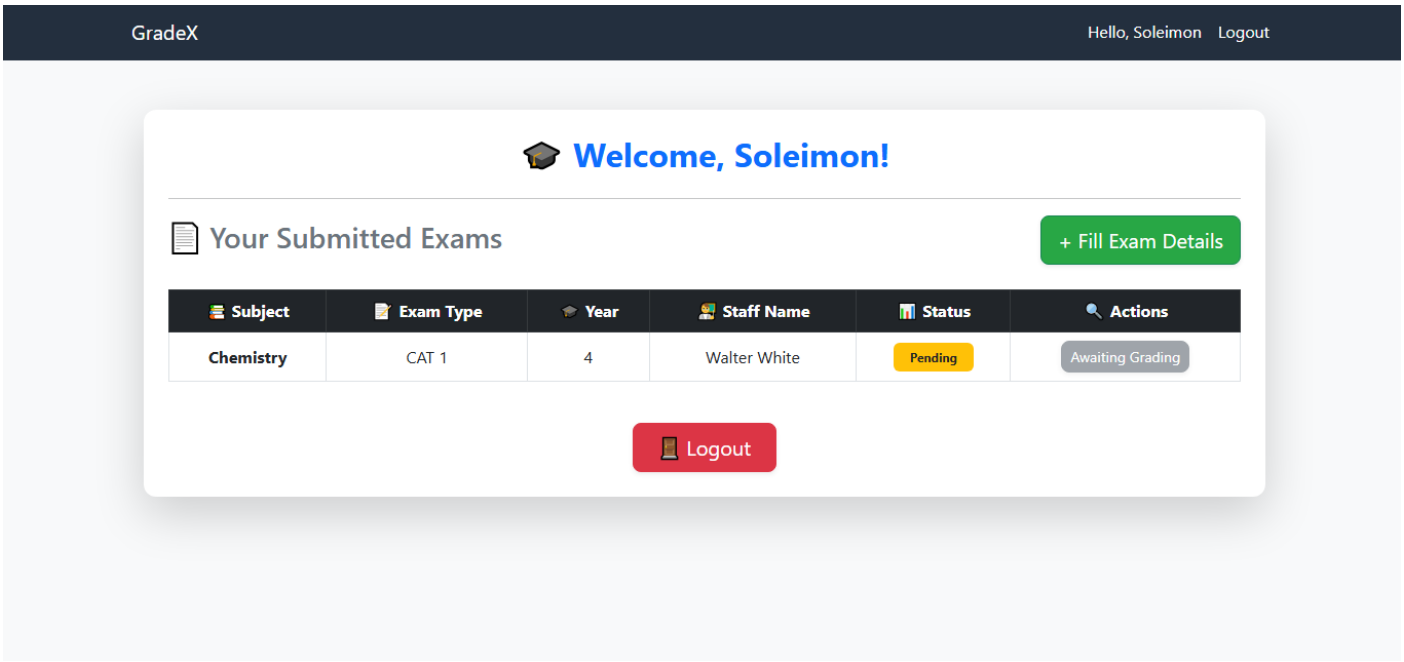

Fig: 8.7 Gradex Student Awaiting Exam Status

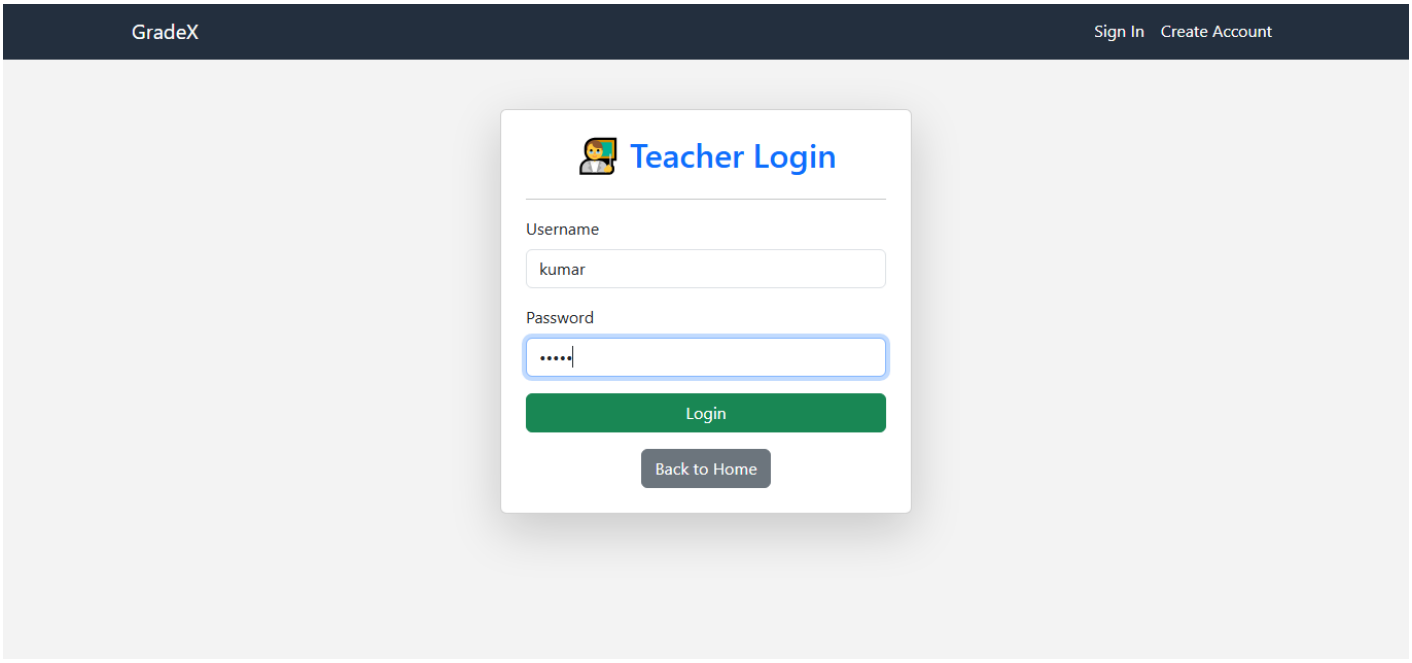

Fig: 8.8 Gradex Teacher Login

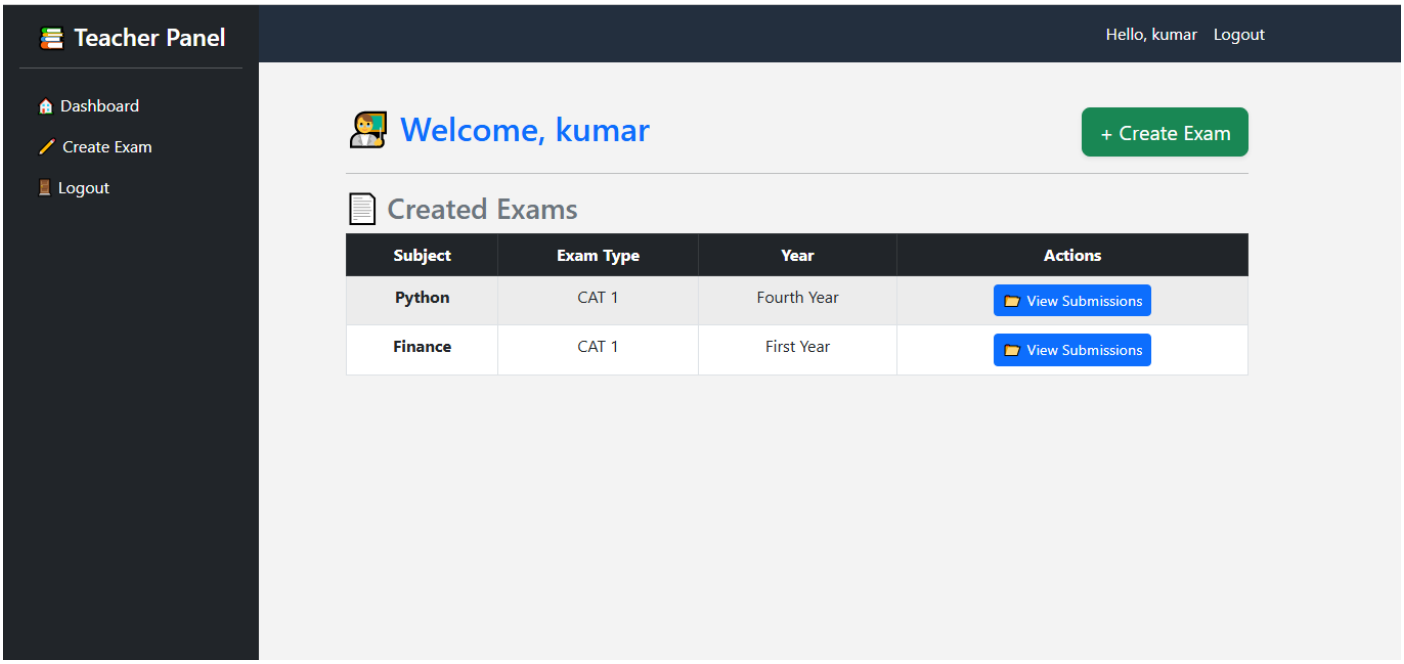

Fig: 8.8 Gradex Teacher Dashboard

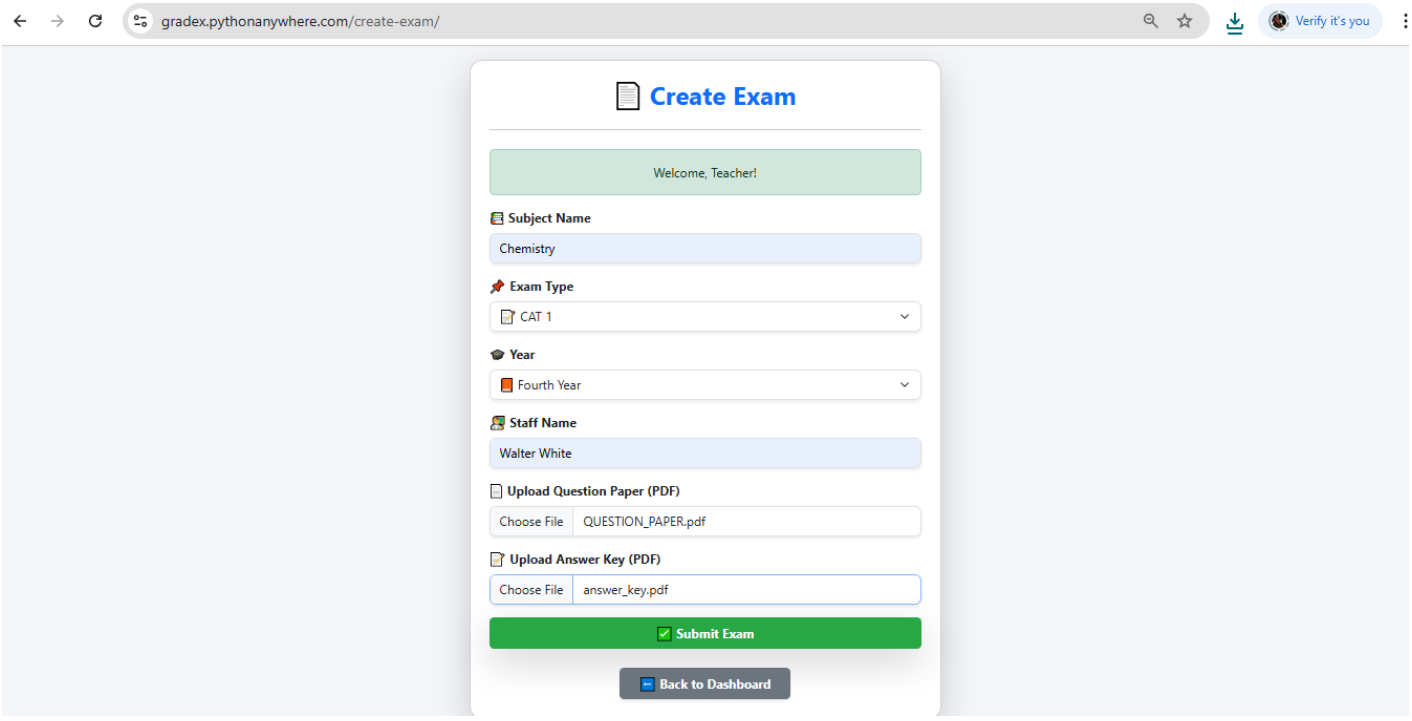

Fig: 8.10 Gradex Teacher Exam Creation

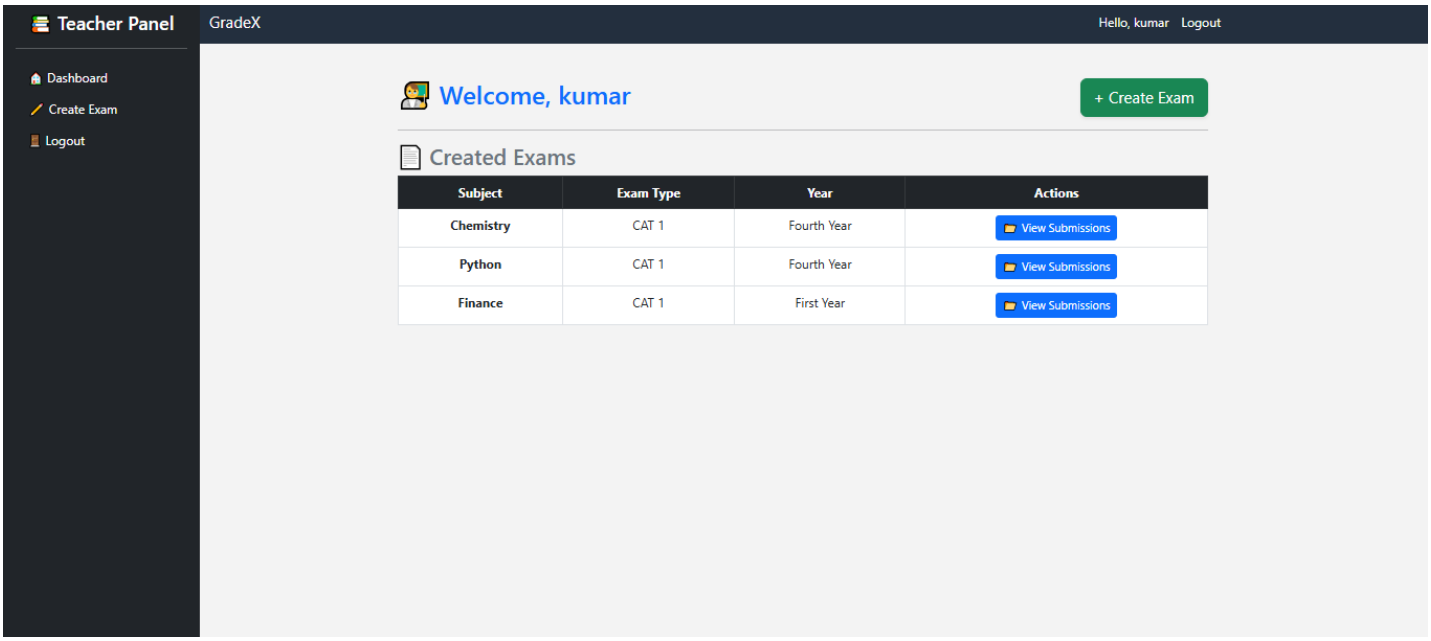

Fig: 8.11 Gradex Teacher Dashboard-Created Exams

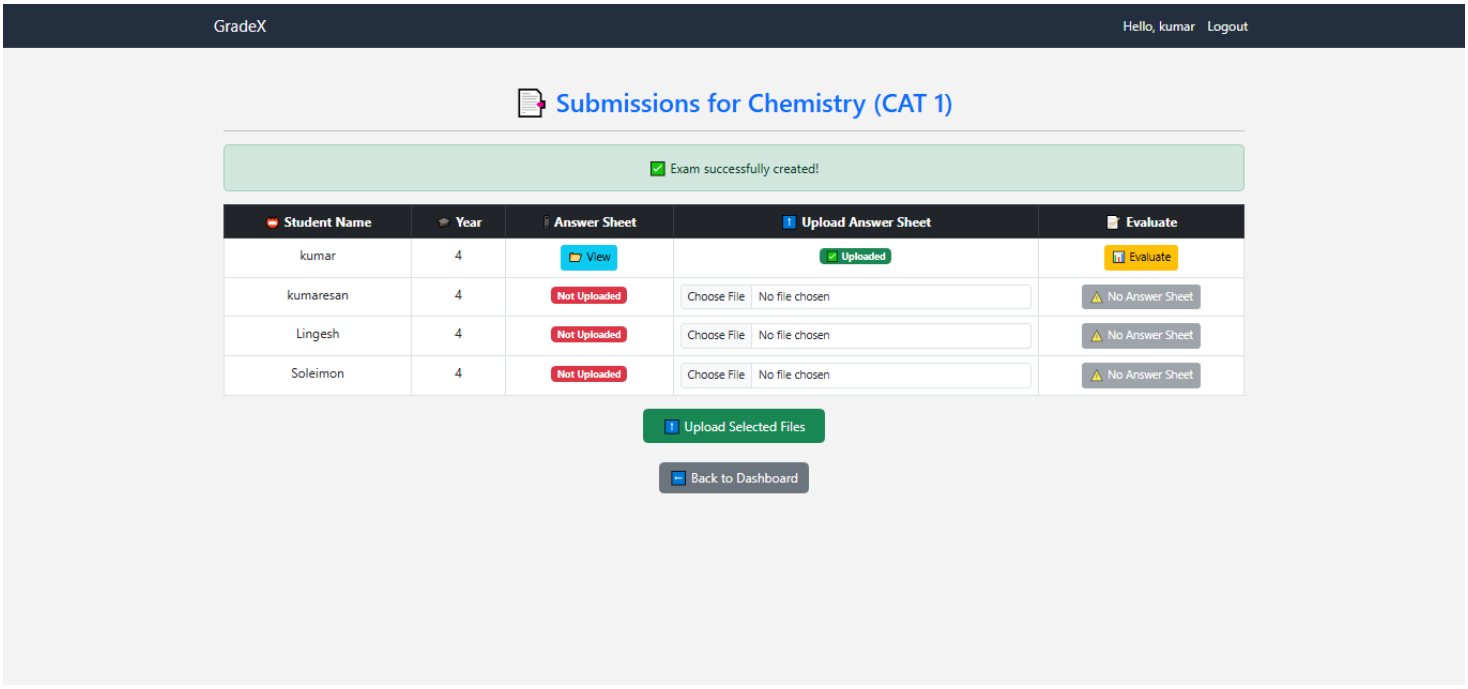

Fig: 8.12 Gradex Teacher Dashboard-Exam Submissin List

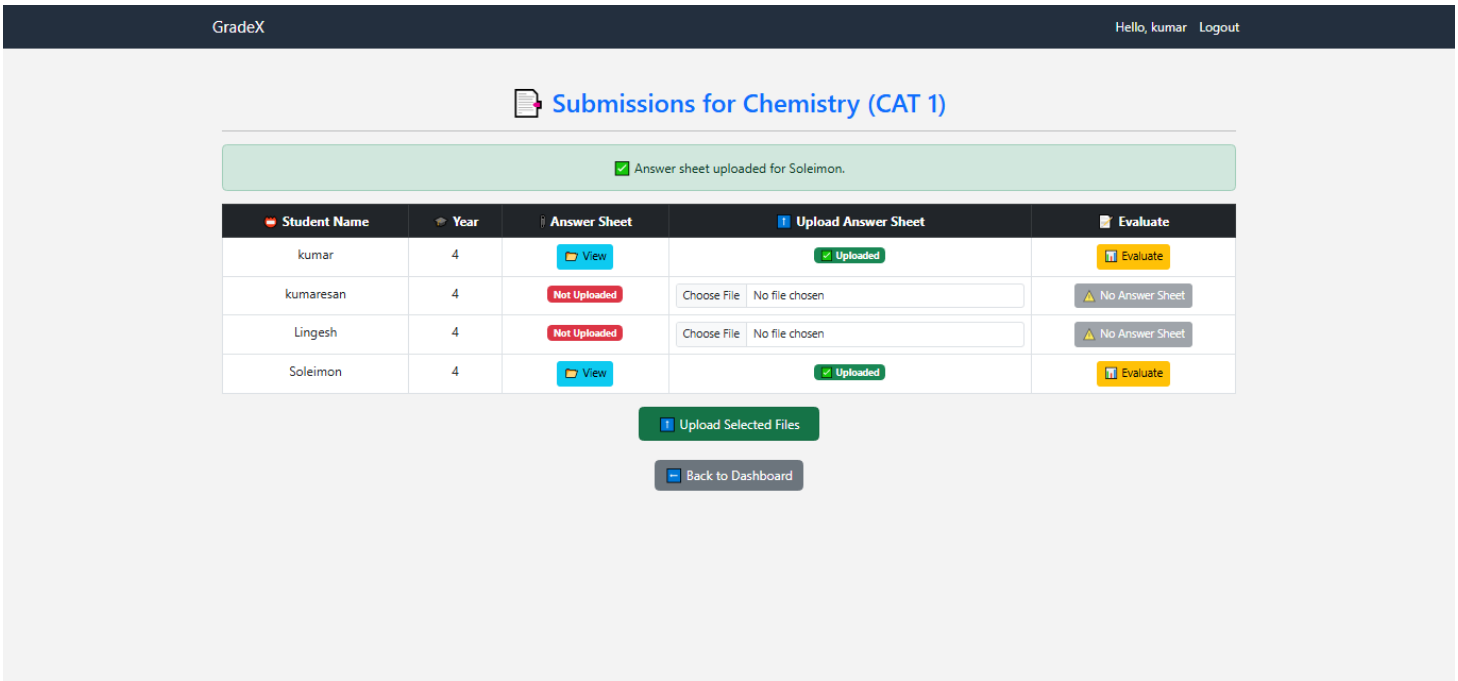

Fig: 8.13 Gradex Teacher Dashboard-Answer Sheet Upload

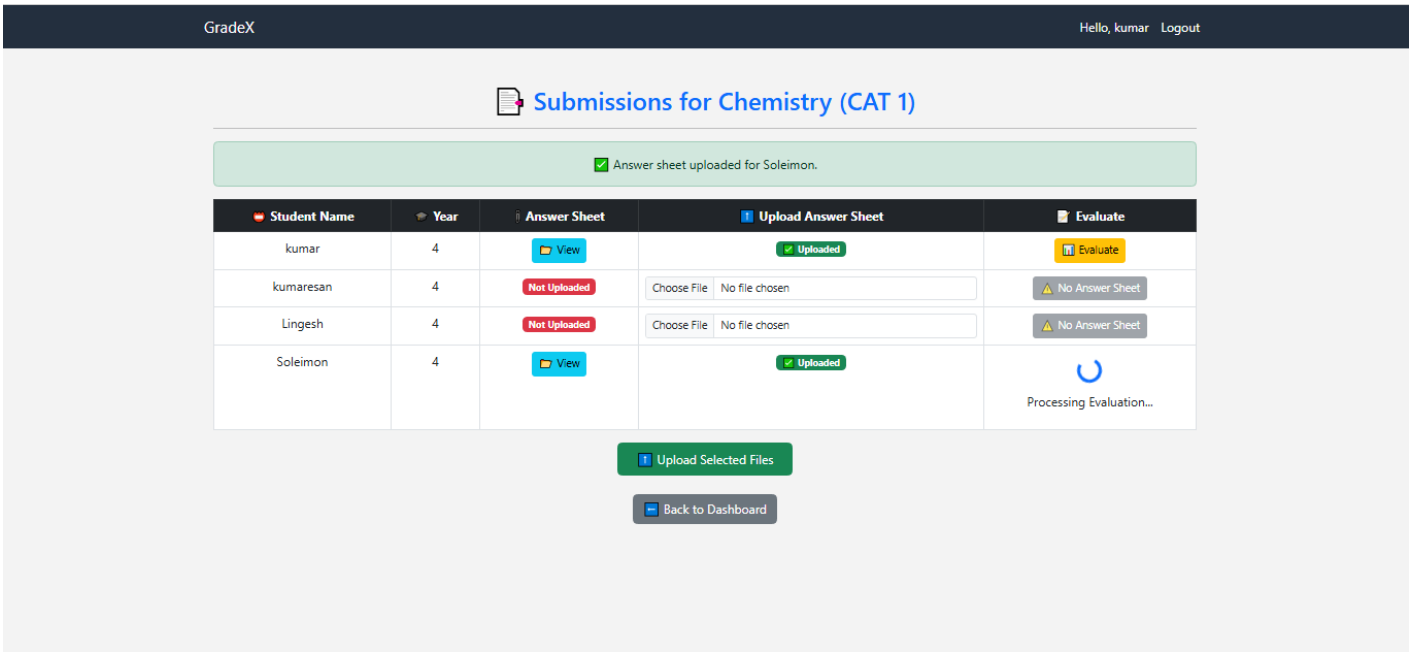

Fig: 8.14 Gradex Teacher Dashboard-Answer Sheet Evaluating

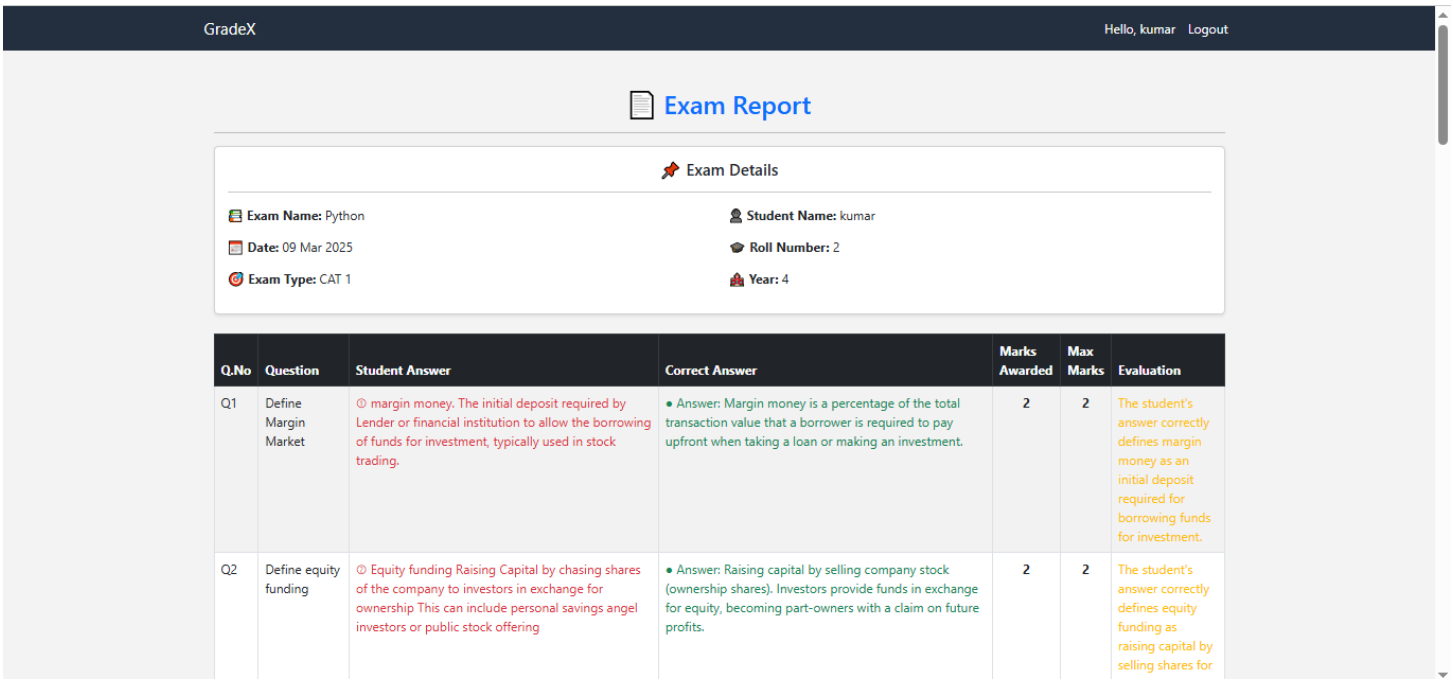

Fig: 8.15 Gradex Teacher Dashboard-Results-1

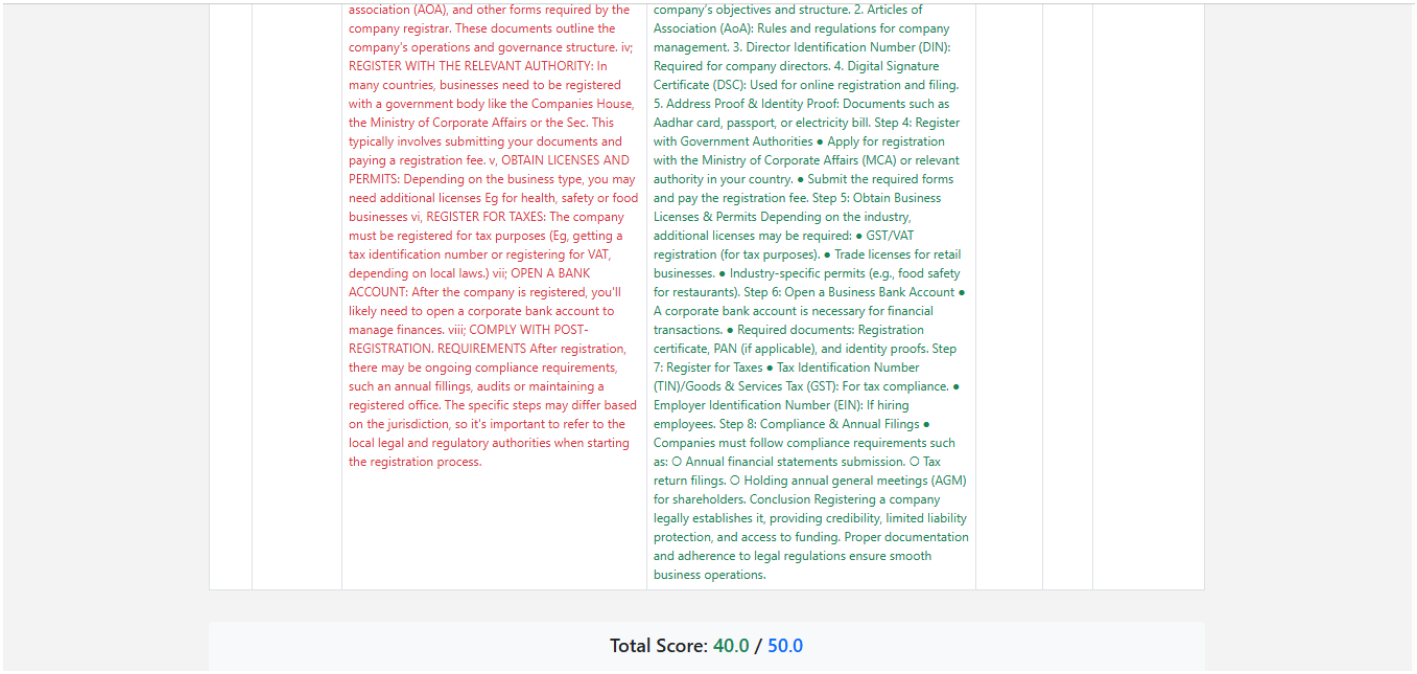

Fig: 8.16 Gradex Teacher Dashboard-Results-2

CHAPTER 9

CONCLUSION

The Gradex System represents a significant advancement in the automation of academic answer sheet evaluation. By integrating state-of-the-art technologies such as Tesseract OCR for text extraction, Ollama 3.1 for intelligent text refinement, and BERT for deep semantic understanding, the system provides a reliable, efficient, and scalable solution to a traditionally time-consuming process.

This system not only accelerates the evaluation process but also ensures fairness and consistency in grading by reducing human bias and manual errors. Teachers benefit from detailed performance reports, customizable exam management, and the ability to override AI evaluations when necessary, ensuring full transparency and control. Students gain access to timely feedback and structured performance tracking, promoting continuous learning and improvement.

The experimental results affirm the system's capability to deliver high accuracy in grading, user-friendly interfaces, and seamless dashboard experiences for both teachers and students. Overall, Gradex stands as a transformative tool in the field of education, helping institutions adopt smarter, AI-powered methods for academic assessment.

CHAPTER 10

FUTURE ENHANCEMENTS

While the Gradex system has successfully streamlined the process of evaluating handwritten student answer sheets using OCR and AI, the current workflow still requires manual scanning or photographing of the answer sheets before processing. A major area for improvement lies in automating this input step to make the system more seamless and scalable.

The primary future enhancement will focus on digitizing the answer sheet collection process. Instead of manually scanning or converting student-written sheets into PDFs or image formats, the system can be integrated with school digital infrastructure to automatically ingest answer sheets directly from:

- **Smart exam papers** written on digital pads or tablets with stylus input
- **Mobile app-based capture systems** where teachers simply click pictures, and the app auto-converts and uploads them to the backend
- **Scanner integration APIs** that trigger evaluation as soon as papers are scanned

This would eliminate delays, reduce human effort, and improve the overall efficiency of the system from input to evaluation.

In addition to this, several other enhancements are planned for the Gradex platform:

- **Multilingual Answer Sheet Support**
  Expanding OCR and NLP capabilities to evaluate responses written in regional languages.

- **Real-time Evaluation via Digital Input Devices**
  Supporting direct writing on tablets to allow instant feedback and auto-evaluation.
- **Learning Feedback Loop for Scoring Adjustment**
  Using machine learning models to learn from teacher corrections and adapt future scoring.
- **Advanced Student Performance Analytics**
  Generating detailed reports with topic-wise analytics, progress tracking, and feedback suggestions.
- **Plagiarism Detection**
  Adding modules to detect similar or copied content between students' answers.
- **LMS and Mobile Integration**
  Integrating with Learning Management Systems (LMS) and offering mobile apps for easy access by both students and teachers.

By focusing on automating the initial input step, Gradex will not only become more efficient but also truly scalable for large-scale educational deployments.

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