University of Dundee

**Mentorship Management and Monitoring system (MMMS)**

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1.Introduction

Mentorship plays a vital role in supporting students academically, emotionally, and professionally. This is especially true for students who simultaneously juggle responsibilities at **universities and in companies** — having two mentors: one academic and one industrial. However, traditional mentorship management methods such as emails, informal meetings, or scattered logbooks are **inefficient, non-scalable, and lack actionable insights**.

To solve this, the **Mentor-Mentee Monitoring System (MMMS)** is designed as a smart, data-driven platform that streamlines the mentorship experience in **dual-mentorship environments**. It enables seamless coordination between students, university mentors, and company mentors by offering structured **student progress tracking**, centralized **communication**, and early **conflict detection** between academic and industrial obligations.

The core goals of MMMS include:

* Facilitating effective **mentor-mentee management** for students with dual responsibilities
* Systematically monitoring **academic performance** (attendance, assignments, etc.) alongside work commitments
* Gathering **feedback** from both academic and industry mentors
* Detecting potential conflicts (e.g., class attendance impacted by work schedules)
* Using **predictive analytics** to flag early signs of disengagement or mentorship breakdown based on data such as:
  + Communication frequency
  + Sentiment in feedback
  + Missed milestones or low academic activity

MMMS is more than just a digital tracker. It’s a **smart coordination tool** that empowers institutions and companies to provide **cohesive, proactive, and personalized mentorship support**. By making mentorship data **centralized, interpretable, and actionable**, it allows mentors and administrators to replace guesswork with **data-driven insights** — enabling more responsive decisions and stronger mentorship outcomes for students balancing both academia and industry.

This project also demonstrates how a **realistic synthetic dataset** combined with **machine learning** can be used to simulate real-world scenarios and test scalable solutions for mentorship challenges in modern educational systems.

2.Overview of MMMS

The **Mentorship Management and Monitoring System (MMMS)** is a comprehensive **platform** designed to transform how mentorship programs are managed within educational institutions — especially for students balancing **academic study and professional work**. These students often have **two mentors**: one from their **university** and another from their **company**, which introduces unique challenges in coordination, engagement, and progress tracking.

MMMS provides a centralized, data-driven, and intelligent solution that supports **continuous mentorship**, **dual-role engagement**, and **early conflict detection**, ultimately enhancing the overall mentorship experience for all stakeholders.

### **Key Features**

#### **Mentor-Mentee**

* Supports **dual-mentor assignments** (academic + industry).

#### **Progress Tracking**

* Each mentor-mentee pair (academic and industry) gets a shared digital space to:
  + Log meetings
  + Track milestone completions
* Enables **transparent accountability** and helps mentors monitor progress over time.
* The system will track student progress using quantifiable indicators such as attendance, assignment completion, and mentor engagement logs. These will serve as inputs for future ML-based risk predictions.

#### **Feedback Mechanism**

* Collected feedback feeds into **analytics models** to highlight.

#### **Conflict & Disengagement Detection**

* Employs **machine learning models** (e.g., Naive Bayes, Random Forest) to detect:
  + Missed meetings or unlogged sessions
  + Negative feedback sentiment
  + Scheduling conflicts between academic and work commitments
  + Reduced academic activity or low mentor engagement

#### **Administrative Dashboard**

* Program coordinators and academic administrators can:
  + Monitor system usage and engagement metrics
  + Identify at-risk students or ineffective mentor matches
  + Intervene early based on real-time data insights

### **Key Stakeholders**

* **Students** – Seek personalized academic and professional guidance while balancing university and work life.
* **Faculty Mentors** – Provide academic support, research supervision, and study tracking.
* **Industry Mentors** – Offer real-world exposure, soft skill development, and career coaching.
* **Program Administrators** – Oversee mentorship program health, engagement trends, and outcomes.

3.Literature Review

### **Why Dual Mentorship Needs a Smarter Approach**

As more students balance **university education with industry roles**, they interact with two mentors—one academic and one professional. While this dual-mentorship model enhances real-world readiness, it also introduces challenges like **scheduling conflicts**, **misaligned expectations**, and **difficulty in tracking overall progress**.

Traditional mentorship practices—emails, spreadsheets, informal logs—are **fragmented, hard to scale, and reactive**. Without a centralized system, institutions often miss early signs of disengagement or conflict.

### **Gaps in Current Mentorship Solutions**

**Commercial platforms** (e.g., Chronus, Mentorloop) offer mentorship matching and communication tools but are geared toward corporate use. They lack:

* Support for **dual mentor structures**
* Academic data integration (e.g., attendance, assignment tracking)
* Predictive capabilities to identify issues early

**Manual systems** in academia are equally limited—inefficient, error-prone, and incapable of scaling. As noted by Crisp & Cruz (2009) and Eby et al. (2008), mentorship programs suffer when they lack structure, alignment, and continuous evaluation.

### **How AI/ML Can Transform Mentorship**

AI and machine learning enable **early detection and proactive support** in mentorship programs by:

* Analyzing **communication frequency** and **feedback sentiment**
* Predicting potential conflict using models like **Naive Bayes** and **Random Forest**
* Scoring engagement through task completion, surveys, and academic data

NLP tools can detect emotional tone in written feedback, while predictive models flag at-risk mentor-mentee pairs. Studies by Guo et al. (2019) and Sezer & Gurdal (2020) support these methods as effective in improving educational outcomes.

### **MMMS: A Data-Driven, Dual-Mentor Solution**

The **Mentorship Management and Monitoring System (MMMS)** fills a critical gap by offering:

* Unified tracking across both academic and industry mentorship
* Early conflict detection and intervention
* Personalized, data-informed support for students

By combining structured mentorship processes with AI analytics, MMMS supports a scalable, proactive, and student-centered approach to modern mentorship.