"Database Design for Comprehensive Student Profiling in Educational Institutions"

Submitted to **Sir Nino Nacua**

In partial requirements for **Fundamentals of Database Systems**

Requirements Gathering

Members:
Betonio, Aldwyn
Galendez, Ronald Franco
Palongpalong, Kyle
Panandigan, Rafi
Viscayno, Vonmar

Section I
Stakeholders

1. Students

- **Role**: As the primary subjects of the profiling system, students contribute their personal, academic, behavioral, and extracurricular information. They rely on the system to track their progress, understand feedback from faculty, and access available support.
- **Needs**: Students need access to:
  - Personal profiles to review and, in some cases, update personal details (such as contact information).
  - Academic performance data, such as grades, GPA, and attendance records, to monitor their academic standing.
  - Information on extracurricular involvement, achievements, and available support programs.
  - Counseling and advising records that provide insight into behavioral assessments or interventions.
- **Impact**: Students benefit from holistic insight into their educational journey, enabling them to make informed decisions about their academic and personal development.

2. Faculty Members (Professors, Advisors, Counselors)

- **Role**: Faculty members use the system to provide and track academic, behavioral, and feedback data for students. They contribute assessments, grades, and comments essential for student profiling, helping identify students needing additional support.
- **Needs**: Faculty require access to:
  - Academic records to input grades, update attendance, and maintain course records.
  - Behavioral assessments and feedback sections to add notes on student conduct, punctuality, or teamwork, as observed during classes or interactions.
  - Support program records to track students referred for tutoring, counseling, or advising.
- **Impact**: Faculty members can better personalize their approach to teaching and advising, allowing them to address individual student needs, foster positive behavior, and track academic progress effectively.

3. Administrative Staff (Registrars, Academic Coordinators)

- **Role**: Administrative staff manage core student records, ensuring accuracy in enrollment, academic standing, and graduation tracking. They use the system to verify and update students' status throughout their educational journey.
- **Needs**: Administrative staff require:
  - Access to enrollment and demographic data to confirm registration, record year levels, update enrollment status, and track program progress.
  - Capability to generate reports on academic standing, enrollment numbers, and overall student data for institutional reporting.
- **Impact**: Administrative staff ensure the integrity of student data and provide accurate reports that inform decision-making at the institutional level, supporting operational needs and strategic planning.

4. IT and System Administrators

- **Role**: IT and System Administrators manage the technical aspects of the profiling system, including security, data backups, and user permissions. They ensure the system remains secure, compliant, and accessible to users.
- **Needs**: IT and System Administrators need:
  - Full system access to manage encryption protocols, role-based access controls, and user authentication settings.
  - Tools to monitor performance metrics, database growth, and storage capacity, ensuring system scalability and reliability.
  - Detailed logging of user activities for audit trails, data integrity, and compliance with data protection regulations.
- **Impact**: By securing the system, IT and System Administrators maintain a safe environment for sensitive student and staff information, ensuring operational continuity and protecting against data breaches.

5. Institution's Compliance and Data Privacy Officers

- **Role**: These officers oversee the system's compliance with data privacy and protection regulations (e.g., Philippine Data Privacy Act, FERPA, GDPR). They ensure that student data is managed responsibly and legally.
- **Needs**: Compliance officers require access to:
  - Consent records showing that students and parents have approved the use of their data for profiling and analysis.
  - Data access logs detailing who accessed what data, when, and for what purpose.
  - Data retention and deletion policies to confirm compliance with data privacy mandates and student records management requirements.
- **Impact**: Compliance officers mitigate risks of regulatory violations and uphold the institution's commitment to ethical data use, enhancing trust and safeguarding the institution's reputation.

6. Counseling and Support Staff (Psychologists, Academic Advisors)

- **Role**: Support staff use the system to record interactions with students needing counseling, tutoring, or other support services. They track intervention efforts and monitor students' behavioral or academic improvement.
- **Needs**: Support staff need access to:
  - Student behavioral records, including assessments and incident logs, to identify and document areas of concern.
  - Academic standing and performance metrics for advising sessions, helping students set goals for improvement.
  - Records of counseling sessions and interventions to ensure continuity in support and document progress.
- **Impact**: Support staff can provide targeted assistance, helping students overcome challenges and succeed academically and socially within the institution.

7. Extracurricular Coordinators (Sports Coaches, Club Advisors)

- **Role**: These stakeholders document and oversee students' extracurricular activities, including club memberships, leadership roles, and achievements. They use this information to highlight non-academic strengths and contributions.
- **Needs**: Coordinators need:
  - Access to extracurricular records, such as lists of clubs, organizations, and events in which students participate.
  - Ability to log leadership roles and awards for inclusion in students' profiles.
- **Impact**: By tracking extracurricular involvement, coordinators help recognize students' holistic achievements and contributions, supporting applications for scholarships, internships, or further studies.
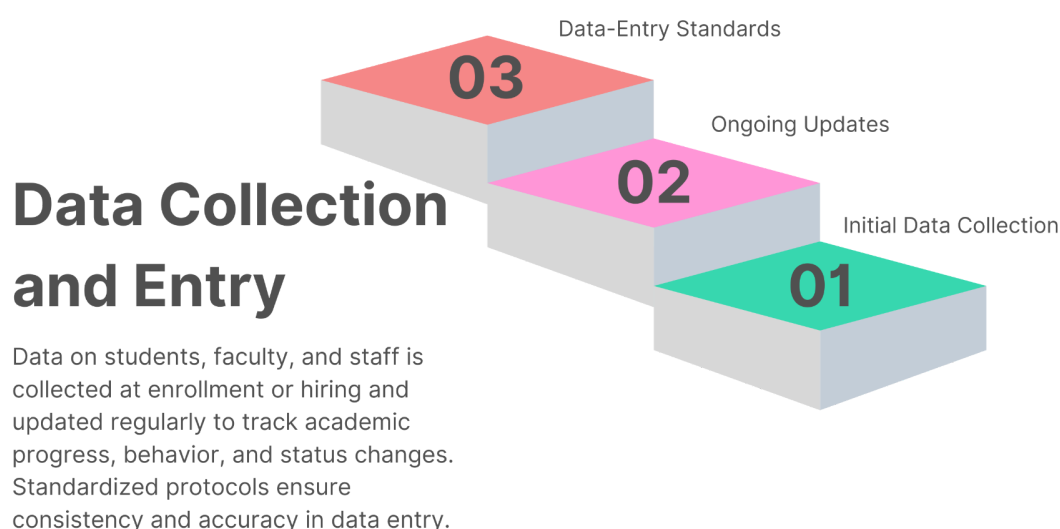
8. Academic Affairs and Institutional Research Teams

- **Role**: These teams analyze student data for institutional planning, evaluating program success, and identifying trends. They contribute to policy-making and program improvement based on data insights.
- **Needs**: Academic affairs and research teams require:
  - Access to reporting and analytics features to examine academic trends, student retention, and areas requiring intervention.
  - Ability to use data fields related to predictive modeling to forecast at-risk students, enabling proactive support measures.
- **Impact**: Through their analyses, these teams help the institution optimize programs, allocate resources effectively, and improve student retention and outcomes.
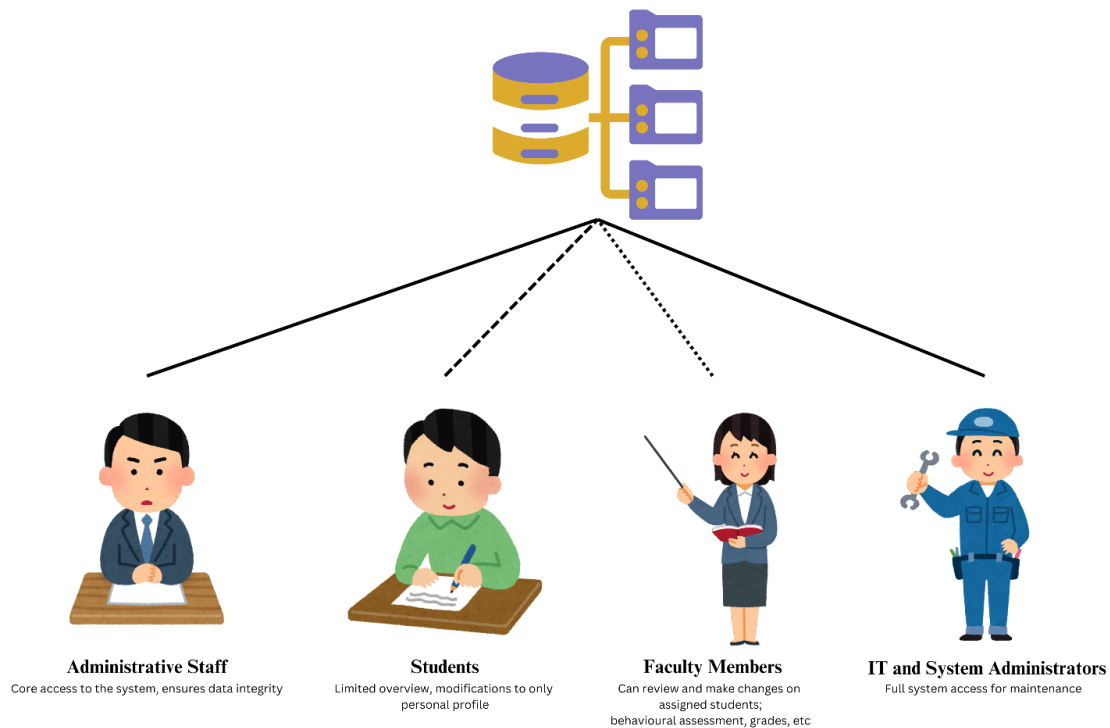
Process

The profiling system in educational institutions follows a structured process to collect, manage, analyze, and protect data. Each step of this process is essential to ensure data integrity, security, and compliance while providing actionable insights for stakeholders. The following describes each stage in detail:

Data-Entry Standards

03

Ongoing Updates

02

Initial Data Collection

01

Data Collection and Entry

Data on students, faculty, and staff is collected at enrollment or hiring and updated regularly to track academic progress, behavior, and status changes. Standardized protocols ensure consistency and accuracy in data entry.

1. Data Collection and Entry

● **Initial Data Collection**: The process begins with gathering data on students, faculty, and staff. For students, data collection happens at enrollment, capturing information such as personal details, academic background, and demographic data. Faculty and staff provide professional details at hiring, including qualifications, departmental affiliations, and roles.

● **Ongoing Updates**: Faculty members and support staff regularly update academic records, behavioral logs, and extracurricular involvement data as students progress. Administrative staff input enrollment status changes (e.g., active, withdrawn) and track students' year levels and program progression.

● **Data Entry Standards**: Standardized data entry protocols are followed to ensure consistency, accuracy, and completeness. For instance, academic grades are entered in a predefined format, and attendance records are logged by semester or term.

Role-based Access

| **Administrative Staff** | **Students** | **Faculty Members** | **IT and System Administrators** |
| Core access to the system, ensures data integrity | Limited overview, modifications to only personal profile | Can review and make changes on assigned students; behavioural assessment, grades, etc | Full system access for maintenance |

2. Data Security and Access Control

- **Role-Based Access**: Access to the system is managed through role-based permissions, meaning each user's access level aligns with their responsibilities. For example, faculty members can input grades but may have limited access to sensitive personal information.
- **Authentication and Authorization**: Users log into the system through secure authentication methods such as password protection, two-factor authentication, or biometric verification. Access control lists ensure that each user only accesses data relevant to their role.
- **Data Encryption**: All data, especially sensitive personal and academic records, is encrypted both at rest and in transit. This encryption protects against unauthorized data breaches.s.
- **Backup and Recovery**: Regular data backups are performed to prevent data loss. The system includes a disaster recovery plan to restore data from recent backups if any data corruption or hardware failure occurs.

3. Data Analysis and Reporting

- **Real-Time Data Access**: The system provides real-time access to data, allowing stakeholders such as faculty, counselors, and administrators to quickly retrieve relevant student information for assessments, counseling, or academic advising.
- **Trend Analysis and Predictive Analytics**: The database supports advanced analytics, enabling academic affairs and research teams to analyze trends in academic performance, behavioral incidents, and extracurricular engagement. Predictive analytics models may be employed to identify at-risk students, such as those with declining grades or attendance, and recommend early interventions.
- **Custom Reporting**: Customized reports can be generated for various stakeholders. For instance, faculty might access reports on student performance in specific subjects, while counselors may view behavioral reports to prepare for advising sessions. Administrative staff also generate institutional reports on enrollment trends, retention rates, and graduation outcomes.
- **Visual Dashboards**: To improve usability, the system includes visual dashboards displaying key metrics like average GPA, attendance rates, and program-specific trends. These dashboards allow quick insights and support data-driven decision-making.

4. Data Compliance and Audit Trail

- **Data Privacy Compliance**: Compliance officers regularly review the system for adherence to privacy laws (e.g., Philippine Data Privacy Act, FERPA, GDPR). This includes verifying that all data use aligns with student consent records and that retention policies are followed.
- **Audit Logs**: A detailed audit trail records every data access, modification, and deletion event within the system, including user ID, time, and action taken. This audit trail helps in tracking data handling, detecting unauthorized access, and providing a transparent record for audits.
- **Data Retention and Deletion**: The system enforces retention policies, ensuring data is stored only as long as necessary. For instance, sensitive student data may be deleted after graduation or after a defined period, per institutional policy and regulatory requirements.

5. Support and Intervention

- **Behavioral and Academic Monitoring**: Faculty and support staff continuously monitor students' academic and behavioral performance. They document any concerns, such as declining grades or frequent absenteeism, which may indicate a need for support.
- **Counseling and Intervention Tracking**: Support staff, including counselors and advisors, log details of each counseling session or intervention. This record helps ensure continuity, enabling different staff members to see past interactions and tailor their approach to meet the student's needs.
- **Automated Alerts for At-Risk Students**: Based on predefined criteria (e.g., GPA below a certain threshold or repeated disciplinary incidents), the system can automatically flag at-risk students. Faculty and support staff receive alerts, allowing them to proactively reach out to students for support.
- **Progress Tracking**: The system maintains detailed records of all interventions and tracks student progress over time. This helps counselors and faculty assess the effectiveness of support measures and make adjustments as needed.
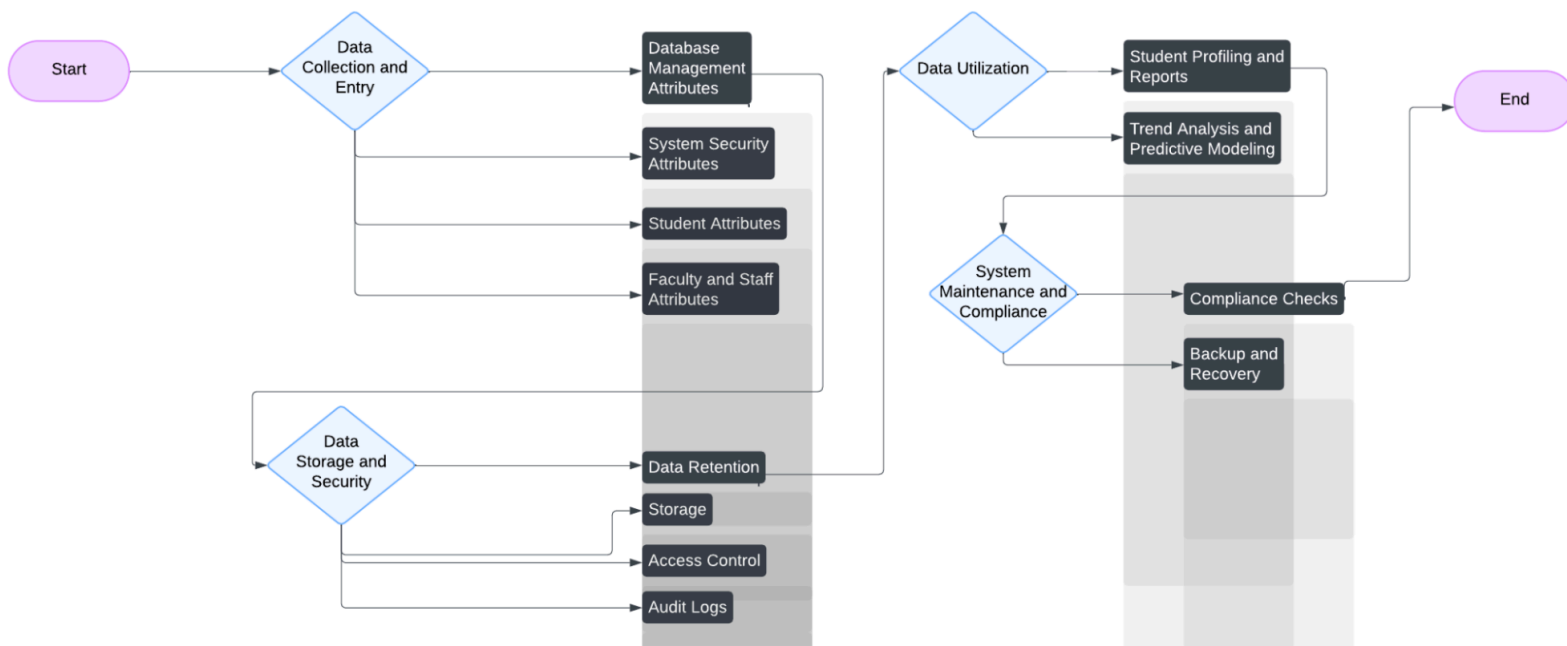
Flowchart Walkthrough

1. **Start**:
   - The process begins with the initiation of data management activities aimed at collecting, storing, and utilizing data for student profiling.
2. **Data Collection and Entry**:
   - This is the foundational step where all relevant data about students, faculty, and staff are gathered. The data collected includes academic records, personal information, interactions, and engagement metrics.
   - Data is entered into the system in a structured format, ensuring consistency and ease of access for later stages. This initial phase sets the groundwork for creating a centralized and comprehensive profile for each individual in the institution.
3. **Database Management and Security Attributes**:
   - Upon data entry, the information branches out into four key attributes:
     - **Database Management Attributes**: These are structural elements defining how data is organized and stored, enabling efficient access and management.
     - **System Security Attributes**: This segment focuses on protecting data integrity and confidentiality through security measures that comply with privacy regulations, such as access restrictions and encryption.
     - **Student Attributes**: Specific data points related to students are categorized, supporting in-depth analysis for student performance, behavioral trends, and personal development.

- ■ **Faculty and Staff Attributes**: Similar to student data, this category stores information on faculty and staff, supporting insights into staff interactions with students and institutional resource allocation.

4. **Data Storage and Security**:
   - ○ After categorizing data, it is securely stored with robust controls in place:
     - ■ **Data Retention**: Policies are established to determine how long data is retained, balancing regulatory requirements and institutional needs.
     - ■ **Storage**: Data is stored in a secure environment with regular backups, ensuring data availability.
     - ■ **Access Control**: This measure limits access to sensitive data, granting permissions only to authorized personnel to maintain data privacy.
     - ■ **Audit Logs**: These logs track all access and modifications to the data, providing an audit trail for compliance and security monitoring.

5. **Data Utilization**:
   - ○ Once data is securely stored, it is ready for utilization, which enables the generation of meaningful insights:
     - ■ **Student Profiling and Reports**: Detailed student profiles and reports are generated, helping faculty and administration to understand individual student needs and trends.
     - ■ **Trend Analysis and Predictive Modeling**: Using data analytics, the institution can predict trends, identify potential challenges, and make proactive decisions to support students. This modeling can improve retention rates, academic support, and resource allocation.

6. **System Maintenance and Compliance**:
   - ○ As data utilization progresses, ongoing maintenance and compliance checks are essential to ensure data integrity and adherence to regulatory standards:
     - ■ **Compliance Checks**: Regular checks ensure that the system complies with relevant data protection laws and institutional policies, addressing potential risks before they escalate.
     - ■ **Backup and Recovery**: Periodic backups are conducted to safeguard data, with recovery mechanisms in place to protect against data loss or system failures.

7. **End**:
   - ○ The process concludes, resulting in a well-maintained, compliant, and secure system that continuously supports student profiling and institutional decision-making.

<div align="center">

Section III

All Company Data

1. Student Attributes

</div>

Personal Information

- **Student ID**: Unique identifier for each student. Eg. a 9-digit number
- **First Name, Last Name**: Full legal name of the student.
- **Date of Birth**: For age verification and demographics.
- **Gender**: Optional for demographics and analysis.
- **Nationality**: Country of origin or citizenship.
- **Home Address**: Physical address for contact and demographic analysis.
- **Contact Information**: Phone number(s), email address.
- **Emergency Contact**: Name, relation, and contact details of emergency contact.

Academic Information

- **Enrollment Status**: Current enrollment status (active, graduated, withdrawn, etc.).
- **Year Level**: Year or grade level the student is currently in.
- **Program of Study/Major**: Specific degree program or major.
- **Academic Records**:
  - **Grades/ GPA**: Subject grades, GPA per term, cumulative GPA.
  - **Courses Taken**: List of courses with corresponding credits.
  - **Attendance Records**: Attendance percentage, absences, tardiness.
  - **Academic Standing**: Standing based on institution's criteria (e.g., good standing, probation).

Behavioral Information

- **Behavioral Assessments**: Evaluations from faculty or counselors (e.g., punctuality, cooperation).
- **Behavioral Incidents**: Records of any disciplinary incidents, if applicable.
- **Feedback/ Comments**: Qualitative comments from faculty, counselors, or support staff.

Extracurricular Activities

- **Clubs and Organizations**: List of clubs or student organizations the student is a part of.
- **Leadership Positions**: Roles held within organizations (e.g., president, secretary).
- **Sports and Competitions**: Participation in sports, tournaments, and other events.
- **Achievements and Awards**: Any awards or recognitions received, both academic and extracurricular.

Support and Intervention Data

- **Counseling/Advising Sessions**: Records of any academic or personal counseling sessions.
- **Intervention Records**: Information on any interventions provided (e.g., tutoring, mentoring).
- **Support Programs**: Participation in academic support or mental health programs.
- **Interaction Logs**: Logs detailing faculty and staff interactions with the student.

2. Faculty and Staff Attributes

Personal and Professional Information

- **Employee ID**: Unique identifier for each faculty or staff member.
- **Name**: First name, last name, and any middle initials.
- **Position/Title**: Current role (e.g., professor, counselor, academic advisor).
- **Department/Program**: Departmental affiliation (e.g., Mathematics, Counseling).
- **Qualifications**: Degrees, certifications, and professional qualifications.
- **Employment Status**: Full-time, part-time, adjunct, etc.
- **Years of Service**: Length of employment at the institution.

Interaction and Engagement Data

- **Student Interaction Records**: Logs of all interactions with students, including type (e.g., academic advising, counseling) and date.
- **Assigned Students/Courses**: List of students or courses assigned to this faculty/staff member.
- **Feedback Provided**: Comments, assessments, or other feedback given to students.

3. System Security Attributes

Data Security and Privacy Protocols

- **User ID**: Unique identifier for each database user (e.g., admin, faculty, student access).
- **Access Level**: Role-based access control level (e.g., admin, read-only, restricted access).
- **Authentication**: Methods of authentication (e.g., password, two-factor authentication).
- **Encryption Standards**: Type of encryption used (e.g., AES-256) for data at rest and in transit.

- **Audit Trail Logs**: Logs of all database activity, including date, time, user ID, and action taken.
- **Backup and Recovery Data**: Information on backup frequency, location, and disaster recovery procedures.

Compliance Measures

- **Consent Records**: Records of student consent for data use, in compliance with privacy laws.
- **Data Access Logs**: Detailed logs of who accessed what data, when, and for what purpose.
- **Data Retention Policy**: Policies on how long specific types of data are retained and criteria for data deletion.
- **Privacy Compliance Documentation**: Documentation that demonstrates compliance with regulations (e.g., Philippine Data Privacy Act, FERPA, GDPR).

4. Database Management and Performance Attributes

Scalability and Future-Proofing

- **Database Size Monitoring**: Tracking data volume growth over time.
- **Data Partitioning and Indexing**: Schema structures that optimize performance as data scales.
- **Performance Metrics**: Metrics for query speed, data retrieval times, and system load.

Reporting and Analytics

- **Custom Reporting Fields**: Dynamic fields for creating custom reports based on user needs.
- **Trend Analysis Data**: Data used to track trends over time (e.g., grade improvements, attendance).
- **Predictive Modeling Inputs**: Fields used in predictive analytics (e.g., factors predicting at-risk students).

Section IV

Conclusion

A comprehensive student profiling system is essential for educational institutions to make data-driven, student-centered decisions. By securely centralizing academic, behavioral, and extracurricular data, the system enables early intervention and personalized support, enhancing each student's educational experience.

This system effectively addresses the needs of students, faculty, and staff, while ensuring data privacy and compliance.