Understanding the AI Development Workflow

Part 1: Short Answer Questions

1. Problem Definition

AI Problem: Predicting Mental Health Crises in University Students

Objectives:

- Predict high-risk students based on academic, behavioral, and health data

- Provide timely alerts to counselors

- Reduce crisis incidents

Stakeholders: University Counseling Services, Students

KPI: Precision of crisis predictions

2. Data Collection & Preprocessing

Data Sources: Academic records, mental health survey responses

Bias: Students who don't visit counselors may be underrepresented

Preprocessing: Imputation, normalization, one-hot encoding

3. Model Development

Model: Random Forest (robust, interpretable)

Data Split: 70/15/15

Hyperparameters: n_estimators, max_depth

4. Evaluation & Deployment

Metrics: Precision, Recall

Concept Drift: Behavioral shifts over time; monitor with retraining

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Challenge: Scalability for large student datasets

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Part 2: Case Study - Patient Readmission Prediction

Problem Scope:

Predict patient readmission within 30 days.

Objectives: Identify high-risk patients, assist care planning

Stakeholders: Hospital administrators, clinicians

Data Strategy:

Sources: EHR, demographics

Ethical Concerns: Privacy, Bias

Preprocessing: De-identification, imputation, feature engineering, normalization

Model Development:

Model: Logistic Regression (interpretable, binary classification)

Confusion Matrix: TP=70, FP=20, FN=30, TN=80

Precision: 0.78, Recall: 0.70

Deployment:

Steps: API, dashboard, staff training

Compliance: Encryption, logging, transparency

Optimization:

Use cross-validation and L2 regularization

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Part 3: Critical Thinking

Ethics & Bias:

Biased models may underpredict certain groups, harming outcomes.

Mitigation: Bias audits, fairness-aware algorithms

Trade-offs:

Interpretability vs Accuracy: Logistic Regression preferred in healthcare

Limited Resources: Use lightweight models, avoid deep learning

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Part 4: Reflection & Diagram

Reflection:

Most challenging: Data preprocessing from multiple systems

Improvement: Real-time processing, dashboard monitoring

Workflow Diagram:

1. Problem Definition
2. Data Collection
3. Data Preprocessing
4. Model Development
5. Evaluation
6. Deployment
7. Monitoring & Update