📌 PART 1 — DATABASE TABLES (Final Schema)

You should design **three core tables** plus one optional for labeling.

📁 1) raw_sensor_data

Purpose: Store the raw sensor packets exactly as received from each node — this is your *source of truth* and is *never overwritten*.

Column	Type	Description
id	INT (PK, auto)	Unique row ID
node_id	VARCHAR	Identifier for sensor node
timestamp	DATETIME	Sensor timestamp
latitude	FLOAT	GPS latitude
longitude	FLOAT	GPS longitude
altitude	FLOAT	GPS altitude (if available)
accel_x	FLOAT	Raw acceleration X
accel_y	FLOAT	Raw acceleration Y
accel_z	FLOAT	Raw acceleration Z
gyro_x	FLOAT	Raw gyro X
gyro_y	FLOAT	Raw gyro Y
gyro_z	FLOAT	Raw gyro Z
mag_x	FLOAT	Raw magnetometer X
mag_y	FLOAT	Raw magnetometer Y
mag_z	FLOAT	Raw magnetometer Z

heading	FLOAT	Heading from sensor (optional)
luminosity	FLOAT	Light sensor (optional)
temperature	FLOAT	Environment temp
humidity	FLOAT	Environment humidity
pressure	FLOAT	Barometric pressure

Notes:
✔ Keep this table for debugging, retraining, and forensics
✔ Do NOT delete raw data

📁 2) feature_vectors

Purpose: Store the *derived and engineered* numeric features used for ML (anomaly detection).

Column	Type	Description
id	INT (PK)	Unique
node_id	VARCHAR	Sensor node
timestamp	DATETIME	Time of derived calculation
latitude	FLOAT	GPS at that time
longitude	FLOAT	GPS at that time
accel_mag	FLOAT	Vibration magnitude
delta_accel_mag	FLOAT	Instant change accel
accel_roll_mean	FLOAT	Rolling mean of accel_mag
accel_roll_std	FLOAT	Rolling std
accel_roll_rms	FLOAT	Rolling RMS
accel_roll_range	FLOAT	Rolling range
mag_norm	FLOAT	Magnetic magnitude

delta_mag_norm	FLOAT	Change in magnetic
mag_roll_std	FLOAT	Rolling mag std
mag_roll_range	FLOAT	Rolling mag range
gyro_mag	FLOAT	Gyro magnitude
delta_gyro_mag	FLOAT	Change in gyro
gyro_roll_std	FLOAT	Rolling gyro std
accel_fft_peak	FLOAT	FFT peak (optional)
temp	FLOAT	Environment temp (optional)
humidity	FLOAT	Humidity (optional)
pressure	FLOAT	Pressure (optional)

Notes:
✔ Don’t store tens of features — use only meaningful ones
✔ Keep latitude/longitude for mapping alerts

📁 3) anomaly_alerts

Purpose: Record every *detected anomaly* with location + score.

Column	Type	Description
alert_id	INT (PK)	Unique alert
node_id	VARCHAR	Sensor node
timestamp	DATETIME	When anomaly occurred
latitude	FLOAT	Where it happened
longitude	FLOAT	Where it happened
anomaly_score	FLOAT	Score from model
severity	VARCHAR	E.g., low/medium/high

alert_type	VARCHAR	E.g., “vibration_anomaly”
status	VARCHAR	e.g., open/closed/ack

📁 Optional: 4) annotations

Purpose: To store *labelled events* (manual/ground truth)

Column	Type	Description
id	INT	Unique
node_id	VARCHAR	Sensor node
timestamp	DATETIME	When event annotated
label	VARCHAR	“normal” / “tampering”
description	TEXT	Human explanation

Useful when you want to *evaluate accuracy* later.