3.2 **Approaches of Earthquake Prediction in Existing Systems**

**Seismological Monitoring** – Uses seismometers and accelerometers to detect ground vibrations and analyze seismic waves for early warning systems.

1. **Statistical and Historical Data Analysis** – Examines past earthquake records and recurrence intervals to estimate the probability of future earthquakes.
2. **Tectonic Plate Movement Analysis** – Monitors plate interactions, fault lines, and stress accumulation using GPS and satellite data to predict potential rupture points.
3. **Foreshock and Seismic Pattern Recognition** – Identifies foreshocks and seismic swarms as potential precursors to major earthquakes.
4. **Geophysical Anomaly Detection** – Observes changes in radon gas emissions, groundwater levels, electromagnetic signals, and ionospheric disturbances.
5. **Geodetic Monitoring** – Uses GPS-based ground deformation measurements to track shifts in the Earth's crust before a seismic event.
6. **Probabilistic Seismic Hazard Assessment (PSHA)** – Applies mathematical models to calculate the likelihood of earthquakes in specific regions based on past data.
7. **Machine Learning and AI-Based Prediction** – Employs deep learning, neural networks, and time series analysis to detect hidden seismic patterns and improve forecasting accuracy.