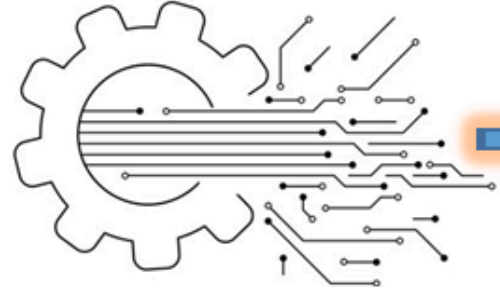
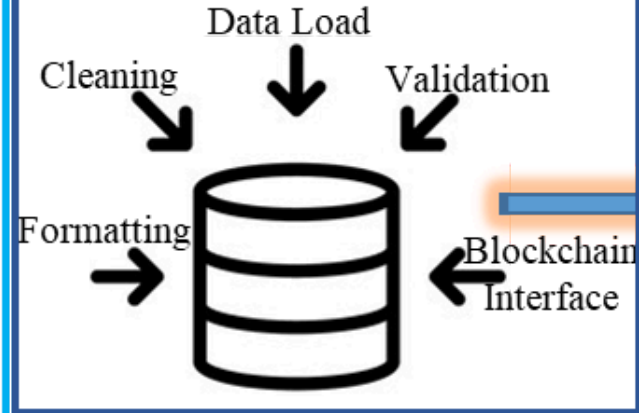


## (1) Input Processing

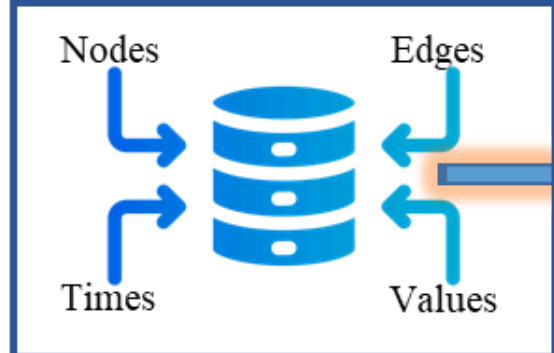
$$D = \{(u_i, v_i, t_i, f_i) \mid i = 1, 2, \dots, n\}$$



### Raw Data Processing



### Input Data

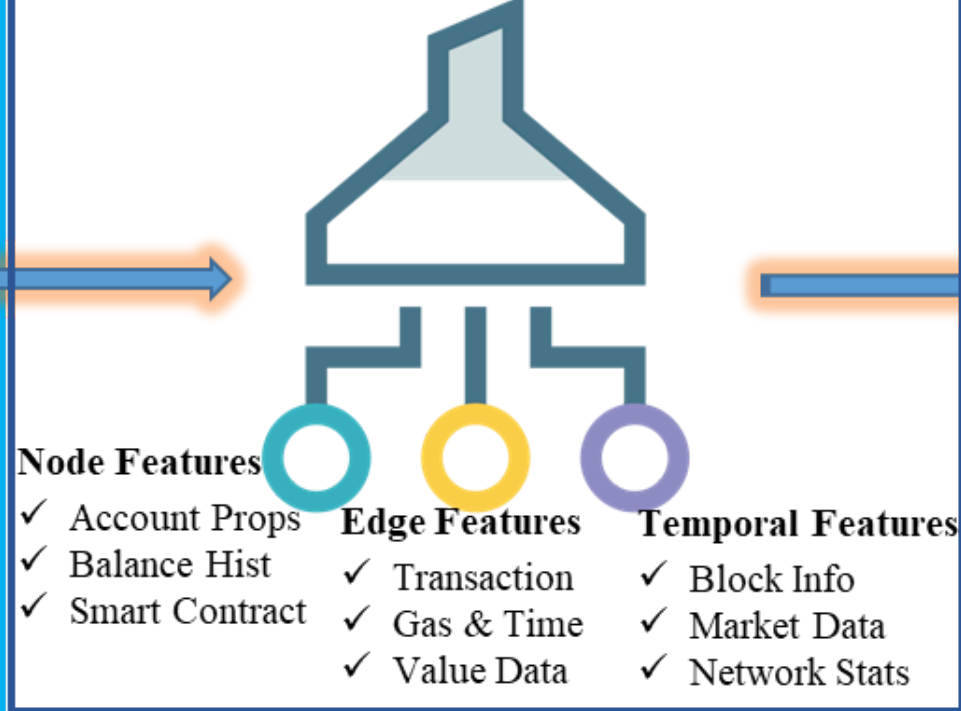


## (2) Feature Engineering

$$\mathbf{X}_n = f_n(D), \quad \mathbf{X}_e = f_e(D), \quad T = f_t(D)$$

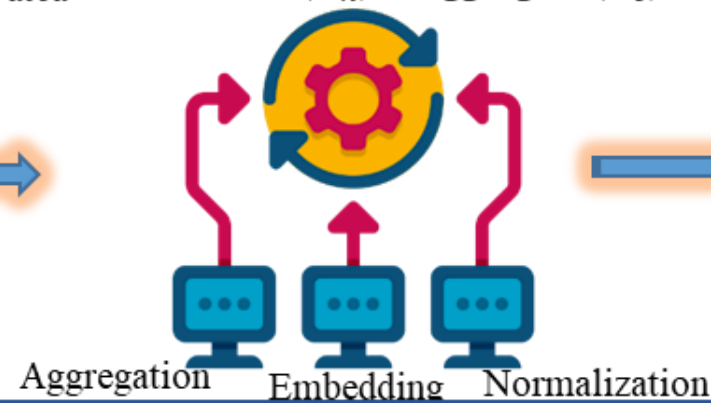


### Feature Extraction Components



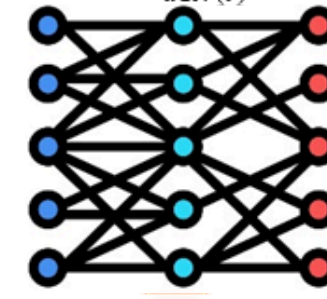
### Feature Integration

$$\mathbf{X}_{integrated} = \text{Normalize}(\mathbf{X}_n) + \text{Aggregate}(\mathbf{X}_e) + T$$



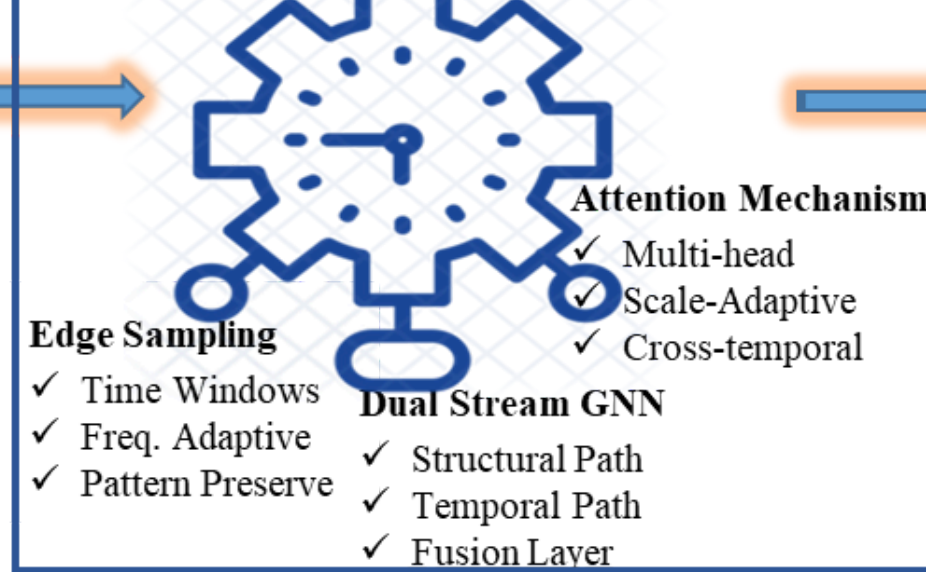
## (3) Neural Architecture

$$\mathbf{h}_v^{(l)} = \text{MLP}^{(l)} \left( (1 + \epsilon) \mathbf{h}_v^{(l-1)} + \sum_{u \in \mathcal{N}(v)} \alpha_{uv} \text{ReLU}(\mathbf{h}_u^{(l-1)} + \mathbf{W} \mathbf{f}_{uv}) \right)$$

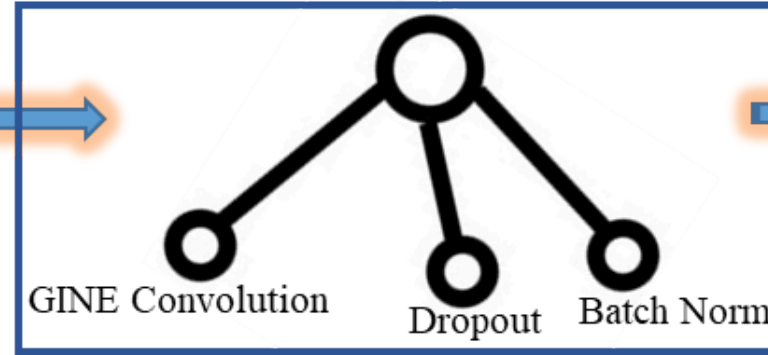


### Temporal Processing Pipeline

$$\alpha_{uv} = \frac{\exp \left( \text{LeakyReLU} \left( \mathbf{a}^T \left[ \mathbf{W} \mathbf{h}_u^{(l-1)} \parallel \mathbf{W} \mathbf{h}_v^{(l-1)} \parallel \mathbf{t}_{uv} \right] \right) \right)}{\sum_{k \in \mathcal{N}(v)} \exp \left( \text{LeakyReLU} \left( \mathbf{a}^T \left[ \mathbf{W} \mathbf{h}_k^{(l-1)} \parallel \mathbf{W} \mathbf{h}_v^{(l-1)} \parallel \mathbf{t}_{kv} \right] \right) \right)}$$



### Model Components

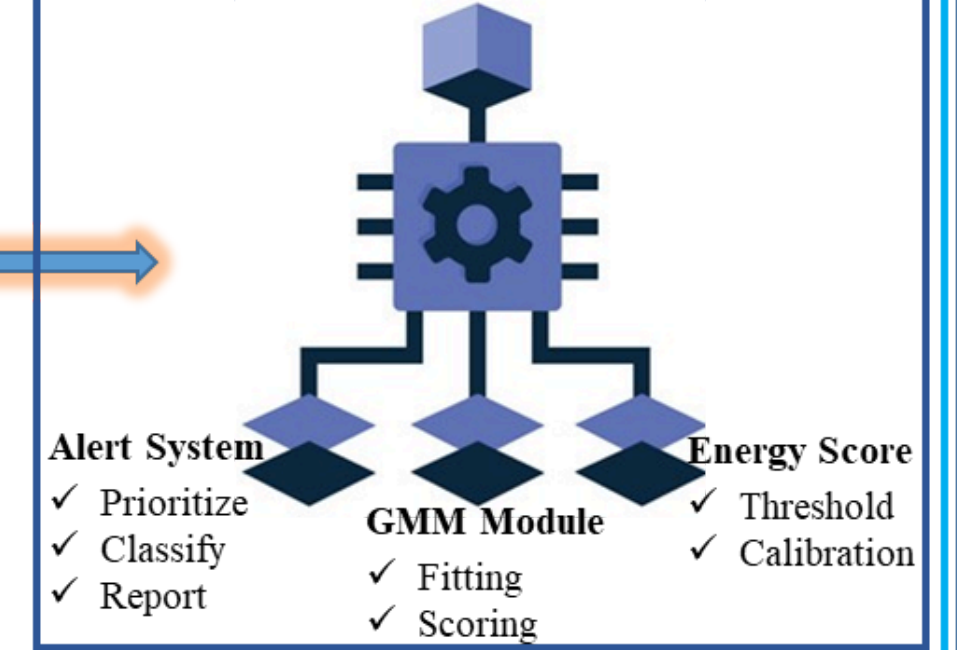


## (4) Anomaly Detection

$$S(v) = g(\mathbf{h}_v^L) = P(y_v = 1 | \mathbf{h}_v^L)$$



### Detection Engine Components



### Output Layer

