Money Laundering: Process of conversion of black money to white money.

Business Problem: These systems are designed to address illegal financial activities like money laundering, terror funding, black money transfer, etc… This activity involves the movement of funds through multiple accounts in order to conceal their origin, ownership, and destination. The main aim of this system is to recognize such illegal transactions and punish the originators of these transactions to avoid such activities in the future.

Stages of Money Laundering:

1. Placement: First step in which money obtained from an illegal source is put into the financial institution.
2. Layering: In this step, various layers are built by dividing money into multiple bank accounts to avoid the actual source of laundering.
3. Integration: Final process of sending multiple layered money to the launder's account.

Important Steps for Anti-Money Laundering ML Project:

1. Data Collection: It includes collecting financial data like transaction reports, customer profiles, income, profession, demographic financial data, age, address, frequency, volume, etc… about the individual account holders.
2. Data Cleaning: This is a statistical step to clean and pre-process the collected data. It includes dealing with missing values, outliers, normalization & standardization of the data as per requirement.
3. Feature Selection: In this process, we will observe relations between the dependent and independent variables of the datasets. It includes data processing of transactional metrics.
4. Model Selection: After data cleaning and data pre-processing, choosing the correct ML algorithms is crucial for getting accurate results while training the data.
5. Model Training: After model selection, fine-tuning the parameter plays an important role to achieve high accuracy and optimal performance.
6. Model Validation: Performance metrics like precision, recall, and accuracy are helpful in making improvements based on the trained model.
7. Deployment: The last step is to integrate the ML model into the existing infrastructure and observe the effectiveness of the Anti-Money Laundering system.

Supervised ML techniques to train the model and identify the patterns of suspicious transactions. This model uses patterns of transaction history, past records, etc… and it is essential to have information precisely assigned and input variables captured.

Unsupervised ML techniques are usually used when input variables details are accurately assigned. It automatically finds the pattern of irregularities and recognizes any suspicious activity without any prior information.

Basic Techniques to detect Money Laundering:

1. Bayesian Network: Model of previous users' activities and will measure future customer activity.
2. K-means Sequence Miner Algorithm: Pattern recognition and mining transactions corresponding to the transactions. And then building clusters of dubious activities.
3. Cluster-based local outlier factor Algorithm: Clustering technique combination and processing of outliers.

Challenges:

1. Limited knowledge of the banking and financial services
2. Lack of detailed information about the customer
3. Data quality management
4. Limited information regarding the legal process and customer profile like KYC…

Constraints:

These systems are subject to various constraints to ensure their effectiveness which includes:

1. Legal Constraints: These systems must follow local and international laws related to financial data, crimes, and privacy.
2. Technical Constraints: These systems must be designed to handle a large volume of data, and operate effectively in real time. And they must be reliable and secure.
3. Ethical Constraints: These systems must also respect the rights and privacy of the individuals.
4. Operational Constraints: These systems must be operated by trained professionals who are aware of the regulations and risks associated with the software and financial laws.