Towards AI-Driven Financial Crime Detection

Ramon Rico

Utrecht University, Netherlands
r.ricocuevas@uu.nl

Financial crime detection is key to safeguard the global economy. Two algorithmic tasks are of paramount interest: *money laundering* and *fraud* detection. *Money laundering* is the process of illegally hiding the origin of monetary benefits gained through illicit activities, and *fraud* is the intentional act of deceiving someone to obtain monetary proceeds. Even though these names are often used interchangeably, their nature is highly different.

On the one hand, money laundering is ruled by *group dynamics*. That is, most of the money laundering signal is hidden in sub-networks of the financial network. In fact, the discovery of money laundering sub–networks is equivalent to the detection of money laundering accounts under ceirtain conditions. We introduce TAML [1]: the first self-explainable GNN (XGNN) capable of solving money laundering classification and sub-network discovery within the same embedding space.

On the other hand, fraud is ruled by *temporal dynamics*. That is, most of the fraud signal is hidden in the evolution of the financial network. We introduce HerdGNN [2]: the first dynamic Graph Neural Network (DGNN) tailored for class-imbalanced settings while keeping a bounded temporal memory footprint.

References

[1] Ramon Rico, Ioana Karnstedt-Hulpus, Stan Leisink, Boyang Zhao, and Yannis Velegrakis. Translating latent representations for money laundering detection. In *Proceedings of the Thirty-Fifth International Joint Conference on Artificial Intelligence*, pages 6500–6508, 2026.

[2] Vahid Shahrivari Joghan, Ramon Rico, Ioana Hulpus, and Yannis Velegrakis. Herdgnn: Hybrid error-guided regularization with deviation for highly imbalanced classification in dynamic graphs. In *Proceedings of the 35th ACM International Conference on Information and Knowledge Management*, pages 4235–4246, 2026.