

Credit Scoring with Dynamic Multilayer Graph Neural Networks

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Abstract

Traditional credit scoring models use loan- or borrower-level data to assess the default risk of a loan applicant. While potential default correlation between borrowers has been acknowledged for some time, it is only more recently that this has started to be further investigated using network science. Network science has been used as a beneficial tool to study the complex systems of interacting entities that can be found in many areas such as finance and economics. Borrowers can be connected in different ways using different connector features available at the time of application, and we can use these connections via multilayer networks to reflect how risk may propagate explicitly. In this project, we present a model for credit risk assessment leveraging a dynamic multilayer network built from a Graph Neural Network and a Recurrent Neural Network, each layer reflecting a different source of connection. We test our methodology using US mortgage loan data, in which two sources of connections are geographical location of the borrower and the company offering the mortgage. The proposed model considers both types of connections as well as their evolution over time. Preliminary results demonstrate that, when it comes to predicting probability of default of the borrowers, our proposed model brings both better results and novel insights compared to traditional methods.

Keywords: Credit Risk; Dynamic Multilayer Networks; Graph Neural Networks; Recurrent Neural Networks