Investment recommendation system on agriculture peer-to-peer lending websites

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Abstract. With the growth of peer-to-peer investment websites, selecting the precise investment is tedious for amateur investors. This study aims to help the no-to-low experienced investors to identify which investments are prospects for them to invest their money. We have collected data from four trusted agriculture peer-to-peer lending websites then used a Decision Tree technique to train and test the data then classify them into a feasible to be invested or not. The result shows that both return and tenor parameters are the top two criteria to be considered. Moreover, the experiment result shows that our recommendation system has successfully performed at 98.29%.

1. Introduction
Peer-to-Peer (P2P) lendings are foreign to most people. P2P lending itself is the practice of giving money to individuals or businesses where borrowers are matched directly with investors through an online lending platform [1]. Recently, P2P lending platforms are growing fast because it offers relatively more comfortable requirements and a lower interest rate for the borrower to apply for a loan than most banks do. Meanwhile, it proposes a swiftly emerging alternative financial market for investors with potentially higher investment returns. In the agricultural field in Indonesia, the P2P lending platform contributes to the growth of the local farming by meeting the farmers with the investors directly through the platform. In the end, it helps the growth of the economy as well. However, some no-to-low experienced investors still unsure of which to invest their money. The researchers have addressed this problem to succeed in the P2P lending process.

Previous researches have discussed the P2P lending mechanism. In [2], U Yunus conducted qualitative research on the different characteristics of the P2P lending platform in Indonesia and Singapore. From this research, one knows the type of P2P lending platform growing in Indonesia, but it does not cover the more specific P2P platform on an agricultural field. While in [3], the author studied on how to build trust between borrowers and investors in this platform. Analysis of mobile application for P2P lending has been conducted by [4] and [5] has conducted an empirical study on the predicted risk of P2P lending platform. In fact, there has not been a practical solution addressing which loan is a prospect to be invested.

Therefore, we propose an investment recommendation system to help the no-to-low experienced investor to pick the best options when investing in agricultural P2P lending platforms. We operate machine learning to investigate lists of loan proposals from the farmers and narrow them down to the prospect ones to invest. From our experiment, we find two crucial parameters to consider a potential loan. Overall, our proposed system performs at a high confidence level.

2. Methodology
This research consists of two main phases, i.e., the training and testing phases, as shown in Figure 1.
We start by collecting investment datasets from four trusted agricultural P2P lending sites based in Indonesia: Tanifund [6], iGrow [7], Vestifarm [8], and Tanijoy [9]. Each dataset has several features, specifically the partner name, product name, yield, tenor, the value per unit, and profit per month (based on value per unit, tenor, and yield). Those features are treated as the inputs of our proposed system to determine the investment decision. Table 1 shows an example of the training dataset.

The training phase starts by labelling the dataset. Annotation by an investment expert is first employed to mark each loan as a prospect or not. The annotation step is essential since the newbie investors do not have any information about how to determine the feasibility investment of the proposed loans. Having known the judgment, we then build a model to draw the pattern.

Table 1. Training dataset example.

| P2P lending Site | Partner name | Product name | Value/unit (IDR) | Return (p.a) | Tenor (mo) | Profit / mo |
|------------------|--------------|--------------|------------------|-------------|------------|-------------|
| TaniFund         | Berkah Pisang Mas | Banana (Pisang Mas) | 100,000          | 0.18        | 24         | 1,500       |
| TaniFund         | Berkah Tani | Papaya (Calina) | 100,000          | 0.18        | 24         | 1,500       |
| TaniJoy          | Agrindo Karya Persada | Corn seeds B5 | 5,575,000       | 0.15        | 12         | 69,688      |
| TaniJoy          | Agrindo Karya Persada | Corn seeds B4 | 5,575,000       | 0.15        | 12         | 69,688      |
| TaniJoy          | Agrindo Karya Persada | Corn seeds B3 | 5,575,000       | 0.15        | 12         | 69,688      |
| iGrow            | CV. Damarayu | Oyster | 500,000          | 0.45        | 13         | 18,750      |
| iGrow            | PT. Ihsan Agritama Teknologi | Fruit trading | 500,000          | 0.26        | 3          | 10,833      |
| Vestifarm        | Bambang Purwanto | Potatoes (Granola) | 2,918,000       | 0.21        | 6          | 51,065      |
| Vestifarm        | Dahlia Girsang, dkk | Potatoes (Granola) | 2,535,000       | 0.11        | 6          | 23,238      |
| Vestifarm        | Daniel P.K Sihombing | Chili | 2,236,000       | 0.12        | 8          | 22,360      |

We utilize the J48 classifier in WEKA, which implements of C.45 Decision Tree technique [10]. J48 is employed due to its ability to simplify decision making. In addition, it is capable of pruning insignificant input information.
In the second phase, new data without prior information of either candidate or not a chance for loans are examined using the J48 classifier model built in the first phase. In the end, the system labelled those data into yes or no for investment.

3. Result and Discussion
The following are the results of our implementation using the J48 (C4.5 Decision Tree algorithm). We use the J48 because of its effectiveness in solving the problem, which has characteristics like the one we are currently used, in terms of analysis all input features and removing insignificant features from the consideration.

We treat 85% of the collected dataset as the training data and the rest as testing data. After manually label the training data, we utilize the J48 Decision Tree algorithm to train our data. From the training data visualization, as shown in Figure 2, we noticed that J48 prunes value per unit and profit per month features and relies on return per annum and tenor features for the decision making. In other words, the pattern used by the expert to classify a loan into feasible to invest or not, mainly return per annum is more than 14.85% and tenor is not more than 13 months.

![Tree structure of the trained data](image)

Figure 2. Tree structure of the trained data.

Next, we apply the previous Decision Tree Model to test the unlabelled dataset and classify them into achievable to be invested or not. Table 2 displayed some of our tested datasets.

| P2P lending Site | Partner name       | Product                     | Value/unit (IDR) | Return (p.a) | Tenor (mo) | Profit / mo | Invest |
|------------------|--------------------|-----------------------------|------------------|--------------|------------|-------------|--------|
| TaniFund         | TF Tani Makmur     | Melon (Sakata Glamour)      | 100,000          | 0.18         | 3          | 1,500       | ?      |
| TaniJoy          | Tanjung Lesung Agropolis | Avocado                 | 2,500,000        | 0.15         | 180        | 31,250      | ?      |
| iGrow            | Komunitas Petani   | cinnamon (Kerinci)         | 500,000          | 0.03         | 1          | 1,250       | ?      |
| VestiFarm        | Wildan Yuda Asmara | Golden Melon               | 2,190,000        | 0.01         | 6          | 18,250      | ?      |
| VestiFarm        | Wildan Yuda Asmara | Rock Melon                 | 2,814,000        | 0.01         | 6          | 23,450      | ?      |

We have measured the accuracy of our investment recommendation model, and it obtains a 98.29% accuracy rate. To test the performance of our method, we have compared our J48 Decision Tree-based model against one of the Artificial Neural Network algorithms, specifically Multi-Layer Perceptron (MLP). It turns out; our proposed method outperforms MLP by 3% accuracy.
4. Conclusion
Applying the J48 Decision Tree algorithm is a straightforward solution for conducting investment recommendations. J48 helps to remove insignificant input criteria from consideration. Besides, it is proven to be efficient since the depth of our tree structure only two levels. Furthermore, having a 98.29% accuracy rate, this system may help a newbie investor who does not have prior knowledge of the investment analysis. Lastly, tenor and return value are the top two criteria to be considered for this type of investment out of five attributes input to the system.

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