





















an online video in a video network connected based on their content. However, [6, 7] also require the definition on the node and edge functions. Moreover, the HeteroSales framework also incorporates the results of external classifiers to the label propagation, which further improves its flexibility and robustness. In [18, 20], the authors use a propagation-based method to estimate product quality on a heterogeneous network. However, they construct the graph from raw data, instead of combining multiple graphs.

Finally, we also find several related articles [9, 14, 24] focusing on improving the effectiveness of selling process. For example, [24] studies the problem how to combine several products into one bundle and recommend it to customers through emails. Since discounts are usually also applied to these product bundles, users may more likely to purchase them, if the bundle contains different product he/she may need. However, all these research works focus on online sales process, which require a large number of training data to fully unleash the power of their proposed methods.

## 6. CONCLUSION

In reality, online and offline sales are the two important parts in the modern selling activities. Unlike online sales selling a small quantity of a product to each customer through methods like sending recommendation emails, offline sales normally target at enterprise customers to sell a large quantity of the product in one single deal. Since the offline sales usually require human contact between the sales agents and the representatives of the buying company, it is more costly and requires longer time and additional human labor to collect the data to be used to research on this problem. Therefore, how to find a new enterprise customer usually depends on the experience and insights of the sales personnels, and computer scientists have rarely get involved in this problem. In this paper, we have introduced a method to utilize the information in an online heterogeneous social network to improve the effectiveness of offline sales. We propose a two-step framework, HeteroSales, to achieve this goal. The HeteroSales first constructs a Company Homophily Graph (CHG) through learning from semantics based meta-paths in the social network, and then adopts a label propagation algorithm on it to find new potential enterprise customers. Based on the offline sales records of a third-party company and a large professional social network, LinkedIn, we introduce statistical findings to show that not all the users' social connections in a network can be helpful for the HeteroSales. For example, we found that those people who are more familiar with the product are more likely to have indicative social connections to help us find new enterprise customers. Finally, based on the extracted data set, we conduct extensive experiments to evaluate the proposed HeteroSales, and show it can constantly outperform other baselines in this task.

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