

Strategy	Benefit	Disadvantage	Suggested use
A	Low training complexity	Lower accuracy	Advanced baseline model
B	Sequential training process	Difficult target variable selection	Alternative for strategy C
B*	Statistical interpretation	Complementary views required	Research purposes
C	Interpretability	High complexity of training	Multi-use
C*	Performance	High complexity of training	Predictive model

Table 5: Summarization of benefit and disadvantage of the different strategies

C*) perform best. It seems that learning a latent subspace leads to an effective feature representation even if the multiple views overlap in some features. In our experiment, the location of the house is, in addition to the satellite image, also partly captured by city dummy variables. On the downside, according to ? (?), it can become difficult to achieve convergence of the neural network model, which raises the complexity of training. In addition, model 5 (Strategy C*) comes as a black-box model. To mitigate this weakness, a semi-transparent multi-neural network as suggested by ? (?) can enhance interpretability. Nonetheless, it comes with an interpretability-accuracy trade-off, as model 4 has weaker predictive performance than model 5. We suggest using the multi-view neural networks for predictive models in applications where explainability is not a key objective.

5 Conclusion

Of course, our work is not without limitations. We have not yet investigated the interrelations between the structured housing attributes and the satellite images. Future research could, for example, analyze which information is overlapping between views and which information can only be captured by one or the other view. Another limitation is related to our data source. We use only a single dataset of Asheville, NC to assess the effect of the learning strategy on predictive performance. As related literature typically refers to neural network architecture search, future research should perform replication and ablation studies to examine, if results can be reproduced across datasets, image types and domains (beyond housing).

Despite these limitations, the following implications for research and practice can be derived from our findings. Satellite images can clearly improve the accuracy of computer-assisted mass appraisal. Our results indicate that the MAE can be reduced by up to 13%, depending on the chosen multi-view learning strategy. Therefore, banks and lenders should consider using visual data to improve their real estate appraisal estimates. Moreover, different techniques match different purposes and user groups. Researchers interested in a statistical interpretation of the results might find the boosting strategy of model 3 more appealing. Practitioners mainly interested in predictive accuracy might prefer model 5, the multi-view neural network.

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