



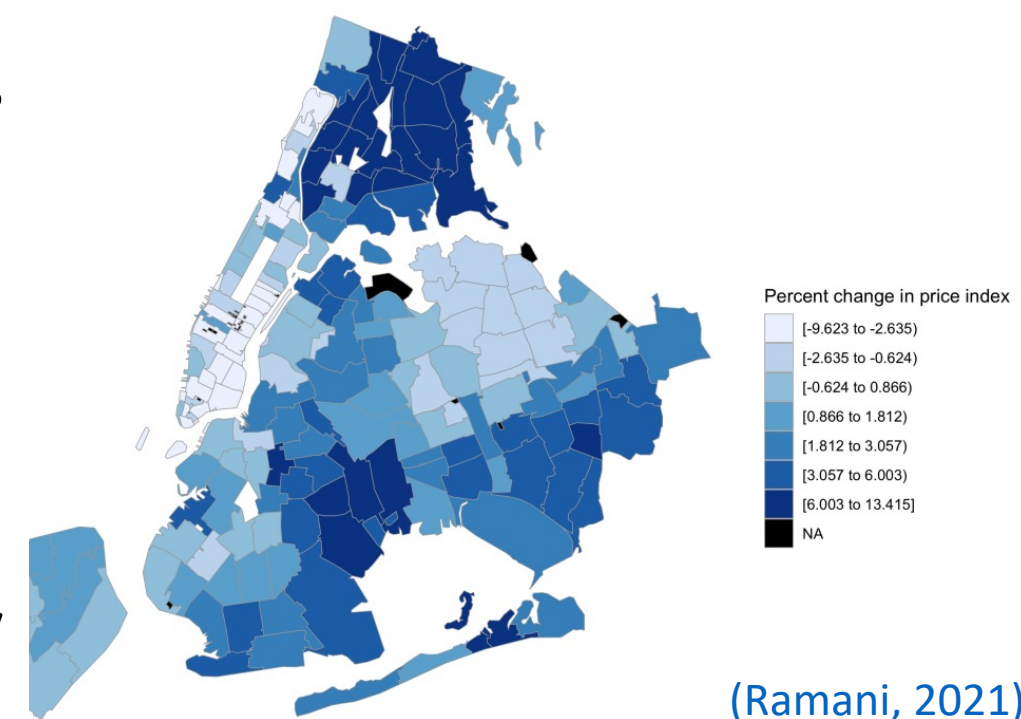
DeepCity: Using Images of Cities to Predict Work-from-Home Shocks



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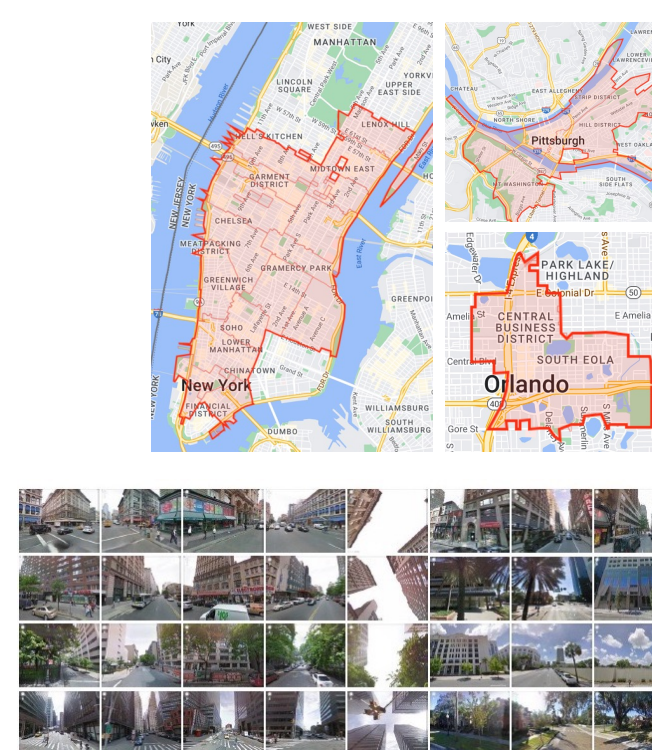
Introduction

- COVID-19 reshaped American housing markets by causing workers with the ability to work-from-home to leave city centers for the suburbs.
- Goal:** Can we better **predict changes in home prices** caused by COVID-19 work-from-home shocks **than tabular economic data** by **visually learning** about neighbourhoods with street view images?

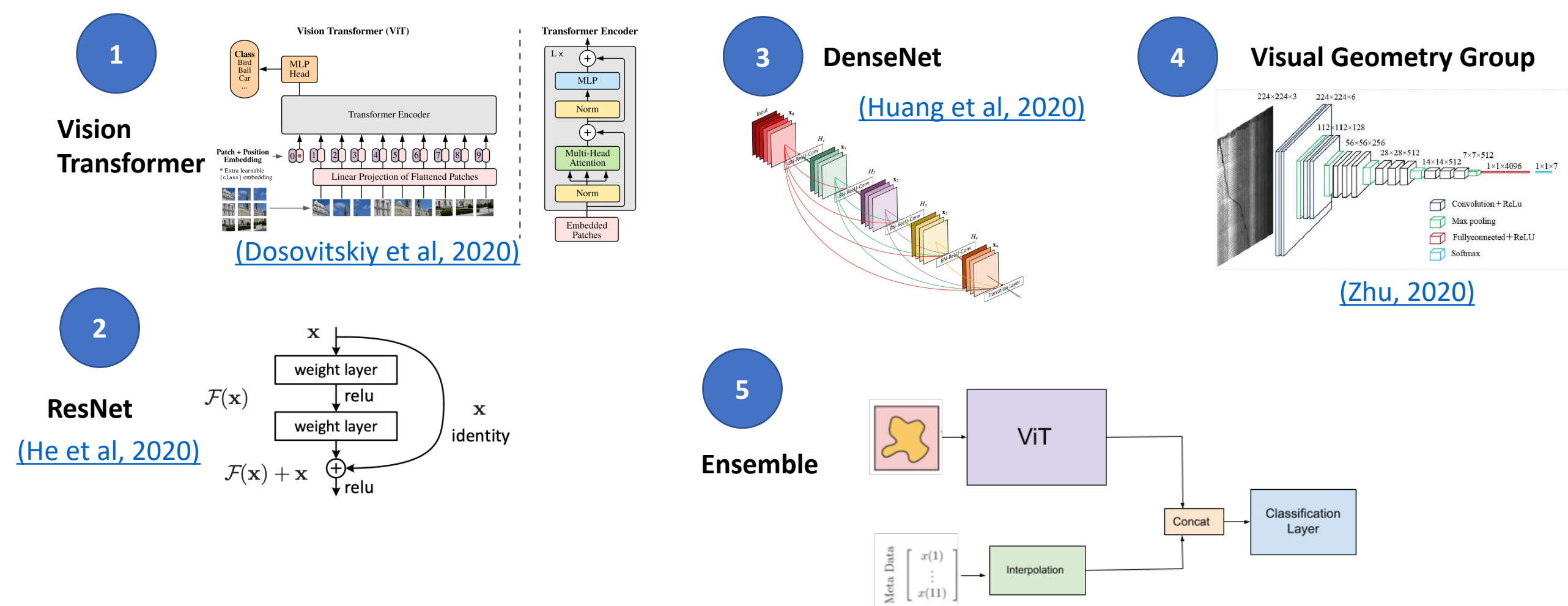


Data

- Input Images:** University of Central Florida Center for Research in Computer Vision Google Street View Dataset, 62,000 images of New York, Pittsburgh, and Orlando
- Input Tabular Data:** Population density, distance from city center, share of teleworkable jobs, number of business establishments
- Target Data:** Growth rate in Zillow's home price index between February 2020 and 2022 (binned into 20 buckets)



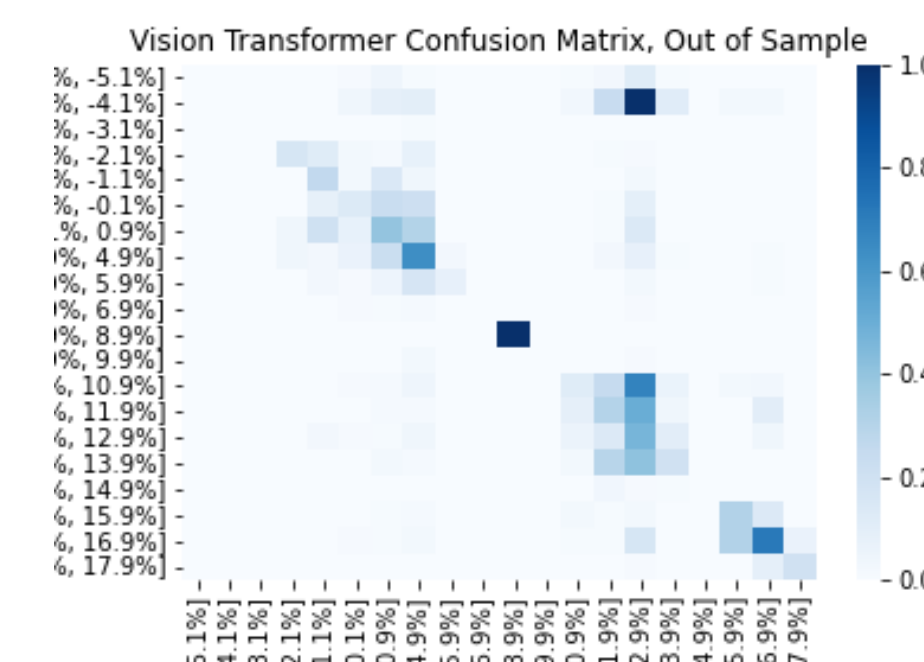
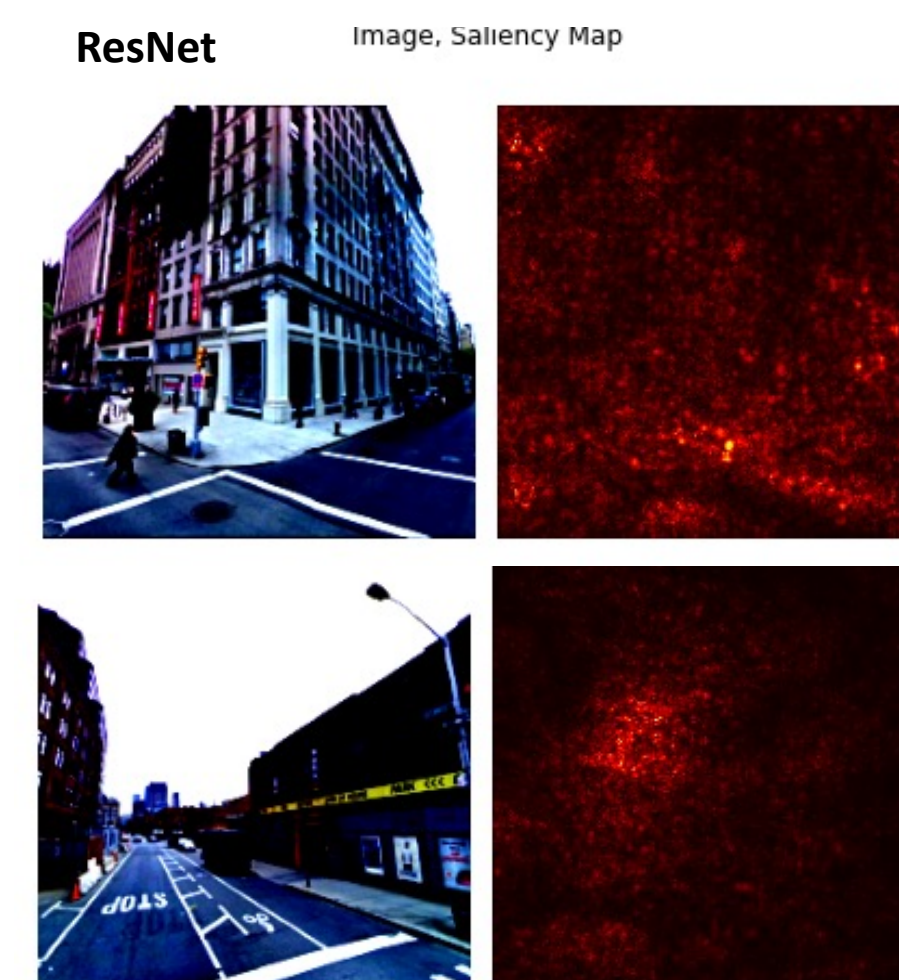
Methods



Results

Image-only Models		
Model	Validation Accuracy (%)	
	North	East
Baselines		
Random Chance	5	5
Logistic Regression	50.45	14.3
Two-Layer CNN	73.5	15.23
Image Models		
DenseNet	74.78	27.46
ResNet	77.34	29.38
VGG	74.53	26.93
ViT	90.56	32.59

Model	Ensemble Models		
	Validation Accuracy (%)		
	Weighted avg Precision	Weighted avg Recall	Raw Accuracy
Model	31	45	45
Logit	33	33	33
ViT + Logit	43	51	51



Conclusion

- Our model seems to focus on skylines, intersections, and building features to learn about neighborhoods and their proximities to economic centers and amenities
- Models trained, tested, and validated on north facing images, are still able to predict well on east facing images
- Our pre-trained Vision Transformer Model performed best out of all of the image-only models
- Our novel, computer vision approach to understanding pandemic changes in the housing market **outperforms** pure tabular economic data
- Future work should attempt to improve results in the continuous regression case