Suburban Dreams:
The Rise of the Rental Market

Industry Project Group 40

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THE UNIVERSITY OF
MELBOURNE

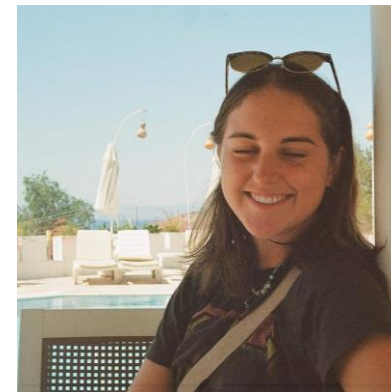# OUR TEAM

CLARISSA

Loves cooking and sewing

YASA

Would talk about anything with anyone. Lives to eat (and drink), sleep is non-negotiable

DUY

If intelligence is a weapon, I'm unarmed

INGRID

Loves a swim, playing footy, and making music with her friends

PHOEBE

Loves to play violin and tennis, and enjoys having a swim

FORECASTING THE RENTAL MARKET IN VICTORIA

INTRODUCING THE PROBLEM:

- Ever-increasing cost of living in Australia

- Slowing economic growth

- Rising interest rates

→ **Increasing rental population**

KEY QUESTIONS:

Q1: Most important **internal** and **external features** in predicting **rental prices**?
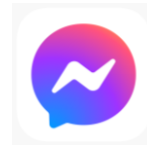
Q2: Top 10 suburbs with **highest predicted growth rate**?

Q3: Most **liveable** and **affordable** suburbs?

PROJECT LOGISTICS

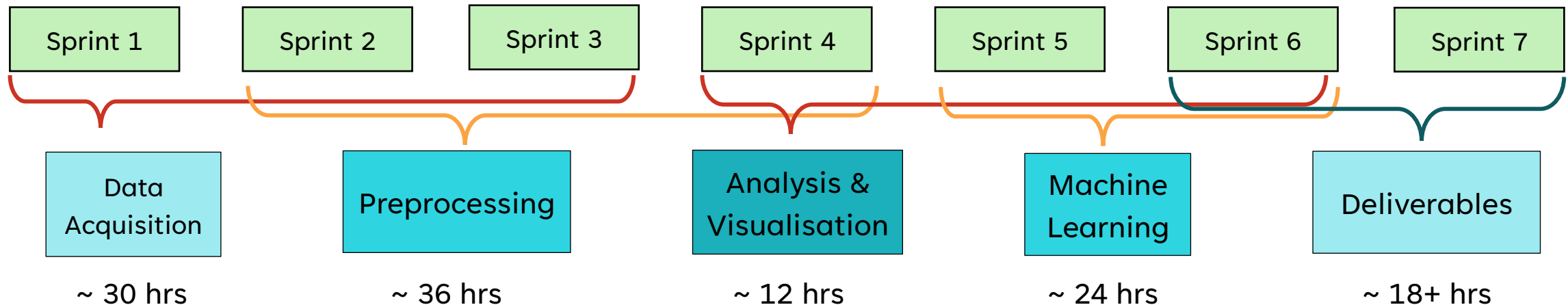## PROGRAMS & APPLICATIONS USED
- Python
- GitHub

COMMUNICATION
- 2 stand-ups per week:
  - 1 weekly in-person
  - 1 weekly zoom
- Regular updates via Teams and Messenger

TIMELINE
- Duration: 6 weeks (thus far)

| Sprint 1 | Sprint 2 | Sprint 3 | Sprint 4 | Sprint 5 | Sprint 6 | Sprint 7 |

| Data Acquisition | Preprocessing | Analysis & Visualisation | Machine Learning | Deliverables |

~ 30 hrs   ~ 36 hrs   ~ 12 hrs   ~ 24 hrs   ~ 18+ hrs

ACQUISITION OF DATA

ACQUISITION OF DATA

RENTAL DATA

Sources: Collected from
domain.com.au

Size: ~ 1,000,000 rows
Time range: 2017 – 2023

Internal Features
- Features relating to properties (eg. No. of rooms, no. of bathrooms, etc.)

INFRASTRUCTURE DATA

Sources: Scraped and collected from many different sources

External Features
- Schools
- Hospitals
- Public transport stops (bus, tram, train)
- Open space (parks, forests, etc.)
- Distance to CBD (from each property)

CENSUS DATA

Sources: Collected from **ABS**

External Features
- Population by postcode
- Median Income by postcode
- Crime rate by postcode

DATA PIPELINE

DATA PIPELINE

LightGBM: a boosting algorithm that uses decision trees as its base learners, similar to Random Forest and XGBoost

COLLECTION	OUTLIER DETECTION	DATA PARTITIONING	DATA IMPUTATION	MODEL TRAINING
Scraped and collected	IQR range Web verification	Train – test set Information leak Privacy requirement	Reasonable imputation	Train with Lasso Regression and Light Gradient Boosting Methods

Box Plot for Price per Week
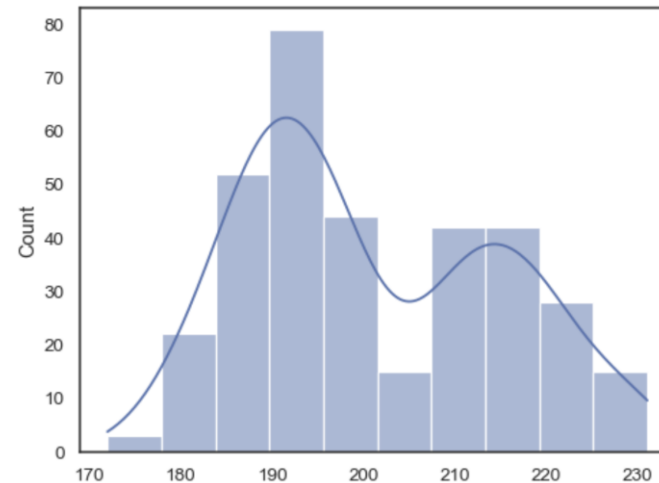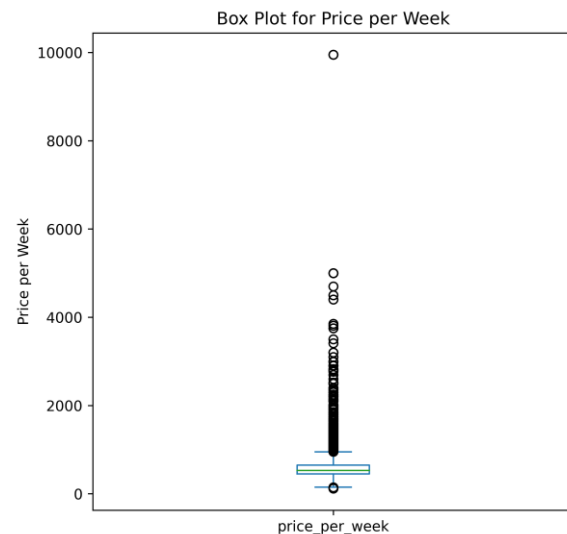
	Lasso	**LGBM**
MAE	138.59	**92.68**
MSE	91262.35	**52919.78**
MAPE	0.2305	**0.1466**

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DETERMINING FACTORS OF RENTAL PRICE

FEATURE PRIORITY

Median Rent Price vs bedrooms
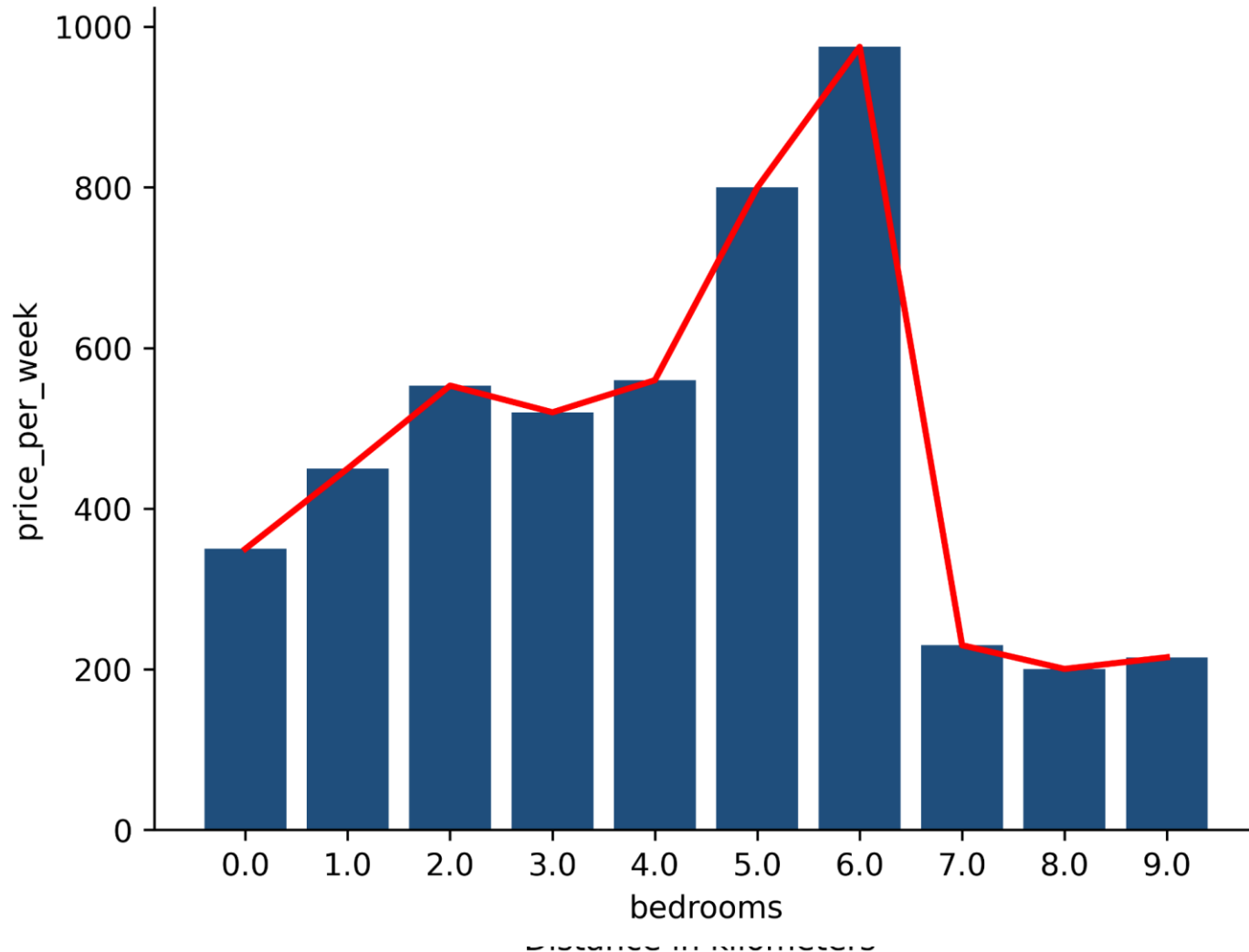
Distance to CBD
Far away from CBD ~ less expensive rent

Postcode
Some are much higher, and lower

Income
Affordability

Bedrooms
More bedrooms ~ more area

SUBURBS RISING IN PRICE

PROPERTY GROWTH

Property proportion

- Others, 2%
- Townhouse, 10%
- Apartment, 40%
- House, 48%

Legend: ■ Apartment ■ House ■ Townhouse ■ Others
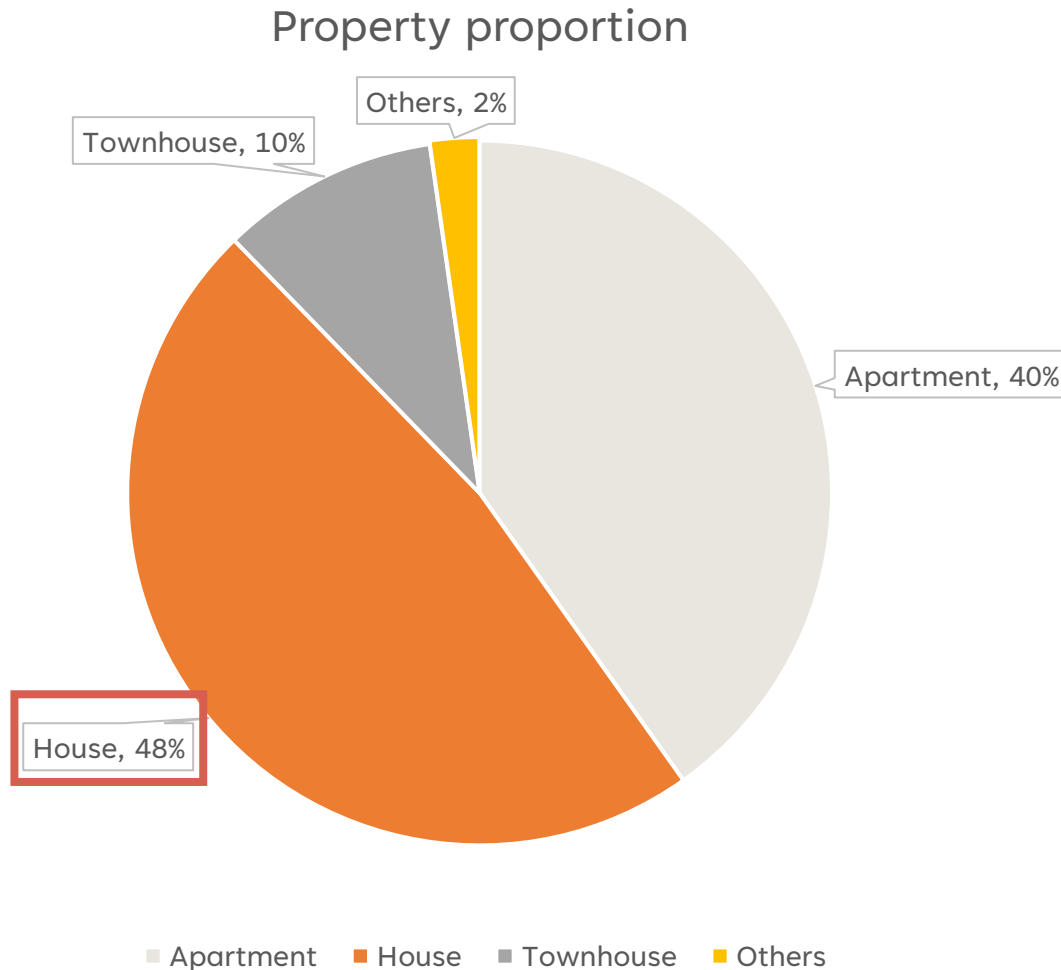
STATISTICS

Assumption: Previous years' data is highly useful for forecasting future growth

MACHINE LEARNING

Postcode	Population_2023	Income_2023
3000	48623	1299
3132	17215	2120
3163	34144	2002
3844	31828	1608
3465	10038	943

Table: Population and income by postcode
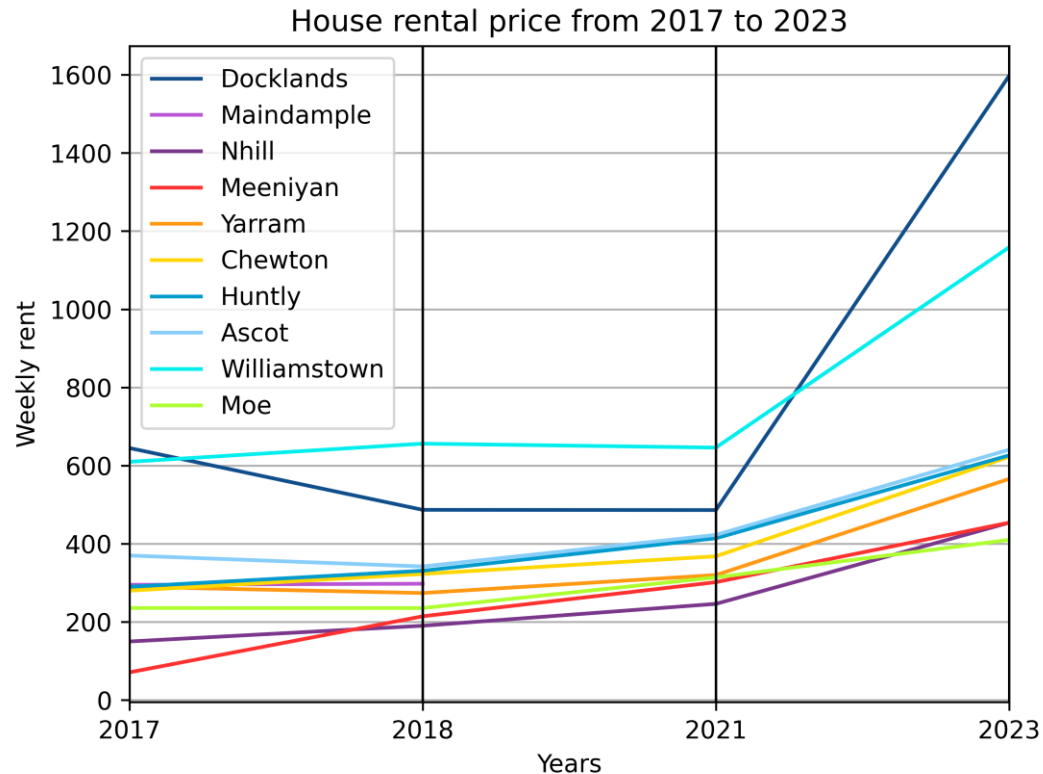
HOUSE GROWTH

STATISTICS

Assumption: Previous years' data is highly useful for forecasting future growth

House rental price from 2017 to 2023

MACHINE LEARNING

7 Overlapping Suburbs: Docklands, Nhill, Meeniyan, Yarram, Ascot, Maindample, Moe

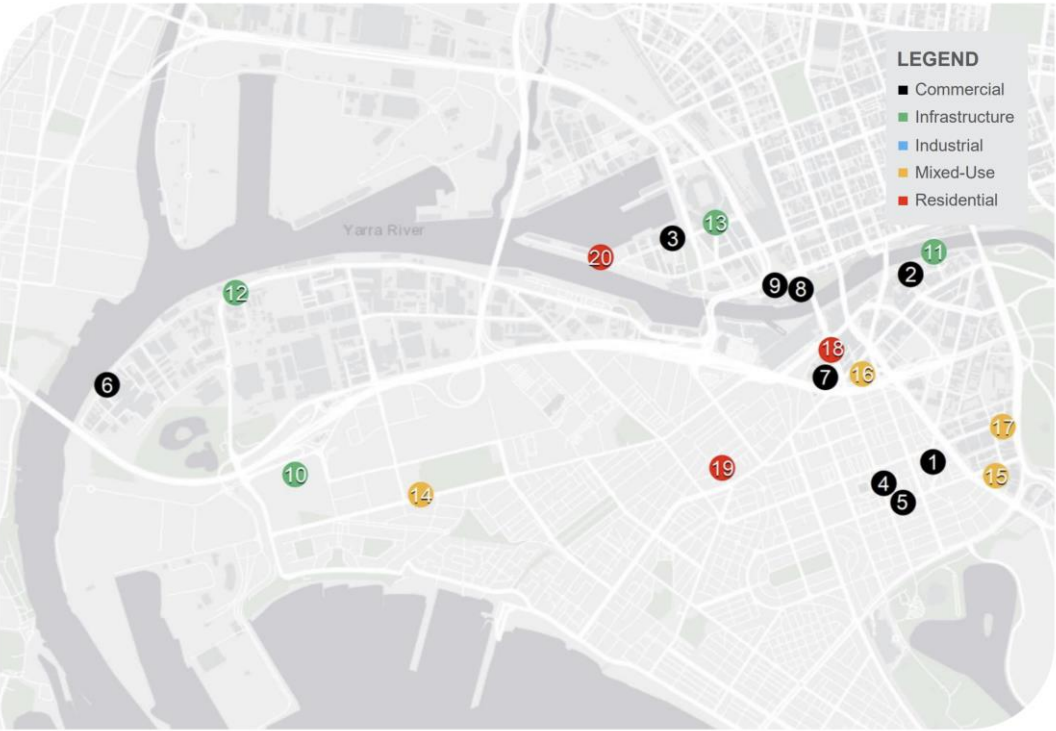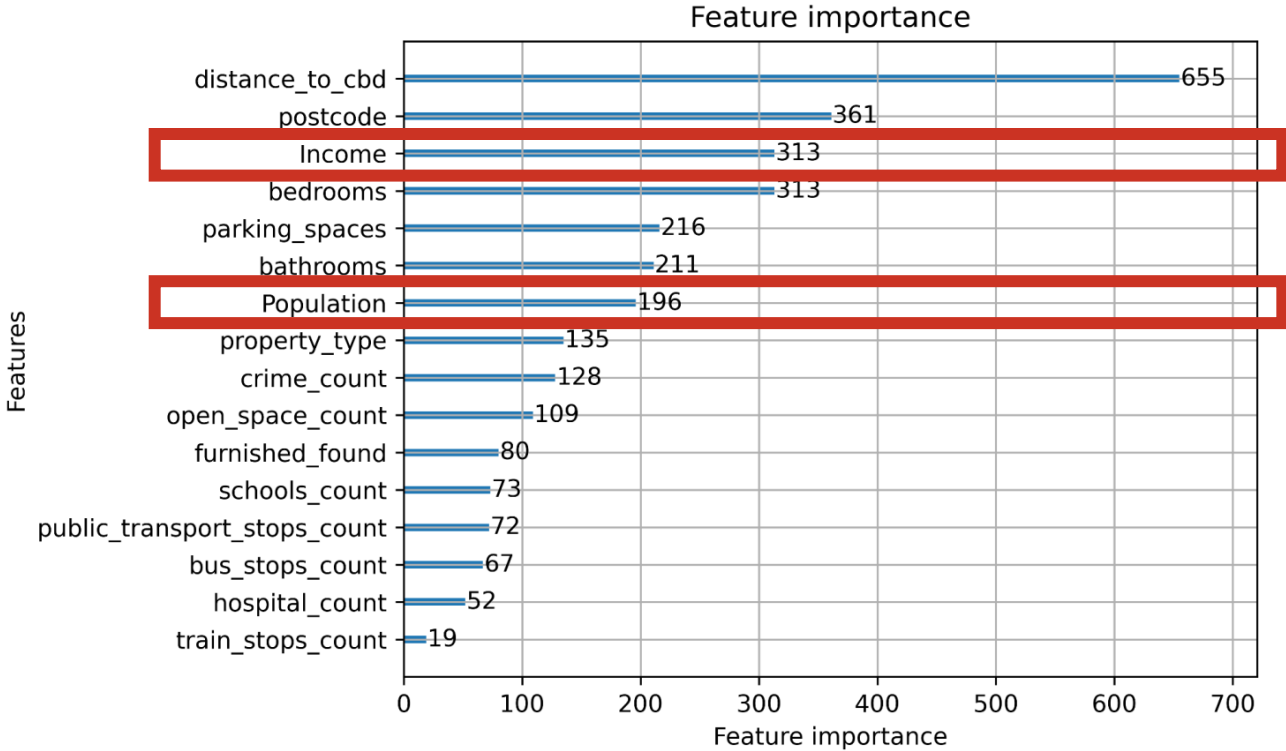Top 10 suburbs with highest predicted growth in rental price in 2026
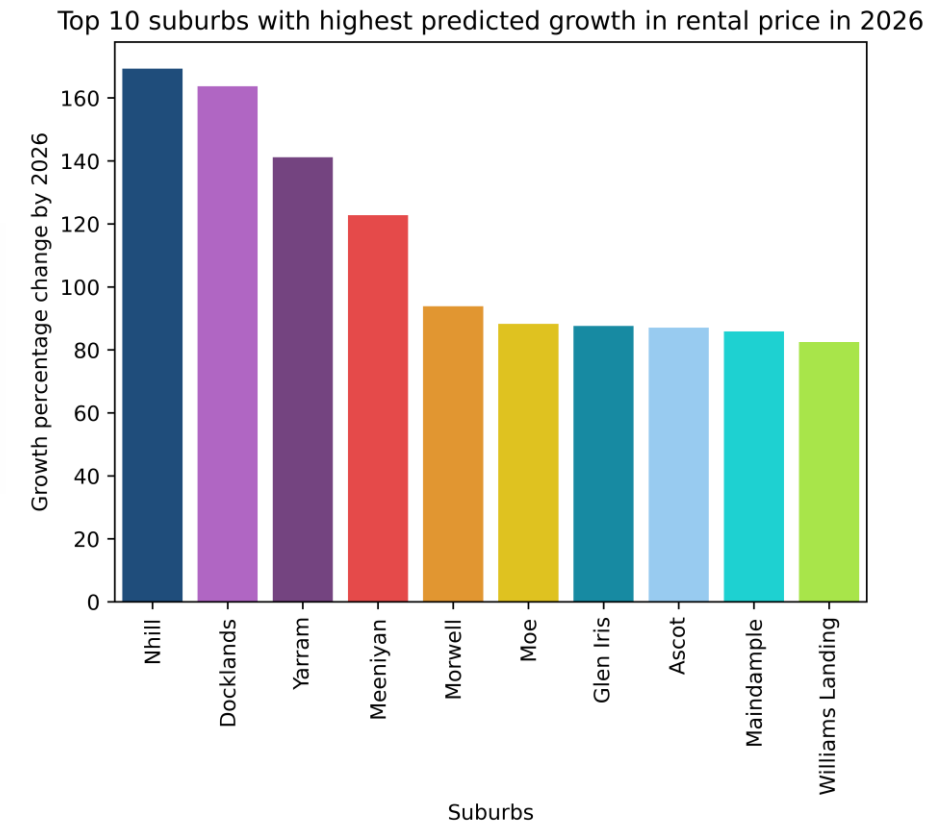
JUSTIFICATION FOR HIGHER PREDICTED GROWTH (DOCKLANDS)

BASED ON INTUITION:

- Effective Urban Planning

BASED ON ML:

- Population

- Income

Feature importance

Feature	Importance
distance_to_cbd	655
postcode	361
Income	313
bedrooms	313
parking_spaces	216
bathrooms	211
Population	196
property_type	135
crime_count	128
open_space_count	109
furnished_found	80
schools_count	73
public_transport_stops_count	72
bus_stops_count	67
hospital_count	52
train_stops_count	19

LEGEND
- Commercial
- Infrastructure
- Industrial
- Mixed-Use
- Residential

| Location	Project$^£$	Type	Estimated Value^μ
1	Eastern Road Commercial Building	Commercial	$16,000,000
2	Mirvac Riverside Quay	Commercial	$3,500,000
3	800 Bourke Street	Commercial	$4,500,000
4	Clarendon Street Commercial Development (Former Anz Bank Site)	Commercial	$7,500,000
5	Park Street Commercial Development	Commercial	$13,000,000
6	Boeing Building 6 Office	Commercial	$3,500,000
7	Haig Street Commercial Building - 57 Haig	Commercial	$20,000,000
8	WTC Wharf	Commercial	$3,500,000
9	637 Flinders Street - Zone Q	Commercial	$80,000,000
10	Port Rail Transformation Project (Prtp)	Infrastructure	$125,000,000
11	Southbank Promenade Walkway Widening	Infrastructure	$5,100,000
12	Defence Science & Technology Group - Fishermans Bend	Infrastructure	$5,000,000
13	Marvel Stadium Redevelopment	Infrastructure	$225,000,000
14	Evelyn Residences- (23 Apartments and 16 Townhouses)	Mixed-use	$60,000,000
15	Eighth Mixed Use Development- (35 Apartments)	Mixed-use	$11,896,000

APARTMENT GROWTH

STATISTICS

Assumption: Previous years data is highly useful for forecasting future growth

House rental price from 2017 to 2023
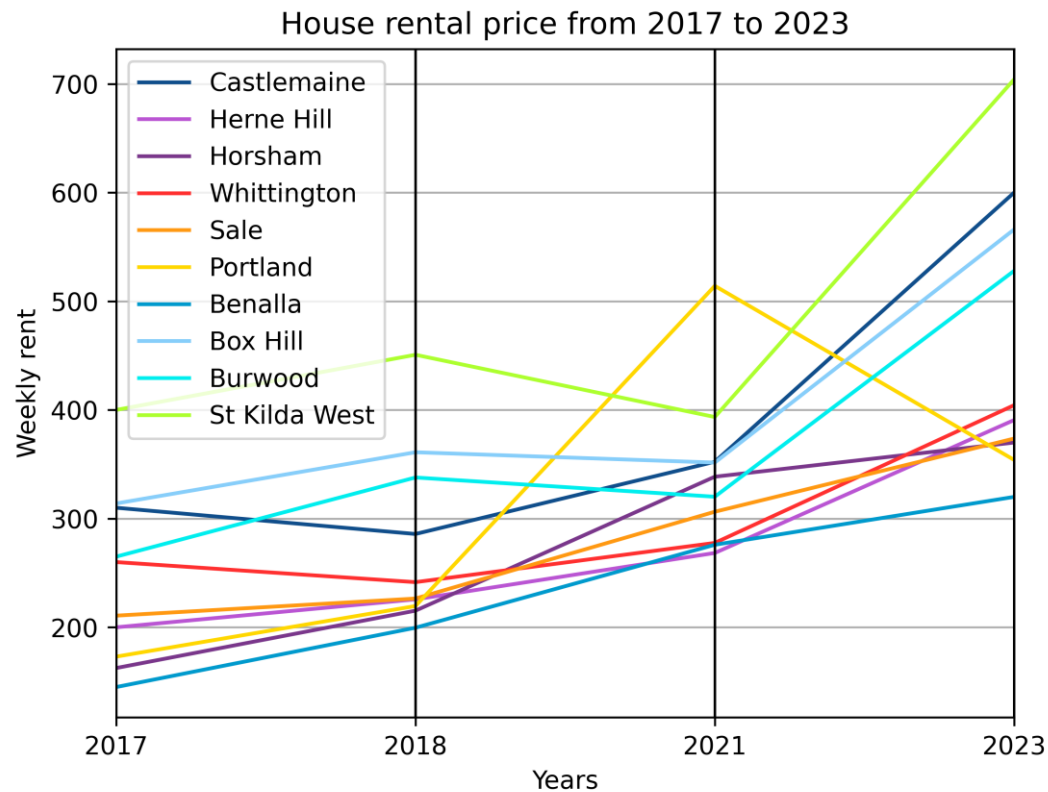
MACHINE LEARNING

Overlapping Suburbs: Portland, Heme Hill, Burwood, Sale
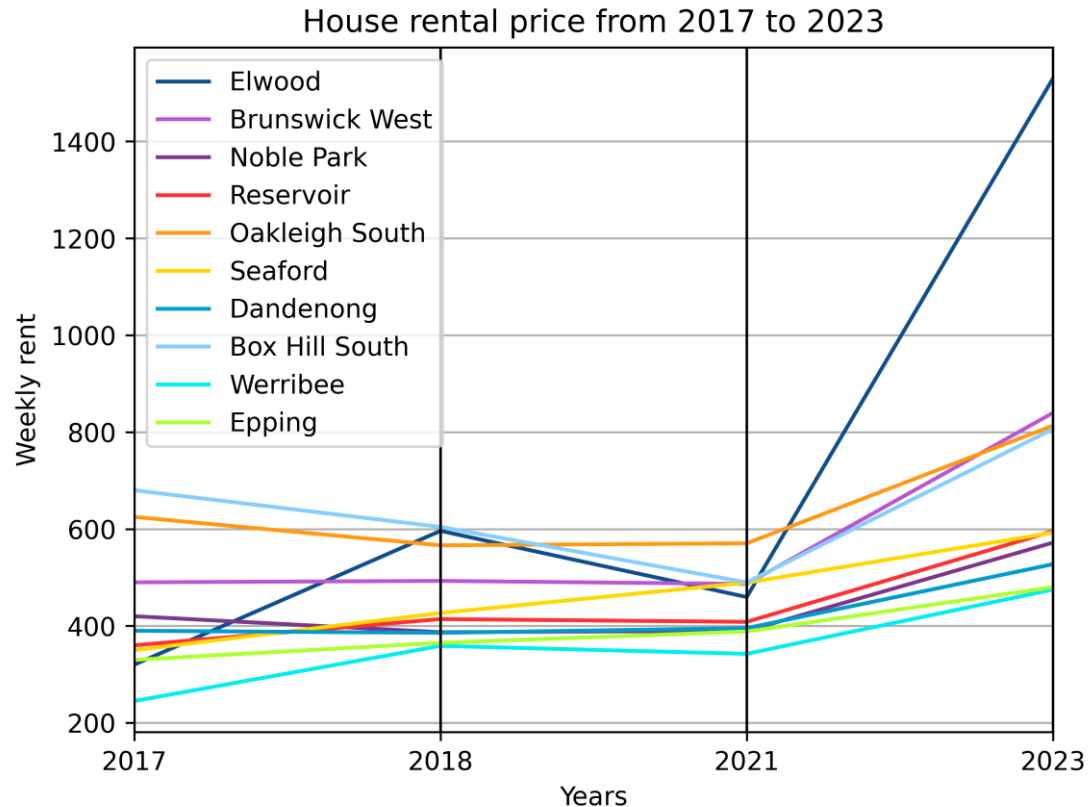

Top 10 suburbs with highest predicted growth in rental price in 2026
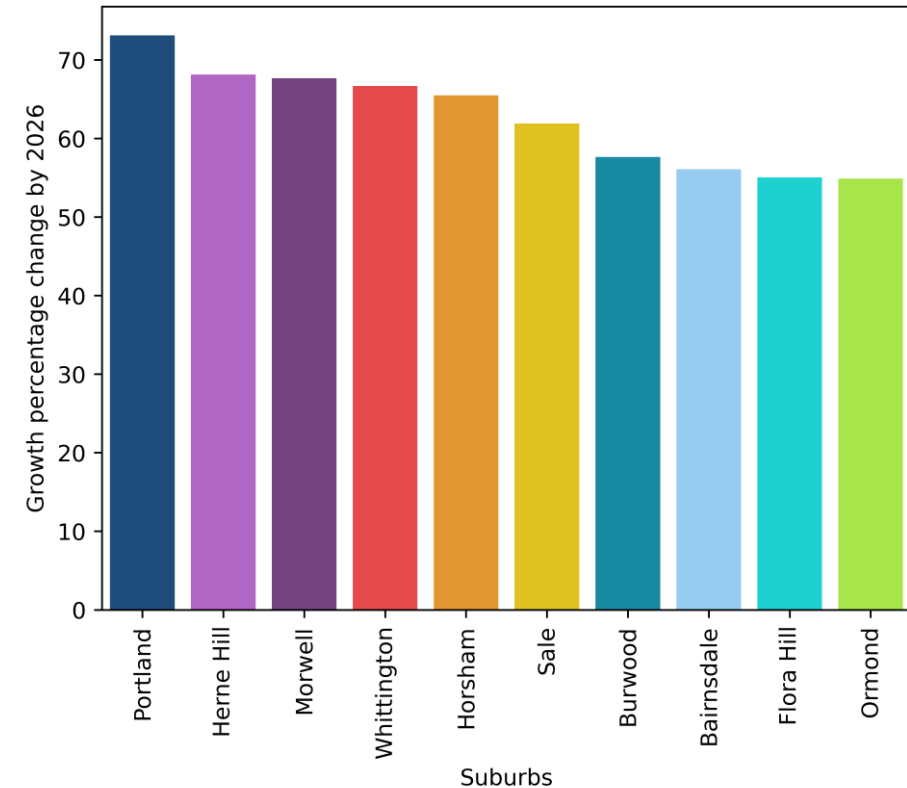
TOWNHOUSE GROWTH

STATISTICS

Assumption: Previous years data is highly useful for forecasting future growth

House rental price from 2017 to 2023

MACHINE LEARNING

Suggested: Elwood, Dandenong, Oakleigh South

Top 10 suburbs with highest predicted growth in rental price in 2026
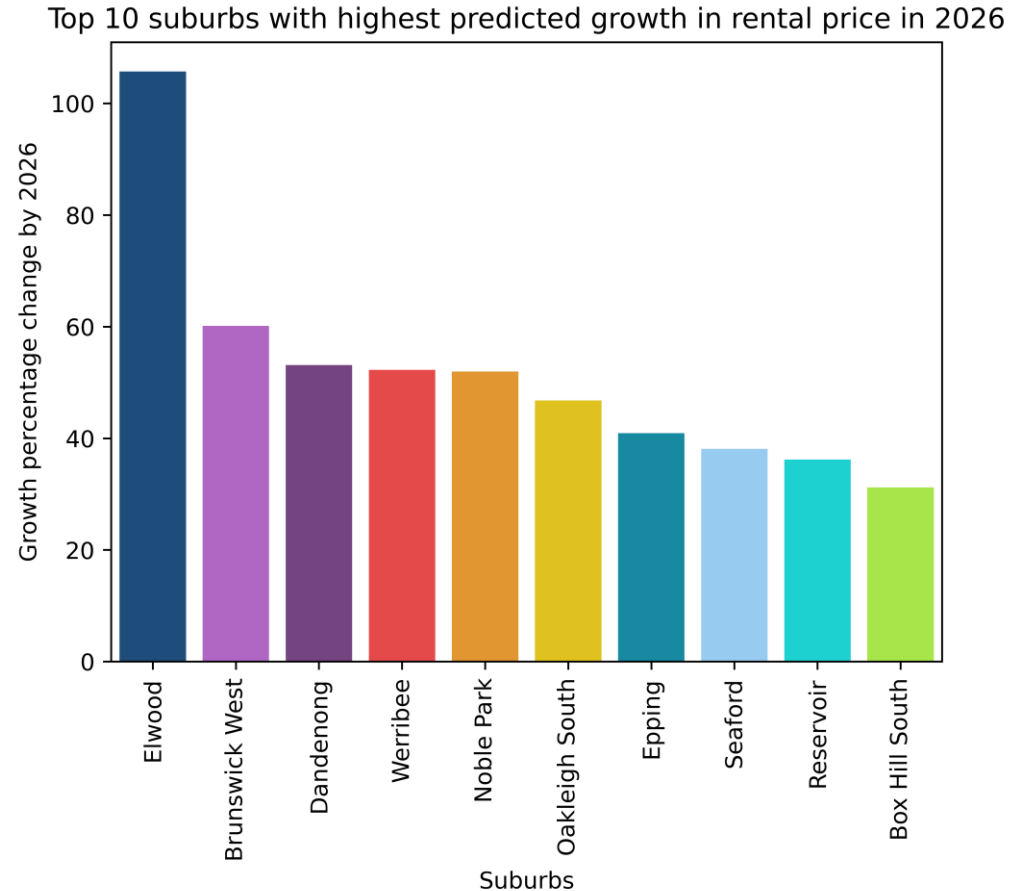
MOST LIVEABLE & AFFORDABLE SUBURBS

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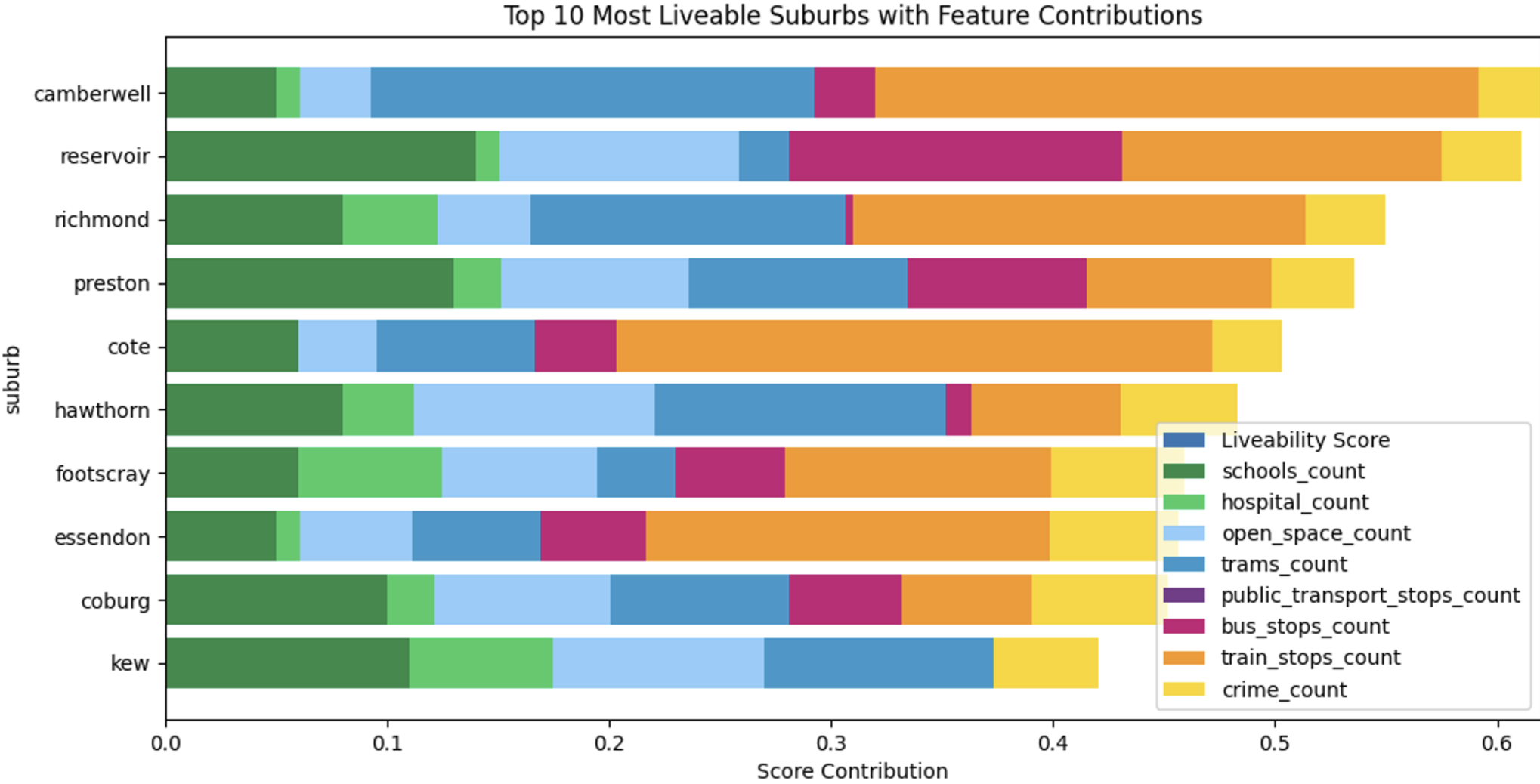# LIVEABILITY

DEFINING LIVEABILITY

All our liveability factors are linked to the <u>United Nations Sustainable Development Goals</u>:

- Access to **healthcare and hospitals**
- Access to **schools, childcares, and universities**
- Access to **open and green space**
- Connectivity through **public transport**
- Absence of **crime**

VICTORIA'S MOST LIVEABLE SUBURBS

Top 10 Most Liveable Suburbs with Feature Contributions

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AFFORDABILITY

DEFINING AFFORDABILITY

'The state of being cheap enough for people to be able to buy'

Cambridge Dictionary,2023,Affordability, https://dictionary.cambridge.org/dictionary/english/affordability

VICTORIA'S UNDERVALUED SUBURBS

Whilst being very liveable, renters will not tolerate further rental increases in Camberwell or Reservoir

Hawthorn, Essendon and Footscray are currently undervalued

Top 10 Most Livable and Affordable Suburbs

Legend:
- Livability (blue)
- Affordability (green)

X-axis (Suburb): camberwell, reservoir, preston, richmond, hawthorn, essendon, footscray, coburg, kew, brunswick

Left Y-axis: Livability Score (0–100)
Right Y-axis: Affordability Score (0–40)

LIMITATIONS AND DIFFICULTIES

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DATA & TIME LIMITATIONS

Some **datasets/features unable to be used** due to **missing data**

Insufficient time to explore **additional datasets/features**

Insufficient time and data to use more complex models

Limited knowledge of **future infrastructure** (upcoming public transport plans are not published)

API quota (**1000 rows** per day)

FINAL RECOMMENDATIONS

FINAL RECOMMENDATIONS

Significant factors in predicting rental price:

Distance to CBD | Postcode

No. of Bedrooms | Income

Recommendations:

When **client is leasing** property:

- Predict possible demographics of interested parties based on first 3 factors

- Determine weekly rent price based on possible interested demographics

Affordability and Liveability Recommendations:
When **client is leasing** property:

- Rental prices in Hawthorn, Essendon and Footscray should be revised and brought in line with current market conditions

- Camberwell and Reservoir rent should not be lifted, at risk of renters looking elsewhere

Top 3 suburbs by growth:

- House: Docklands, Nhill, Meeniyan

- Apartment: Portland, Burwood, Box Hill

- Townhouse: Elwood, Dandenong, Oakleigh South

Recommendations:

For **investors**:

- Most profitable to invest in houses and apartments in the aforementioned suburbs

For **clients living in the above suburbs** and **planning to sell**:

- Delay selling property (if possible)

- Rent out property instead

FEASIBILITY OF PROJECT

<u>CURRENT VALUE PRODUCED</u> (within 6 weeks)

Insights

- Understand determining factors of rental price
- Suburbs rising in price and potential reasons
- Most liveable and affordable suburbs

Quality of Model

- Performing well (low error), despite simplicity of model

<u>POTENTIAL VALUE FOR FUTURE EXPLORATION</u> (total project length ~ 3-4 months)
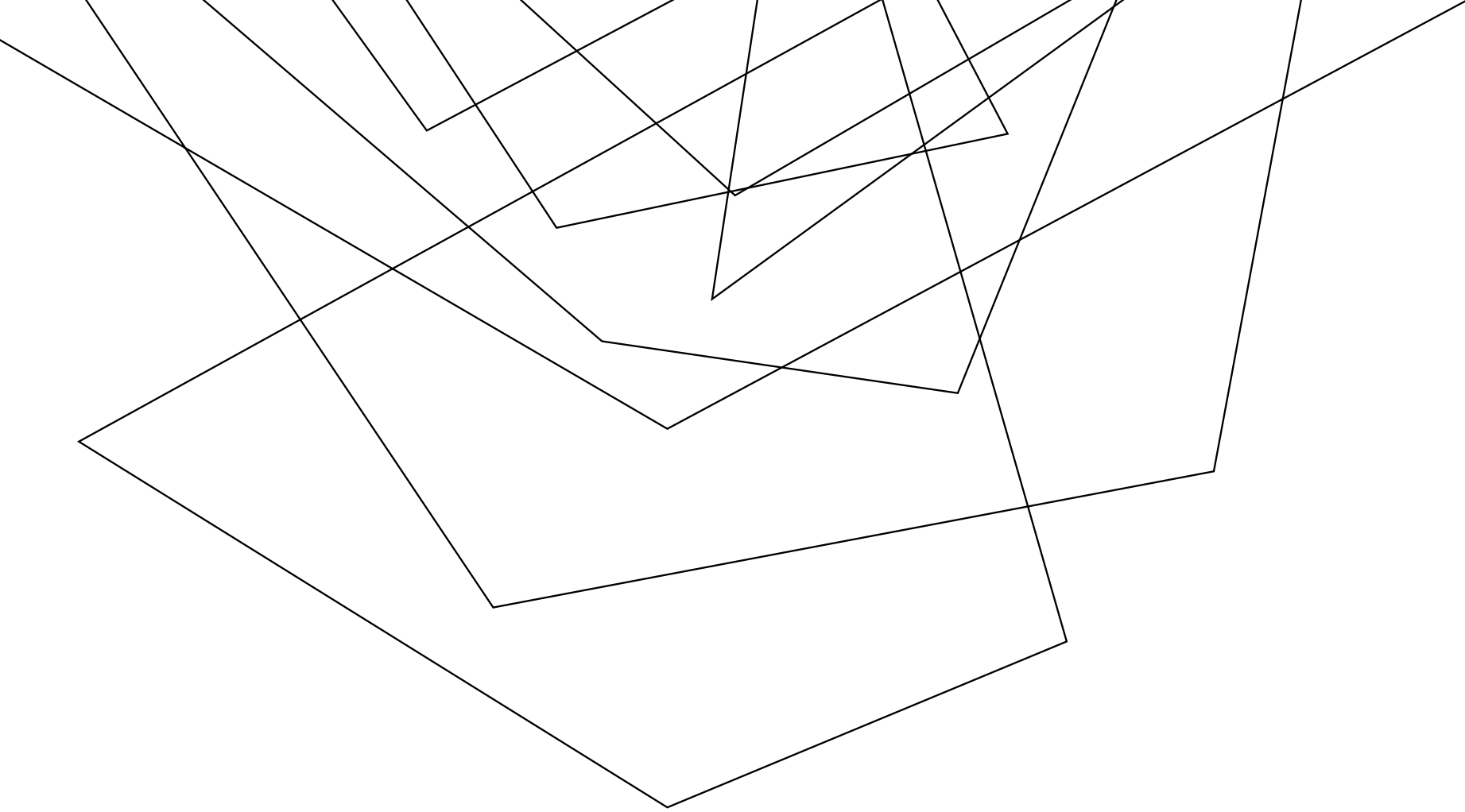
Other Features

- Consider other economic factors: expected future dwellings, expected net immigration, interests rates, gov. incentives

Granularity

- Instead of using affordability based on average income, divide population into different categories by income, then determine affordability for each of these groups

Model Choice

- Deep Learning Time Series forecasting: Transformer-based models (eg. Autoformer, N-BEATS)

THANK YOU!