

Phase 3 Case Study

Victorian Education

Elements of Data Processing

Name: Akira Wang

Before we start...

- Bad formatting (symbols such as *, Y, <, A filled the dataset)
- Missing statistical data on schools as well as large variances in housing prices
- Excel parsing (spreadsheets imported were terribly formatted and easier to fix in Excel)
- Merging housing prices with the VCAA dataset - same localities but different names (Example ALBERT PARK-MIDDLE PARK-WEST ST KILDA = ALBERT PARK, after fixing it an extra 44 localities were recovered)
- For the sake of this analysis I have ignored adult institutions and schools with less than 20 students under recommendation from VCAA's Head Data Analyst

Full Slides, Analysis and Details:

<https://github.com/akiratwang/Victorian-Education-Analysis/>

Datasets:

1. 2016-2017 VCAA School Dataset (Obtained from the Head Data Analyst of VCAA)
2. 2016-2017 Housing rent cost in Victoria quarterly
(<https://www.data.vic.gov.au/data/dataset/rental-report-quarterly-moving-annual-rents-by-suburb>)
3. 2016-2017 State budget for Education and Training
(<https://www.data.vic.gov.au/data/dataset/state-budget-2017-18-department-of-education-and-training-financial-statements>)
4. 2016 On Track Year 12 or equivalent
(<https://www.data.vic.gov.au/data/dataset/2016-on-track-year-12-or-equivalent-completers-student-level-destination-data>)
5. 2015-2016 Department of Education and Training Contractors
(<https://www.data.vic.gov.au/data/dataset/det-contractors-2015-16>)

Research question

What are the major key factors that determine a school's performance and the outcome of students in Victoria (through the VCAA education system)

Why?

- Numerous changes in VCAA study designs (2015-2017)
- Increase in demand for better education
- See if the location of a school as well as the socio-economic standards of households affect school performances
- Does the sector of school matter
- Is the education funding used by VCAA working

Main topics of research

High Performing Schools

What separates them from normal schools?

- Selective entry?
- Number of students?
- Variety of subjects offered?
- Location?

Locality & educational availability

Does the locality influence education?

- What's the correlation?
- Differences between localities
- Do certain suburbs offer a larger variety of school sectors?

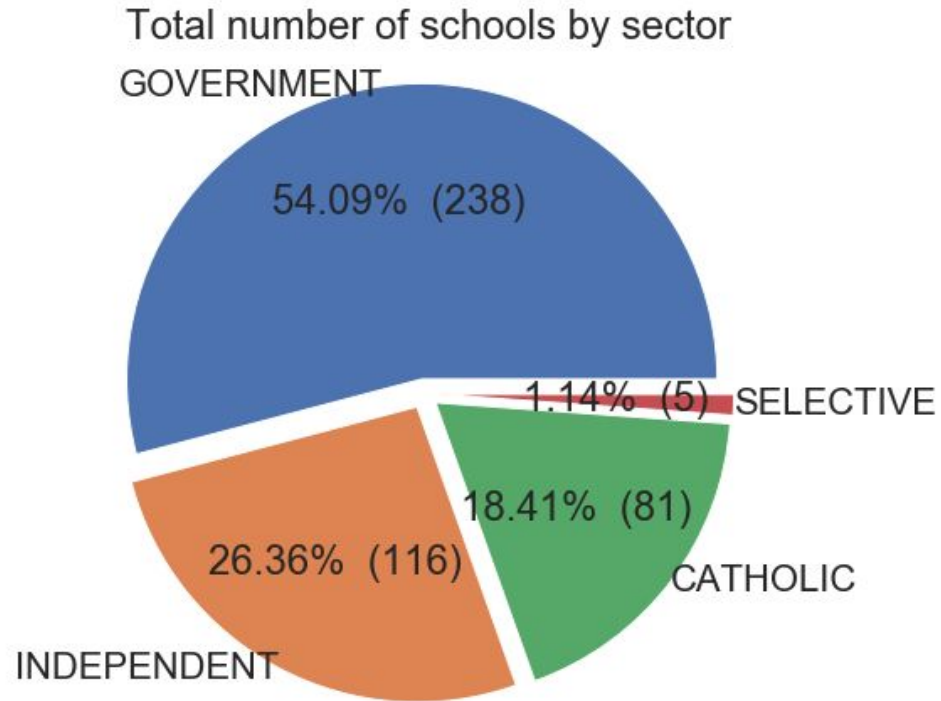
Diversity of Graduate Pathways

What do the statistics of graduate pathways suggest?

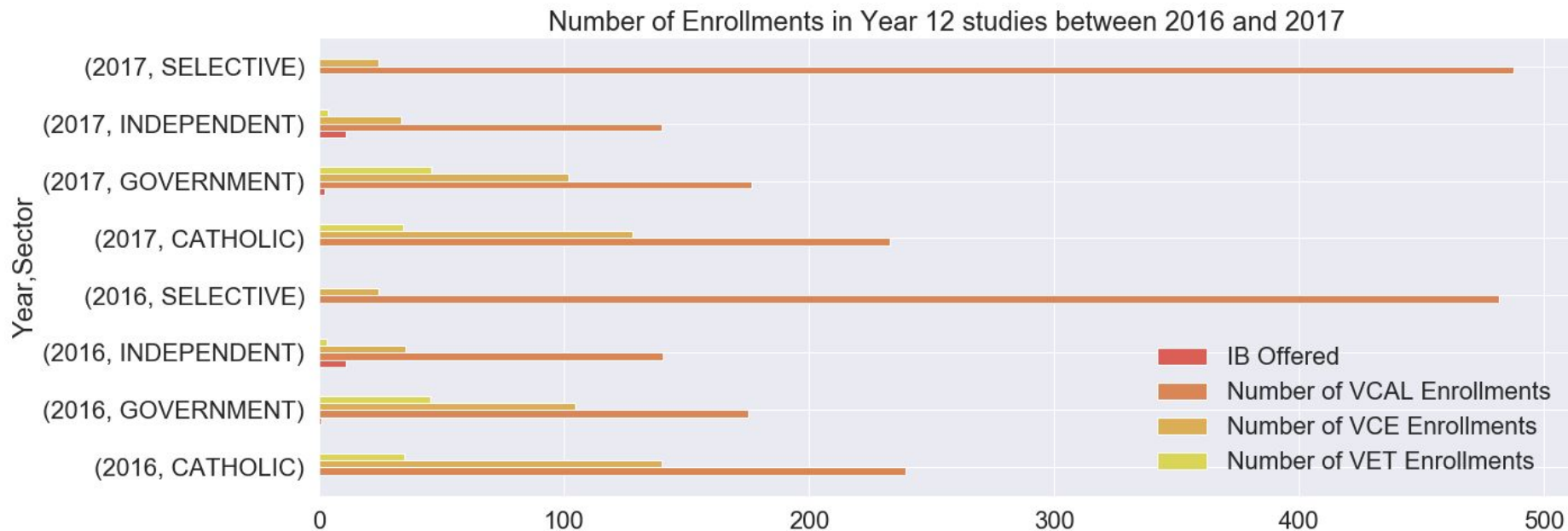
- Which sector is better for pathways
- Where do graduates mainly go

General Distribution of Sectors

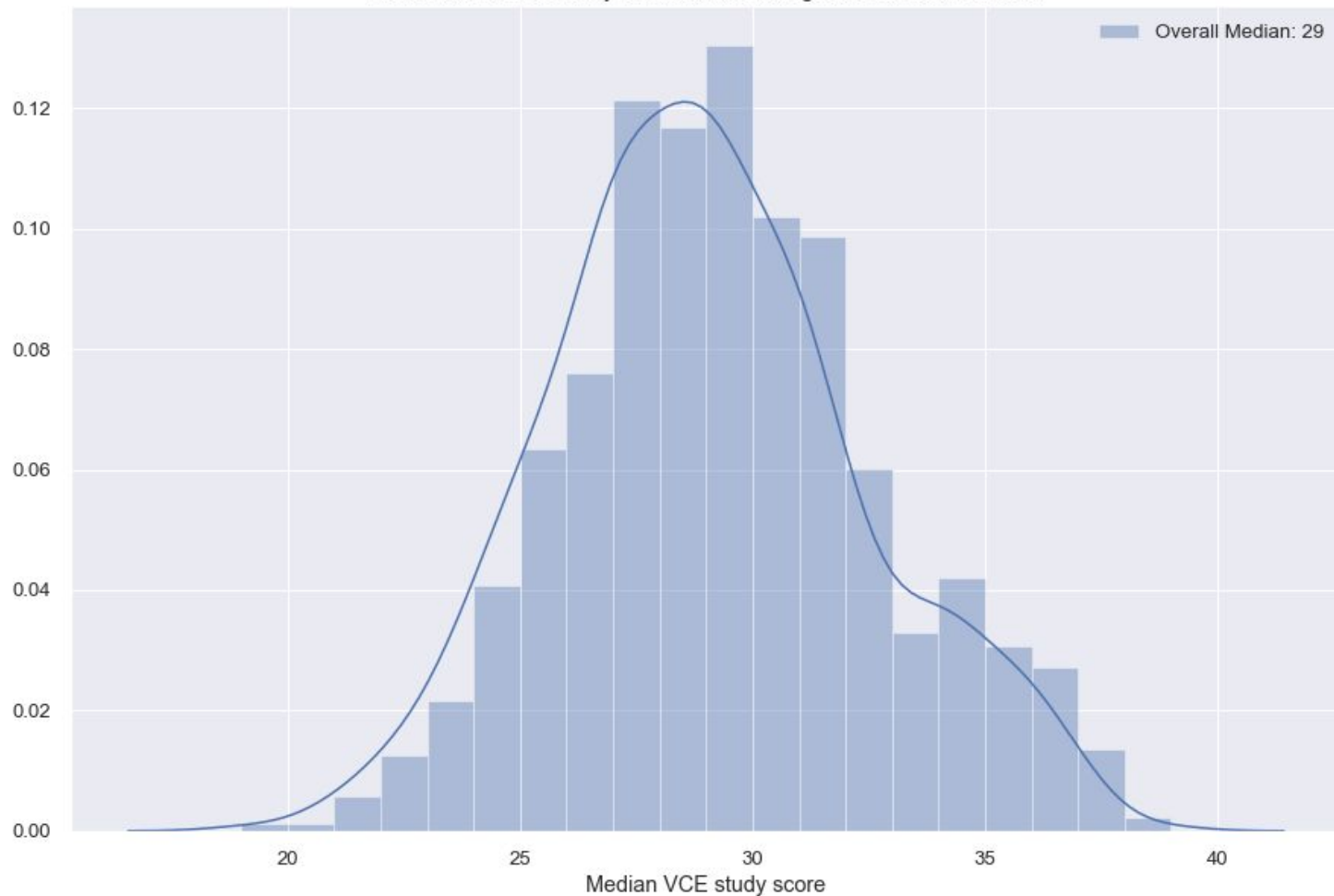
Selective schools are funded by the government



Average number of student enrollments

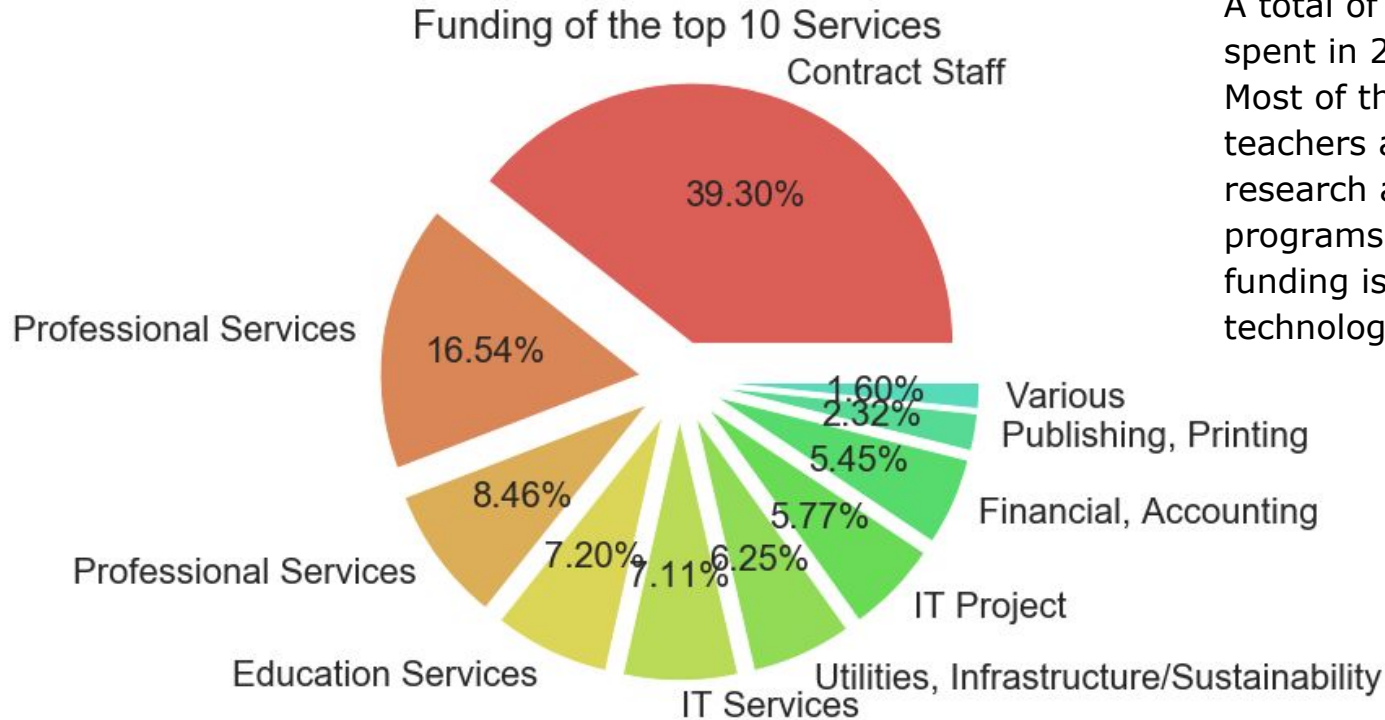


Distribution of VCE study scores not including Adult or Small Schools



The actual median is 30 (calculated using a bell curve), but for the sake of this analysis I have ignored adult institutions and schools with less than 20 students under recommendation from VCAA

Education Funding

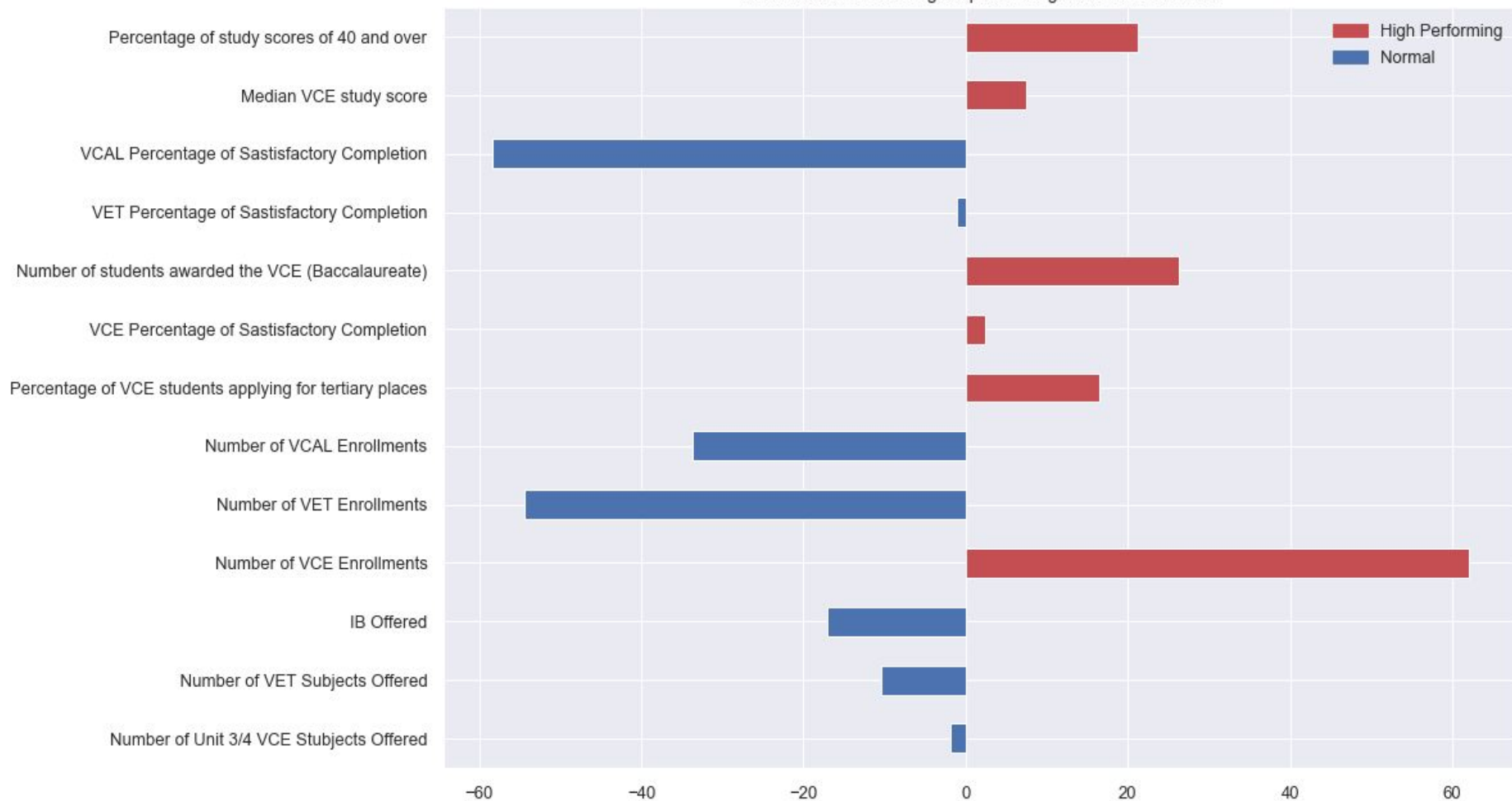


A total of \$133,586,693 was spent in 2016 on contractors. Most of the funding goes to teachers and staff, followed by research and development programs. Quite a fair bit of the funding is also poured into technology

What separates a high achieving school from a normal school?

Schools with a median study score of 35 and above are classified as high achieving / performing

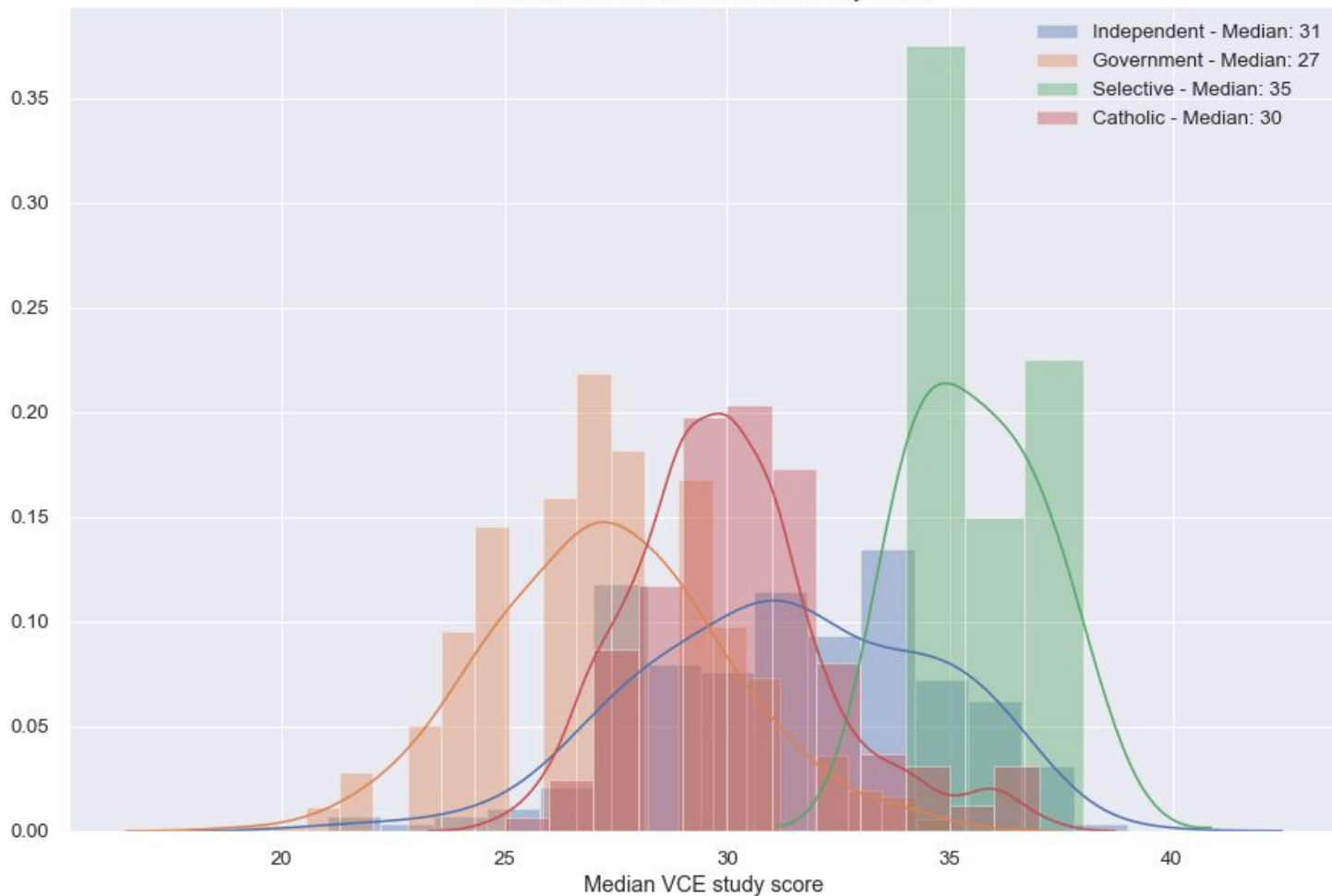
Differences between higher performing and normal schools



The graph before was calculated using the differences of mean. From the visualization we can see:

- Higher performing schools will have about a 20% increase in proportion of study scores over 40 as well as a hefty increase of 8 median study scores (27 vs 35 on the bell-curve)
- Due to the scaling of subjects (languages scale higher), students who complete languages will result in a higher study score and also be awarded the Baccalaureate
- Aside from selective schools, the next highest performing sector is the independent sector (will show next slide) which have a higher number of students applying for tertiary places (an we will see this later on in the slides again)
- High performing schools also have a higher number of student enrollments but will be less likely to offer IB - this is most likely due to the fact that high achieving students studying IB will not count towards the schools VCE result thus lowering the schools performance

Distribution of Sector Median VCE study scores



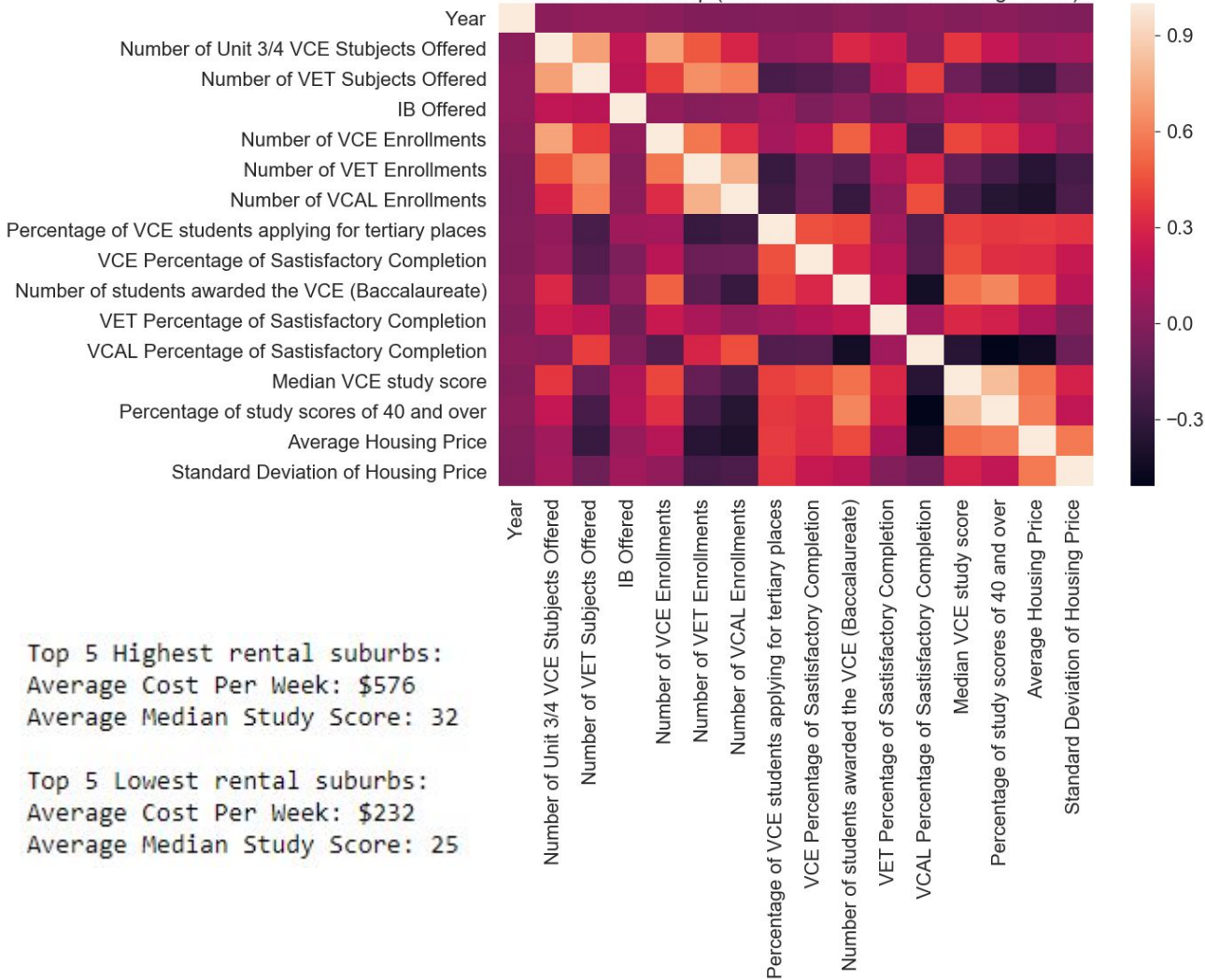
Selective entry schools perform well above any other sector overall.

As stated before, an 8 study score difference between higher performing schools compared to normal schools is quite large (60 ATAR vs 90 ATAR)



Does the locality influence
education?

Correlation Heatmap (School attributes and Housing Prices)



Correlation:

Median VCE study score: 0.5542

Percentage of study scores of 40 and over: 0.5899

Although correlation does not imply causality, it's a plausible argument to assume that households able to afford higher rents will be able to afford better lifestyles.

Note that this is only for the government sector as other sectors may take students regardless of location

Top 5 Highest rental suburbs:
Average Cost Per Week: \$576
Average Median Study Score: 32

Top 5 Lowest rental suburbs:
Average Cost Per Week: \$232
Average Median Study Score: 25

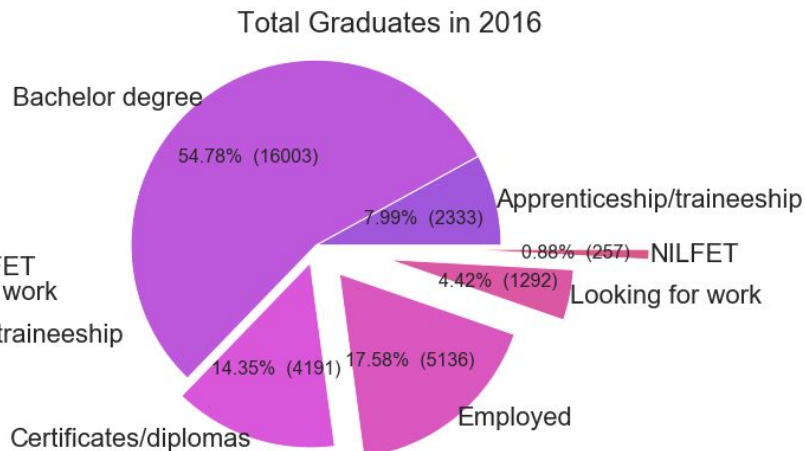
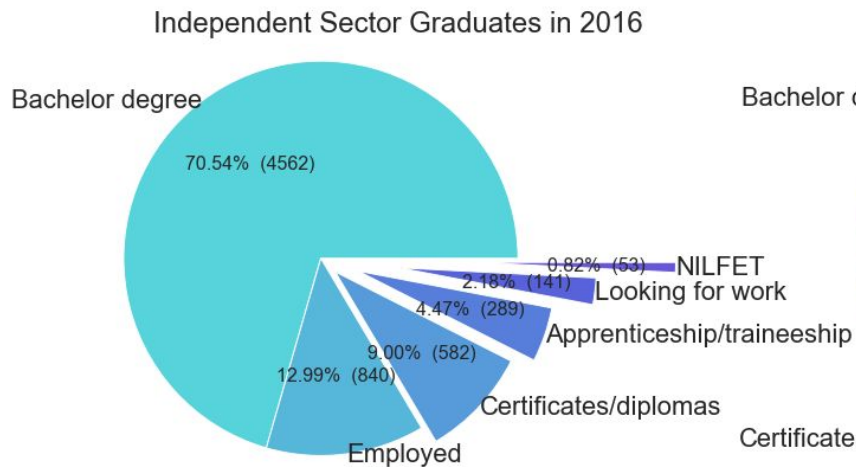
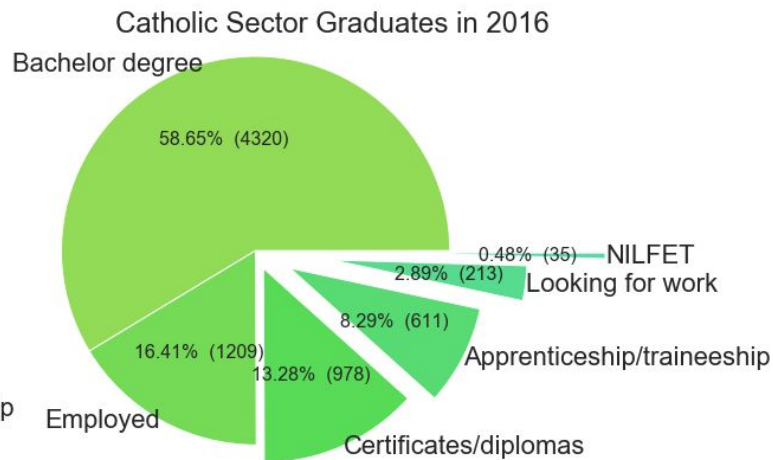
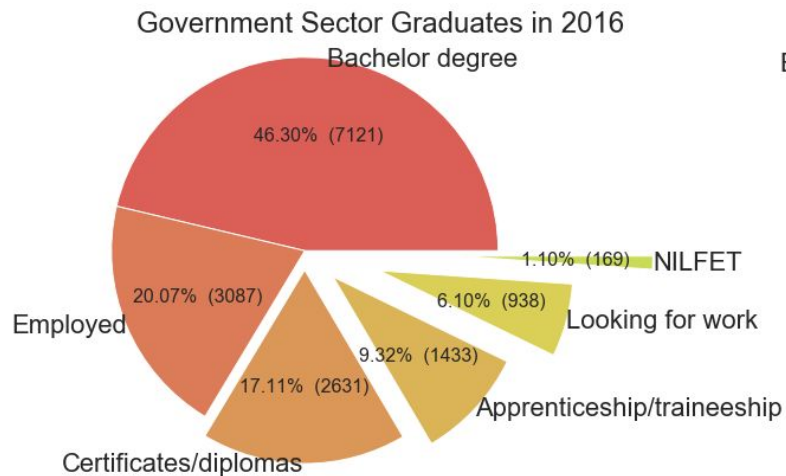
Top 10 suburbs with the best availability

	Average Housing Price	Median VCE study score	Schools	Schools offering IB
Locality				
KEW	481.000	33.000000	10	3
BERWICK	385.000	32.428571	10	0
SHEPPARTON	266.875	27.500000	10	0
WERRIBEE	333.125	30.500000	9	2
BALLARAT	270.625	30.666667	9	0
CRANBOURNE	370.000	28.000000	9	0
ESSENDON	377.500	29.500000	9	0
BROADMEADOWS	339.375	28.800000	8	0
CANTERBURY	462.875	33.500000	8	0
WARRNAMBOOL	290.625	29.000000	8	0

From the information above, we can already see it. Sorting by median study scores, Kew and Canterbury (both eastern suburbs) offer a large number of schools as well as a higher median study score but are on average \$150 more expensive per week to live in. Overall, Kew offers the best with 10 schools in which 3 offer IB and a 33 median study score.



What do the graduate pathways
look like?



2016 Graduate Pathway Statistics

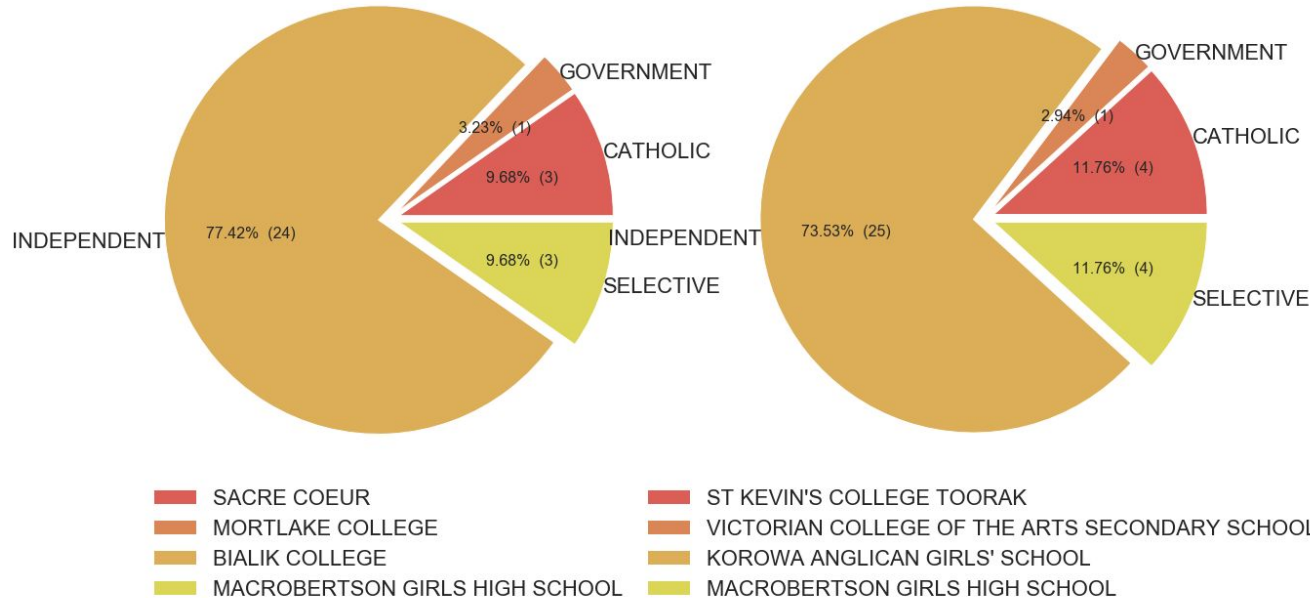
NILFET: *Not in the labour force, employment or training*



Statistics of the Top Schools

2016 Top Performing Schools by Sector

2017 Top Performing Schools by Sector



Although selective schools perform highest overall, the independent sector still dominates top performing schools in the rankings. At a higher cost (since they are not funded by the government), they will also yield better results as well as offering IB if students wish to take it.

	Sector	Locality
School		
BENDIGO SENIOR SECONDARY COLLEGE	GOVERNMENT	BENDIGO
MACROBERTSON GIRLS HIGH SCHOOL	SELECTIVE	MELBOURNE
MELBOURNE HIGH SCHOOL	SELECTIVE	SOUTH YARRA
BIALIK COLLEGE	INDEPENDENT	HAWTHORN EAST
WERRIBEE SECONDARY COLLEGE	GOVERNMENT	WERRIBEE

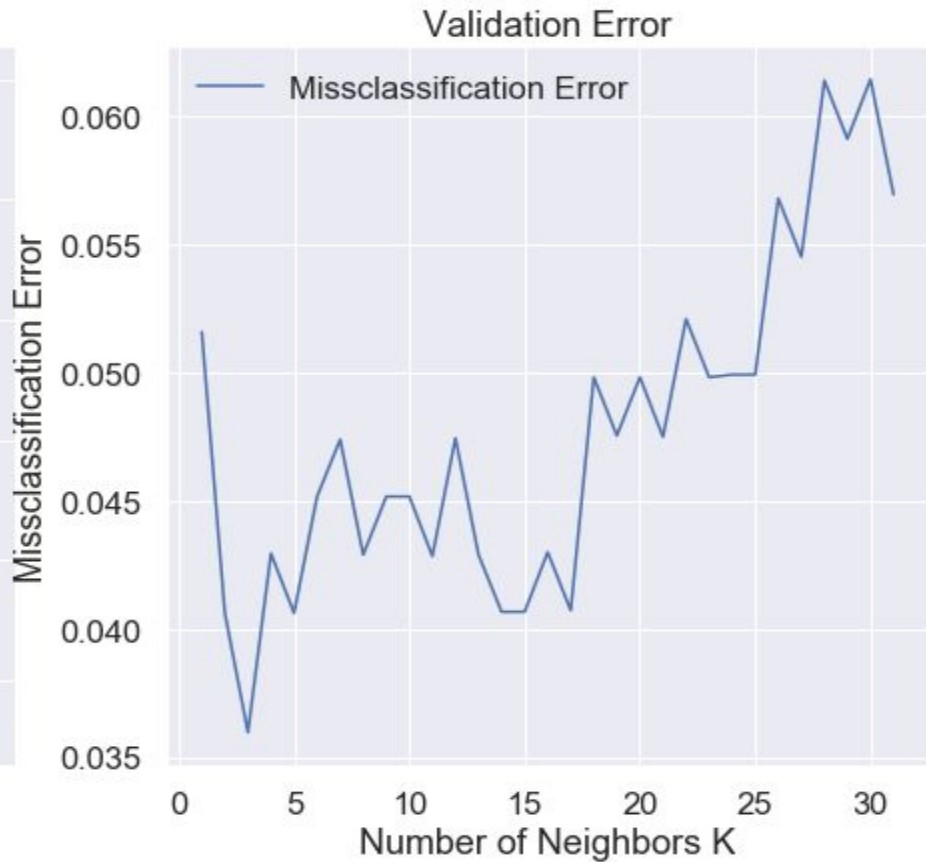
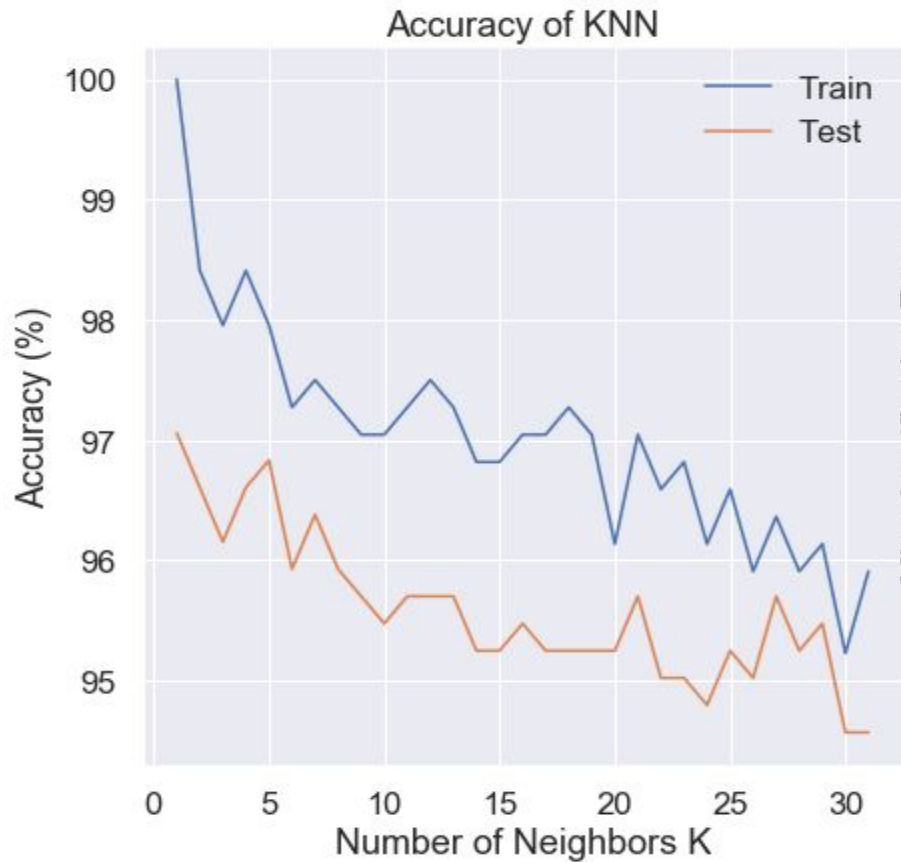
Top 5 overall schools boasting in:

- High number of student enrollments (Average of 500+)
- High number of subject variety (75+)
- High average median study score (34)
- At least 95% complete VCE with a pass and roughly 90% apply for tertiary education

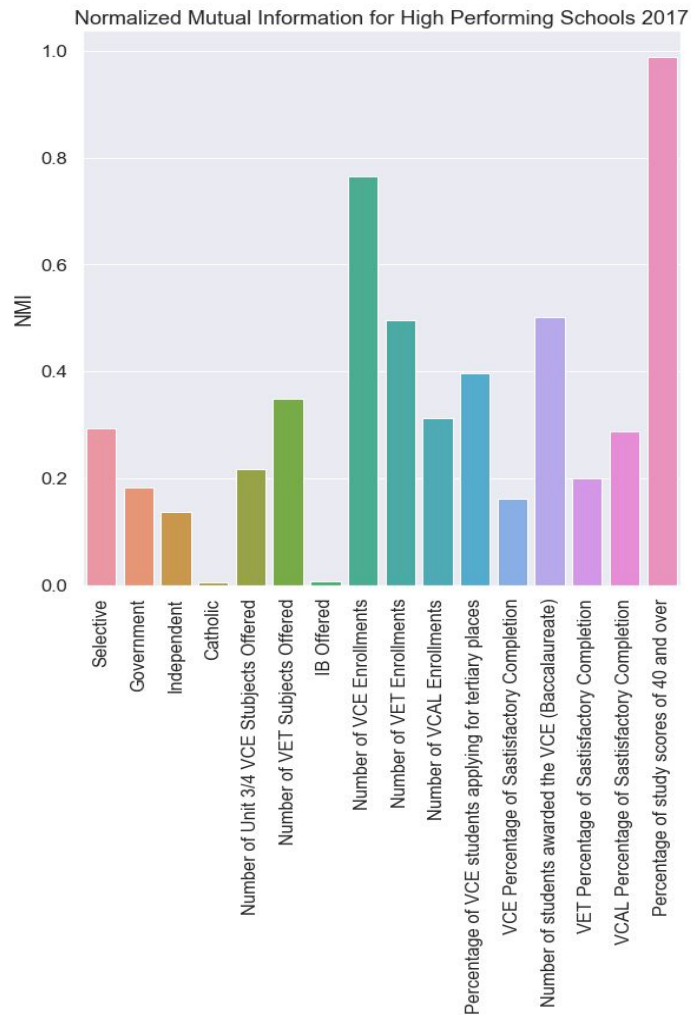
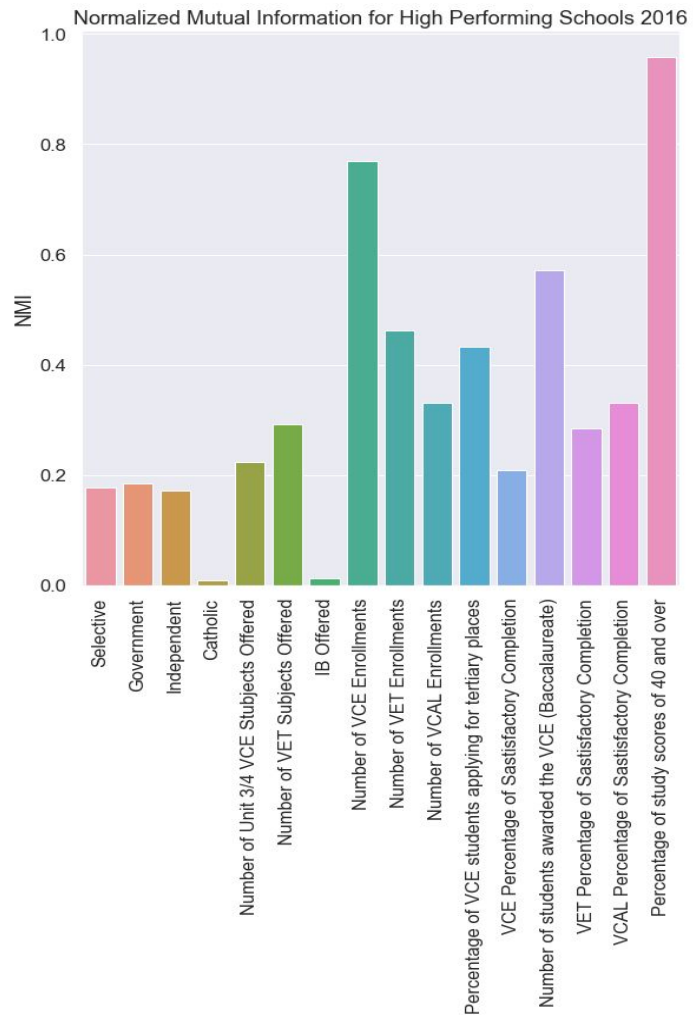
Note that Bendigo SSC and Werribee SC are **NOT** high achieving schools, but are overall top due to the sheer number of variety and student enrollments

Labelling and Predicting future High Performing Schools

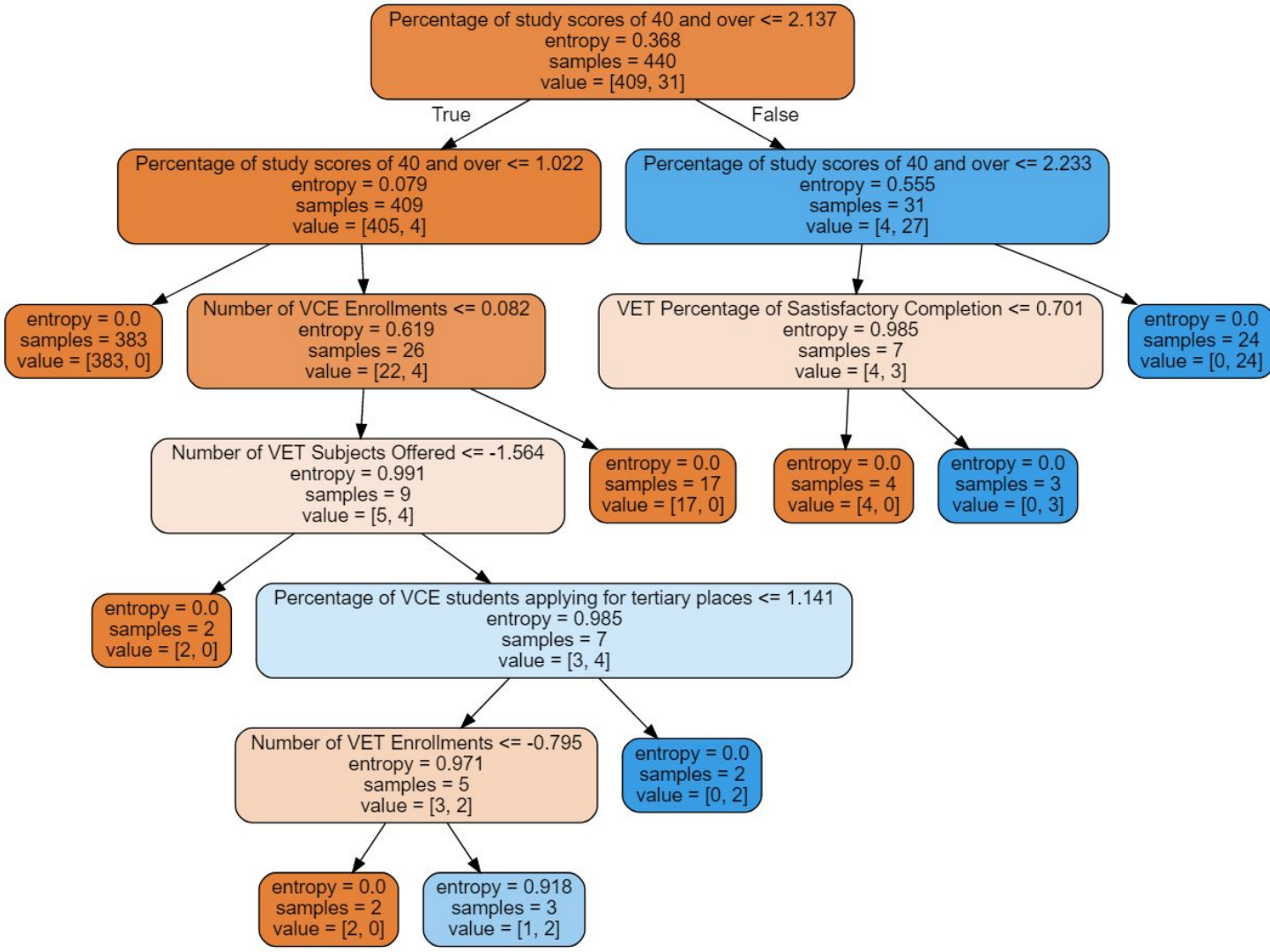
Using the year 2016 as the training data to predict the schools of 2017



With the optimal number of neighbours given as [3] - misclassification error of [0.03596195]:
Train Accuracy: 97.95%
Test Accuracy: 96.15%



The NMI suggests that the most important factor of a school is relative to the number of student enrollments and the percentage of those students that achieve a study score over 40



As expected, using an optimal max_depth of 6 - the results verify that the percentage of study scores over 40 is the biggest factor that determines a schools performance. The overall trend can be fitted to a linear regression model to predict schools which can grow into high achieving schools

97.74% with train accuracy 99.77%

Conclusion and Advice

- A high performing school will generally have a higher student enrollment count within a location with a higher rental cost per week.
- For households enrolling their children into a “local” school, their best chance would be to move to the Eastern suburban areas of Victoria which perform better compared to other suburbs
- Students that generally attend selective entry schools will perform significantly better compared to any other sectors as expected
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- Sending your children to an independent school will yield in a better education compared to a local school - but is it really worth the money? (The cost can be from anywhere between 10k to 50k a year)
- Whilst most independent schools result in graduates pursuing a tertiary education, those in the government sector may choose to enter the workforce straight after graduating. Overall, half the students will end up studying at a tertiary level
- And yes, the location of your average local government school plays an important role in how it performs.