Job Market Data Analysis

2030ICT/7030ICT | Introduction to Big Data Analytics | Assessment 3 Part 2

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Data Analysis and Interpretation

Analysis by comparison

Nuance in the dataset can be explored further by drawing a comparison between subsets. For instance, we may select data from two cities, Sydney, and Brisbane, to contrast them. Sydney has more job listings with 46357, while there are 16538 job listings in Brisbane. Most of these listings for both Sydney and Brisbane are full time, followed by contract/temp, casual/vacation, and lastly part time (Table 1).

Job Type	No. Of Job Listings	
	Sydney	**Brisbane**
Casual/Vacation	2542	1543
Contract/Temp	8420	3164
Full Time	32267	10431
Part Time	2277	988
Total	46357	16538

Table 1: Job listings by type in Sydney and Brisbane

For both Sydney and Brisbane, the top sector is Information & Communication Technology (ICT). Trades & Services, Hospitality & Tourism, and Manufacturing Transport & Logistics are among the top for both locations. However, Accounting takes the 3rd ranking in Sydney, while in Brisbane it is taken by Healthcare & Medical (Table 2). Figure 1 illustrates these sector distributions, highlighting Sydney's larger stake in ICT.

Sydney		**Brisbane**	
Classification	**No. of Job Listings**	**Classification**	**No. of Job Listings**
ICT	6999	ICT	2041
Trades & Services	3181	Trades & Services	1627
Accounting	3105	Healthcare & Medical	1341
Hospitality & Tourism	3081	Manufacturing, Transport & Logistics	1338
Manufacturing, Transport & Logistics	2536	Hospitality & Tourism	1032

Table 2: Top 5 sectors in Sydney and Brisbane

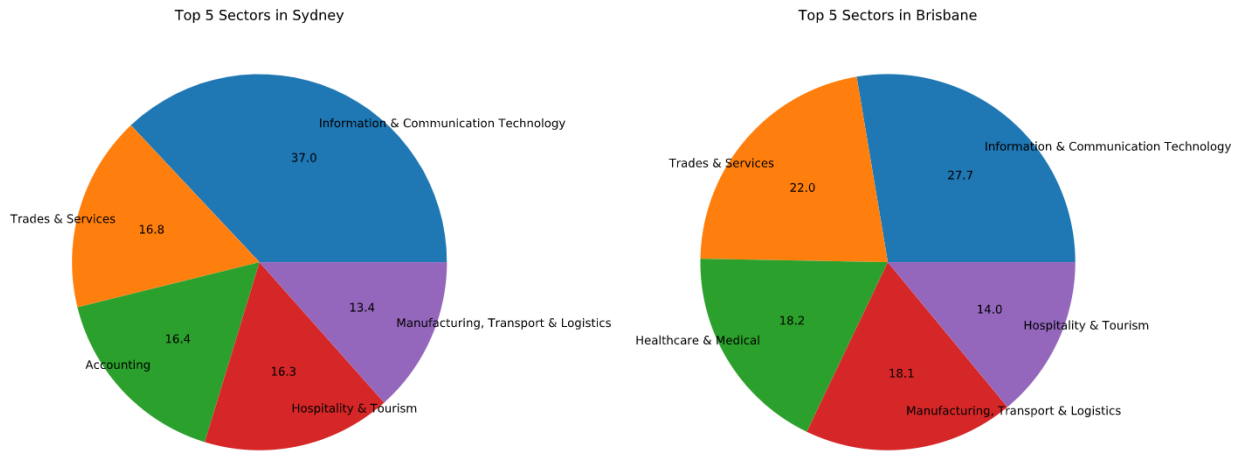

Figure 1: Top 5 Sectors in Sydney & Brisbane

The majority of job listings lie within the 0 to 30 salary range (Table 4). By finding the distribution of salary ranges and summing this percentage by the average of each range it is clear that Sydney is 9.2% more well paid than Brisbane.

	No. of Job Listings	
Salary Range	**Sydney**	**Brisbane**
0 – 30	8427	2962
30 – 40	3035	1192
40 – 50	4406	2271
50 – 60	3751	1481
60 – 70	4152	1611
70 – 80	3850	1384
80 – 100	3702	1317
100 – 120	4330	1494
120 – 150	4228	1076
150 – 200	4718	1202
200 – 250	1758	548

Table 4: Job listings by salary range in Sydney & Brisbane

According to the number of jobs listed, the top 5 companies in Sydney are Jora Local, Robert Walters, Design & Build, Bluefin Resources Pty Limited, and Paxus. In Brisbane, Jora Local, u&u Recruitment Partners, Hudson, The University of Queensland, and Programmed Skilled Workforce. Although, the large volume of listings is due to them providing an avenue for recruitment.

It is evident from the dataset that Sydney is better for employees. The amount of job listings in comparison to Brisbane show that there is a higher demand. In addition, the salary distributions show that Sydney offers better pay, as there are more opportunities for higher paying jobs.

Analysis by time

Figure 2 shows that October had more than double the job listings on Seek.com compared to November. However, this can be assumed due to the shorter time frame for collecting data in November with data only being retrieved for 13 days shown in Figure 5 compared to Octobers time frame of 31 days as seen in Figure 4.

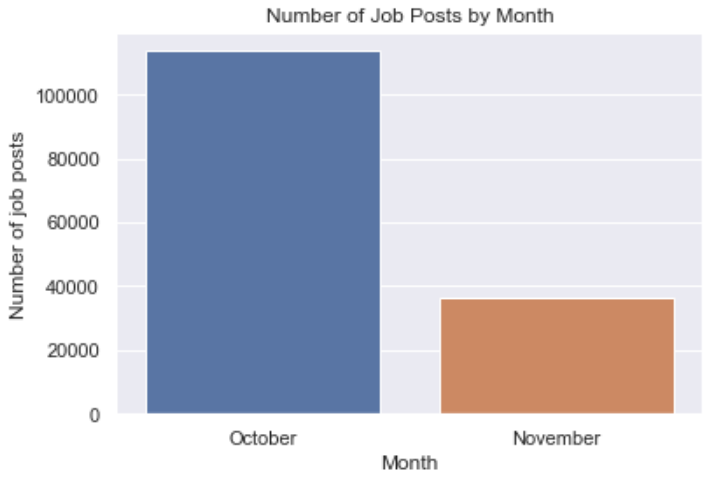

Figure 2: Number of Jobs per month

When looking at the overall data of both months it can be seen when visualizing the jobs per day of the week in Figure 3, that there is a large decrease in job listings on the weekend compared to weekdays which is to be expected as Monday to Fridays are considered working days and therefore during these days is when most of the job listings timeframes would be set. Monday and Tuesday as well as Thursday and Friday show similar job listing numbers in the week, however, Wednesday shows a significant increase in job listings with 4000+ jobs compared to the second highest job listing day Monday with around 3000 job listings. This abnormal increase in job listings could be caused due to a high likelihood of employers listing job offerings for applicants with less likelihood of interruption from holidays that usually occur on Monday or Friday for long weekends.

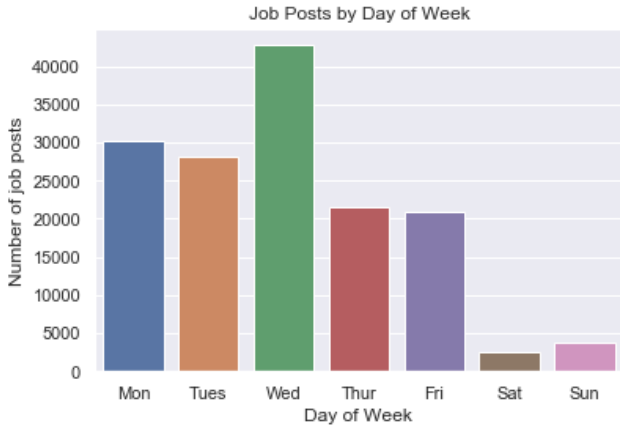

Figure 3: Jobs per day of the week

Figure 4 and 5 visualizes the number of job offerings each day during October and November. The Figures both show a pattern of job listings having regular spikes in number of job listings throughout the month and then decreasing sharply again. This pattern is better represented in Figure 6 with both months combined on a single graph and visualized as a line graph for job trends with focus on the big 5 cities. From Figure 10, Sydney, Melbourne, Brisbane, and Perth show the largest spikes which are drastically larger than any other city listing jobs. From these large peaks it can be assumed that the large increases in job listing in Figure 4 and 5 are most likely job listings from these 4 cities. However, the 5th city Adelaide shows near identical trends to the other cities and therefore is not as influential as the other big cities. The number of jobs listing per month in these 5 cities can be correlated to the geography, population, and job opportunities of the cities. Cities on the eastern coast having a higher population then western cities due to activities such as tourism and international connections such as trades. Therefore, in these higher density locations there are larger amount of job offerings and job sectors.

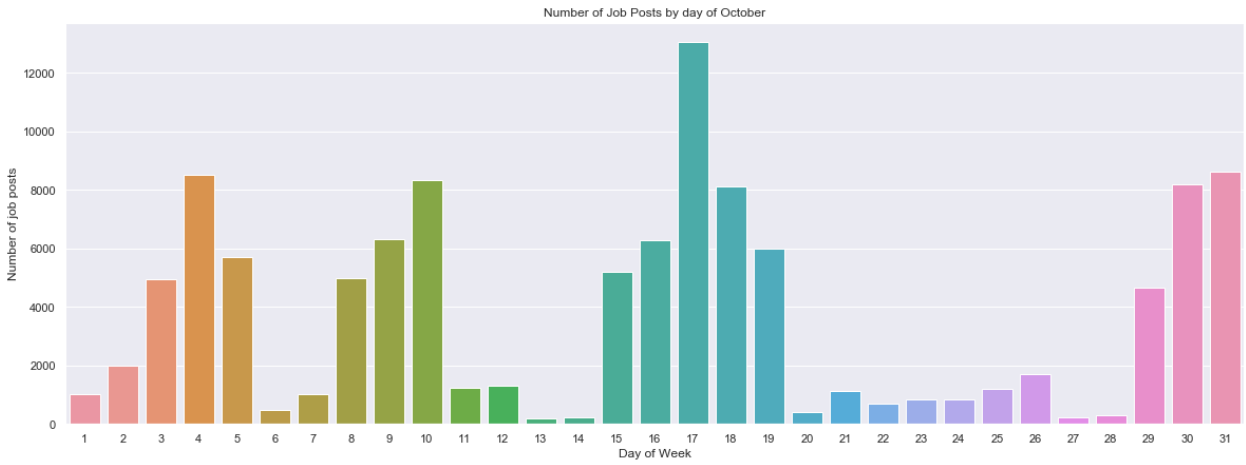

Figure 4: Number of jobs per day in the month of October

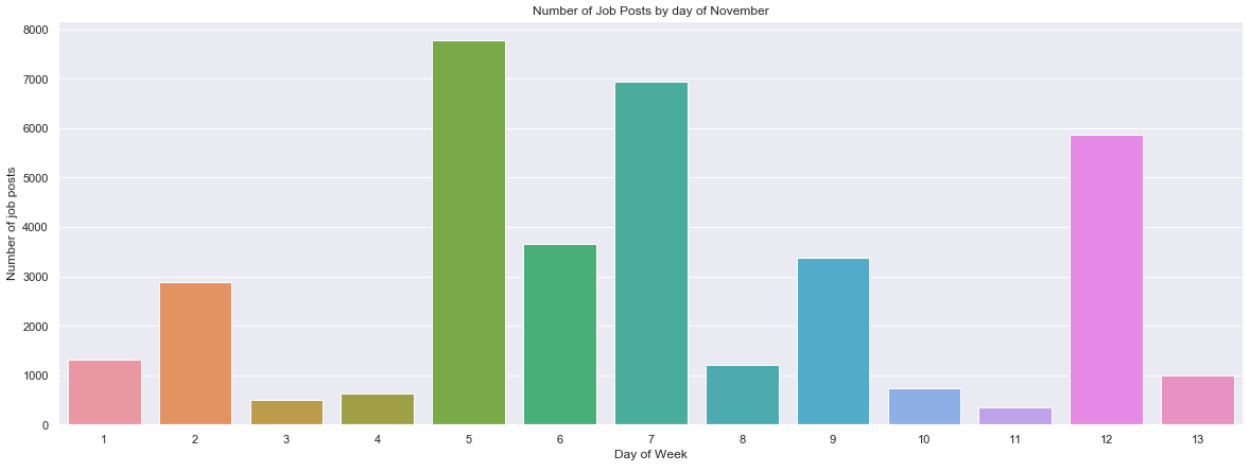

Figure 5: Number of jobs per day in the month of November

Figure 6 shows that as time goes on there are large peak in job listings around the 2000+ count throughout the month that last between 3 and 5 days then return down to below 500 job listings per day. The pattern can be assumed to be caused by postings of jobs from employers every week to refresh the job offering list which would make sense as the spikes in job listings are in near week intervals.

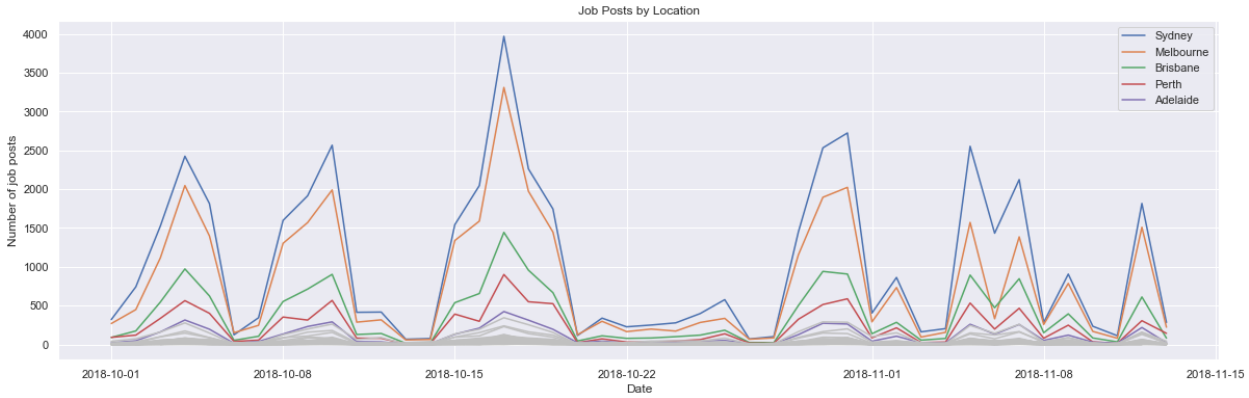

Figure 6: Trending job postings for the big 5 cities

Forecasting and skill extraction

Figure 7 and 8 visualise the number of job postings per day, along with a 7- and 30-day moving average for the full period represented in the data. It is clear from this graph that the 7-day moving average is a far better prediction than the 30-day moving average as the 30-day moving average results in an overly smoothed result. Due to this over smoothing the substantial changes in the data have little influence on the 30-day moving average while the 7-day moving average shifts to reflect these changes much more quickly. However, it is also clear that the moving average method of prediction is not particularly accurate in either case due to the extreme inconsistency and spikes in the data which cannot be predicted.

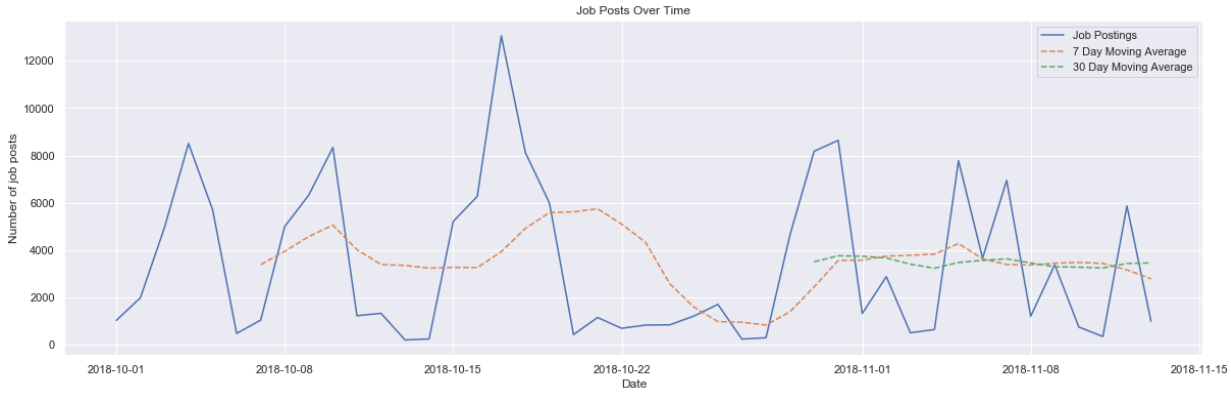

Figure 7: Number of job postings per day with 7- & 30-Day moving average

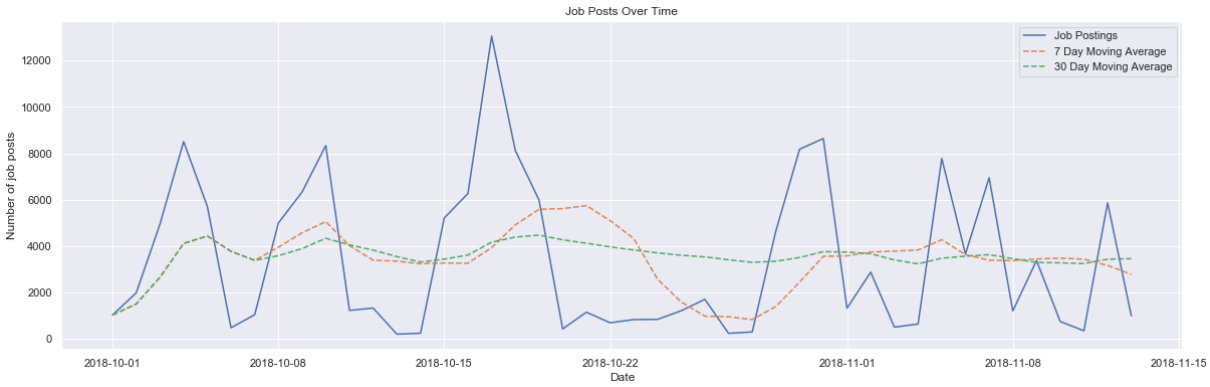

Figure 8: Number of job postings per day with 7- & 30-Day moving average including earlier data

The following word cloud was created with TF-IDF analysis of the requirements data for jobs in the Information & Communication Technology sector. To produce this the sklearn TF-IDF Vectorizer was used.

Information & Communication Technology

TF-IDF Analysis of Requirements

Discussion

Scenario 1

From the data set there are 5 big locations within Queensland: Brisbane, Gold Coast, Sunshine Coast, Gladstone & central QLD, and Rockhampton & Capricorn Coast. With consideration of Toms goal to have a job with a stable income larger than or equal to 80 thousand dollars, there are a total of 6,667 possible jobs for Tom (Table 5). Figure 9 presents the top 5 job sectors across these locations showing ICT being the most popular job listing with 23.2% followed by Healthcare & Medical with 12.7%. From these results it would be safe to assume Tom should apply for a major in the Information & Communication Technology (ICT) sector to more likely to receive a job that has an income of greater or equal to 80 thousand dollars. However, If Tom decides not to pursue ICT, He could apply for the second most popular job offering within the Healthcare & Medical field.

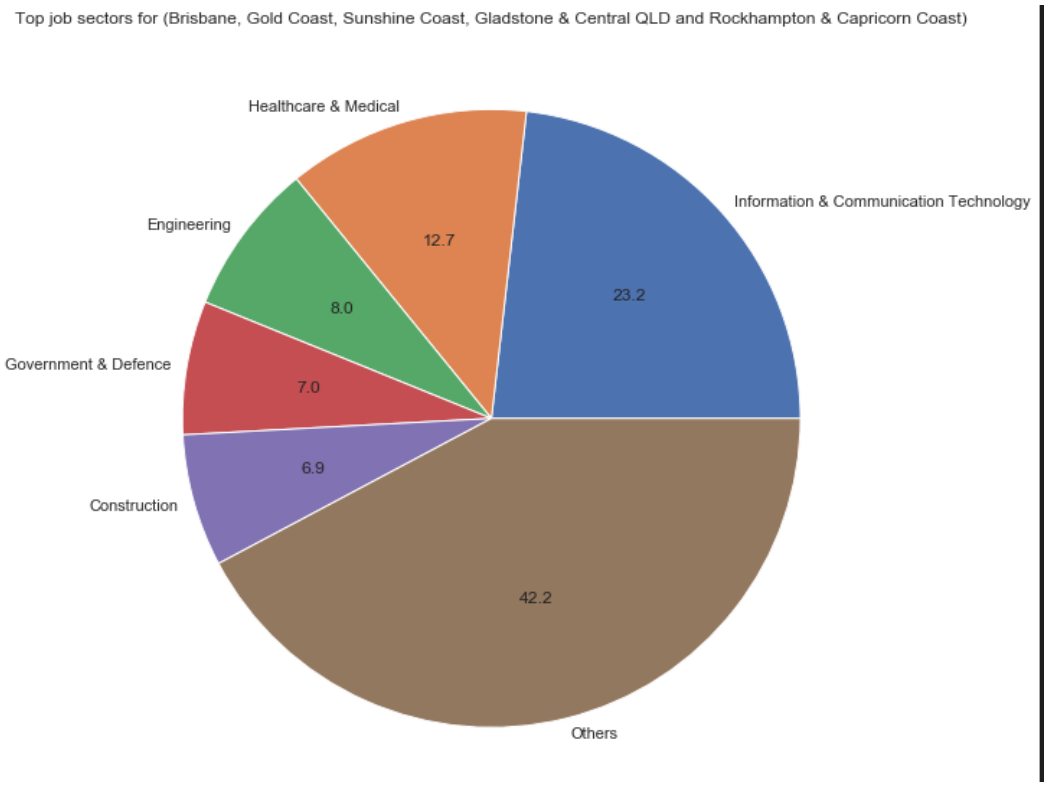

Figure 9: Top 5 job sectors in Brisbane, Gold Coast, Sunshine Coast, Gladstone & central QLD, and Rockhampton & Capricorn Coast

Location	**Number of jobs**
Brisbane	5637
Gold Coast	453
Sunshine Coast	179
Rockhampton & Capricorn Coast	189
Gladstone & Central QLD	209
	TOTAL = 6667 Jobs

Table 5: Number of jobs of the five largest cities in Queensland with an income greater or equal to 80 thousand dollars

However, the results presented in Figure 9 are misleading. Table 5 displays the number of job offerings with incomes greater than 80 thousand dollars across the 5 locations. From the table it is shown that Brisbane has more than 5 times the job offerings of the rest of the locations combined. Therefore, the percentage of job offerings per job sector such as ICT is skewed towards the jobs offered in Brisbane. Figure 10 shows that ICT is the number one position within the top job sectors for Brisbane with 26.6% (14,999) of job offerings. ICT job offerings do not appear in the top 5 sectors for the remaining locations except for Gold Coast, the ICT job sector on the Gold Coast is the fourth most popular job offering sector with only 7.1% (32) of job offerings. Therefore, if Tom would like to have a job within ICT his best locations would be limited to Brisbane as it has the highest total job offerings out of all the locations. This would also mean that if Tom would like the possibility to get a job within Brisbane, he should undertake an ICT major. For Tom to have the best opportunity in the future for an ICT job, he should major in software development as software programming has the highest percentage of 16.6% across all four location and furthermore undertake subjects in programming, analytics, and management. These subjects will allow for Tom to have a high opportunity of employability as the sub sectors Developers/Programmers, Programme & Project Management and Business/Systems Analytics represent 45.7% of the total job offerings available across all locations within ICT (Figure 11). The recommendation for majors and subjects to secure an ICT job is further supported by Figure 12 which shows that Developers/Programmer jobs are very popular in Brisbane and Gold Coast appearing with offerings such as Business/Systems Analysts which Tom could do if he chose the previously mentioned subjects and major. Another major that Tom could undertake that is identified in Figure 12 is Architecture. Within Brisbane, Architecture is the fourth most popular job offering with 141 offerings. This would be a good option for Tom if wanting to do ICT outside Brisbane, as it's offered also in Gold Coast and Sunshine Coast. For Tom to do Architecture he would need to do subjects in Architect, Engineering – Software and Programming, it would be advisable and helpful if Tom was to complete some mathematics subjects to enhance the engineering side of Architecture as well. Doing these majors and subjects will allow Tom to have the best opportunity to secure an ICT job in Brisbane which is shown by Figure 12 to be best location but also assist in securing a job outside Brisbane if unsuccessful with a Brisbane offering due to the majors and subjects chosen can be accredited towards other offerings that appear in other locations but in much lower capacity.

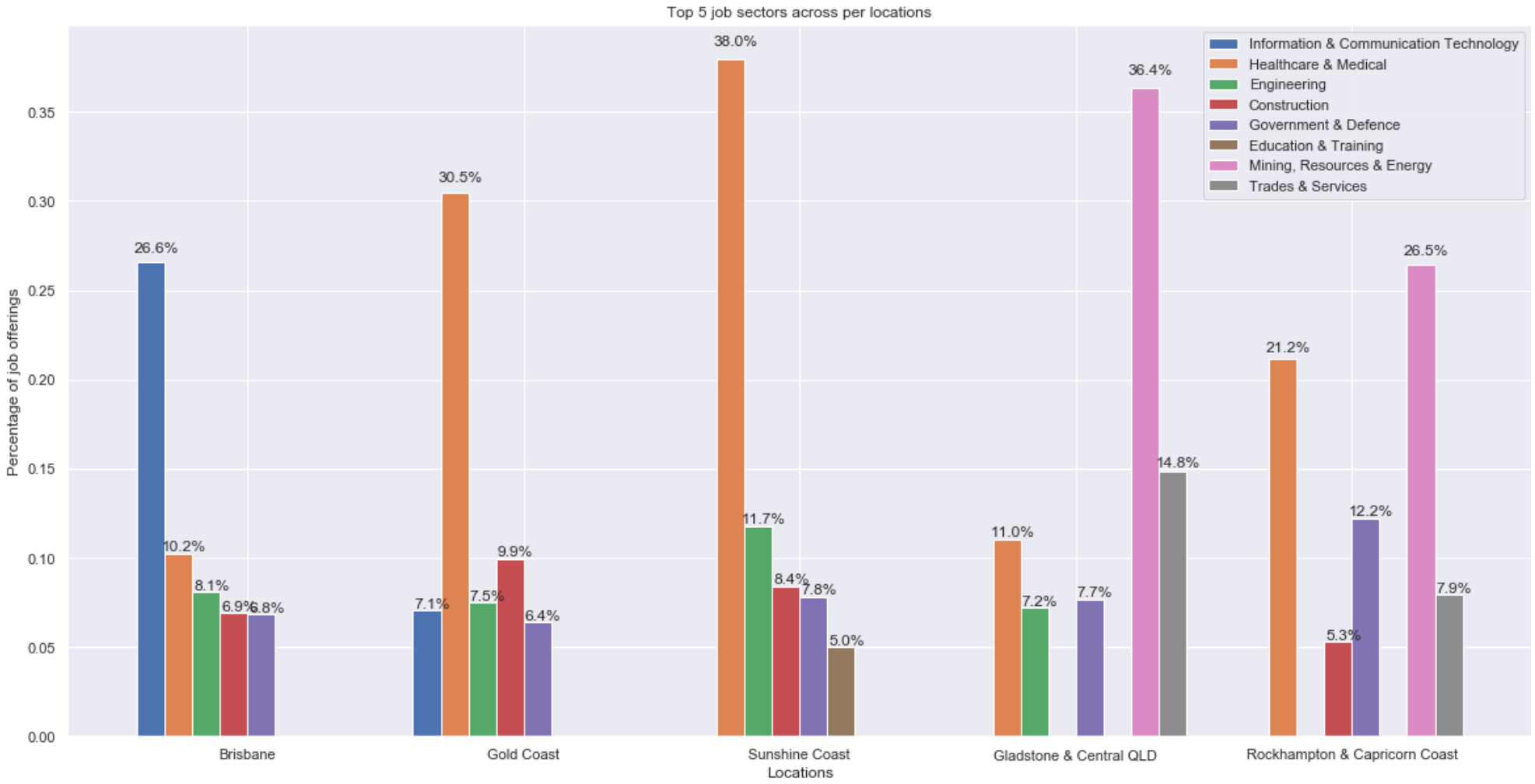

Figure 10: Top 5 job sectors per 5 locations within Queensland

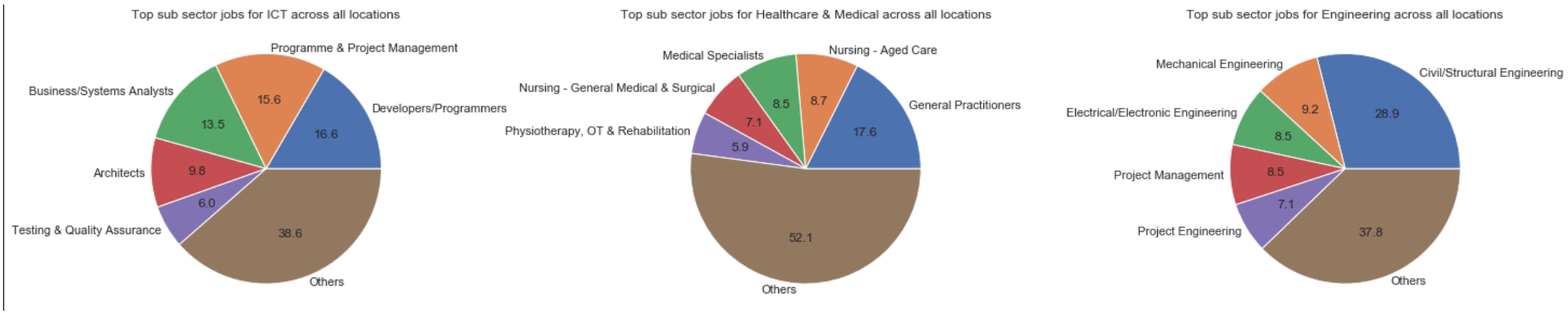

Figure 11: Top five sub sectors for ICT, Healthcare & Medical and Engineering sectors across all 5 locations

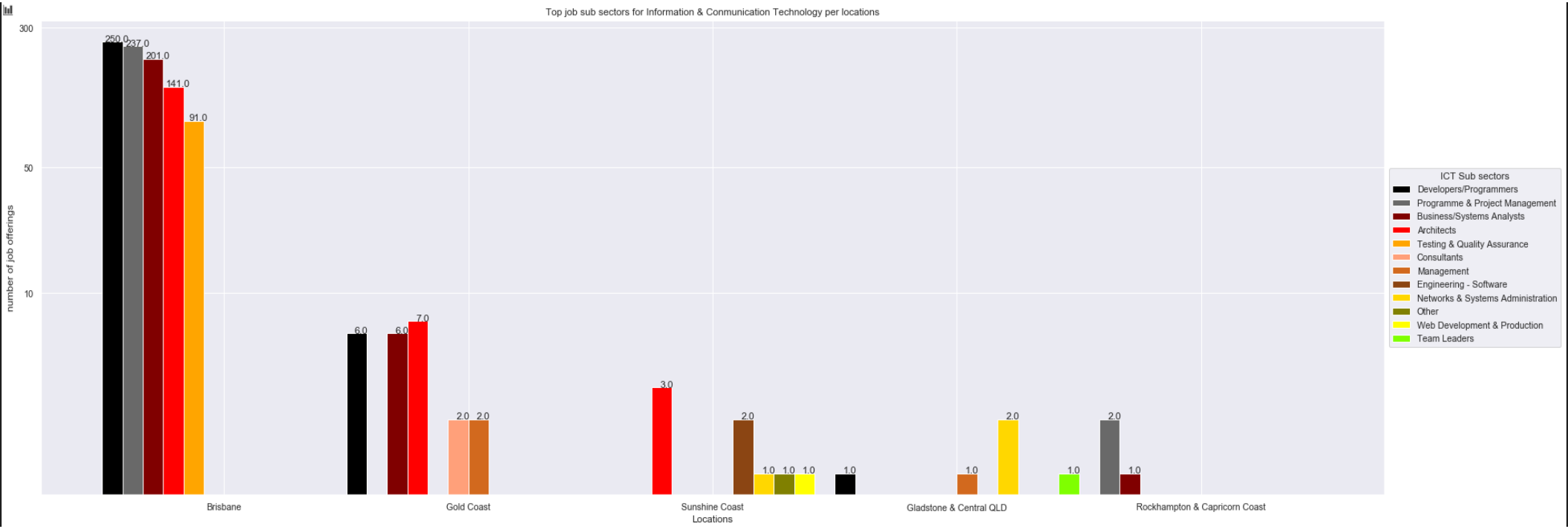

Figure 12: Top sub sectors for ICT per all 5 locations

As mentioned above Tom's second best option according to Figure 9 would be to take a major within the Healthcare and Medical field, as it is the second highest job offering across all locations with 12.7% of the 6,667 total jobs with an income greater or equal to 80 thousand dollars. However, as stated before, Table 5 shows that there is a large skew of job offerings from Brisbane compared to the 4 other locations. This means Tom is still more likely to receive a Healthcare & Medical job within Brisbane than Sunshine Coast that has the highest job offering for that sector of 36% compared to Brisbane's 10.2% (Figure 10). This is due to Brisbane's 10.2% representing 575 job offerings of their total 5637 jobs within that location compared to Sunshine Coasts significantly larger percentage of 36% only representing 64 job offerings of their 179 total job offerings. Figure 10 shows the Healthcare & Medical sector is consistently within the top 3 positions of job offerings across all locations, therefore, if Tom were to look for a job outside Brisbane then he has a likely chance of getting a job within Healthcare & Medical across all 4 other locations compared to an ICT job. However, if Tom wanted to find a job in Brisbane but decided not to go with ICT his second-best option would be Healthcare & Medical. Figure 11 shows that Tom would need to major in medicine to have an opportunity for the highest sub sector job offering for General Practitioner with 17.6% total. Tom should then take subjects such as anatomy, biology, and immunology for him to apply for 3 of the top 5 sub sectors, General Practitioner, Medical Specialists Physiotherapy, OT & Rehabilitation that have a combined percentage of 32% the total job offerings for Healthcare & Medical sector. Resulting in Tom, similarly to ICT, having a high employability skill set. Tom could also major in nursing with subjects in clinical practice, anatomy and pharmacy to be eligible for the remainder two top 5 sub sectors, Nursing - aged Care 8.7% and Nursing – General Medical & Surgical 7.1%. According to Figure 13 If Tom were to decide on either majors medicine or nursing, he would still have a high possibility of securing a job across Brisbane, Gold Coast and Sunshine Coast but might have further luck with a medicine major as positions for General Practitioners and Medical Specialists are still sought after in Gladstone & Central QLD and Rockhampton & Capricorn Coast. Figure 13 supports the suggested majors and subjects for Tom to secure a high-income job within the Healthcare & Medical field in Queensland.

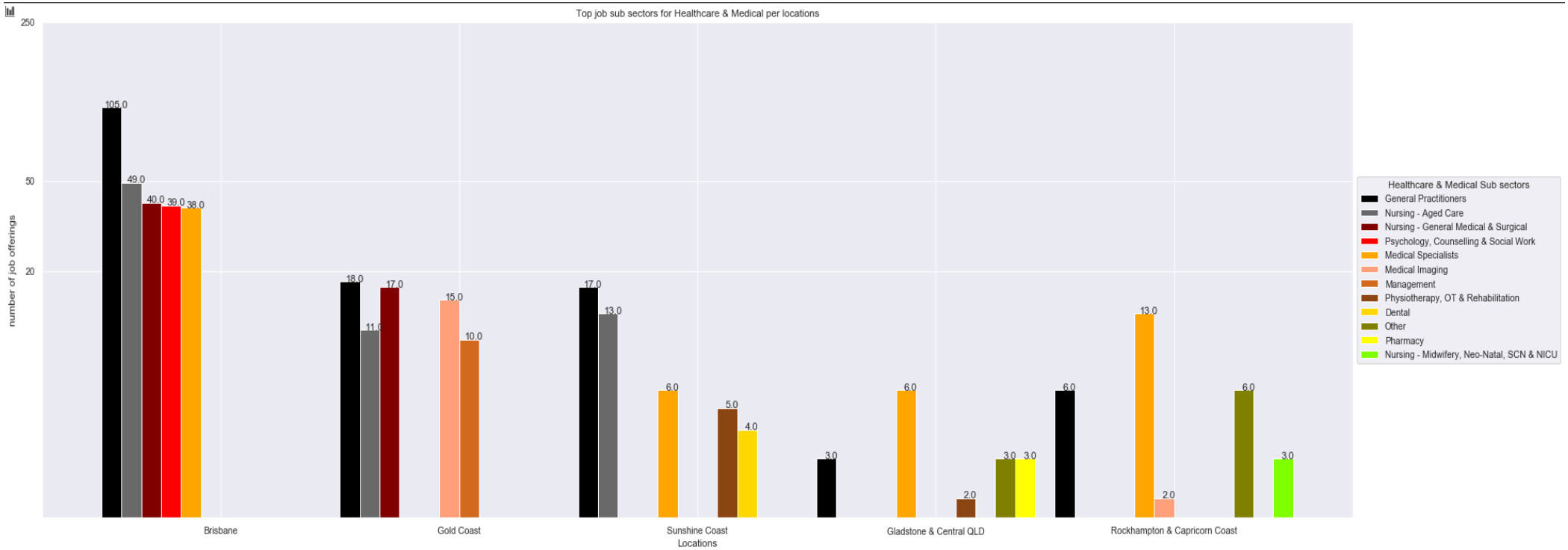

Figure 13: Top sub sectors for Healthcare & Medical per all 5 locations

A last resort option for Tom is employment in the Engineering or Construction sectors as seen in Figure 9 with both professions within the top 5 job sectors of all locations. Both sectors, as seen in Figure 10, have a higher job offer potential, 2.1 fold for Engineering and 1.4 fold for Construction compared to Government and Defence jobs (another top 5 job offering sector) within Brisbane, Gold Coast and Sunshine Coast. These locations were selected as they are the closest high-density population locations that are significant to Queensland's economy located near and including Brisbane which should allow for Tom to secure future jobs easier assuming the population will continue to grow. However, as Tom's desire is to go to university to complete a major for a job, Engineering is better suited to his parameters to enable him to get that job sector compared to Construction which most universities are unable to offer the same level of service for Tom.

Scenario 2

In order to enhance the employability of graduates it is most important for Griffith University to pay attention to the most popular job sectors as these will have the greatest number of new positions for graduates. Table 6 shows that the IT sector had the most job postings across the provided data with a total of 16661 postings, almost 26% of postings in the top 5 sectors. This was more than 2000 more than the next highest sector Trades & Services which had 14125 postings. However, just because the IT sector has so many more positions over this period does not mean it is always the best sector when looking for a job.

Sector	**Number of jobs**
Information & Communication Technology	16661
Trades & Services	14125
Healthcare & Medical	12515
Hospitality & Tourism	11818
Manufacturing, Transport & Logistics	9608

Table 6: Total number of job postings in the top 5 sectors.

Figure 14 shows a direct comparison of the top 5 job sectors over the provided timeframe, revealing fluctuations in the entire job market along with these individual sectors. This shows that while the IT sector is ahead of others for a most of the time period by the end there is a significant change in the market resulting in it performing worse than others. During this period, the trades and services sector performs far better than all others, followed by hospitality and tourism. These kinds of changes in job postings reveal the need for some form of predictive approach to determining future job market trends, especially as it takes at least 3 year to graduate from an undergraduate program.

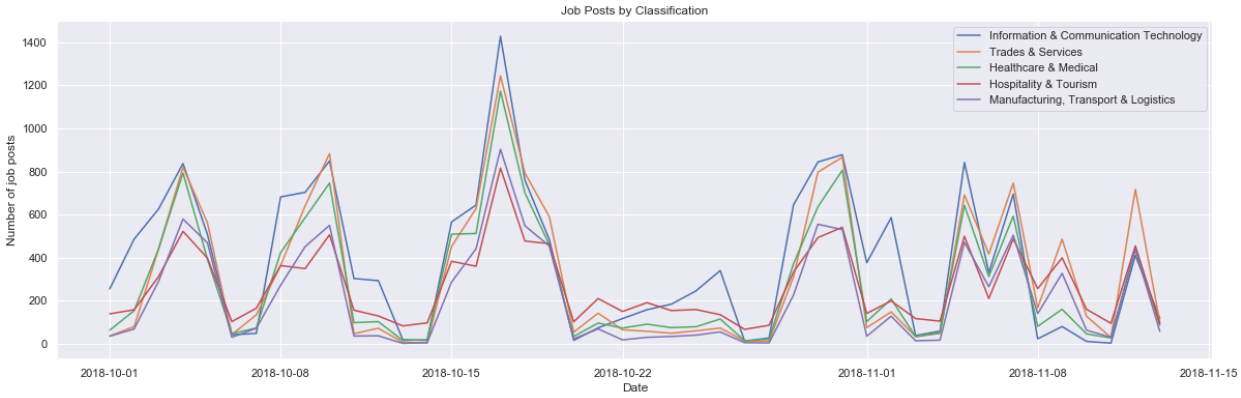

Figure 14: Number of job posts over time for the top 5 sectors.

Considering this one approach is to use linear regression on the job postings for each sector and compare their trajectories over a period, the results of which can be seen in figure 15. The linear regression for the IT sector shows that the number of IT job postings is falling significantly, as expected from poor performance in the last segment of the data. However, this is also the case for all the top 5 job sectors, perhaps due to some market wide fluctuation. As such, the severity of the downward slope can be compared to identify the most resilient job sectors, which may be able to offer more opportunities to graduates than others.

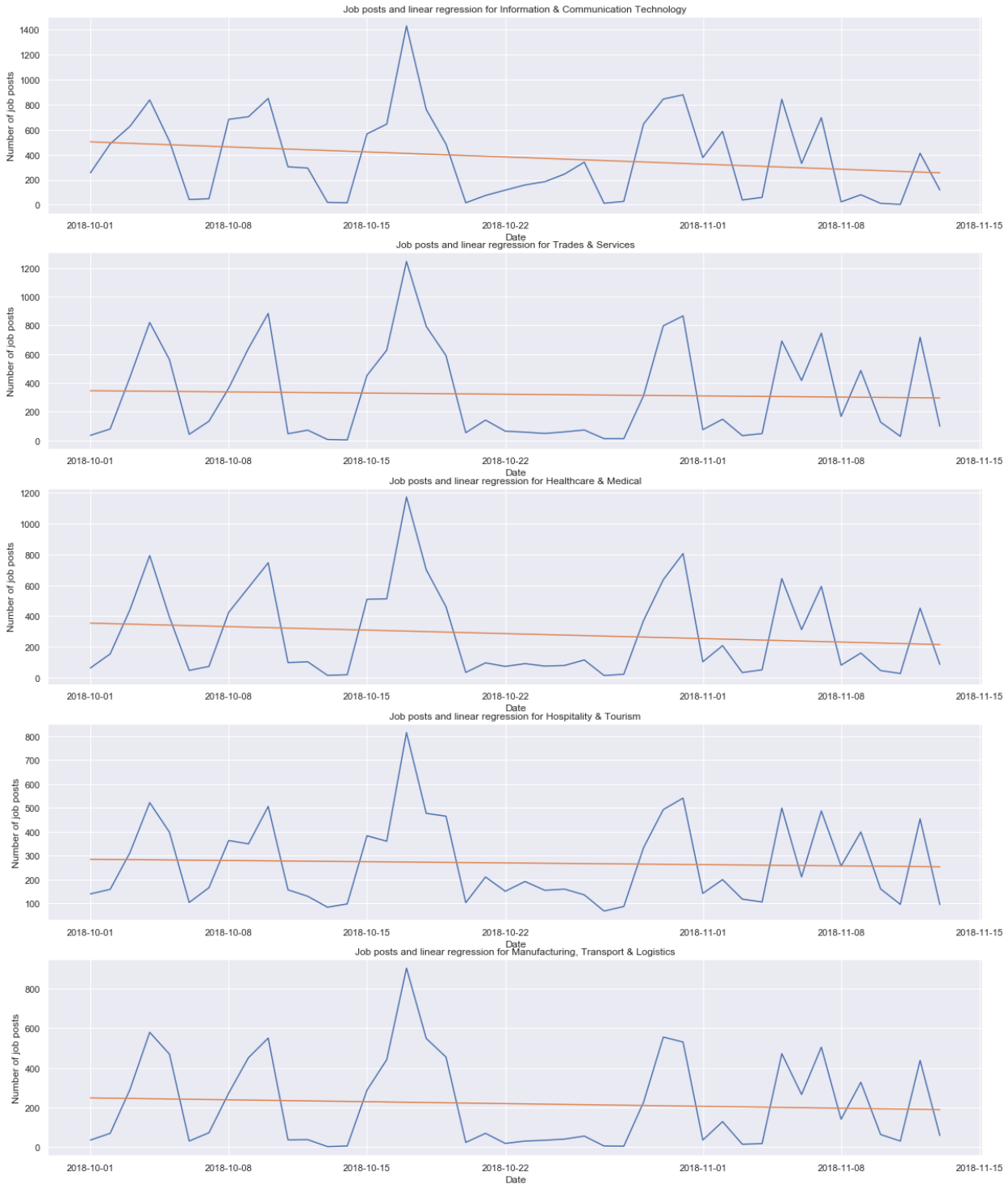

Figure 15: Linear regression of job posts over time for the top 5 sectors.

Clearly from the linear regression the worst performing job sectors during this period were information & communication technology and healthcare & medical, while trades & services and hospitality & tourism performed the best it terms of consistently high job postings. From this information, it can be recommended that programs and majors in these areas could lead to better outcomes transitioning into work in the future. However, the overall number of job postings must also be considered as there were still far more postings in IT over the period despite the reduction over time. Another caveat to any recommendation is that the provided data covered a very short timeframe, decreasing the certainty of any potential long-term trends. From the above results further analysis should be done into the performance of the subsectors within the IT and healthcare sectors to determine if there are any majors that will likely lead to disproportionally bad outcomes if these trends continue.

Figure 16: Linear regression of job posts in the top 7 subsectors of IT.

Due to its steep downward slope further analysis into the IT sector was performed resulting in figure 16. Like the overall IT sector, the main subsectors within IT all appear to have a downward slope. This is especially the case for the developer/programmer subsector with the linear regression beginning around 100 job posts per day and dropping to just 50. Similarly, business systems analysis, project management, and software engineering performed poorly. Meanwhile, out of all the top IT subsectors the best performer is help desk and IT support, with networks and systems administration and architects also performing better than the overall industry. As such it can be recommended that the number of students taking software development or engineering majors be reduced, while the networking and support focused majors remain the same or grow.

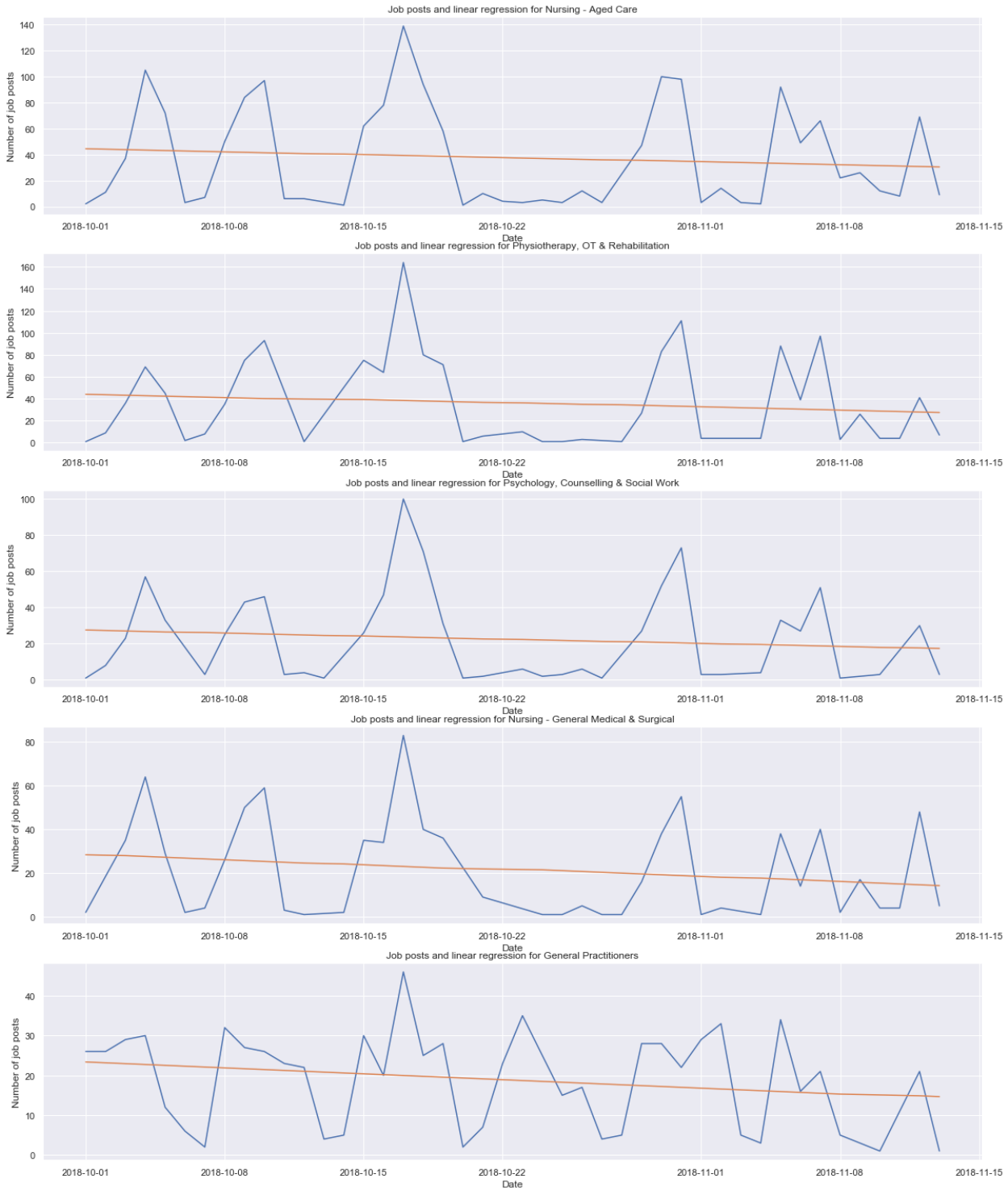

Figure 17: Linear regression of job posts in the top 5 subsectors of Healthcare and Medical.

Another poor performing sector that should be further examined is the healthcare and medical sector. As such the linear regressions for the top 5 healthcare and medical subsectors were found, as can be seen in figure 17. In this sector the worst performing subsectors were the two largest, nursing and aged care, and physiotherapy, OT and rehabilitation, along with the smaller general medical and surgical nursing, suggesting that majors in these subjects should be reduced. Meanwhile the psychology, counselling and social work and general practitioners' subsectors also fell but to a less severe degree, meaning that majors could either be reduced or stay the same.