Fast Food Business Opportunities

Potential opportunities in fast food industry in Sydney, Australia

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1. Introduction

1.1 Background discussion

Sydney is the state capital of New South Wales and the most populous city in Australia and Oceania.

The city is made up of 658 suburbs, 40 local government areas and 15 contiguous regions. As of June 2017, Sydney's estimated metropolitan population was 5,230,330 and is home to approximately 65% of the state's population.

There are 17 universities providing undergraduate and postgraduate studies in 32 campuses across Sydney. Some of these are among the most distinguished universities in Australia and the World. Overall Sydney universities teach 254,000 students combined, including 51,000 from overseas.

Most popular universities are:

University	THE Times Higher Education Australian University Rankings			
	Aus Rank	Asia/Pacific Rank	General World Ranking	Subject Specific World Ranking (only if within TOP 100)
University of Sydney (sydney)	4	11	59	18 - Arts and Humanities
University of New South Wales (unsw)	6	16	96	46 - Social Sciences
University of Technology Sydney (uts)	9	26	196	-
Macquarie University (mq)	13	38	201+	67 - Arts and Humanities
University of Western Sydney (uws)	25	69	351+	-
CQ University (cqu)	28	77	501+	-

1.2 Problem description

X&Y Capital is a global investment fund which owns fast food restaurants in Asia (mainly China and India). They particularly focus on university areas and quick-service dining. Since the fast-food portion of the broader restaurant industry has grown while full-service restaurants have lost ground in recent years, this has been proven to be a profitable investment for them.

Considering Sydney is one of the education hubs in Asia-Pacific, X&Y Capital wants to explore business opportunities in Sydney area. They are particularly interested with:

- What types of restaurants are around universities in Sydney?

- What type of food they serve?

- Are there any differences between various university locations?

- What would be the ideal location for the first restaurant?

1.3 Target audience

This report is prepared for X&Y Capital senior management, which wants to investigate business opportunities in Sydney, Australia.

2. Data description

Following list of Sydney University Locations and Foursquare data (extracted via API) have been used.

#	University Campus	Post Code
1	University of Sydney (Camden)	2570
2	Western Sydney University (Campbelltown)	2560
3	University of Sydney (Camperdown)	2006
4	Curtin University (Chippendale)	2007
5	University of Notre Dame Australia (Chippendale)	2007
6	University of Tasmania (Darlinghurst)	2010
7	University of Sydney (Erskineville)	2043
8	Western Sydney University (Hawkesbury)	2753
9	Charles Darwin University (Haymarket)	2000
10	University of New South Wales (Kensington)	2033
11	University of Sydney (Lidcombe)	2141
12	University of Technology Sydney (Lindfield)	2070
13	University of Wollongong (Liverpool)	2170
14	University of Wollongong (Loftus)	2232
15	Western Sydney University (Milperra)	2214
16	Macquarie University (Macquarie Park)	2113
17	Australian Catholic University (North Sydney)	2060
18	Western Sydney University (Parramatta)	2150
19	University of New England (Parramatta)	2150
20	Western Sydney University (Penrith)	2747
21	Western Sydney University (Quakers Hill)	2763
22	University of Sydney (Rozelle)	2039
23	University of Tasmania (Rozelle)	2039
24	Australian Catholic University (Strathfield)	2135
25	University of Sydney (Surry Hills)	2010
26	CQ University (Sydney City)	2000
27	La Trobe University (Sydney City)	2000
28	University of Newcastle (Sydney City)	2000
29	Victoria University (Sydney City)	2000
30	Torrens University Australia (The Rocks)	2000
31	University of Technology Sydney (Ultimo)	2007
32	Torrens University Australia (Ultimo)	2007

Foursquare data has been extracted via API from places data on https://developer.foursquare.com/

3. Methodology

- The geographical coordinates of Sydney, Australia extracted from geopy library as -33.9247891, 151.2277413 and map of Sydney created with folium:
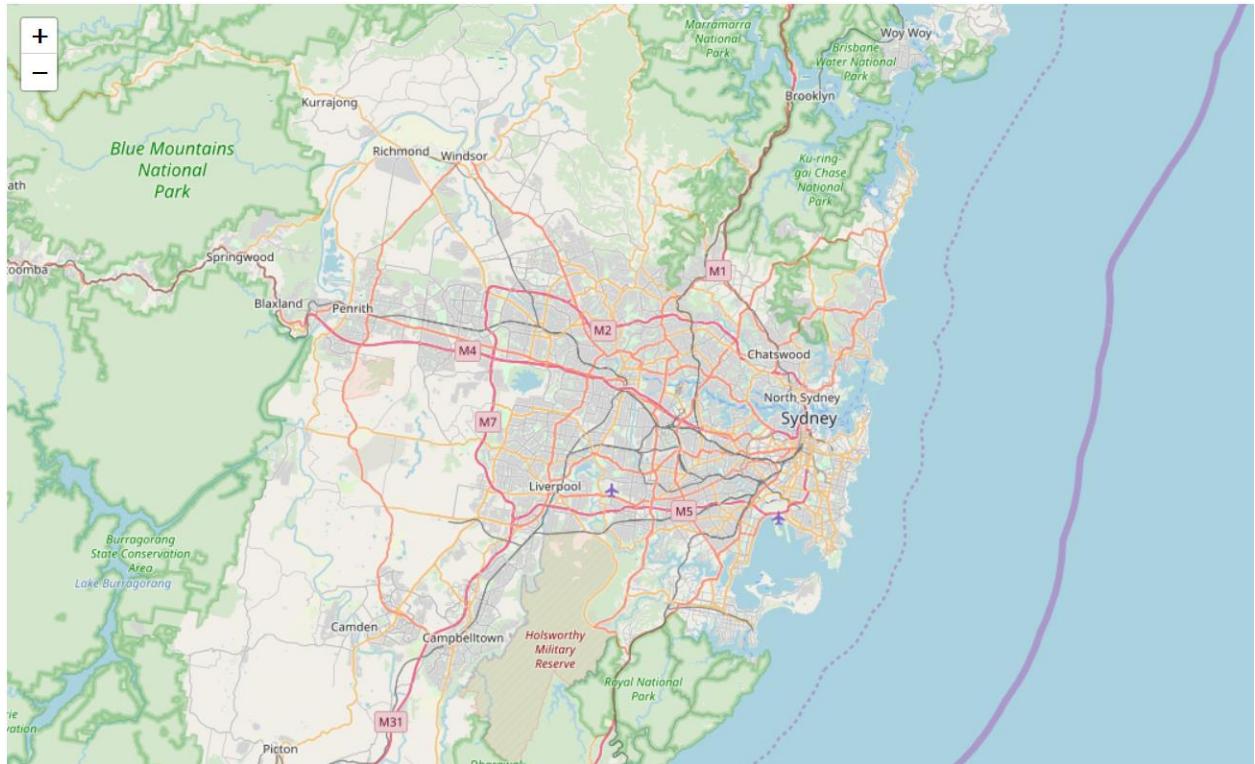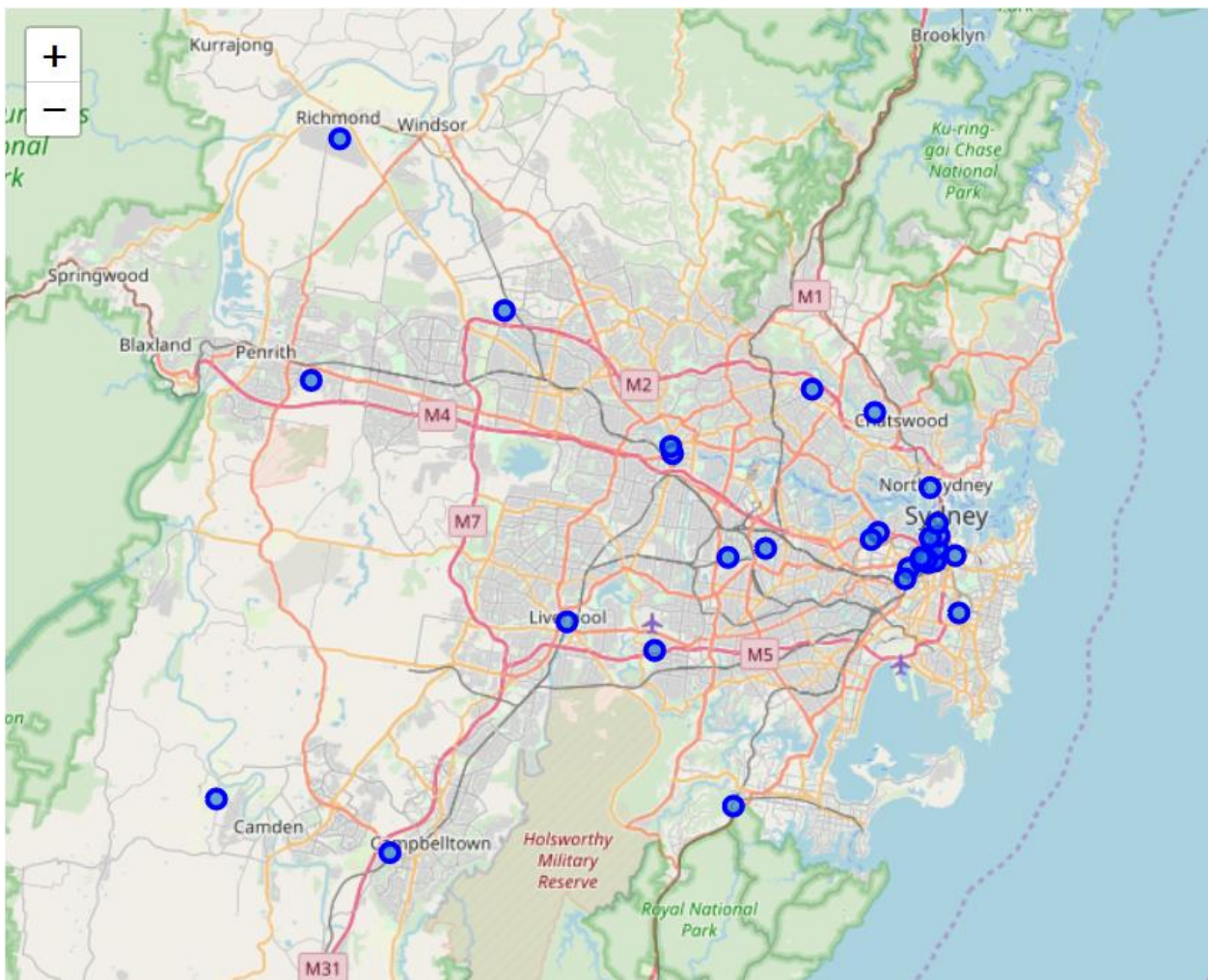

- The Latitude and longitude information of Sydney university campuses prepared (extracted from Google)

#	University Campus	Post Code	Latitude	Longitude
1	University of Sydney (Camden)	2570	-34.035282	150.655934
2	Western Sydney University (Campbelltown)	2560	-34.069407	150.788561
3	University of Sydney (Camperdown)	2006	-33.888584	151.1873473
4	Curtin University (Chippendale)	2007	-33.88530565	151.202449263599
5	University of Notre Dame Australia (Chippendale)	2007	-33.884555	151.197259
6	University of Tasmania (Darlinghurst)	2010	-33.880336	151.222100
7	University of Sydney (Erskineville)	2043	-33.89593915	151.184601328301
8	Western Sydney University (Hawkesbury)	2753	-33.614059	150.750230
9	Charles Darwin University (Haymarket)	2000	-33.8829724	151.2034853
10	University of New South Wales (Kensington)	2033	-33.9170154	151.225182312696
11	University of Sydney (Lidcombe)	2141	-33.881779	151.048948
12	University of Technology Sydney (Lindfield)	2070	-33.789820	151.161041
13	University of Wollongong (Liverpool)	2170	-33.922595	150.925338
14	University of Wollongong (Loftus)	2232	-34.040595	151.052926
15	Western Sydney University (Milperra)	2214	-33.940717	150.991445
16	Macquarie University (Macquarie Park)	2113	-33.7740328	151.112709182732
17	Australian Catholic University (North Sydney)	2060	-33.83747735	151.203156261191
18	Western Sydney University (Parramatta)	2150	-33.8162163	151.005608280936
19	University of New England (Parramatta)	2150	-33.8109384	151.0044325
20	Western Sydney University (Penrith)	2747	-33.768640	150.728890
21	Western Sydney University (Quakers Hill)	2763	-33.723952	150.876917
22	University of Sydney (Rozelle)	2039	-33.865922	151.163402

#	University Campus	Post Code	Latitude	Longitude
23	University of Tasmania (Rozelle)	2039	-33.870528	151.157556
24	Australian Catholic University (Strathfield)	2135	-33.87567305	151.076798470119
25	University of Sydney (Surry Hills)	2010	-33.884471	151.207870
26	CQUniversity (Sydney City)	2000	-33.8715329	151.205143709099
27	La Trobe University (Sydney City)	2000	-33.8757242	151.209197
28	University of Newcastle (Sydney City)	2000	-33.868359	151.210343
29	Victoria University (Sydney City)	2000	-33.869672	151.203861
30	Torrens University Australia (The Rocks)	2000	-33.859992	151.2083216
31	University of Technology Sydney (Ultimo)	2007	-33.8828784	151.200681195462
32	Torrens University Australia (Ultimo)	2007	-33.881896	151.197136297382

- University campuses added on the map:

- GET request URL for foursquare API created to extract the top 100 venues that are around each university campus within a radius of 500 meters.

- University campus, venue name, venue latitude, venue longitude and venue category information of 1,309 venues extracted from foursquare in the sample format shown below:

	University_Campus	Venue	Venue Latitude	Venue Longitude	Venue Category
1	University of Sydney (Camperdown)	Handcraft Specialty Coffee	-33.89264	151.18573	Café
2	University of Sydney (Camperdown)	Azzuri Espresso	-33.88966	151.19117	Coffee Shop
3	University of Sydney (Camperdown)	1989 Bar Arcade Kitchen	-33.89259	151.18692	Beer Bar
4	University of Sydney (Camperdown)	Parma Cucina & Bar	-33.88924	151.19112	Café
5	University of Sydney (Camperdown)	Charles Thai at Newtown	-33.89245	151.18645	Thai Restaurant
6	University of Sydney (Camperdown)	University Sports & Aquatic Centre (USAC)	-33.89108	151.19143	College Rec Center
7	University of Sydney (Camperdown)	Urban Bites	-33.89288	151.18588	Café
8	University of Sydney (Camperdown)	Courtyard Restaurant and Bar	-33.88508	151.18711	Café
9	University of Sydney (Camperdown)	Graffiti Tunnel	-33.88549	151.18757	Public Art
10	University of Sydney (Camperdown)	The Grandstand Sports Bar & Function Centre	-33.88858	151.18463	Sports Bar
11	University of Sydney (Camperdown)	Taste Baguette	-33.8875	151.19003	Café
12	University of Sydney (Camperdown)	Hermanns Bar	-33.88964	151.19043	Beer Garden

- 1,309 venues belong to 169 unique venue categories.

- A "University Campus x Venue Category" matrix of (1309, 169) created in the format shown below:

University_Campus	Aquarium	Arcade	Argentinian Restaurant	Art Gallery	Asian Restaurant	Australian Restaurant	...
University of Sydney (Camden)	0	1	0	0	0	0	...
Western Sydney University (Campbelltown)	0	0	0	0	0	0	...
Western Sydney University (Campbelltown)	0	0	0	0	0	0	...
Western Sydney University (Campbelltown)	0	0	0	0	0	1	...

- Data in the matrix grouped by University Campus by taking the mean of the frequency of occurrence of each category. A matrix of (32, 169) created as the following sample shows:

University_Campus	Aquarium	Arcade	Argentinian Restaurant	Art Gallery	Asian Restaurant	Australian Restaurant	...
Australian Catholic University (North Sydney)	0	0	0	0	0	0	...
Australian Catholic University (Strathfield)	0	0	0	0	0	0	...
CQUniversity (Sydney City)	0.01	0	0	0	0	0.02	...
Charles Darwin University (Haymarket)	0	0	0	0.019608	0	0.019608	...
Curtin University (Chippendale)	0	0	0	0.019231	0	0.038462	...
La Trobe University (Sydney City)	0	0	0	0	0	0.02	...

- TOP 10 most common venue categories for each university campus extracted from the matrix above. Following are some samples:

```
----Australian Catholic University (North Sydney)----
                  venue  freq
0                   Café  0.30
1                    Bar  0.11
2    Japanese Restaurant  0.08
3              Juice Bar  0.05
4   Vietnamese Restaurant  0.05
5                    Pub  0.05
6                 Bakery  0.05
7            Coffee Shop  0.05
8             Restaurant  0.03
9                   Park  0.03

----University of Sydney (Surry Hills)----
                  venue  freq
0                   Café  0.19
1                    Pub  0.07
2    Japanese Restaurant  0.07
3        Thai Restaurant  0.07
4            Coffee Shop  0.06
5   Vietnamese Restaurant  0.04
6                 Hostel  0.04
7            Yoga Studio  0.03
8         Sandwich Place  0.03
9                 Bakery  0.03

----University of New South Wales (Kensington)----
                      venue  freq
0        Indonesian Restaurant  0.11
1                         Café  0.11
2            Italian Restaurant  0.11
3         Fast Food Restaurant  0.11
4          Japanese Restaurant  0.05
5                Grocery Store  0.05
6    General College & University  0.05
7            Mexican Restaurant  0.05
8                        Plaza  0.05
9             Cuban Restaurant  0.05
```

- Based on this information a "University Campus x TOP 10 most common venues" matrix of (32,10) created

	University_Campus	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Australian Catholic University (North Sydney)	Café	Bar	Japanese Restaurant	Coffee Shop	Vietnamese Restaurant	Pub	Juice Bar	Bakery	Sandwich Place	Restaurant
1	Australian Catholic University (Strathfield)	Park	Bookstore	Yoga Studio	Electronics Store	Food & Drink Shop	Flower Shop	Flea Market	Fish & Chips Shop	Fast Food Restaurant	Farmers Market
2	CQUniversity (Sydney City)	Coffee Shop	Café	Hotel	Cocktail Bar	Bar	Thai Restaurant	Shopping Mall	Bookstore	Ramen Restaurant	Japanese Restaurant
3	Charles Darwin University (Haymarket)	Thai Restaurant	Café	Hostel	Ice Cream Shop	Coffee Shop	Dessert Shop	Bakery	Hotel	Hotpot Restaurant	Indonesian Restaurant
4	Curtin University (Chippendale)	Café	Thai Restaurant	Bar	Bakery	Hotel	Australian Restaurant	Coffee Shop	Hostel	Wine Bar	Ice Cream Shop
5	La Trobe University (Sydney City)	Café	Thai Restaurant	Hotel	Japanese Restaurant	Coffee Shop	Korean Restaurant	Chinese Restaurant	Breakfast Spot	Cocktail Bar	Greek Restaurant
6	Macquarie University (Macquarie Park)	Café	Hotel	Art Gallery	College Cafeteria	Gym	Trail	Juice Bar	Event Space	Food & Drink Shop	Flower Shop
7	Torrens University Australia (The Rocks)	Café	Hotel	Australian Restaurant	Pub	Italian Restaurant	Cocktail Bar	Park	Brewery	Museum	Hotel Bar
8	Torrens University Australia (Ultimo)	Café	Coffee Shop	Bar	Hotel	Dumpling Restaurant	Gym	Food Court	Shopping Mall	Lounge	Malay Restaurant
9	University of New England (Parramatta)	Thai Restaurant	Coffee Shop	Australian Restaurant	Café	Lebanese Restaurant	Dessert Shop	Gym	Ice Cream Shop	Miscellaneous Shop	Sandwich Place
10	University of New South Wales (Kensington)	Fast Food Restaurant	Café	Italian Restaurant	Indonesian Restaurant	Sandwich Place	Pub	Bar	Japanese Restaurant	General College & University	Grocery Store
11	University of Newcastle (Sydney City)	Café	Speakeasy	Bar	Sandwich Place	Hotel	Coffee Shop	Cocktail Bar	Shopping Mall	Electronics Store	Clothing Store
12	University of Notre Dame Australia (Chippendale)	Café	Bar	Thai Restaurant	Coffee Shop	Burger Joint	Dumpling Restaurant	Pub	Chinese Restaurant	Supermarket	Italian Restaurant
13	University of Sydney (Camden)	Construction & Landscaping	Electronics Store	Food Court	Food & Drink Shop	Flower Shop	Flea Market	Fish & Chips Shop	Fast Food Restaurant	Farmers Market	Event Space
14	University of Sydney (Camperdown)	Café	Coffee Shop	Music Venue	Beer Garden	Beer Bar	Bus Line	Thai Restaurant	College Rec Center	Sports Bar	Middle Eastern Restaurant
15	University of Sydney (Erskineville)	Thai Restaurant	Café	Bar	Pub	Pizza Place	Japanese Restaurant	Bookstore	Coffee Shop	Italian Restaurant	Boutique
16	University of Sydney (Lidcombe)	Park	Construction & Landscaping	Dumpling Restaurant	Food & Drink Shop	Flower Shop	Flea Market	Fish & Chips Shop	Fast Food Restaurant	Farmers Market	Event Space
17	University of Sydney (Rozelle)	Park	Café	Hotel Bar	Gym / Fitness Center	Malay Restaurant	Fast Food Restaurant	Bakery	Pizza Place	Food & Drink Shop	Dessert Shop
18	University of Sydney (Surry Hills)	Café	Thai Restaurant	Japanese Restaurant	Pub	Coffee Shop	Hostel	Vietnamese Restaurant	Sandwich Place	Bakery	Yoga Studio
19	University of Tasmania (Darlinghurst)	Café	Italian Restaurant	Thai Restaurant	Pub	Bar	Pizza Place	Burger Joint	Boutique	Bookstore	Indian Restaurant

|	University_Campus	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
20	University of Tasmania (Rozelle)	Café	Pool	Italian Restaurant	Football Stadium	Fast Food Restaurant	Farmers Market	Flower Shop	Pub	Deli / Bodega	Department Store
21	University of Technology Sydney (Lindfield)	Bus Line	Park	Soccer Field	Yoga Studio	Electronics Store	Flower Shop	Flea Market	Fish & Chips Shop	Fast Food Restaurant	Farmers Market
22	University of Technology Sydney (Ultimo)	Café	Thai Restaurant	Hostel	Coffee Shop	Hotel	Bar	Bakery	Malay Restaurant	Australian Restaurant	Dumpling Restaurant
23	University of Wollongong (Liverpool)	Coffee Shop	Fast Food Restaurant	Café	Shopping Mall	Supermarket	Burrito Place	Lebanese Restaurant	Big Box Store	Electronics Store	Sandwich Place
24	University of Wollongong (Loftus)	Athletics & Sports	Train Station	Gym	Basketball Court	Yoga Studio	Electronics Store	Food & Drink Shop	Flower Shop	Flea Market	Fish & Chips Shop
25	Victoria University (Sydney City)	Bar	Café	Cocktail Bar	Coffee Shop	Shopping Mall	Hotel	Australian Restaurant	Speakeasy	Thai Restaurant	Bookstore
26	Western Sydney University (Campbelltown)	Asian Restaurant	Café	Yoga Studio	Event Space	Food Court	Food & Drink Shop	Flower Shop	Flea Market	Fish & Chips Shop	Fast Food Restaurant
27	Western Sydney University (Hawkesbury)	Football Stadium	Café	Event Space	Food Court	Food & Drink Shop	Flower Shop	Flea Market	Fish & Chips Shop	Fast Food Restaurant	Farmers Market
28	Western Sydney University (Milperra)	Thai Restaurant	Home Service	Pharmacy	Deli / Bodega	Fast Food Restaurant	Yoga Studio	Flower Shop	Flea Market	Fish & Chips Shop	Farmers Market
29	Western Sydney University (Parramatta)	Café	Thai Restaurant	Burger Joint	Asian Restaurant	Chinese Restaurant	Coffee Shop	Fast Food Restaurant	Department Store	Dessert Shop	Mexican Restaurant
30	Western Sydney University (Penrith)	Sandwich Place	College Basketball Court	Bus Station	Café	Electronics Store	Flower Shop	Flea Market	Fish & Chips Shop	Fast Food Restaurant	Farmers Market
31	Western Sydney University (Quakers Hill)	Café	Yoga Studio	Event Space	Food Court	Food & Drink Shop	Flower Shop	Flea Market	Fish & Chips Shop	Fast Food Restaurant	Farmers Market

- k-means clustering applied on the data set above and university campuses grouped into four clusters as shown below:

	University Campus	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	University of Sydney (Camden)	-34.03528	150.65593	2	Construction & Landscaping	Electronics Store	Food Court	Food & Drink Shop	Flower Shop	Flea Market	Fish & Chips Shop	Fast Food Restaurant	Farmers Market	Event Space
1	Western Sydney University (Campbelltown)	-34.06941	150.78856	0	Asian Restaurant	Café	Yoga Studio	Event Space	Food Court	Food & Drink Shop	Flower Shop	Flea Market	Fish & Chips Shop	Fast Food Restaurant
2	University of Sydney (Camperdown)	-33.88858	151.18735	3	Café	Coffee Shop	Music Venue	Beer Garden	Beer Bar	Bus Line	Thai Restaurant	College Rec Center	Sports Bar	Middle Eastern Restaurant
3	Curtin University (Chippendale)	-33.88531	151.20245	3	Café	Thai Restaurant	Bar	Bakery	Hotel	Australian Restaurant	Coffee Shop	Hostel	Wine Bar	Ice Cream Shop
4	University of Notre Dame Australia (Chippendale)	-33.88456	151.19726	3	Café	Bar	Thai Restaurant	Coffee Shop	Burger Joint	Dumpling Restaurant	Pub	Chinese Restaurant	Supermarket	Italian Restaurant
5	University of Tasmania (Darlinghurst)	-33.88034	151.2221	3	Café	Italian Restaurant	Thai Restaurant	Pub	Bar	Pizza Place	Burger Joint	Boutique	Bookstore	Indian Restaurant
6	University of Sydney (Erskineville)	-33.89594	151.1846	3	Thai Restaurant	Café	Bar	Pub	Pizza Place	Japanese Restaurant	Bookstore	Coffee Shop	Italian Restaurant	Boutique
7	Western Sydney University (Hawkesbury)	-33.61406	150.75023	0	Football Stadium	Café	Event Space	Food Court	Food & Drink Shop	Flower Shop	Flea Market	Fish & Chips Shop	Fast Food Restaurant	Farmers Market
8	Charles Darwin University (Haymarket)	-33.88297	151.20349	3	Thai Restaurant	Café	Hostel	Ice Cream Shop	Coffee Shop	Dessert Shop	Bakery	Hotel	Hotpot Restaurant	Indonesian Restaurant
9	University of New South Wales (Kensington)	-33.91702	151.22518	3	Fast Food Restaurant	Café	Italian Restaurant	Indonesian Restaurant	Sandwich Place	Pub	Bar	Japanese Restaurant	General College & University	Grocery Store
10	University of Sydney (Lidcombe)	-33.88178	151.04895	1	Park	Construction & Landscaping	Dumpling Restaurant	Food & Drink Shop	Flower Shop	Flea Market	Fish & Chips Shop	Fast Food Restaurant	Farmers Market	Event Space
11	University of Technology Sydney (Lindfield)	-33.78982	151.16104	3	Bus Line	Park	Soccer Field	Yoga Studio	Electronics Store	Flower Shop	Flea Market	Fish & Chips Shop	Fast Food Restaurant	Farmers Market
12	University of Wollongong (Liverpool)	-33.9226	150.92534	3	Coffee Shop	Fast Food Restaurant	Café	Shopping Mall	Supermarket	Burrito Place	Lebanese Restaurant	Big Box Store	Electronics Store	Sandwich Place
13	University of Wollongong (Loftus)	-34.0406	151.05293	3	Athletics & Sports	Train Station	Gym	Basketball Court	Yoga Studio	Electronics Store	Food & Drink Shop	Flower Shop	Flea Market	Fish & Chips Shop
14	Western Sydney University (Milperra)	-33.94072	150.99145	3	Thai Restaurant	Home Service	Pharmacy	Deli / Bodega	Fast Food Restaurant	Yoga Studio	Flower Shop	Flea Market	Fish & Chips Shop	Farmers Market
15	Macquarie University (Macquarie Park)	-33.77403	151.11271	3	Café	Hotel	Art Gallery	College Cafeteria	Gym	Trail	Juice Bar	Event Space	Food & Drink Shop	Flower Shop

	University Campus	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
16	Australian Catholic University (North Sydney)	-33.83748	151.20316	3	Café	Bar	Japanese Restaurant	Coffee Shop	Vietnamese Restaurant	Pub	Juice Bar	Bakery	Sandwich Place	Restaurant
17	Western Sydney University (Parramatta)	-33.81622	151.00561	3	Café	Thai Restaurant	Burger Joint	Asian Restaurant	Chinese Restaurant	Coffee Shop	Fast Food Restaurant	Department Store	Dessert Shop	Mexican Restaurant
18	University of New England (Parramatta)	-33.81094	151.00443	3	Thai Restaurant	Coffee Shop	Australian Restaurant	Café	Lebanese Restaurant	Dessert Shop	Gym	Ice Cream Shop	Miscellaneous Shop	Sandwich Place
19	Western Sydney University (Penrith)	-33.76864	150.72889	3	Sandwich Place	College Basketball Court	Bus Station	Café	Electronics Store	Flower Shop	Flea Market	Fish & Chips Shop	Fast Food Restaurant	Farmers Market
20	Western Sydney University (Quakers Hill)	-33.72395	150.87692	0	Café	Yoga Studio	Event Space	Food Court	Food & Drink Shop	Flower Shop	Flea Market	Fish & Chips Shop	Fast Food Restaurant	Farmers Market
21	University of Sydney (Rozelle)	-33.86592	151.1634	3	Park	Café	Hotel Bar	Gym / Fitness Center	Malay Restaurant	Fast Food Restaurant	Bakery	Pizza Place	Food & Drink Shop	Dessert Shop
22	University of Tasmania (Rozelle)	-33.87053	151.15756	3	Café	Pool	Italian Restaurant	Football Stadium	Fast Food Restaurant	Farmers Market	Flower Shop	Pub	Deli / Bodega	Department Store
23	Australian Catholic University (Strathfield)	-33.87567	151.0768	1	Park	Bookstore	Yoga Studio	Electronics Store	Food & Drink Shop	Flower Shop	Flea Market	Fish & Chips Shop	Fast Food Restaurant	Farmers Market
24	University of Sydney (Surry Hills)	-33.88447	151.20787	3	Café	Thai Restaurant	Japanese Restaurant	Pub	Coffee Shop	Hostel	Vietnamese Restaurant	Sandwich Place	Bakery	Yoga Studio
25	CQUniversity (Sydney City)	-33.87153	151.20514	3	Coffee Shop	Café	Hotel	Cocktail Bar	Bar	Thai Restaurant	Shopping Mall	Bookstore	Ramen Restaurant	Japanese Restaurant
26	La Trobe University (Sydney City)	-33.87572	151.2092	3	Café	Thai Restaurant	Hotel	Japanese Restaurant	Coffee Shop	Korean Restaurant	Chinese Restaurant	Breakfast Spot	Cocktail Bar	Greek Restaurant
27	University of Newcastle (Sydney City)	-33.86836	151.21034	3	Café	Speakeasy	Bar	Sandwich Place	Hotel	Coffee Shop	Cocktail Bar	Shopping Mall	Electronics Store	Clothing Store
28	Victoria University (Sydney City)	-33.86967	151.20386	3	Bar	Café	Cocktail Bar	Coffee Shop	Shopping Mall	Hotel	Australian Restaurant	Speakeasy	Thai Restaurant	Bookstore
29	Torrens University Australia (The Rocks)	-33.85999	151.20832	3	Café	Hotel	Australian Restaurant	Pub	Italian Restaurant	Cocktail Bar	Park	Brewery	Museum	Hotel Bar
30	University of Technology Sydney (Ultimo)	-33.88288	151.20068	3	Café	Thai Restaurant	Hostel	Coffee Shop	Hotel	Bar	Bakery	Malay Restaurant	Australian Restaurant	Dumpling Restaurant
31	Torrens University Australia (Ultimo)	-33.8819	151.19714	3	Café	Coffee Shop	Bar	Hotel	Dumpling Restaurant	Gym	Food Court	Shopping Mall	Lounge	Malay Restaurant

4. Results

- More than half of the campuses are located in or around city centre (56% or 18 out of 32).
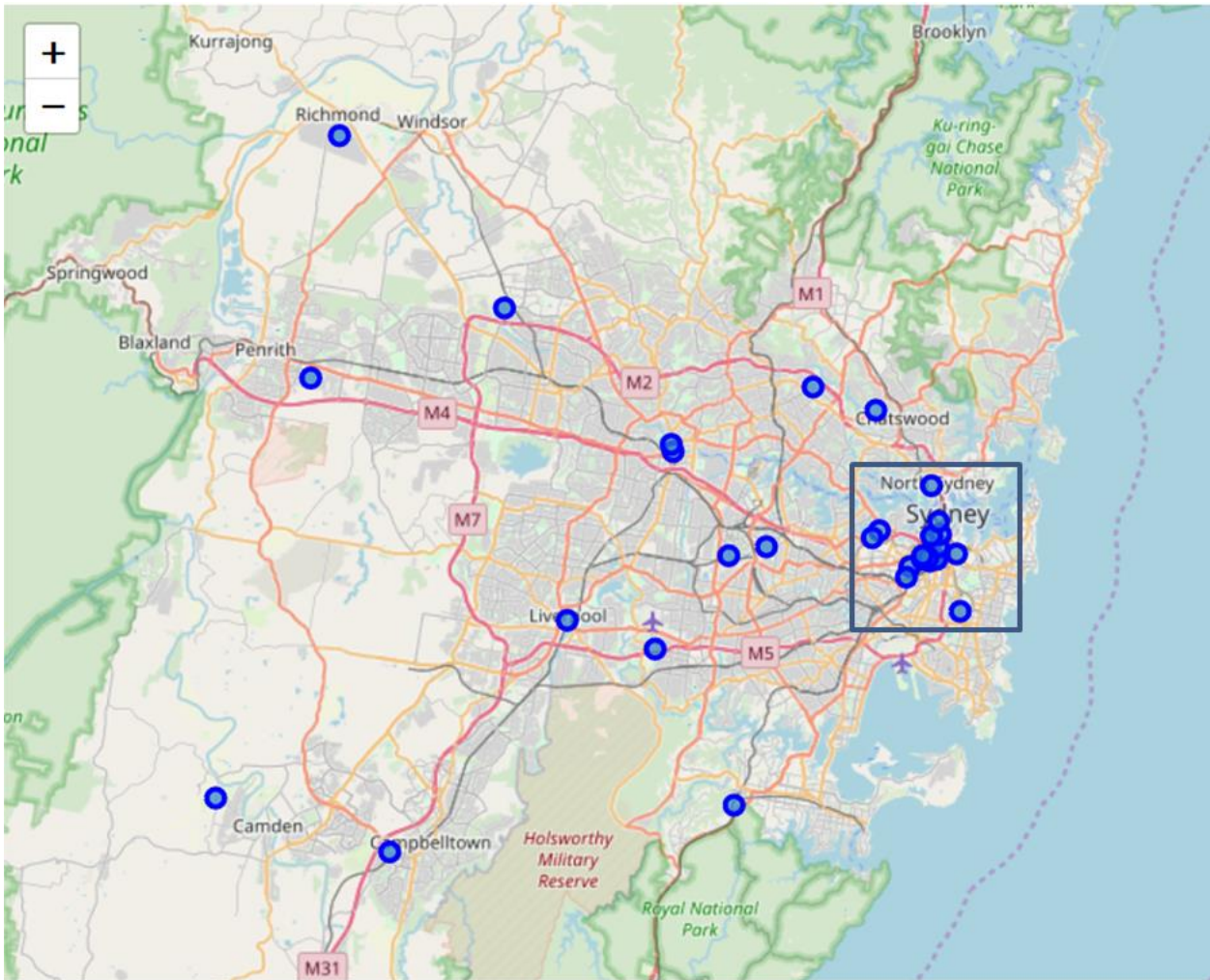
- Sydney university campuses are located in following 25 suburbs (note that in total there are 658 suburbs in Sydney).

Suburb	
1	Camden Sydney NSW Australia
2	Campbelltown Sydney NSW Australia
3	Camperdown Sydney NSW Australia
4	Chippendale Sydney NSW Australia
5	Darlinghurst Sydney NSW Australia
6	Erskineville Sydney NSW Australia
7	Hawkesbury Richmond NSW Australia
8	Haymarket Sydney NSW Australia
9	Kensington Sydney NSW Australia
10	Lidcombe NSW Australia
11	Lindfield NSW Australia
12	Liverpool Sydney NSW Australia

	Suburb
13	Loftus Sydney NSW Australia
14	Milperra NSW Australia
15	Macquarie Park NSW Australia
16	North Sydney NSW Australia
17	Parramatta Sydney NSW Australia
18	Penrith Kingswood NSW
19	Quakers Hill NSW Australia
20	Rozelle Sydney NSW Australia
21	Strathfield Sydney NSW Australia
22	Surry Hills Sydney NSW Australia
23	Sydney City Center Sydney NSW Australia
24	The Rocks Sydney NSW Australia
25	Ultimo Sydney NSW Australia

- Only 6 campuses (all in CBD), have 100 or more venues and 12 campuses have less than 10 venues within a radius of 500 meters from the campus location (note that this is based on foursquare data only, there might be venues not on foursquare).

University Campus	Venue Count
CQ University (Sydney City)	100
La Trobe University (Sydney City)	100
Torrens University Australia (The Rocks)	100
University of Newcastle (Sydney City)	100
University of Notre Dame Australia (Chippendale)	100
Victoria University (Sydney City)	100
Western Sydney University (Parramatta)	86
University of Tasmania (Darlinghurst)	80
University of Sydney (Surry Hills)	68
University of Technology Sydney (Ultimo)	65
Curtin University (Chippendale)	52
Charles Darwin University (Haymarket)	51
University of Sydney (Erskineville)	50
Torrens University Australia (Ultimo)	49
University of New England (Parramatta)	41
Australian Catholic University (North Sydney)	37
University of Wollongong (Liverpool)	27
University of Sydney (Camperdown)	24
University of New South Wales (Kensington)	19
University of Sydney (Rozelle)	12
University of Tasmania (Rozelle)	9
Macquarie University (Macquarie Park)	8
Western Sydney University (Milperra)	5
University of Wollongong (Loftus)	4
Western Sydney University (Campbelltown)	4
Western Sydney University (Penrith)	4
Australian Catholic University (Strathfield)	3

University Campus	Venue Count
University of Sydney (Lidcombe)	3
University of Technology Sydney (Lindfield)	3
Western Sydney University (Hawkesbury)	2
Western Sydney University (Quakers Hill)	2
University of Sydney (Camden)	1

- According to foursquare data, in total, there are 1,309 venues within a radius of 500 meters from each campus location and these venues fall under 169 unique venue categories.
5 most common venue categories are shown below (representing approx. 1/3th of the total):

Venue Category	Venue Count
Café	199
Thai Restaurant	67
Bar	48
Australian Restaurant	27
Bakery	20

- In order to work with more focused data set, TOP 10 most common venue categories within a radius of 500 meters from each campus location extracted from the whole data set, then some categories merged (example: café and coffee shops as café) and some upper categories created (example: Thai restaurant and Italian restaurant assigned under "restaurant" upper category) and some further analyses performed. Following are the results:

  - Restaurant, Food & Drink Shop, Other Shop/Store, Café and Fitness-Event-Activity Centres represent 94% of the main venue categories. Two categories (Restaurant and Food & Drink Shop) account for 57% of the total:

Main Venue Category	Count	%
Restaurant	130	41%
Food & Drink Shop	50	16%
Other Shop/Store	47	15%
Café	43	13%
Fitness-Event-Activity Centres	32	10%
Shopping Mall	5	2%
Transportation	4	1%
Accommodation	4	1%
Other	3	1%
Construction & Landscaping	2	1%
Grand Total	320*	100%

* 32 campuses x TOP 10 most common venue categories = 320 records

- The "Restaurant" main category is split into three sub categories as Asian 31%, Bar & Bistro 30% and Fast Food 25%.

Main Venue Category	= Restaurant

Sub Venue Category	Count	%
Asian	40	31%
Bar & Bistro	39	30%
Fast Food	33	25%
European	7	5%
Australian	6	5%
Middle Eastern	3	2%
not specified	1	1%
Mexican	1	1%
Grand Total	130	100%

Thai restaurants are the most popular ones among Asian restaurants. Fish and Chips Shops represent almost 1/3th of the Fast Food restaurants:

Main Venue Category	= Restaurant

Sub Category 1	Sub Category 2	Count	%
Asian	Thai	14	35%
	Japanese	6	15%
	Dumpling	4	10%
	Malay	3	8%
	Chinese	3	8%
	Vietnamese	2	5%
	Asian	2	5%
	Indonesian	2	5%
	Korean	1	3%
	Indian	1	3%
	Hotpot	1	3%
	Ramen	1	3%
Grand Total		40	100%

Main Venue Category	= Restaurant

Sub Category 1	Sub Category 2	Count	%
Fast Food	Fast Food	14	42%
	Fish & Chips Shop	10	30%
	Food Court	5	15%
	Burger Joint	3	9%
	Breakfast	1	3%
Grand Total		33	100%

- k-means clustering applied on "TOP 10 most common venue categories" data set and university campuses grouped into four clusters as shown below:

Cluster 1:

University_Campus	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
Western Sydney University (Campbelltown)	Asian Restaurant	Café	Yoga Studio	Event Space	Food Court	Food & Drink Shop	Flower Shop	Flea Market	Fish & Chips Shop	Fast Food Restaurant
Western Sydney University (Hawkesbury)	Football Stadium	Café	Event Space	Food Court	Food & Drink Shop	Flower Shop	Flea Market	Fish & Chips Shop	Fast Food Restaurant	Farmers Market
Western Sydney University (Quakers Hill)	Café	Yoga Studio	Event Space	Food Court	Food & Drink Shop	Flower Shop	Flea Market	Fish & Chips Shop	Fast Food Restaurant	Farmers Market

Cluster 2:

| University_Campus	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
University of Sydney (Lidcombe)	Park	Construction & Landscaping	Dumpling Restaurant	Food & Drink Shop	Flower Shop	Flea Market	Fish & Chips Shop	Fast Food Restaurant	Farmers Market	Event Space
Australian Catholic University (Strathfield)	Park	Bookstore	Yoga Studio	Electronics Store	Food & Drink Shop	Flower Shop	Flea Market	Fish & Chips Shop	Fast Food Restaurant	Farmers Market

Cluster 3:

University_Campus	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
University of Sydney (Camden)	Construction & Landscaping	Electronics Store	Food Court	Food & Drink Shop	Flower Shop	Flea Market	Fish & Chips Shop	Fast Food Restaurant	Farmers Market	Event Space

Cluster 4:

University_Campus	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
University of Sydney (Camperdown)	Café	Coffee Shop	Music Venue	Beer Garden	Beer Bar	Bus Line	Thai Restaurant	College Rec Center	Sports Bar	Middle Eastern Restaurant
Curtin University (Chippendale)	Café	Thai Restaurant	Bar	Bakery	Hotel	Australian Restaurant	Coffee Shop	Hostel	Wine Bar	Ice Cream Shop
University of Notre Dame Australia (Chippendale)	Café	Bar	Thai Restaurant	Coffee Shop	Burger Joint	Dumpling Restaurant	Pub	Chinese Restaurant	Supermarket	Italian Restaurant
University of Tasmania (Darlinghurst)	Café	Italian Restaurant	Thai Restaurant	Pub	Bar	Pizza Place	Burger Joint	Boutique	Bookstore	Indian Restaurant
University of Sydney (Erskineville)	Thai Restaurant	Café	Bar	Pub	Pizza Place	Japanese Restaurant	Bookstore	Coffee Shop	Italian Restaurant	Boutique
Charles Darwin University (Haymarket)	Thai Restaurant	Café	Hostel	Ice Cream Shop	Coffee Shop	Dessert Shop	Bakery	Hotel	Hotpot Restaurant	Indonesian Restaurant
University of New South	Fast Food	Café	Italian	Indonesian	Sandwich Place	Pub	Bar	Japanese	General College &	Grocery Store

University_Campus	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
Wales (Kensington)	Restaurant		Restaurant	Restaurant				Restaurant	University	
University of Technology Sydney (Lindfield)	Bus Line	Park	Soccer Field	Yoga Studio	Electronics Store	Flower Shop	Flea Market	Fish & Chips Shop	Fast Food Restaurant	Farmers Market
University of Wollongong (Liverpool)	Coffee Shop	Fast Food Restaurant	Café	Shopping Mall	Supermarket	Burrito Place	Lebanese Restaurant	Big Box Store	Electronics Store	Sandwich Place
University of Wollongong (Loftus)	Athletics & Sports	Train Station	Gym	Basketball Court	Yoga Studio	Electronics Store	Food & Drink Shop	Flower Shop	Flea Market	Fish & Chips Shop
Western Sydney University (Milperra)	Thai Restaurant	Home Service	Pharmacy	Deli / Bodega	Fast Food Restaurant	Yoga Studio	Flower Shop	Flea Market	Fish & Chips Shop	Farmers Market
Macquarie University (Macquarie Park)	Café	Hotel	Art Gallery	College Cafeteria	Gym	Trail	Juice Bar	Event Space	Food & Drink Shop	Flower Shop
Australian Catholic University (North Sydney)	Café	Bar	Japanese Restaurant	Coffee Shop	Vietnamese Restaurant	Pub	Juice Bar	Bakery	Sandwich Place	Restaurant
Western Sydney University (Parramatta)	Café	Thai Restaurant	Burger Joint	Asian Restaurant	Chinese Restaurant	Coffee Shop	Fast Food Restaurant	Department Store	Dessert Shop	Mexican Restaurant
University of New England (Parramatta)	Thai Restaurant	Coffee Shop	Australian Restaurant	Café	Lebanese Restaurant	Dessert Shop	Gym	Ice Cream Shop	Miscellaneous Shop	Sandwich Place
Western Sydney University (Penrith)	Sandwich Place	College Basketball Court	Bus Station	Café	Electronics Store	Flower Shop	Flea Market	Fish & Chips Shop	Fast Food Restaurant	Farmers Market
University of Sydney (Rozelle)	Park	Café	Hotel Bar	Gym / Fitness Center	Malay Restaurant	Fast Food Restaurant	Bakery	Pizza Place	Food & Drink Shop	Dessert Shop
University of Tasmania (Rozelle)	Café	Pool	Italian Restaurant	Football Stadium	Fast Food Restaurant	Farmers Market	Flower Shop	Pub	Deli / Bodega	Department Store
University of Sydney (Surry Hills)	Café	Thai Restaurant	Japanese Restaurant	Pub	Coffee Shop	Hostel	Vietnamese Restaurant	Sandwich Place	Bakery	Yoga Studio
CQUniversity (Sydney City)	Coffee Shop	Café	Hotel	Cocktail Bar	Bar	Thai Restaurant	Shopping Mall	Bookstore	Ramen Restaurant	Japanese Restaurant
La Trobe University (Sydney City)	Café	Thai Restaurant	Hotel	Japanese Restaurant	Coffee Shop	Korean Restaurant	Chinese Restaurant	Breakfast Spot	Cocktail Bar	Greek Restaurant
University of Newcastle (Sydney City)	Café	Speakeasy	Bar	Sandwich Place	Hotel	Coffee Shop	Cocktail Bar	Shopping Mall	Electronics Store	Clothing Store
Victoria University (Sydney City)	Bar	Café	Cocktail Bar	Coffee Shop	Shopping Mall	Hotel	Australian Restaurant	Speakeasy	Thai Restaurant	Bookstore
Torrens University Australia (The Rocks)	Café	Hotel	Australian Restaurant	Pub	Italian Restaurant	Cocktail Bar	Park	Brewery	Museum	Hotel Bar
University of Technology Sydney (Ultimo)	Café	Thai Restaurant	Hostel	Coffee Shop	Hotel	Bar	Bakery	Malay Restaurant	Australian Restaurant	Dumpling Restaurant
Torrens University Australia (Ultimo)	Café	Coffee Shop	Bar	Hotel	Dumpling Restaurant	Gym	Food Court	Shopping Mall	Lounge	Malay Restaurant

5. Discussion

Combining the Sydney university locations data with foursquare venue categories data (based on TOP 100 venues around each university campus within a radius of 500 meters) and applying k-means clustering (for k = 4 *) showed that:
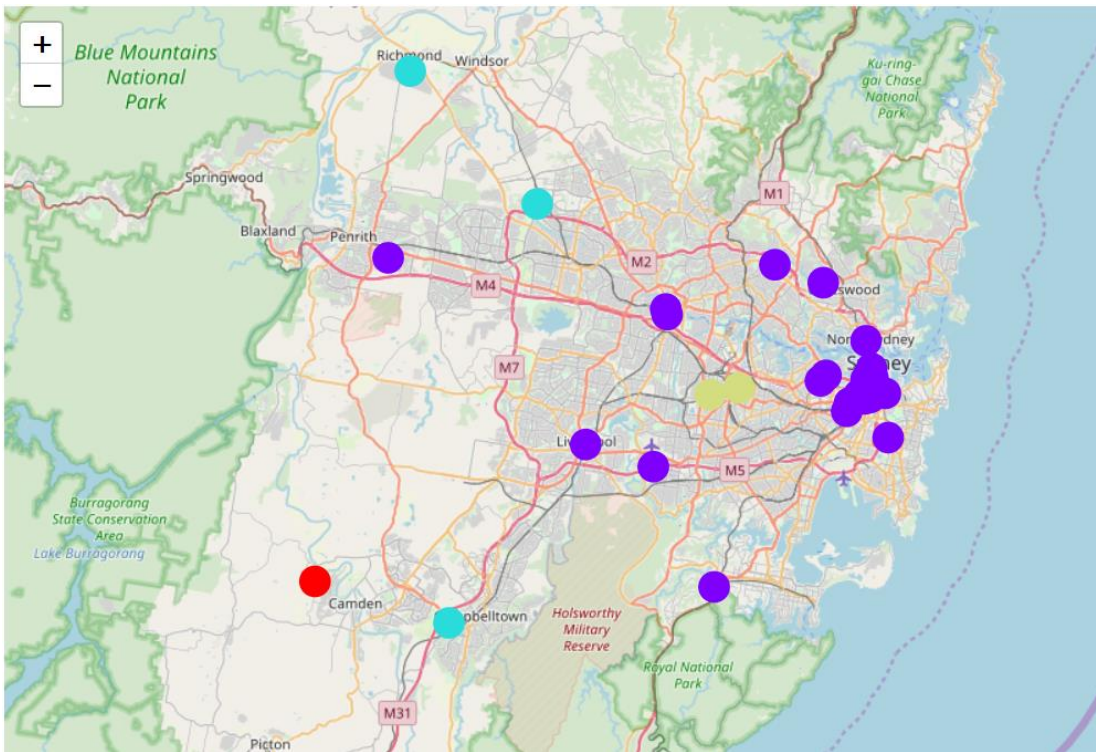
- 26 out of 32 campus locations in and around Sydney have similar characteristics based on foursquare venue categories. Within this group "coffee shops" are, by far, the most common venue category. This is followed by restaurants (mainly Thai and some Italian, Japanese), fast food/sandwich stores, pubs/bars and gyms. These campuses are mainly within CBD area and some congested suburbs out of the CBD, such as North Ryde and Chatswood in the north, Sutherland in the south, Liverpool in the south west, and Penrith in the west.

- 2 inner city campuses (University of Sydney in Lidcombe and Australian Catholic University in Strathfield) are within the same category. The first two most common venues around both locations are not food related, which is interesting. These suburbs are within few kilometres next to each other and due to new construction projects (residential units, railway and highway upgrades) population density in Strathfield in particular increased and will continue to increase in coming years (this may present a good opportunity for fast-food restaurant business).

- 3 campuses of Western Sydney University in Campbelltown, Hawkesbury, Quakers Hill and 1 campus of Sydney University in Camden are located in outskirts of the city. Particularly Camden is considered a remote area (rural NSW). All of these locations, at present have low population density. For short to mid-term these locations may not present good investment opportunities.

In addition, further analysis of the TOP 10 most common venue categories data set showed that more than half (57%) of venues around Sydney university locations are food related (restaurant or food & drink shop). About half of this (Asian 31% and Fast Food 25%) is within X&Y Capital's business area.

*the k-means clustering methodology has been repeated separately for k = 3, 4, 5, 6, 7, 8, 9 and 10. After reviewing the results, it has been decided that k = 4 provides the optimum clusters. Even with higher k values, majority of locations are grouped under the same cluster.

6. Conclusion

Considering Sydney is one of the education hubs in Asia-Pacific, X&Y Capital, which is a global investment fund that owns fast food restaurants in Asia, wants to explore business opportunities in Sydney area and hence requested this report. Based on the analysis of available data, following are the report findings:

What types of restaurants are around universities in Sydney?

According to the TOP 10 most common venue categories around each campus, 57% of the venues are Restaurants and Food & Drink Shops. Among restaurants three categories: Asian (31%), Bar & Bistro (30%), Fast Food (25%) represent 86% of the overall total.

Main Venue Category	Count	%
Restaurant	130	41%
Food & Drink Shop	50	16%
Other Shop/Store	47	15%
Café	43	13%
Fitness-Event-Activity Centres	32	10%
Shopping Mall	5	2%
Transportation	4	1%
Accommodation	4	1%
Other	3	1%
Construction & Landscaping	2	1%
Grand Total	320*	100%

* 32 campuses x TOP 10 most common venue categories = 320 records

Main Venue Category	= Restaurant

Sub Venue Category	Count	%
Asian	40	31%
Bar & Bistro	39	30%
Fast Food	33	25%
European	7	5%
Australian	6	5%
Middle Eastern	3	2%
not specified	1	1%
Mexican	1	1%
Grand Total	130	100%

What type of food they serve?

Common food types served in Asian restaurants are Thai (35%), Chinese (21%) and Japanese (18%) followed by Malay (8%), Vietnamese (5%) and Indonesian (5%).

Bar & Bistro restaurants in Sydney mainly serve steak, pasta and pizza; although the detailed breakdown is not available in foursquare data.

Fast Food restaurants category is also very popular, here it is important to note that Fish & Chips restaurants represent 30%, other restaurant categories are burger joints (McDonalds, KFC, Hungy Jaks –Burger King brand – and local joints), sandwich places (such as Subway) and fast food restaurants in food courts.

Main Venue Category	= Restaurant		

Sub Category 1	Sub Category 2	Count	%
Asian	Thai	14	35%
	Japanese	6	15%
	Dumpling	4	10%
	Malay	3	8%
	Chinese	3	8%
	Vietnamese	2	5%
	Asian	2	5%
	Indonesian	2	5%
	Korean	1	3%
	Indian	1	3%
	Hotpot	1	3%
	Ramen	1	3%
Grand Total		40	100%

Main Venue Category	= Restaurant		

Sub Category 1	Sub Category 2	Count	%
Fast Food	Fast Food	14	42%
	Fish & Chips Shop	10	30%
	Food Court	5	15%
	Burger Joint	3	9%
	Breakfast	1	3%
Grand Total		33	100%

Are there any differences between various university locations?

Analyses indicate that, based on the common venue categories around campuses, university locations in Sydney can be grouped into four categories.

The main category represents 81% of campuses (26 out of 32) with similar characteristics. These campuses are located both in and around Sydney CBD or some congested suburb centres out of the CBD area, such as North Ryde and Chatswood in the north, Sutherland in the south, Liverpool in the south west, and Penrith in the west (locations represented with blue on the map below).

Apart from 2 inner city campuses, University of Sydney in Lidcombe and Australian Catholic University in Strathfield (represented with light green on the map below), remaining campuses are far away from the city or suburb centres.
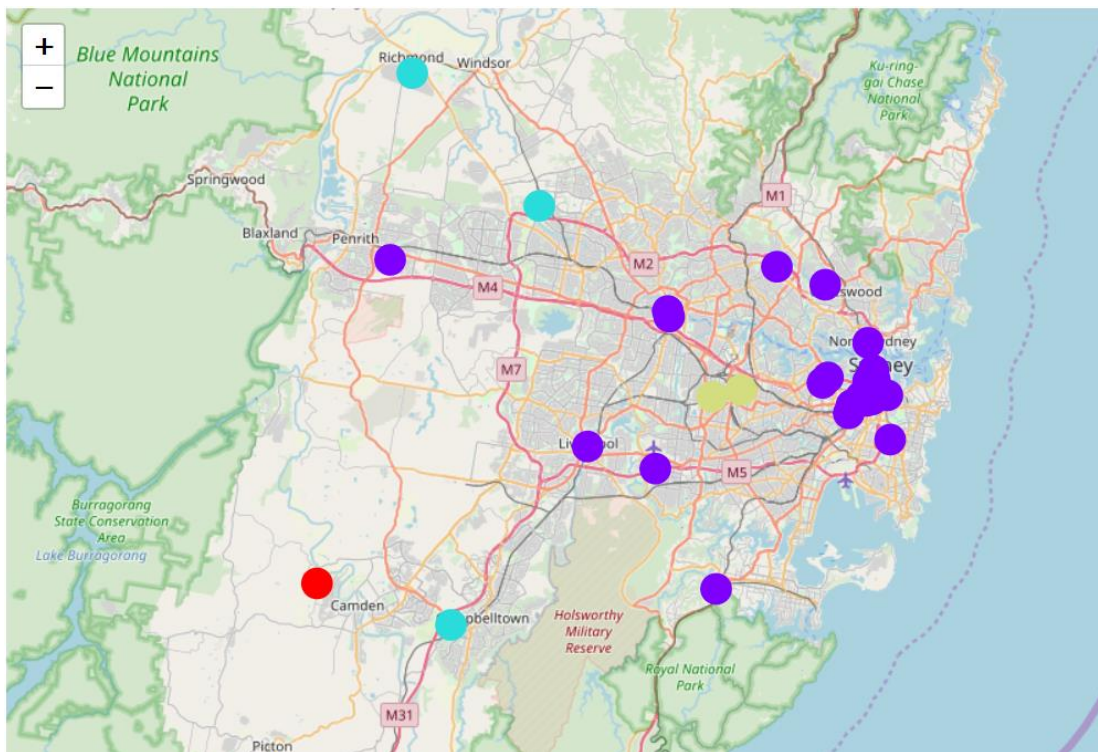
What would be the ideal location for the first restaurant?

As stated above, since vast majority of campuses fall into the same category and are in and around Sydney city centre, this area would be the ideal location to open the first restaurant.

Suburb of Ultimo within the city centre is home of two university campuses; University of Technology Sydney and Torrens University Australia, and also is close (in walking distance) to University of Sydney's main campus in Camperdown. Therefore Ultimo can be considered as the ideal location for the first restaurant.