

SYSTEMS DESIGN ENGINEERING

2018 CLASS PROFILE

August 2018

Krishn Ramesh
krishtnr@gmail.com
@KrishnRamesh

FOREWORD

Systems Design Engineering (SYDE) is a unique engineering program at the University of Waterloo which teaches students to solve complex problems using multidisciplinary design-focused methods. The program consists of 8 terms of courses and 6 technical co-ops over 5 years. The curriculum is interdisciplinary—spanning mechanical, electrical, and software engineering—with a heavy emphasis on design thinking and processes.

SYDE is known to produce big-picture thinkers and leaders who use systems theory as a way to understand the world and design methods to change it. SYDE students have a diverse set of interests, and use the program's flexibility to pursue them.

Because of its holistic nature, SYDE means different things to different people; this document extends the SYDE 2017 Class Profile, and aims to tell the stories of the Class of 2018, to serve as a memento and to share our experience with the world.



This document attempts to quantify our university experience between 2013 and 2018.

ANALYST'S NOTE

78 of 91 students (86%) are represented in this survey. It must be stressed that the results of this profile do not extend beyond the experiences of the SYDE 2018 class. The data does not necessarily generalize to other university students, nor even other SYDE cohorts. These results do not aim to make any inferences about a larger population, but only seek to represent the class as it was.

The terms 1A, 1B, 2A etc. refer to the semester of study, the number indicating the year and A or B indicating the first or second term. There were 6 total co-op work terms which alternated with school terms. The SYDE class of 2018 started school in September 2013, making that the 1A term.

All analysis involving income is expressed in Canadian dollars. The exchange rate used to convert from USD to CAD is 1.3, which is the mean exchange rate over the last 3 years.

The class profile was conducted by students independent of the department, faculty, and university.

CONTENTS

BACKGROUND / Demographics, Hometowns, Family, High School

CO-OP / Salaries, Locations, Industries, Brain Drain

ACADEMICS / Grades, Courses, Attendance, Exams

SOCIAL & LIFESTYLE / Friends, Extracurriculars, Community, Dating, Mental Health

THE FUTURE / Jobs, Salaries, Brain Drain, Pay Gap, Life Plans

BACKGROUND

Demographics, Hometowns, Family, High School

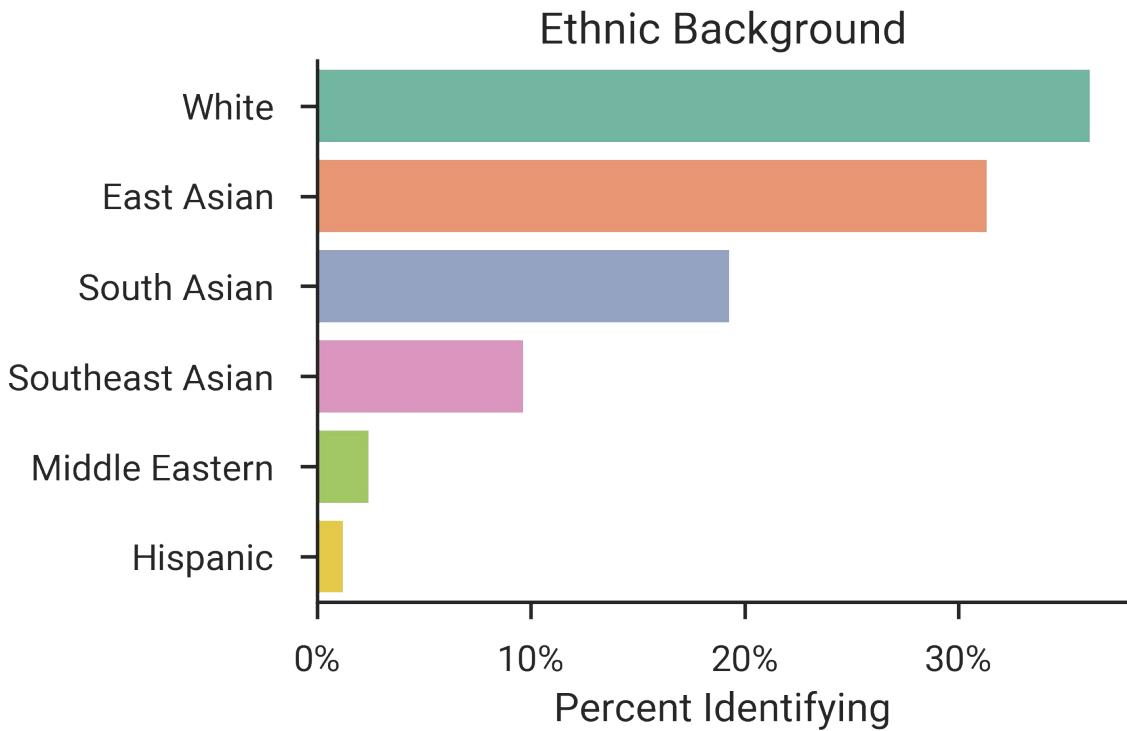
The class is diverse in ethnicity and religion, but not in gender.

The class is majority visible minorities, however there were no Black or Indigenous students.

36% of the class is female, which is higher than the UW Engineering average.

6% of the class identify as queer or bisexual. The remaining 94% identify as straight.

55% are not religious, however 9 different faiths are represented.



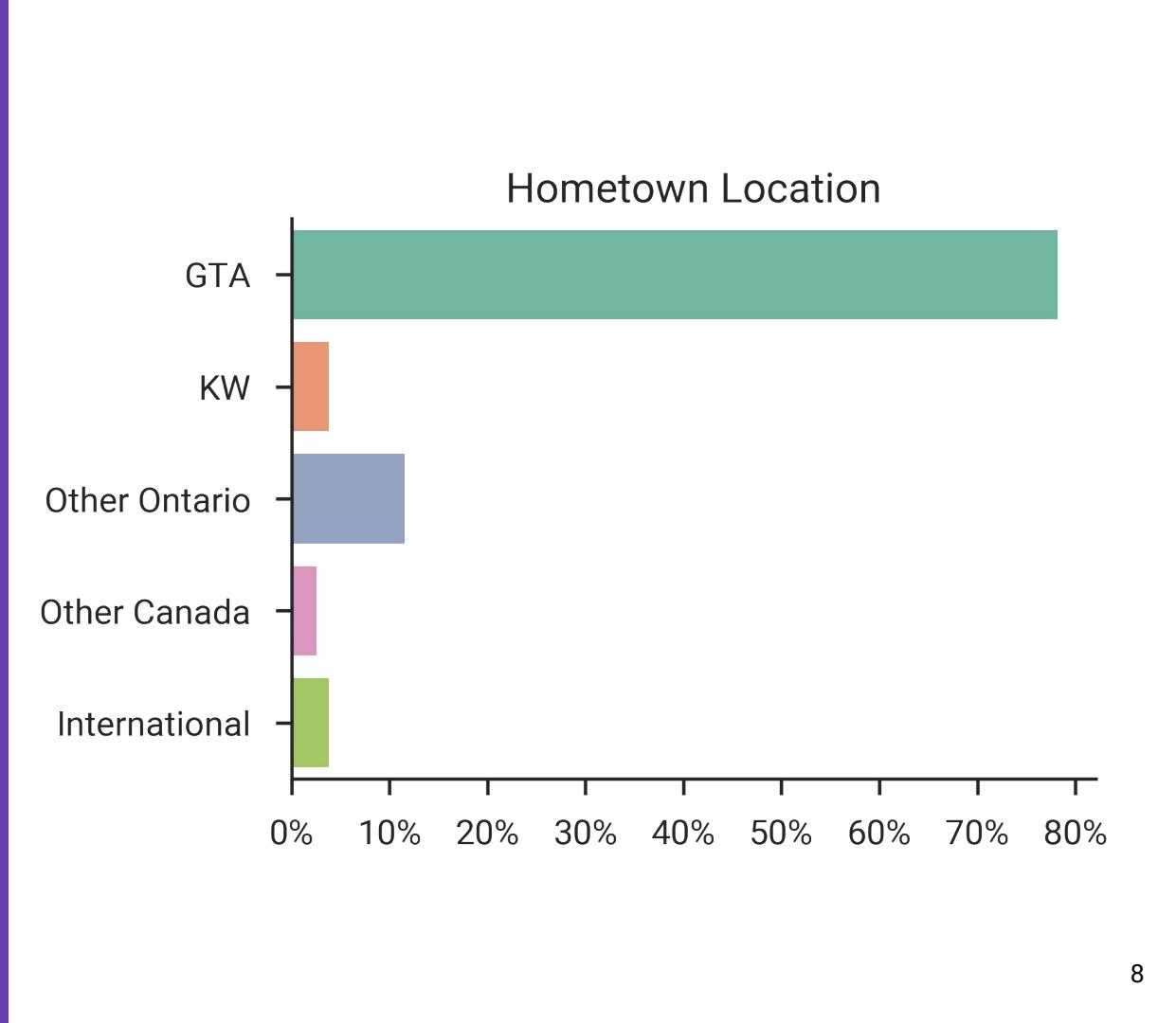
Almost everyone calls Ontario home & just under half were immigrants.

78% of the class was from the Greater Toronto Area.

Only 3% of the class were international students, which is considerably lower than 18% of the university at large.

44% of the class was not born in Canada, comparable to 46% of Toronto.

50% of those not born in Canada immigrated between 2000 and 2005 i.e. between kindergarten and Grade 5.

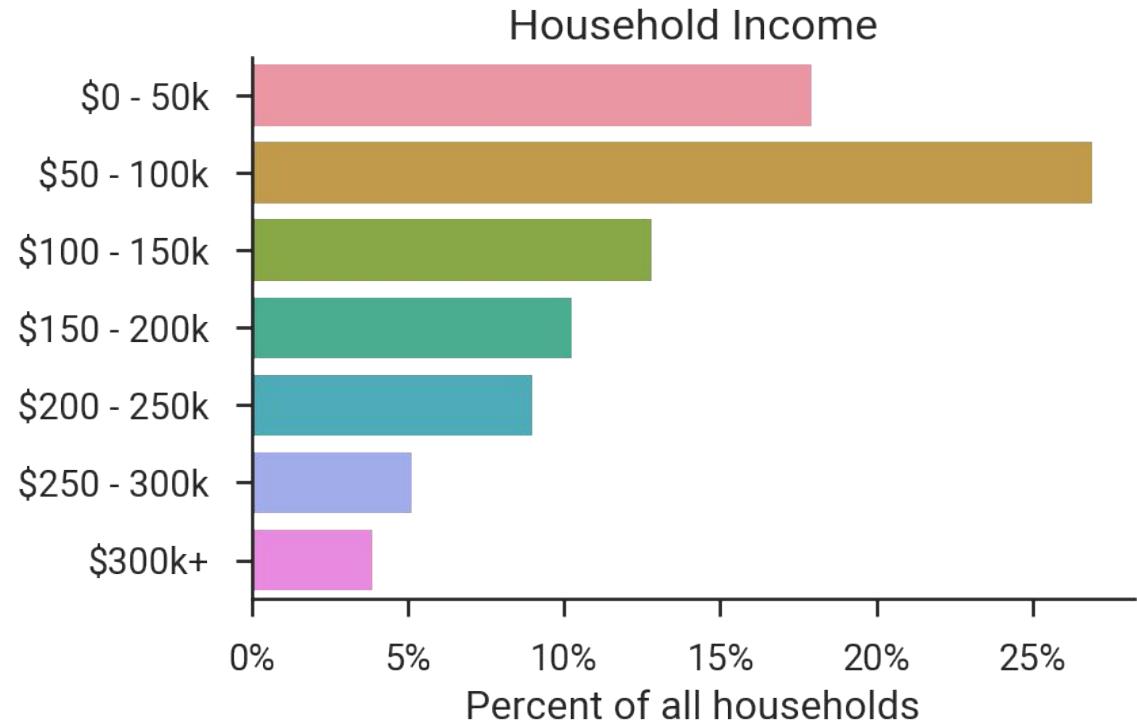


The class mostly came from wealthy and well-educated households.

The median household income was in the \$100 - 150k range; this is significantly higher than the \$70k median household income in Canada.

77% of students came from households with at least one university degree; 40% of households had at least one graduate degree.

30% of students had at least one parent with an engineering degree; 53% had at least one parent with a STEM degree.



The class excelled in high school and arrived with experience.

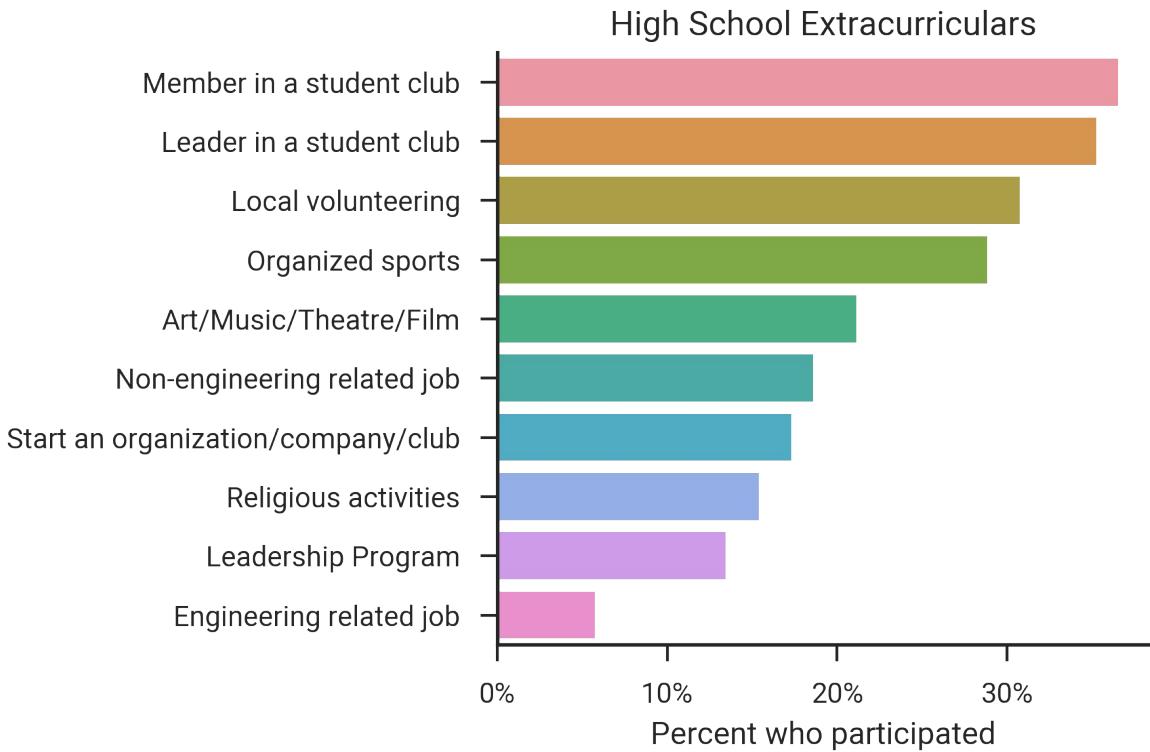
The mean entrance average was 93%.

35% of students were founders, 51% were leaders, 49% had worked jobs.

62% of the class did an enriched curriculum (21% AP, 17% IB, 15% gifted).

35% of the class considered Engineering Science at UofT.

UofT was considered by 58% of students, followed by McMaster, Queens & Western.



CO-OP

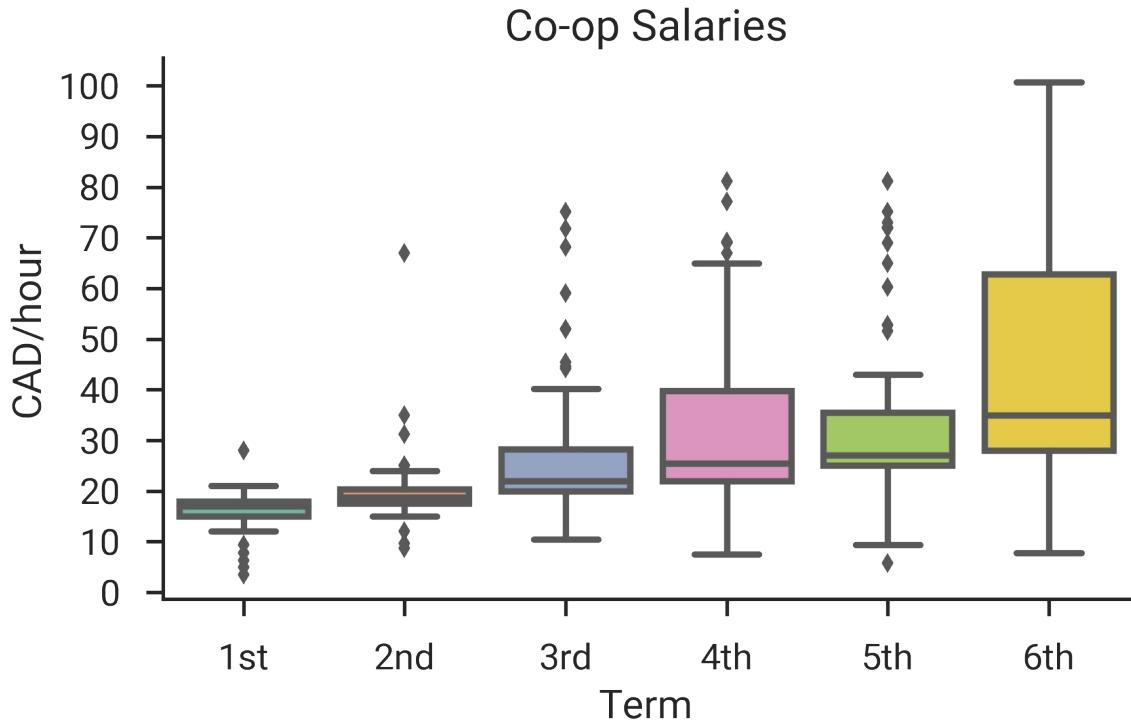
Salaries, Locations, Industries, Brain Drain

The median student made \$93,024 over the course of 6 terms.

Note that salary amounts are in CAD and include all compensation including housing stipends and bonuses.

Median salary increased from \$17/hour (\$33k annually) to \$35/hour (\$67k annually).

The variance in salary starting in the 3rd term is due to jobs in the USA, which paid more. The last 4 terms have a bimodal distribution with 2 peaks for American and Canadian salaries.

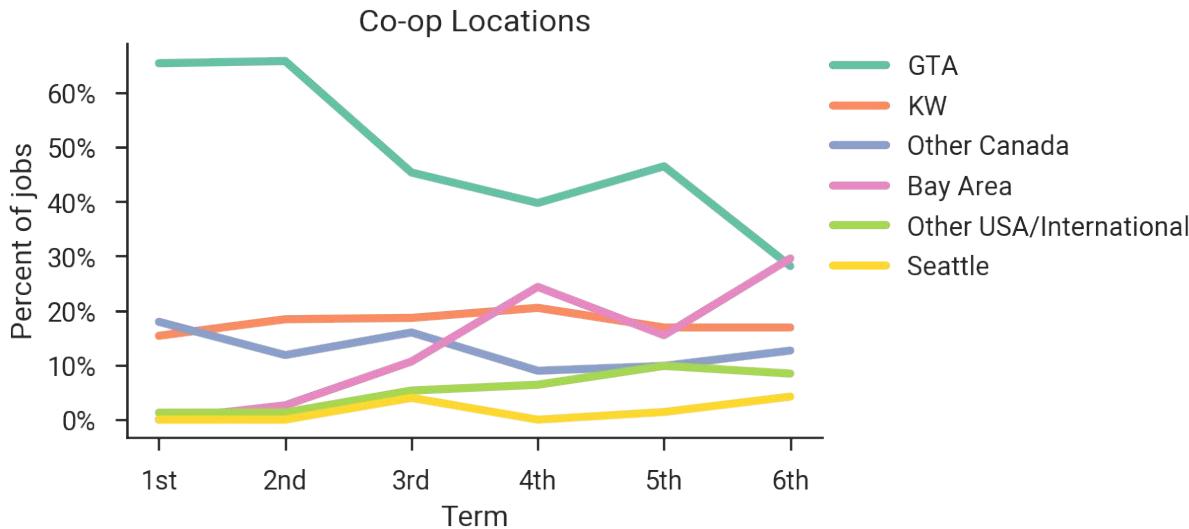


The Bay Area rose quickly to the most popular co-op location.

KW jobs held constant at 20% throughout due to strong employer connections locally.

The GTA and Bay Area/Seattle jobs are mirrors of each other—suggesting that students chose the Bay Area/Seattle over Toronto.

The median employment rate remained high across the 6 coop terms at around 97%.



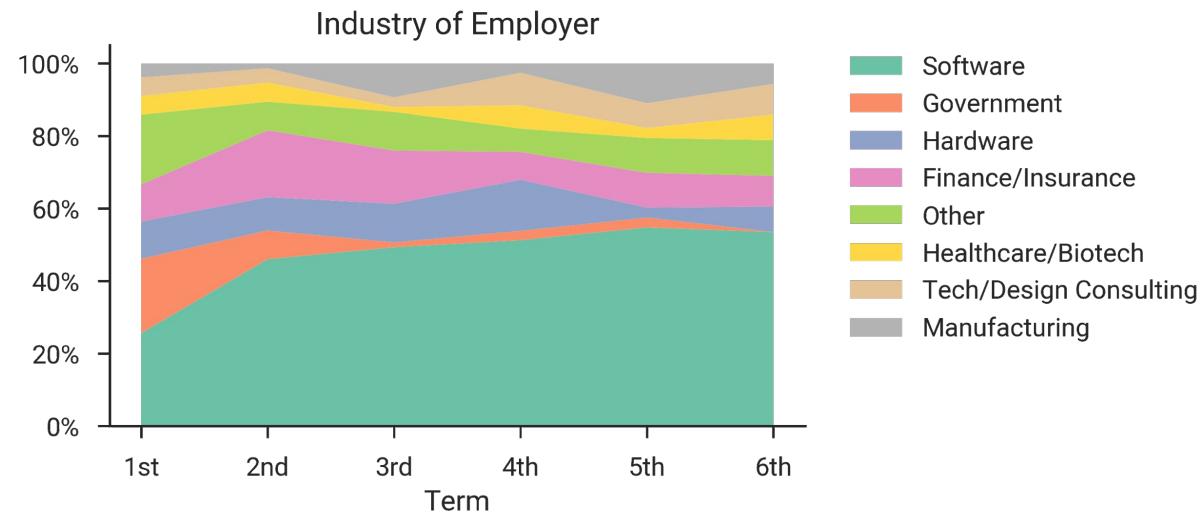
Over 50% of co-ops were in the software industry.

Government jobs were popular in the first couple terms but then reduced to zero.

A total of 12 different industries employed SYDE students—speaking to the diverse interests and skills of the students.

91% of students were consistently rated as Outstanding or Excellent, suggesting rating inflation.

60% of jobs were in large companies compared to 20% at small startups.

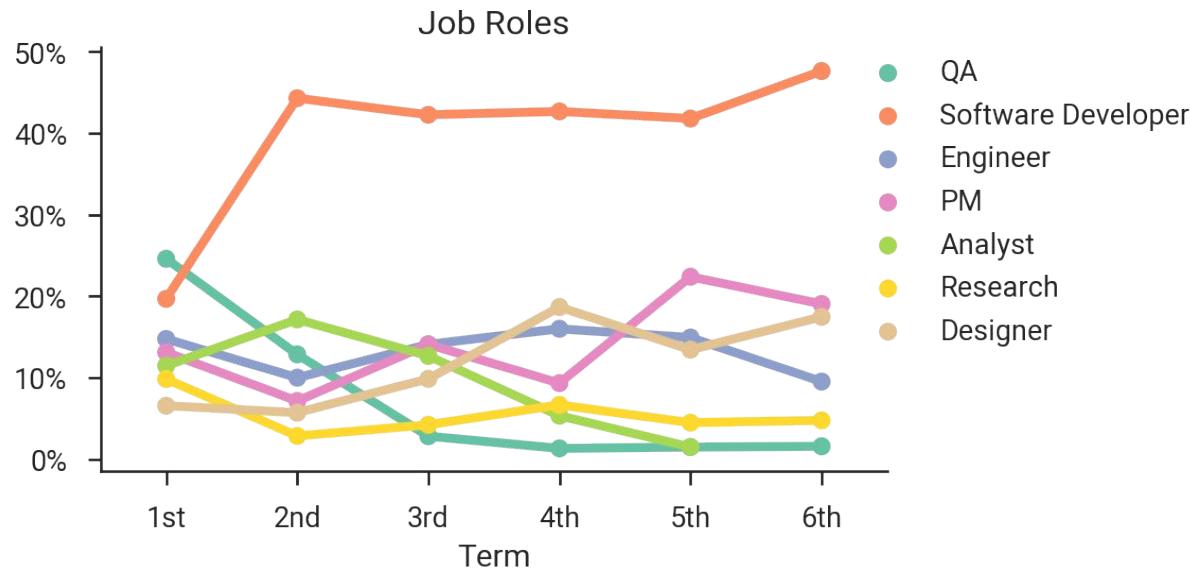


Between 40-50% of the class worked as software developers.

Quality Assurance (QA) started as the most popular role due to lack of technical experience but quickly shrank to the least popular role.

Product Management (PM) and Designer roles started out rare due to limited available positions but rose to about 20% of the class each.

Software development was so popular mainly due to two reasons: large number of available positions and high salaries.



High grades and software jobs resulted in higher salaries.

There was no pay gap between sexes.

South and East Asians out-earned everyone with \$37/hour, compared to below \$30/hour for others.

Household income, household education level and STEM degrees in household did not affect salary.

Entrance average and accelerated high school programs were correlated to salary—those above 94% or from IB/AP programs earned significantly higher (\$40+/hour).

| Factor | Segment | Median Salary (CAD/hour) |
|----------|------------------------|--------------------------|
| GPA | < 73 | 26 |
| | 73-79 | 36 |
| | 79-85 | 38 |
| | 85+ | 44 |
| Industry | Software | 39 |
| | Manufacturing | 36 |
| | Finance/Insurance | 33 |
| | Tech/Design Consulting | 32 |
| | Healthcare/Biotech | 29 |
| | Hardware | 26 |
| | Other | 25 |

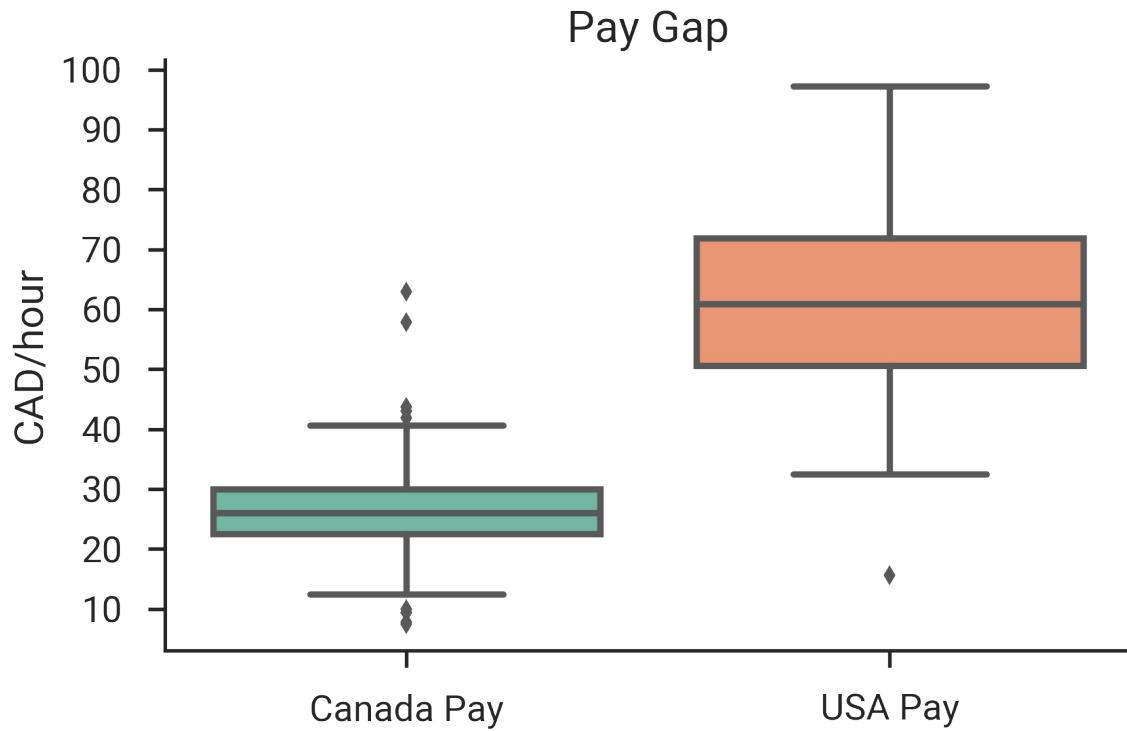
Only the last 3 senior co-op terms are considered for this analysis.

The brain drain is primarily due to significantly higher pay in the USA.

At a median of \$62/hour, compensations in the USA are 2.4x higher than in Canada.

Canada goes from 100% of all co-op jobs during the 1st term down to 58% for the 6th term. Meanwhile, USA rises quickly from 0% to 41%.

Note that only the last 3 senior co-op terms are considered, pay includes all compensation including housing stipends and bonuses, an average exchange rate over the past 3 years of 1.3 CAD/USD was used.



ACADEMICS

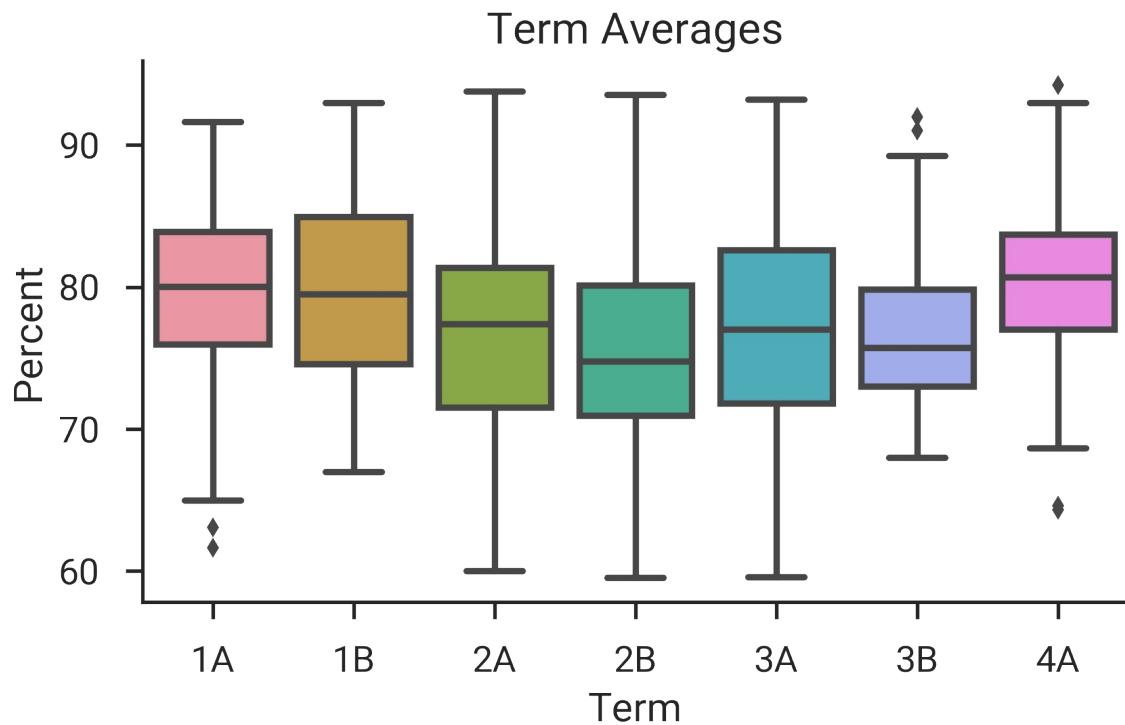
Grades, courses, attendance, exams

First year was the easiest and 2B was the most difficult.

Term averages for the class stayed consistently between 77% and 80%, with the exception of 2B.

Attendance decreased steadily over the terms. Between 1A and 4B, the proportion of students “always attending” decreased from 72% to 23% while those who “never attended” increased from 0% to 23%.

The data supports the anecdotal evidence of the 2A-2B-3A terms as being the difficult hurdle.



The wealthy, South Asians & IB grads had the highest GPAs.

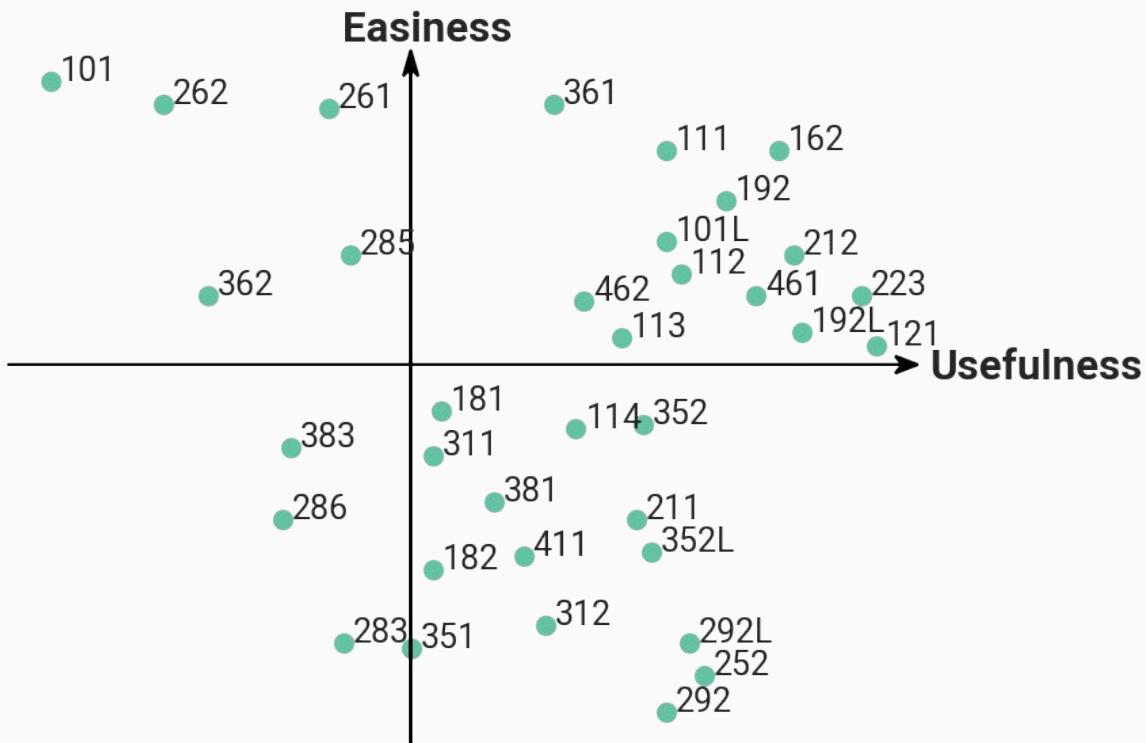
Entrance average was a somewhat strong predictor of GPA.

The only statistically significant difference affecting GPA was being in an accelerated program in high school vs not.

Gender, ethnicity, attendance, # of friends in SYDE and parental education background all had non-significant or inconclusive effects on GPA.

| Factor | Segment | Median GPA |
|---------------------------------|-----------------|------------|
| Accelerated High School Program | IB | 81.8 |
| | Gifted | 80.2 |
| | AP | 77.9 |
| | None | 75.7 |
| Ethnic Background | South Asian | 80.7 |
| | East Asian | 78.2 |
| | White | 77.7 |
| | Southeast Asian | 75.2 |
| Household Income | \$200k+ | 80.5 |
| | \$100-200k | 78.6 |
| | \$0-100k | 76.6 |

Courses



Course mapping can be found [here](#)

Best Courses (Easy + Useful)

SYDE 162
(Human Factors in Design)

SYDE 111
(Fundamental Eng. Math 1)

SYDE 192
(Digital Systems)

Worst Courses (Hard + Not Useful)

SYDE 283
(Electricity, Magnetism & Optics)

SYDE 351
(Systems Models)

SYDE 286
(Mechanics of Deformable Solids)

The class pursued an eclectic range of interests.

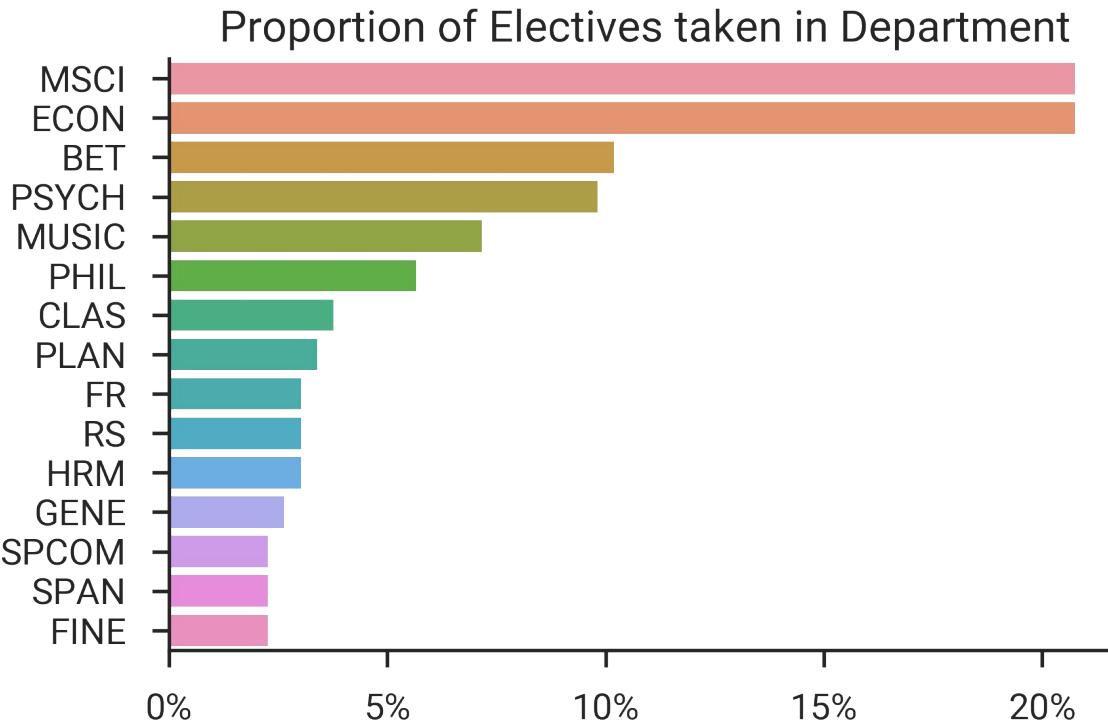
Electives hailed from 52 departments!

The top technical electives were:

- Conflict Resolution
- Machine Intelligence
- Software Design
- Cognitive Ergonomics
- Image Processing
- Intro to Pattern Recognition

The top non-SYDE electives were:

- Organizational Behaviour
- Microeconomics
- Macroeconomics
- Introductory Psychology
- Organizational Design & Tech



Department codes can be found [here](#)

70% of students have cheated in some capacity.

80% of students were satisfied with the design courses and projects.

Some class favourite profs include:

Igor Ivkovic

Matthew Borland

Hamid Tizhoosh

Paul Fieguth

Keith Hipel

Roydon Fraser

Sean Speziale

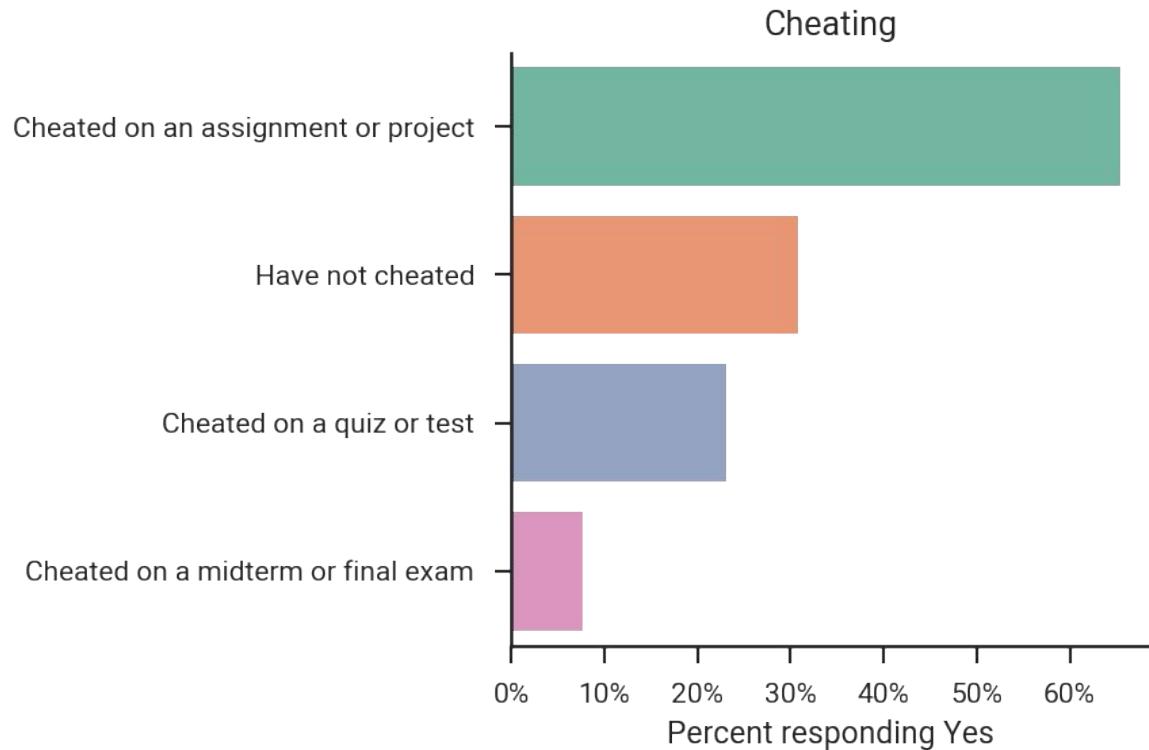
Carolyn MacGregor

Stephen Birkett

Orion Bruckman

Amenda Chow

Andrew Beltaos



Three-quarters of the original cohort made it to graduation.

95% of the graduating class were part of the original cohort (as opposed to transfers). All of the transfers into the class felt they were well integrated.

1 in 5 have failed at least one course.

Most of the class would choose to do SYDE again.

29% of the class went on exchange—mostly during 3B. Popular destinations included Singapore, Hong Kong, Spain, France, Switzerland, the Netherlands, Sweden & the UK.

If you could go back in time, what program would you choose?

| Program, University | Percentage |
|--------------------------------------|------------|
| Systems Design Engineering, Waterloo | 78% |
| Not Sure | 8% |
| Mechatronics Engineering, Waterloo | 5% |
| Computer Science, Waterloo | 3% |
| Software Engineering, Waterloo | 2% |
| Computer Engineering, Waterloo | 1% |
| Biomedical Engineering, Waterloo | 1% |
| Applied Math, Waterloo | 1% |
| Computer Science & BBA, Waterloo | 1% |

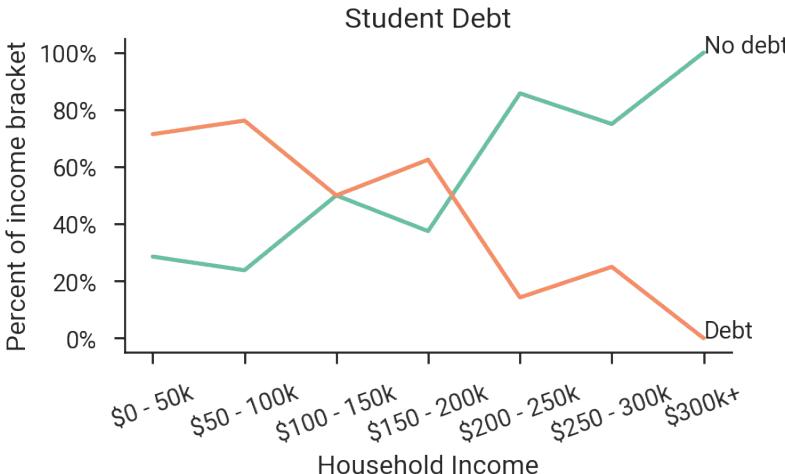
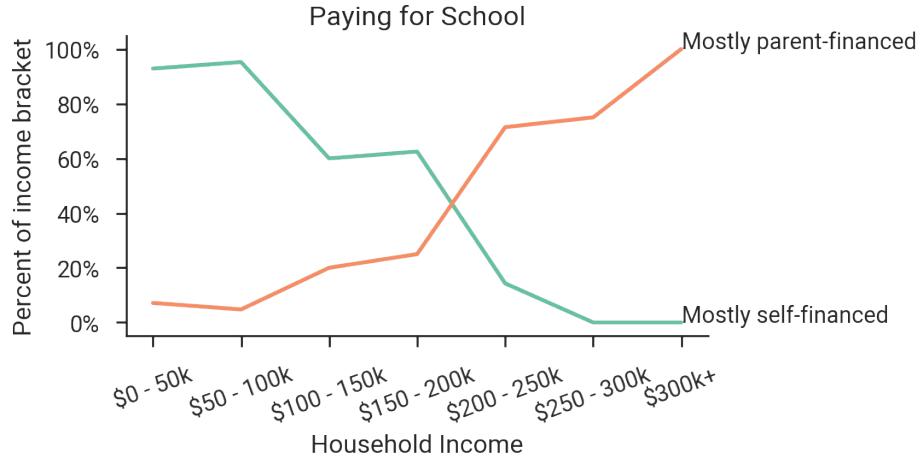
Almost half the class (47%) graduated debt-free.

Lower-income students mostly self-financed their education and graduated with debt.

The median amount of debt is \$0 - 5k.
The mean amount of debt is \$10 - 15k.

27% (mostly from lower income households) have over \$20k in debt.

Half of the class financed almost all (80% +) of their university education by themselves.



SOCIAL & LIFESTYLE

Friends, Extracurriculars, Community, Dating, Mental Health

University was about a lot more than just studying.

The most popular extracurricular was intramural sports (38% of the class), followed by involvement with a club (16%) and religious activities (13%).

1 in 4 started or worked on a startup.

3 in 4 participated in a hackathon like Hack the North.

15% of the class held a class representative or student government position.



Two-thirds would invite more than 10 classmates to their birthday party.

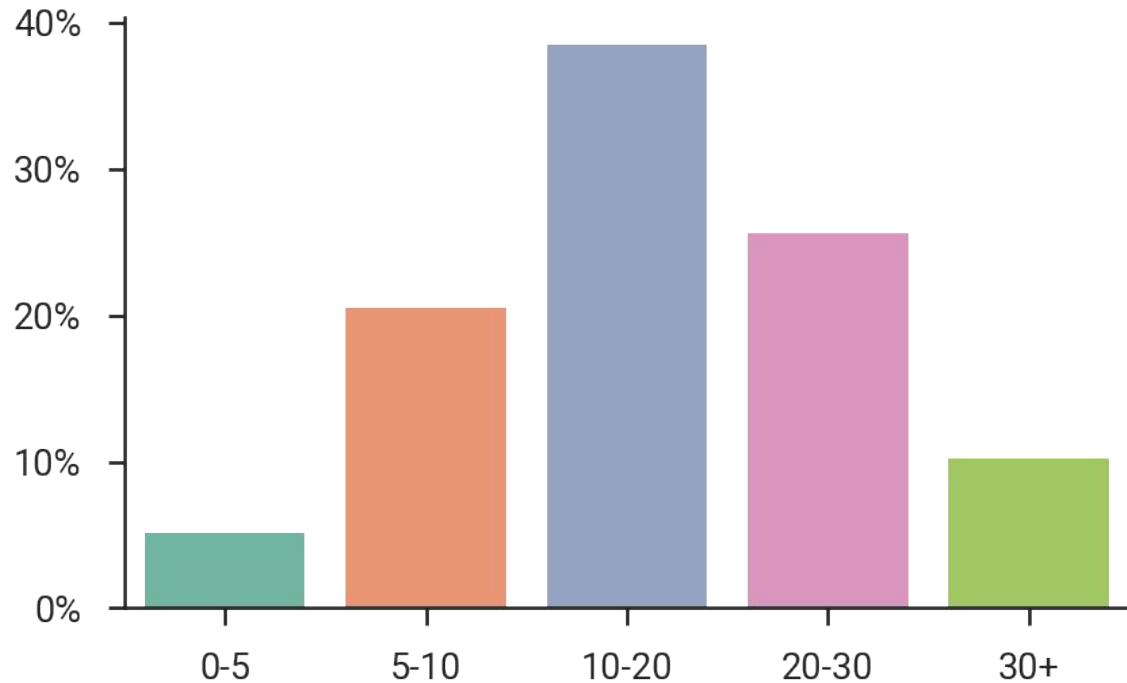
The median student had 4 out of their 5 closest friends in SYDE.

64% of the class attended at least one student-organized SYDE social event almost every term.

90% have shared advice with younger cohorts. The class gave more referrals to younger cohorts (33%) than the older cohorts gave to the class (23%).

The median students had 9 unique roommates out of which 4 were in SYDE.

Number of friends in SYDE



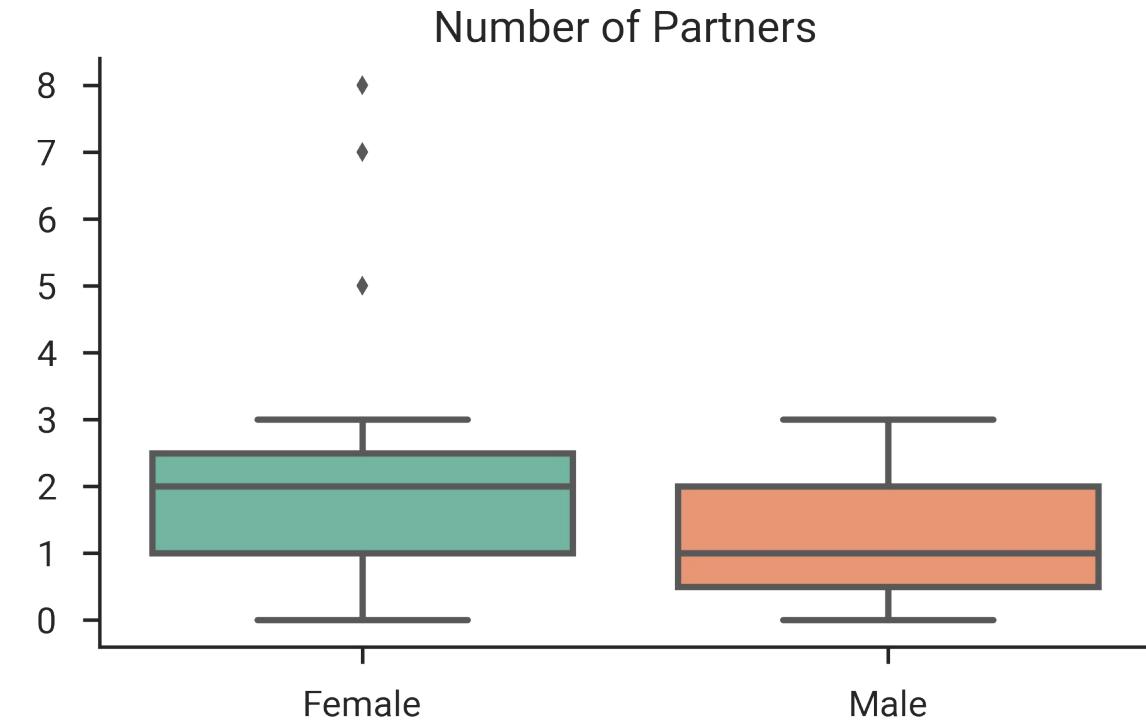
15% dated a classmate, 13% dated someone in another cohort.

74% of males and 90% of females have had at least one romantic partner during university.

The median number of partners for males is 1 and for females is 2.

The most common ways for males to meet partners were knowing them from high school, through friends or in SYDE.

The most common ways for females to meet partners were through co-op, in SYDE or through friends.



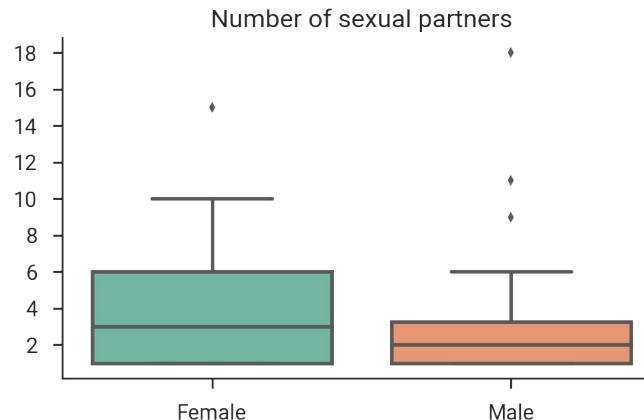
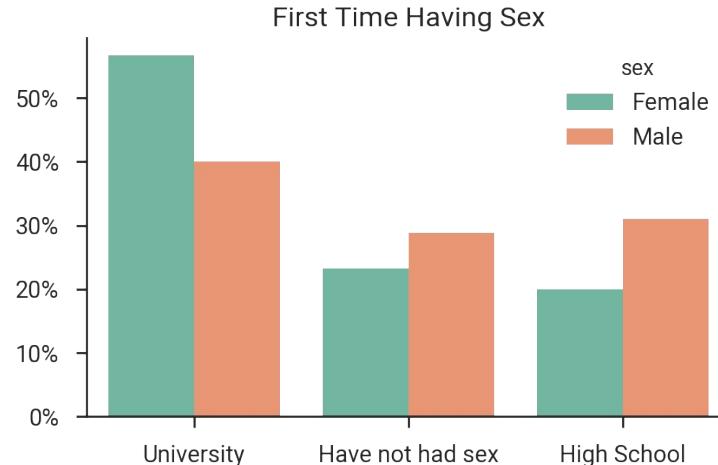
47% of the class had sex for the first time in university.

Males were more likely to have had sex in high school, as well as to not have had sex at all.

The majority of females in the class had sex for the first time in university.

27% of the class have not had sex.

Females had a median of 3 sexual partners while males had a median of 2.



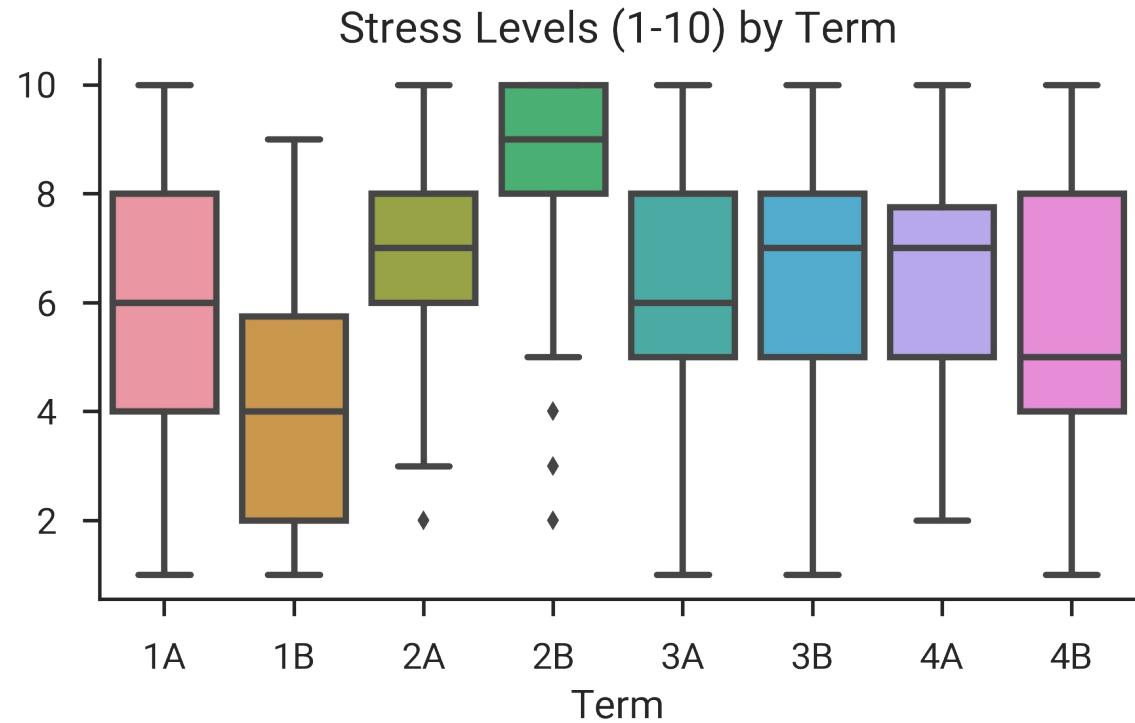
Stress levels are negatively correlated with the mean term GPA.

2B was by far the most stressful with a median rating of 9.

1B was the least stressful term with a mean rating of 4.

First year was the easiest due to the highest grades as well as least stress.

Second year was the most stressful with a median stress level of 8.



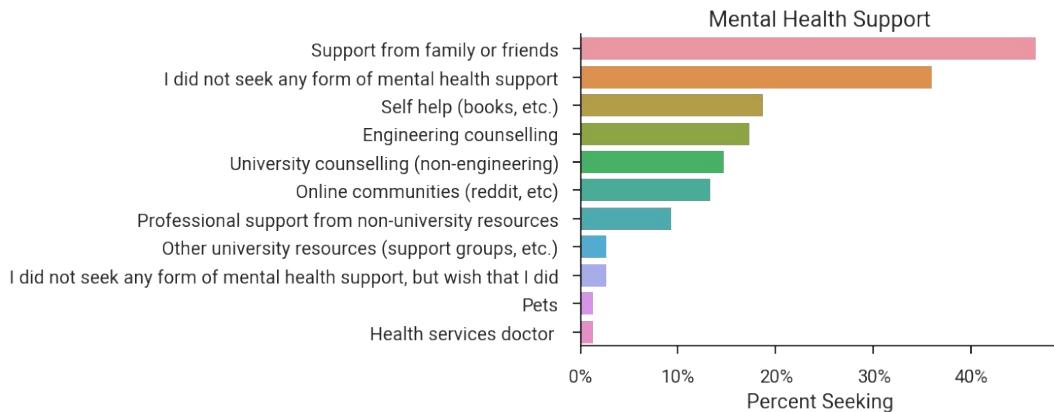
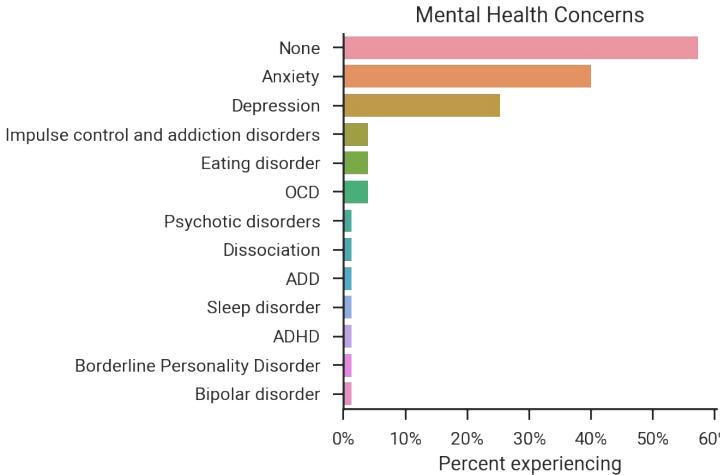
43% of the class experienced mental health concerns.

By far the most common concerns were anxiety (2 in 5 students) and depression (1 in 4 students).

36% of the class did not seek any form of mental health support.

The most common sources of support were family/friends (47%) and self help methods (19%).

28% of the class used at least one form of university-offered support.



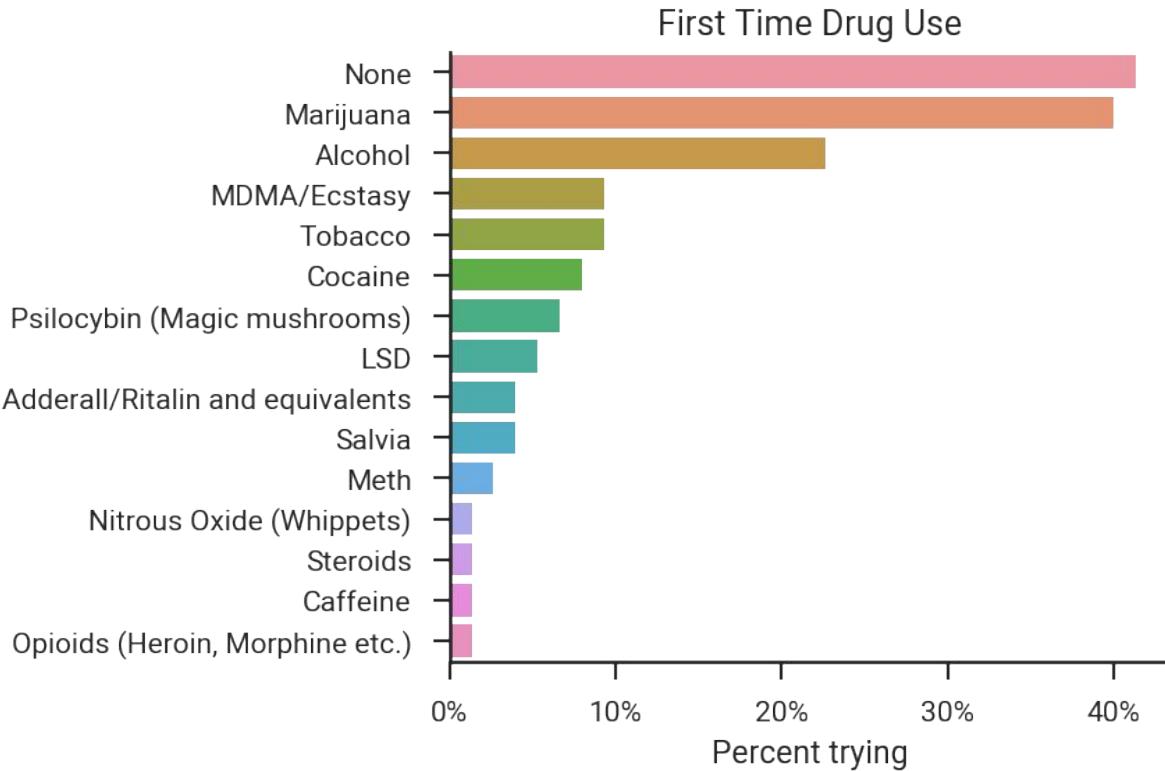
59% of the class experimented with new drugs.

The most commonly tried drug was Marijuana with 40% of the class trying it for the first time.

Although alcohol was the most widely used drug, only a quarter of the class tried it for the first time in university (meaning most had tried it before).

Psychedelics like MDMA, mushrooms and LSD were popular, however hard drugs like opioids, methamphetamine and cocaine still attracted a few.

"Study drugs" like Adderall/Ritalin were only used by a small minority.

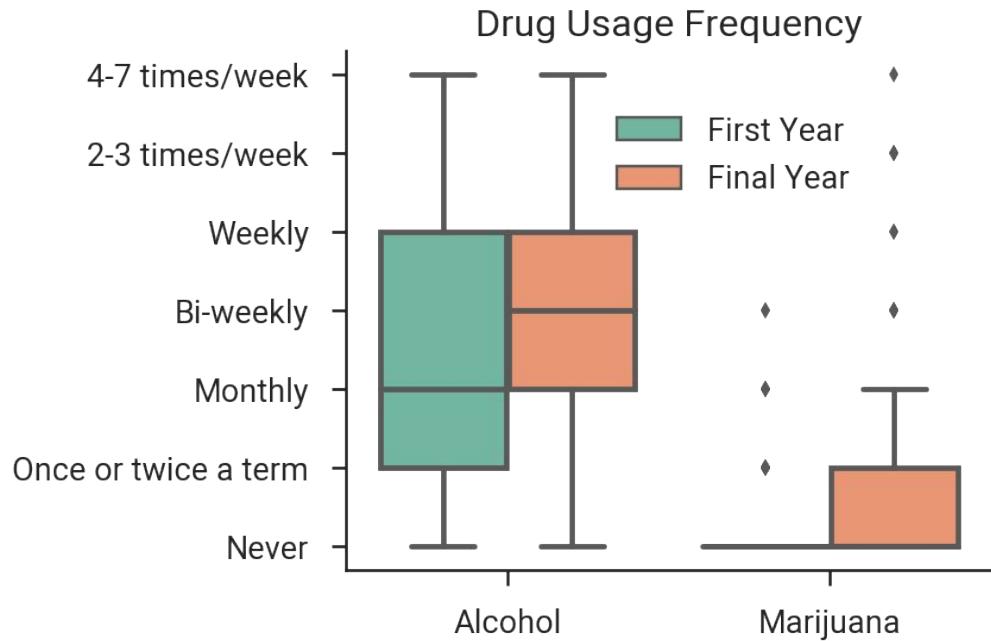


Drinking and marijuana consumption increased.

In first year, the median student drank monthly, and never consumed marijuana.

In fourth year, the median student drank bi-weekly, and still never consumed marijuana.

Although marijuana consumption for the bottom 50% did not change, the top 50% increased their use with some even consuming weekly to daily.



THE FUTURE

Jobs, Salaries, Brain Drain, Pay Gap, Life Plans

80% of those planning to work are employed as of graduation.

57% of those planning to work were employed one term before graduating (mostly from US companies which recruit early).

10% plan to pursue graduate school.

Some of these programs are:

SYDE / Waterloo

Aerospace Vehicle Design / Cranfield

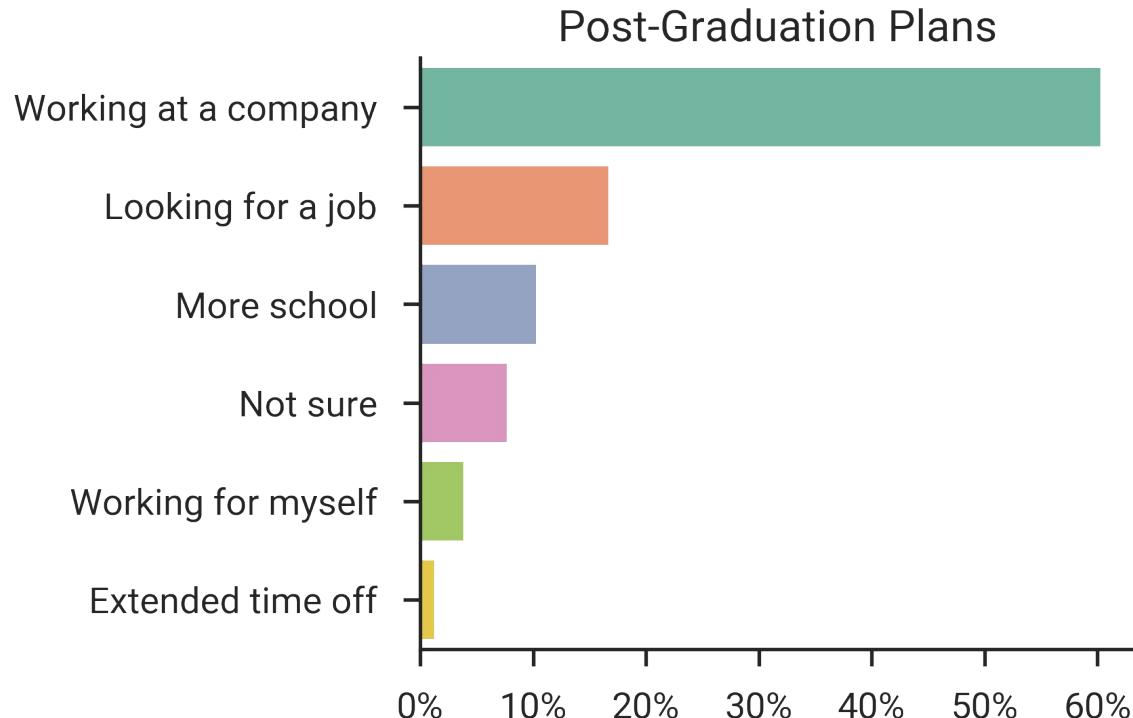
Computer Science / Unknown

Biosignals / Waterloo

Biomedical Engineering / Western

Bioengineering / Johns Hopkins

Machine Intelligence / Waterloo



Half will work in software companies as software engineers.

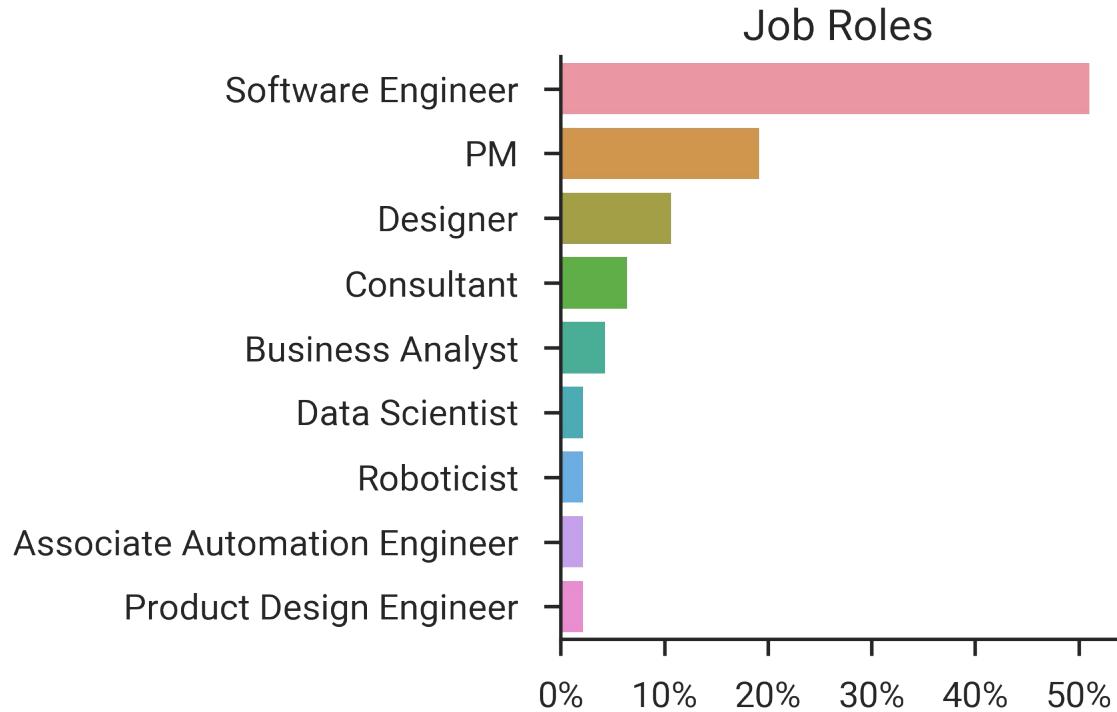
1 in 5 will work as Product Managers.

1 in 10 will work as Designers.

62% will work at software companies with less than 10% each at consulting, biotech, hardware and finance firms.

90% of jobs are related or somewhat related to SYDE.

Half of those employed are returning to a company they have done a co-op at.



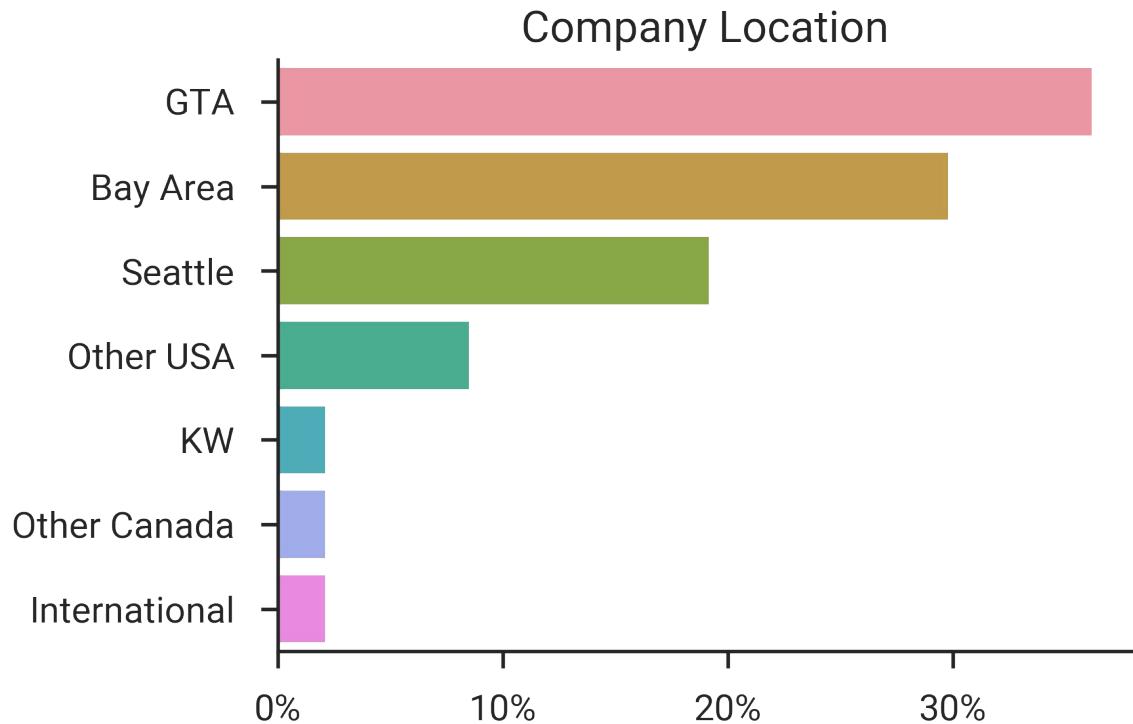
Half of those employed will relocate to the Bay Area or Seattle.

60% of those employed will relocate outside Canada.

Among the top cited reasons for leaving were: higher compensation, better career opportunities, fun, better tech scene, new life experiences, prestige or no offices in Canada.

Within Canada, 90% of jobs are in the GTA.

Seattle made large gains over the Bay Area compared to their proportions during the last few co-op terms.



The median compensation for those employed is 173k CAD/year.

The total compensation package includes a base annual salary, an equity package that generally vests over 4 years, and a one-time signing bonus (split over 4 years for analysis).

Compensation varies significantly by location, role and sex. These trends are analysed in detail over the next few slides.

Note that sample sizes are small (# employed=47) and these trends should not be generalized.

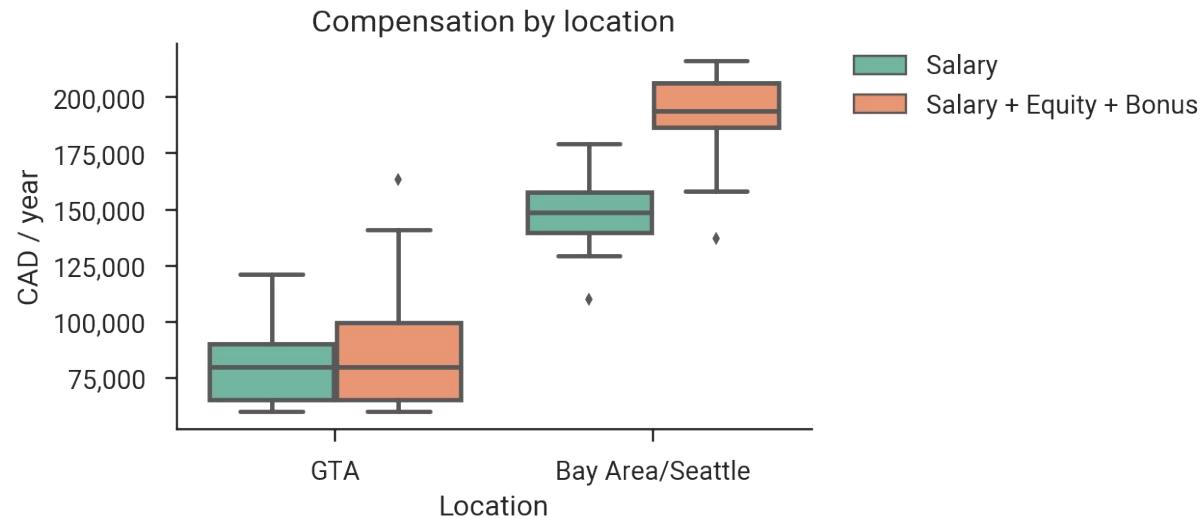
| Factor | Segment | Median Compensation (CAD) |
|----------|--|---------------------------|
| Pay | Salary / year | 129k |
| | Equity / year (fixed amount over 4 years) | 36k |
| | Bonus / year (one-time but split over 4 years for analysis) | 8k |
| Location | Bay Area/Seattle | 193k |
| | Other USA | 137k |
| | GTA | 80k |
| Role | PM | 188k |
| | Software Engineer | 183k |
| | Designer | 105k |
| Sex | Male | 187k |
| | Female | 114k |

Much higher pay in the USA is a large factor in the brain drain.

Bay Area/Seattle salaries are 1.9x higher and compensations are 2.4x higher than the GTA. The CAD/USD exchange rate only explains 1.3x of the difference.

The median compensation in the GTA is \$80k, while the median Bay Area/Seattle compensation is \$194k.

Note that equity and signing bonuses are not very common in Canada, leading to lower compensation packages.



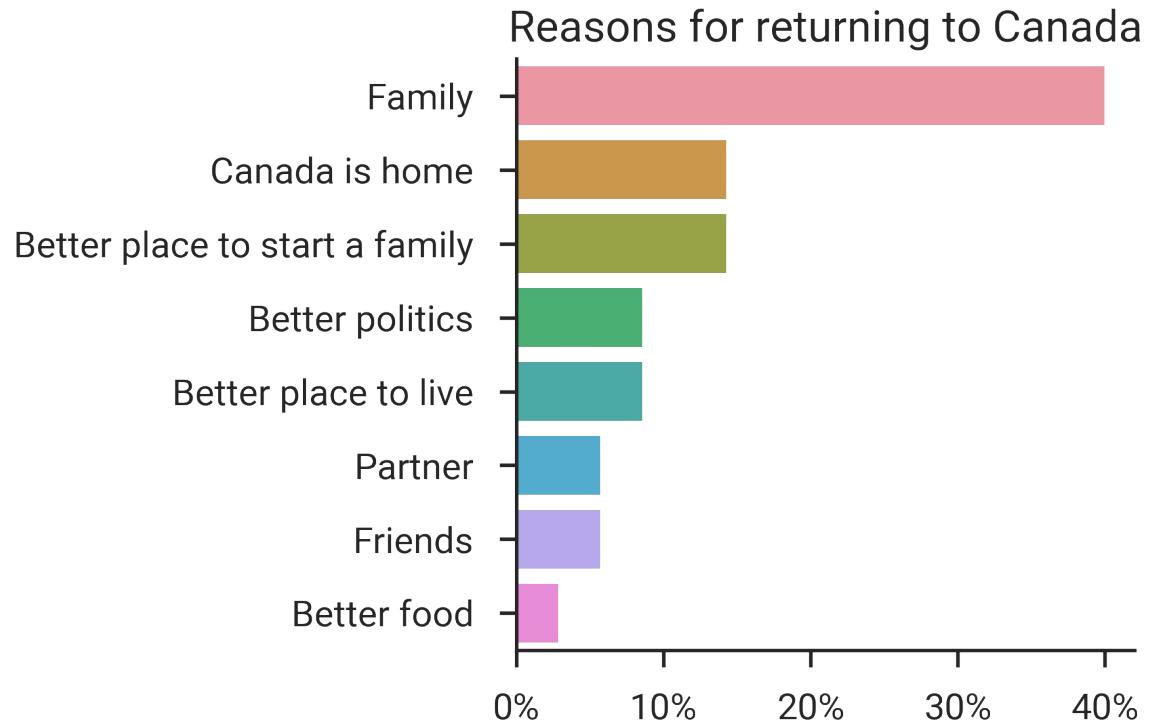
Despite leaving, 86% plan to eventually come back to Canada.

57% of those leaving plan to return within 5 years.

21% are not sure if/when they will return. No one said they would never return.

Being close to parents and family is the number one reason for returning.

Many would also like to start a family in Canada, preferring its political climate and deeming it to be a better place to live.



There is a significant pay gap between males and females.

Median male salaries are 1.3x higher and median male compensations are 1.6x higher than for females.

This is partly due to only 50% of females working in Bay Area/Seattle compared to 63% of males.

As well, 90% of males have the higher paying roles of PM and Software Engineer compared to 45% of females.

However, even after controlling for location and role, male compensations are 10-20% higher across the board.



The class is passionate about equity, education, and environment.

Excerpts on what change the class would like to see in the world:

"more compassion, listening, communication and understanding"

"equal access to opportunity for all"

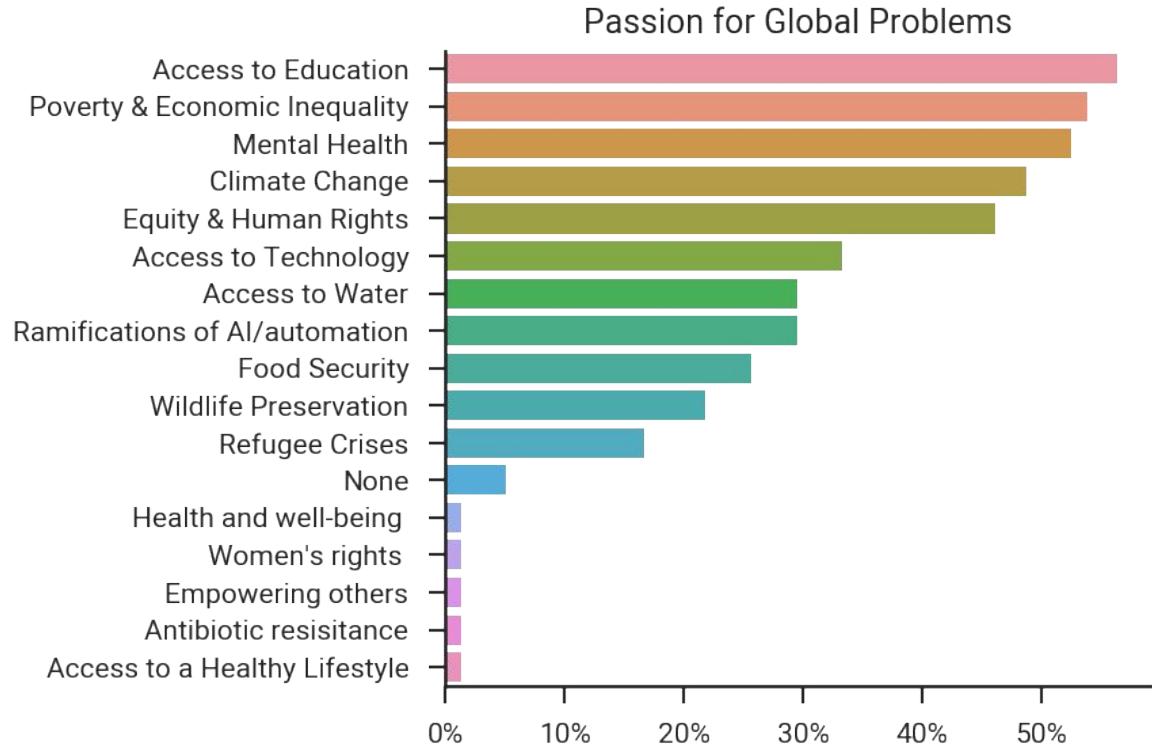
"more empowered women, more efficient healthcare"

"being able to close the technology and poverty gap"

"improved human rights through increased access to education"

"not letting potential go wasted"

"climate change eradicated"



Most want to marry at 28 and have kids at 30.

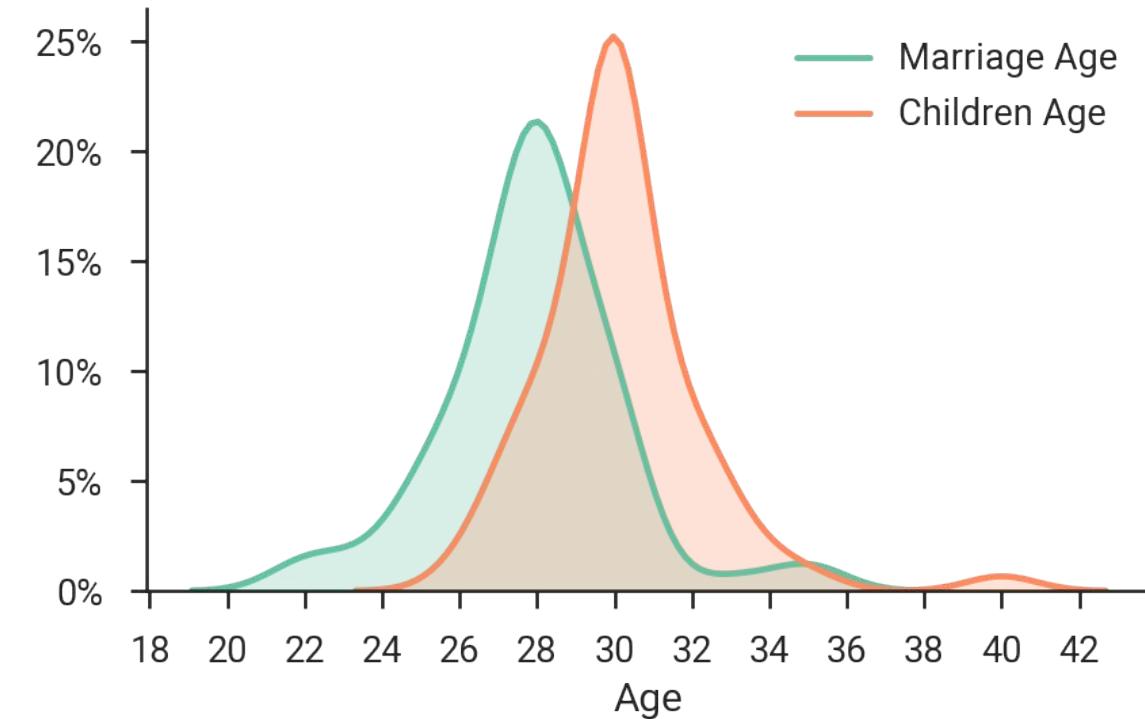
A decade on, more hope to work in Education, Healthcare and Non-Profits.

The median student plans to keep in touch with 1-5 classmates.

52% plan on donating to SYDE or UW.

Two-thirds plan to get another degree such as a Masters, MBA, PhD, MD or JD. However, only 10% of the class are attending school after graduating.

A majority plan to settle down in Canada (Toronto is preferred by a third).



Final Remarks

I would like to thank Joey Loi and Atef Chaudhury for inspiring this effort with their 2017 SYDE class profile, as well as Andy Zhang for his 2018 Software Engineering class profile.

I appreciate the help of my classmates who assisted in various ways throughout the process of creating this document.

I am deeply grateful to my professors, TAs, department staff and classmates who made the SYDE experience truly life-changing.

For any inquiries about the data, methods or analysis, I can be reached at krishnr@gmail.com or [@KrishnRamesh](https://twitter.com/KrishnRamesh) on Twitter.