# Technion CS student salary survey report

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## Introduction

This report analyzes the salaries of Technion computer science students in their first student position. Salaries are analyzed according to various parameters such as gender, semester, year and more. All the salaries in the report are described using ILS per hour, as accepted in the student positions.

The report is based on a survey that was published in the Facebook group *'מדעי המחשב בטכניון'* which contains 8.1K members (as of 03/09/2022). It was also distributed in the CS student Whatsapp groups. The data was collected using two identical surveys: the first was published at the 21/09/2021, and was answered by students who got their job offer in 2019 to 2021, and the second at 16/08/2022, and was answered by students who got their job offer in 2022. The survey transcript can be found here.

Among the main findings of this report:

- There is no significant difference in the average salary for women and for men.
- Most candidates (76%) did not try to negotiate; Surprisingly, women candidates negotiated more than men (33% of women, 20% of men).
- The courses a candidate had taken prior to the offer did not make a significant difference on the offered salary; however, the semester they were in when receiving the offer did make a difference. The highest offers were given to $4^{th}$ semester students.
- There is a significant difference in the salary offered by different companies.

One of the main purposes of this analysis was to create a solid foundation for future salary surveys, to help people from different organizations and backgrounds to conduct these surveys, and to aid in the goal of achieving equal opportunities. Therefore, all the code is published in a repository on GitHub (more information can be found here).

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# Data Preparation

363 people answered the survey. Out of those, 14 entries were removed during the cleaning process:

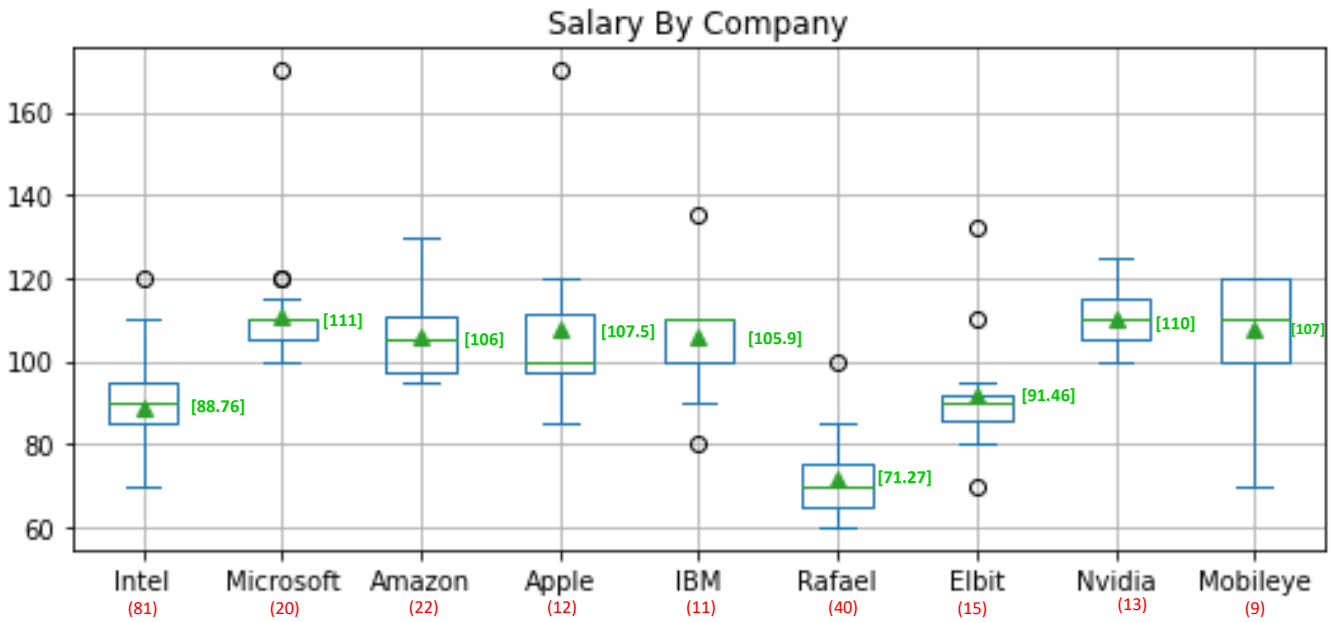
a. 9 entries had a missing or illegal (negative numbers or words) salary values.
b. 3 entries where the salary was extremely low and most likely does not belong to a hi-tech position.
c. 1 entry with extremely high salary, most likely due to prior experience.
d. 1 entry with a missing grade average.

349 answers remained.

Outliers in this analysis was defined as samples which their values are higher than $Q3 + 1.5 \cdot IQR$, or lower than $Q1 - 1.5IQR$. $Q1, Q3$ are the first and third quartile of the data, respectively, and $IQR = Q3 - Q1$.

# Salary By Company

We examined the salary average and distribution by the offering company. The results are shown in the following boxplot chart.




The mean value for each company is marked by a green triangle ( ) and the exact value is written next to it in green. Outliers are marked by unfilled circles ( ). The number of answers in each company is in red below the horizontal axis.

## T-Test

We further compared the mean values in each company versus the other companies using an unpaired t-test. Since the number of records in each specific company was relatively low, we can expect that most of the salary differences would not be statistically significant. However, we did find some significant differences.

First, the salary offered by Rafael was significantly lower than all other companies (with p-values ranging between $6.99 \cdot 10^{-20}$ $and$ $3.00 \cdot 10^{-8}$). Elbit and Intel offers were also significantly lower than the remaining companies (with p-values ranging between $1.418 \cdot 10^{-12}$ and $1.675 \cdot 10^{-6}$). The differences between other companies were not statistically significant.

## Discussion

We can see that the salaries vary by company. It is important to mention that the number of survey answers for some of the companies is relatively low, and therefore not necessarily representative to the real salaries for students in those companies. However, we decided to publish these results, as a basic guideline that gives an idea about salaries in different companies.

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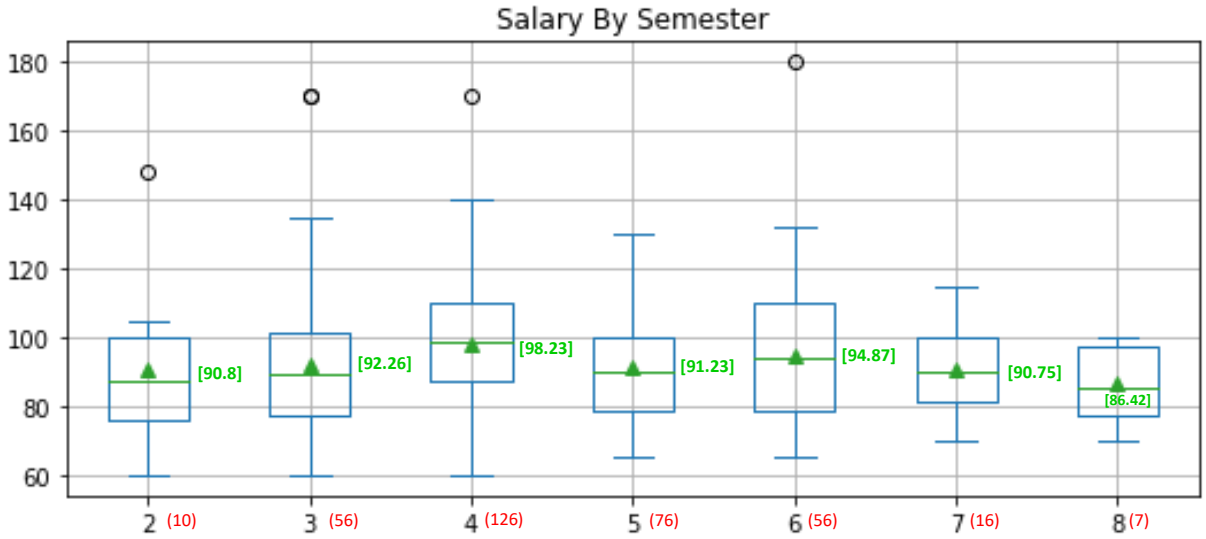
# Salary By Semester

We analyzed the salary average and distribution by the semester on which the students were when they got their job offer. The results are shown in the following boxplot chart.




The mean value for each semester is marked by a green triangle ( ) and the exact value is written next to it in green. Outliers are marked by unfilled circles ( ). The number of answers in each semester is in red below the horizontal axis.

## T-Test results

We further compared the mean values for each semester versus the other semesters using an unpaired t-test. The statistic value and p-value can be seen in the table below.

| Semester number | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|
| 2 | statistic: -0.184, pvalue: 0.855 | statistic:1.235, pvalue: 0.219 | statistic: --0.076, pvalue: 0.94 | statistic: -0.537, pvalue: 0.593 | statistic: 0.007, pvalue: 0.995 | statistic: 0.425, pvalue: 0.677 |
| 3 | | **statistic: -1.916, pvalue: 0.057** | statistic: 0.305, pvalue: 0.761 | statistic: -0.618, pvalue: 0.538 | statistic: 0.253, pvalue: 0.801 | statistic: 0.658, pvalue: 0.513 |
| 4 | | | **statistic: 2.831, pvalue: 0.005** | statistic: 1.116, pvalue: 0.266 | statistic: 1.634, pvalue: 0.104 | statistic: 1.729, pvalue: 0.086 |
| 5 | | | | statistic: -1.115, pvalue: 0.267 | statistic: 0.115, pvalue: 0.908 | statistic: 0.779, pvalue: 0.438 |
| 6 | | | | | statistic: 0.728, pvalue: 0.469 | statistic: 1.01, pvalue: 0.316 |
| 7 | | | | | | statistic:0.774, pvalue: 0.448 |

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## Discussion

First, we note that many students get their first job on the 4th semester (126, 36%) and on the 5th semester (76, 22%). This can be explained by the student year schedule. Most of the students start their degree in the winter semester, and therefore, their even semesters are conducted during the spring, and end before the summer vacation. The summer vacation is considered a good time to start a student position, since it allows more time to work during the summer, and to learn the required skills in a new workplace in a full-time capacity. The summer after the 4th semester is a particularly suitable time to look for a first student position, once the student has completed Introduction to Systems programming, Data structures, and Algorithms courses, which may aid greatly in the interview process.
Hence, it is likely that most of the students would like to start their position at the summer, and therefore look for a student position during the even semesters (before the summer). Others take advantage of the summer vacation for the interview process.

The average salary for 4th semester students was significantly higher than that of 3rd semester students (p-value=0.057). This is likely due to the courses of semester 4, such as Data Structures, which improve the student's ability to succeed in a coding interview.

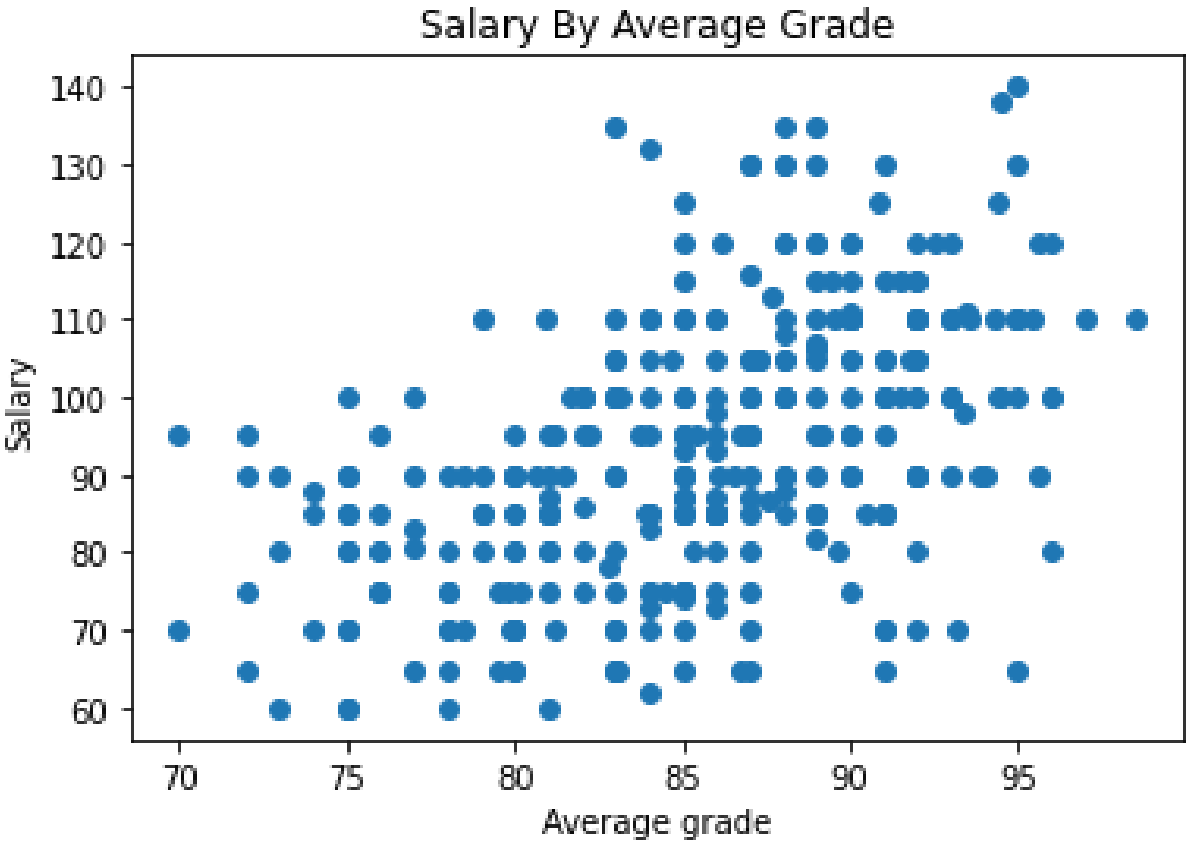
The salary for 4th semester students was also higher than that of 5th semester students (p-value=0.005). This is counter-intuitive; one could expect that the more courses and knowledge a student gains, the higher their salary will be. However, we hypothesize that students who got their offer on the 5th semester started looking for a job on the previous semester and took longer to land a position, which made them compromise over the compensation.

This phenomenon occurs in the 6th and 7th semesters again, but with smaller salary differences (p-value>0.5).

# Salary By Grade

All the answers that did not include the salary or grade field (missing or illegal values) were removed from the dataset. While it is possible that these are not randomly missing values, these records cannot be used to analyze the connection between salary and grade average.

Afterwards, the outliers were removed (according to the outlier definition in the data preparation section), to create an easy-to-read scatter point graph.
In the graph, each blue point corresponds to an individual reply; the horizontal axis is the replier's average grade, and the vertical axis is their salary.



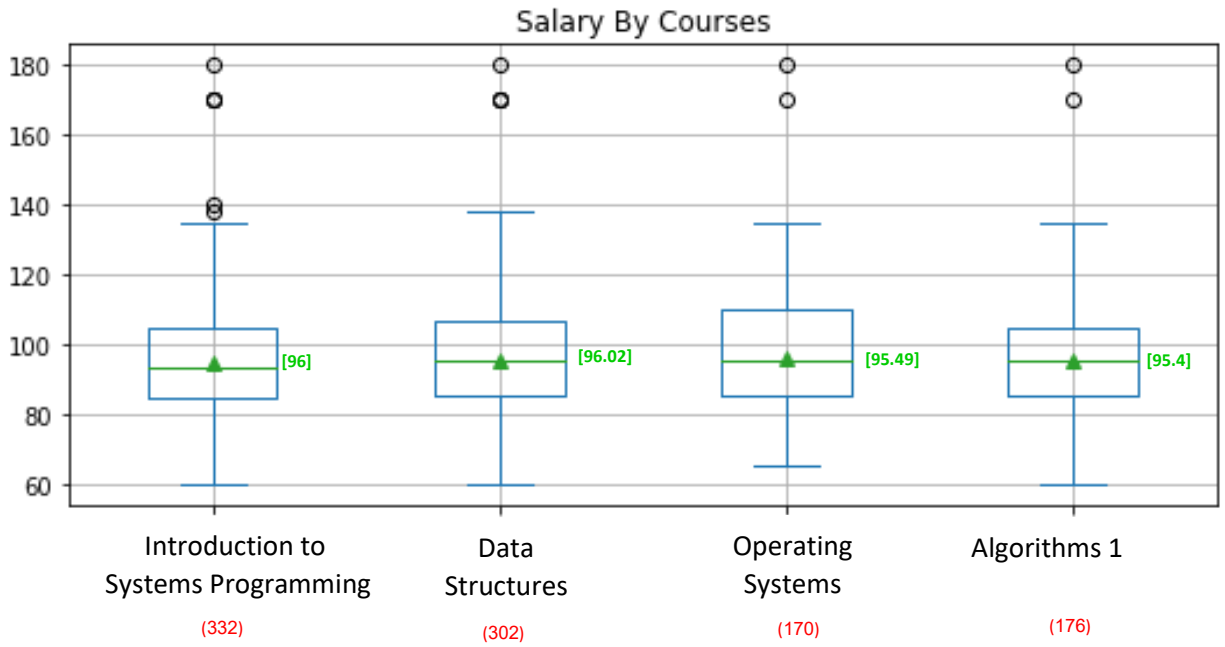

*Pearson's correlation coefficient: 0.50 p-value: 1.421e-22*

## Discussion

We can see that according to the Pearson's correlation test, there is a high positive correlation between a student's average grade and their job offer salary.
However, we can still see in the scatter point graph that there is some variance in the salaries of students with the same average grade. This variance might be the result of previous experience, grades in specific courses or personal skills. Most of the students in the survey (319 out of 349) are at the beginning of their careers, without prior experience in the field, and the grade sheet can be one of the main indicators about the student's skills and potential.

# Salary By Courses

We examined the salary average and distribution by the courses that the students finished at the time they got their job offer. The results are shown in the following boxplot chart.




The mean value for each course is marked by a green triangle ( ) and the exact value is written next to it in green. Outliers are marked by unfilled circles ( ). The number of answers in each course is in red below the horizontal axis.

## T-Test results

We further compared the mean salary values for each course versus the others using an unpaired t-test. The statistic value and p-value can be seen in the table below.

| | Data Structures | Operating Systems | Algorithms 1 |
|---|---|---|---|
| Introduction to Systems Programming | statistic: -0.503, pvalue: 0.615 | statistic: -0.706, pvalue: 0.481 | statistic: -0.421, pvalue: 0.674 |
| Data Structures | | statistic: -0.283, pvalue: 0.778 | statistic: 0.01, pvalue: 0.992 |
| Operating Systems | | | statistic: 0.263, pvalue: 0.793 |

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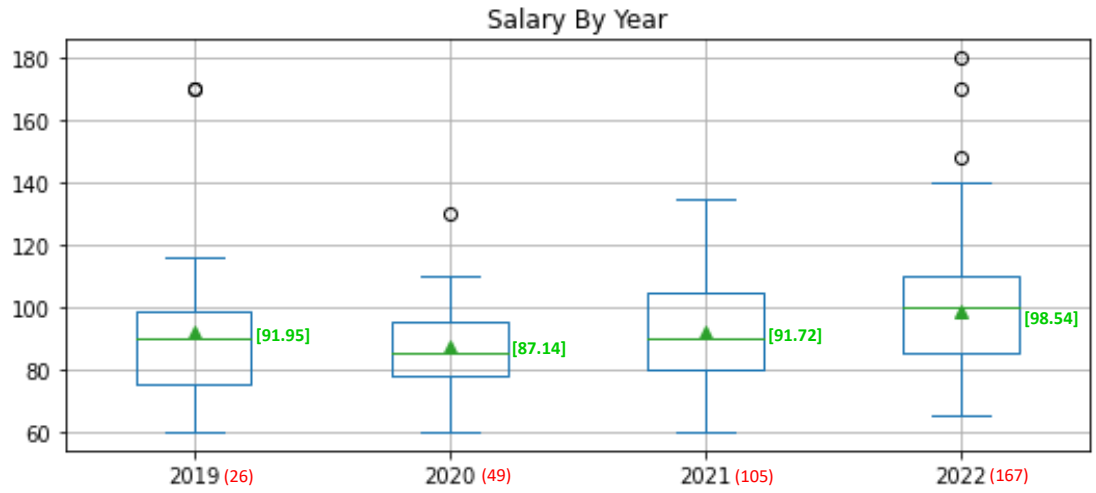
## Discussion

We could not find any statistically significant difference in the salary just by examining the courses the replier had finished.

This, along with the results we saw in the grade section and the semester section, suggests that employers do not use the courses taken as an indicator of a candidate's potential; they may care more about the specific grade in these courses. To get an understanding of the progress an individual made in their degree, and of the remaining time it would take them to complete it, the employer possibly uses the semester that the student is on, rather than the courses they took.

# First Salary Over Time

We examined the salary average and distribution by the year that the offer was made. The results are shown in the following boxplot chart.




The mean value for each year is marked by a green triangle ( ) and the exact value is written next to it in green. Outliers are marked by unfilled circles ( ). The number of answers in each year is in red below the horizontal axis.

## T-Test results

We further compared the mean values for each year versus the other years using an unpaired t-test. The statistic value and p-value can be seen in the table below.

| | 2020 | 2021 | 2022 |
|---|---|---|---|
| 2019 | statistic=1.012, pvalue=0.315 | statistic=0.055, pvalue=0.95 | statistic=-1.54, pvalue=0.125 |
| 2020 | | statistic=-1.62, pvalue=0.11 | **statistic=-3.83, pvalue=0.000167** |
| 2021 | | | **statistic=-2.98, pvalue=0.0032** |

## Discussion

We can see that there is a statistically significant rise in the salary in 2022 compared to the salary in the years 2020 and 2021 (p-value=0.0002 and 0.003, respectively). However, results did not show a statistically significant difference between the salaries in the years 2019, 2020 and 2021. The lack of statistical significance is likely a result of the low number of replies in those years.

In addition, in previous surveys that were conducted in the Computer Science faculty (published on 2017, the survey reference and additional details can be found here), the average salaries in the years 2015-2017 varied between 73 to 79 ILS per hour, which can support the hypothesis that there is an overall trend of rising salaries over time.

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# Salary By Gender

The records were split by the replier's declared gender. The mean salary by gender can be seen in the following boxplot.


The mean value for each gender is marked by a green triangle ( ) and the exact value is written next to it in green. Outliers are marked by unfilled circles ( ). The number of answers for each gender is in red below the horizontal axis.

*T-Test values: (statistic=1.09, pvalue=0.277)*

## Discussion

The difference in the salaries by gender is not statistically significant (p-value=0.28). However, in the boxplot of salary by gender, we can see that among the men, several individuals were marked as outliers, with a salary much higher than average (ranging from 138 to 180). Most of them (4 out of 5) had prior experience due their military service, which is possibly the cause of the (minor) gap in salaries between genders.

# Negotiation Statistics

The records were split by the replier's declaration about the negotiation process and declared gender.

The results can be seen in the table below.

| | Men | Women |
|---|---|---|
| Negotiated | Amount: 20% (53/254)<br>Average salary: 94.12 | Amount: 33% (26/79)<br>Average salary: 85.71 |
| Did not Negotiate | Amount: 80% (205/254)<br>Average salary: 95.61 | Amount: 67% (53/79)<br>Average salary: 95.39 |

## T-Test results

We further compared the mean salary values for each category versus the others using an unpaired t-test. The statistic value and p-value can be seen in the table below.

| | Men who did not negotiate | Women who negotiated | Women who did not negotiate |
|---|---|---|---|
| Men who negotiated | statistic: -0.501, pvalue: 0.617 | statistic: 1.912, pvalue: 0.06 | statistic: -0.39, pvalue: 0.698 |
| Men who did not negotiate | | statistic: 1.912, pvalue: 0.06 | statistic: 0.078, pvalue: 0.938 |
| Women who negotiated | | | **statistic: -2.642, pvalue: 0.01** |

## Discussion

One of the interesting observations from this analysis is that the percentage of women who negotiated was higher than the percentage of men (in contrast to some popular beliefs). This difference is statistically significant (p-value of 0.023 when comparing those numbers using a test for proportion difference).
This can be explained by the growing prevalence of mentoring programs and professional workshops offered for women in and out of the Technion CS faculty. Negotiation over the offered salary is an important topic in many of these programs.

In addition, we observed that women who negotiated had a significantly lower average salary than women who did not negotiate. The same phenomenon was observed for men with a smaller difference. Importantly, this does not mean that negotiation may lower a female candidate's salary. It is likely that candidates who were offered a relatively low salary, negotiated to raise it. It would be interesting to conduct a follow-up survey to assess the reasons and effects of negotiation on salaries for female and male candidates.

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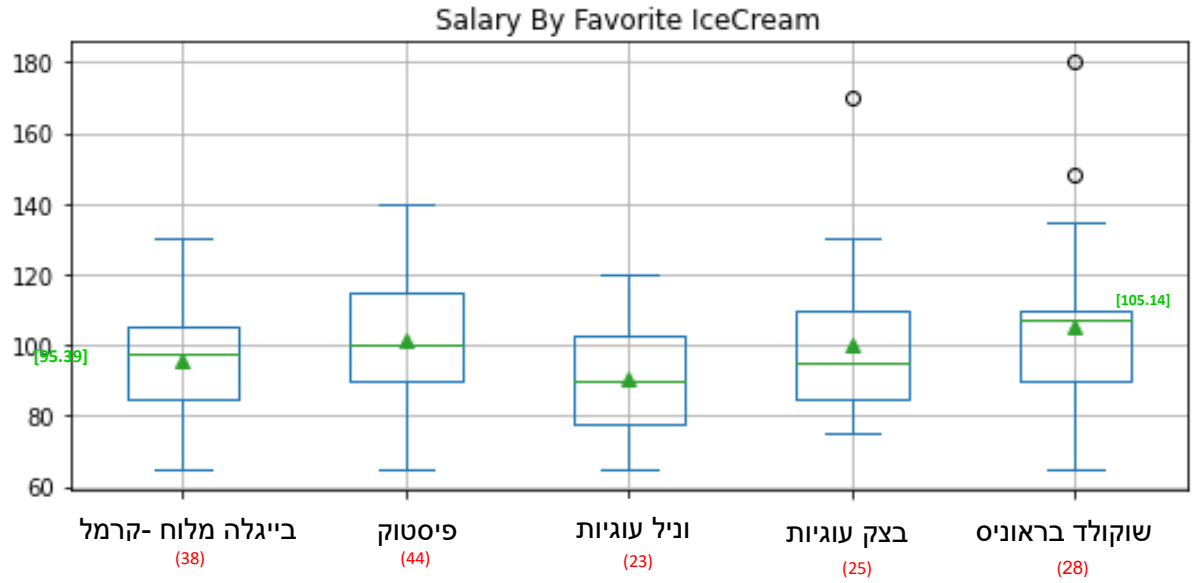
# Salary By Favorite Ice Cream Flavor

As part of this survey, we decided to solve one of the main controversies in the modern society once and for all – which Ice Cream flavor is best?
As the famous saying goes - there's no accounting for taste. However, we can do some accounting to salaries pretty good (as you saw in this document), so we decided to stick with the facts and check how the replier salary vary (and might be affected?) by the replier favorite ice-cream taste.




The mean value for each Ice-Cream flavor is marked by a green triangle ( ) and the exact value is written next to it in green. Outliers are marked by unfilled circles ( ). The number of answers in each company is in red below the horizontal axis.

## T-Test results

We further compared the mean salary values for each category versus the others using an unpaired t-test. The statistic value and p-value can be seen in the table below.

| | פיסטוק | וניל עוגיות | בצק עוגיות | שוקולד בראוניס |
|---|---|---|---|---|
| בייגלה מלוח - קרמל | statistic: -1.5363, pvalue: 0.1284 | statistic: 1.1246, pvalue: 0.2653 | statistic: -1.0672, pvalue: 0.2901 | **statistic: -2.0388, pvalue: 0.0456** |
| פיסטוק | | **statistic: 2.2944, pvalue: 0.025** | statistic: 0.2028, pvalue: 0.8399 | statistic: -0.7615, pvalue: 0.4489 |
| וניל עוגיות | | | statistic: -1.7638, pvalue: 0.0844 | **statistic: -2.52, pvalue: 0.015** |
| בצק עוגיות | | | | statistic: -0.7856, pvalue: 0.4357 |

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## Discussion

As suited for the best ice-cream flavour known to our modern civilization at this point, people who like Pistachio had indeed reported on one of the highest average salaries among the survey repliers. It was second (with 101.34 NIS per hour) only to Chocolate Brownies, which had a high average salary as well. In addition, we can see that we have a statistically significant difference between Chocolate Brownies and Pistachio to some of the other flavors (TBH for one second here) is surprising, and interesting results.

To conclude, it seems like I won in the small debate I had with my flat mates, and they will have to buy me some great Pistachio ice cream for the coming weekend.

So, I guess all the hours I put into this survey paid off eventually :) .

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# Source Code

One of the main purposes of this project was to create a solid foundation for future salary surveys in different universities/organizations, or for the Technion students in the future.

All the data preparation process and data analysis were written in python (mostly with pandas and numpy libraries). The code is fully documented and was written as generic, individual components that can be used for any future surveys.

You are more than welcome to use the code for your own survey analysis, or to contribute by opening new issues or submitting pull requests.
I will be happy to support you in the process and do my best to help with any challenge along the way.

GitHub repo: https://github.com/itay-nakash/SalarySurvey

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# Survey Transcript (In Hebrew)

**מסלול לימודים :** *אפשרויות תשובה: מדמ"ח, מדמ"ח-מתמטיקה, הנדסת מחשבים*

**באיזה סמסטר היית כשקיבלת את הצעת העבודה :** *אפשרויות תשובה: 1, 2,..., 8*

**ממוצע (נכון לתקופת חיפוש העבודה) :** *תשובה פתוחה*

**קורסי מפתח שעשית לפני הצעת העבודה :** *בחירה מרובה :מת"מ, מבני נתונים, הפעלה, אלגו, קורס בחירה הקשור לתחום(מערכות לומדות / הגנה וכו..)*

**האם היה לך ניסיון לפני קבלת המשרה :** *אפשרויות תשובה :ללא ניסיון כלל, ניסיון מהצבא, פרויקטים אישיים משמעותיים*

**שכר שעתי במשרת הסטודנט הראשונה (ש"ח לשעה) :***תשובה פתוחה*

**האם התמקחת לאחר קבלת ההצעה? :** *אפשרויות תשובה :כן, לא*

**חברה (נא לכתוב את שם החברה באנגלית) :***אפשרויות תשובה של מספר חברות גדולות באזור, ובנוסף אפשרות להוסיף תשובה אחרת*

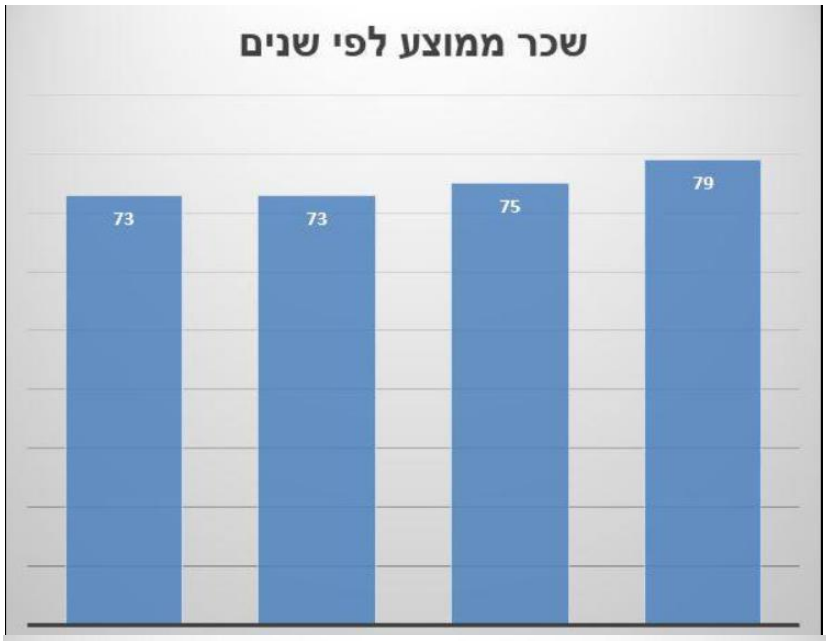
**תחום המשרה :** *Validation/Testing, Embedded, Full Stack, Frontend, Backend, Software Development, Product, Devops, firmware*

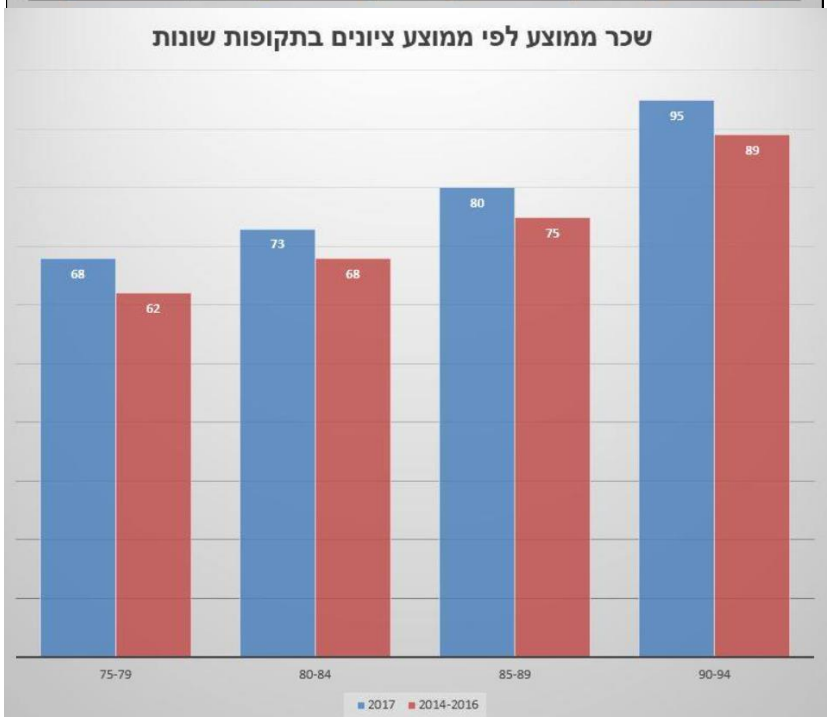
**מין :** *אפשרויות תשובה: זכר ,נקבה, מעדיף לא לציין/א-בינארי*

**טעם גלידה אהוב :** וניל עוגיות, פיסטוק, שוקולד בראוניס, בייגלה מלוח - קרמל

# Previous Surveys

This survey was published in the Facebook group *'מדעי המחשב בטכניון'* on 27/11/2017 by Pavel Larionov.

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