

מועמדים יקרים!

כפי שצוין בכנס המתמודדים, ענף אוטונומיה כולל בתוכו צוותים ממוקדי תוכנה וצוותים ממוקדי חומרה ותכנון מערכת.

לפניכם שני חלקים: חלק ראשון מורכב מ-3 שאלות בנושא תוכנה.  
חלק שני מורכב משאלה אחת בנושא חומרה ותכנון מערכת.

שימו לב:

- במידה ואתם מעוניינים להתמייין לאחד מצוותי התוכנה עליכם לענות על **אחת** מהשאלות בנושא תוכנה.
- במידה ואתם מעוניינים להתמייין לאחד מצוותי החומרה ותכנון מערכת עליכם לענות על שאלת החומרה.
- במידה ואתם מעוניינים להתמייין לשני סוגי הצוותים, עליכם לענות על שאלת תוכנה **אחת** ועל שאלת החומרה (**סך הכל 2 שאלות**).

להזכירכם, צוותי התוכנה הינם:

- DevOps
- Planning
- Simulator
- Perception & Mapping

צוותי החומרה ותכנון מערכת הינם:

- System Architecture
- Sensing
- Control

עליכם למלא את השאלון המופיע בקישור מטה ולהגיש בו את המטלה לפי ההנחיות המופיעות בסוף כל מטלה, **עד לתאריך 29.3 בשעה 23:59**.  
לאחר ההגשה מועמדים מתאימים יוזמנו לראיון אישי.

קישור להגשה:

<https://forms.gle/VSJnQvHRFXT8YCSD6>

**\*\*שימו לב שאת ההגשה ניתן לבצע דרך כניסה לחשבון המייל של אוניברסיטת בן גוריון בלבד**  
(*post.bgu.ac.il*)

לשאלות נוספות ניתן לפנות אלינו לכתובת המייל: [bgracing@post.bgu.ac.il](mailto:bgracing@post.bgu.ac.il)

המשימות מנוסחות בלשון זכר מטעמי נוחות אך מתייחסות כמובן לשני המינים

בהצלחה!

## **Software Assignment 1: Face Recognition**

Face detection is among the most popular computer vision project ideas. It has applications in many areas, security, social media, healthcare, etc. Face detection is a considerable section of computer vision.

You can use Python or OpenCV libraries.

Task:

- Use your own images or videos to perform face recognition
- Calculate success rate of your correct face recognition, and false alarm
- You can use this reference (or any other for your choice):  
<https://pypi.org/project/face-recognition/>
- Do you think this can be used for road cones recognition:



Please submit (in the google forms) a zip file that includes:

- your code.
- your results (in word document).
- any other resource that shows your work (optional).

## Software Assignment 2: Traffic Signs Recognition

You must have heard about the self-driving cars in which the passenger can fully depend on the car for traveling. But to achieve level 5 autonomous, it is necessary for vehicles to understand and follow all traffic rules.

In the world of Artificial Intelligence and advancement in technologies, many researchers and big companies like Tesla, Uber, Google, Mercedes-Benz, Toyota, Ford, Audi, etc are working on autonomous vehicles and self-driving cars. So, for achieving accuracy in this technology, the vehicles should be able to interpret traffic signs and make decisions accordingly.

- Use Python or OpenCV to build Traffic Signs Recognition
- Recognize: stop sign



- You can use:

<https://data-flair.training/blogs/python-project-traffic-signs-recognition/>

Please submit (in the google forms) a zip file that includes:

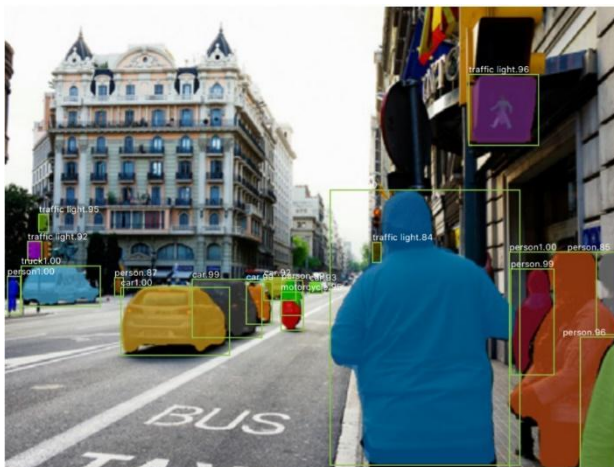
- your code.
- your results (in word document).
- any other resource that shows your work (optional).

### Software Assignment 3: Image segmentation

You might have wondered how fast and efficiently our brain is trained to identify and classify what our eyes perceive. Somehow our brain is trained in a way to analyze everything at a granular level. This helps us distinguish an apple from a bunch of oranges.

Computer vision is a field of computer science that enables computers to identify and process objects in videos and images just the way we humans do. Although computer vision might seem like not a very old concept, it dates back to the late 1960s when the first digital image scanner which transformed images into grids of numbers was invented.

- Upload your own image or an image you find online with a car on it and perform image segmentation.
- Demonstrate how you obtain the car segment.
- You can use:  
<https://data-flair.training/blogs/image-segmentation-machine-learning/>



Please submit (in the google forms) a zip file that includes:

- your code.
- your results (in word document).
- any other resource that shows your work (optional).

### **Hardware (& System) Assignment:**

One of the challenges in the autonomous department is making a “heavy metal box on wheels” (a.k.a the car) drive by itself.

To do so we need to create artificial eyes, brain, hands, and legs to the car.

Your assignment is to design a sensor suit for autonomous driving.

Answer the following questions:

1. What sensors are required for an autonomous car:
  - a. Describe the purpose of each sensor?
  - b. Where would you locate each sensor and why?
  - c. What problems might occur during the race to the sensor?
  - d. How would you solve them? (do not worry about correctness, you can be creative)
  
2. Considering the race car as a whole system:
  - a. What issues should we address when connecting a sensor to the car?
  - b. How would you solve them? (do not worry about correctness, you can be creative)
  
3. Pick one sensor out of this list and answer the following questions:
  - a. LiDAR
  - b. IMU
  - Describe in detail the components of the sensor
  - What is the input and output of the sensor
  - How does the sensor work
  
4. Add any additional comments considering sensors and systems of the autonomous car that may be worth mentioning. (optional)

You may use these sources (and any other):

- [https://www.youtube.com/watch?v=9QyWZmU1WxE&list=PLtuNXpGPOQ\\_bI72Cjqu2fAEfQ6TwCASVK&index=3](https://www.youtube.com/watch?v=9QyWZmU1WxE&list=PLtuNXpGPOQ_bI72Cjqu2fAEfQ6TwCASVK&index=3)
- [https://www.researchgate.net/publication/333077486\\_AMZ\\_Driverless\\_The\\_Full\\_Autonomous\\_Racing\\_System](https://www.researchgate.net/publication/333077486_AMZ_Driverless_The_Full_Autonomous_Racing_System)

Please submit (in the google forms) a zip file that includes:

- Word document that includes your answers.
- Any other resource that shows your work (optional).