<table>
<thead>
<tr>
<th>No.</th>
<th>Project Domain</th>
<th>Project Name</th>
<th>Company</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>User experience, web programming, data bases, design pattern</td>
<td><strong>AUSTIN - Automation Usability SimplicaTioN</strong></td>
<td>Intel</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>Operating systems, internet of things (IoT), computer communications</td>
<td><strong>Optimizing machine learning on IoT/embedded Linux</strong></td>
<td>Qualcomm</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Israel</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>deep learning, machine learning, pattern classification, computer vision</td>
<td><strong>Automatic end-of-procedure detection in wireless capsule endoscopy</strong></td>
<td>Medtronic</td>
<td>5</td>
</tr>
<tr>
<td>4.</td>
<td>deep learning, machine learning, pattern classification, computer vision</td>
<td><strong>Segmentation of the GI tract from capsule endoscopy images using Deep Learning</strong></td>
<td>Medtronic</td>
<td>6</td>
</tr>
<tr>
<td>5.</td>
<td>Machine learning, computer vision</td>
<td><strong>Adapting a trained deep neural network to new inputs using only a few samples</strong></td>
<td>IBM</td>
<td>8</td>
</tr>
<tr>
<td>6.</td>
<td>Cryptography, networks</td>
<td><strong>Secure multi-party Computation (MPC)</strong></td>
<td>IBM</td>
<td>9</td>
</tr>
<tr>
<td>7.</td>
<td>video streaming and processing, networking, HTML5, video standards</td>
<td><strong>Basic live video streaming web service over HTTP using the Golang programming language</strong></td>
<td>IBM</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Research – Haifa Lab</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Micro Services, Kubernetes, Helm, Open Source, Docker, CI/CD</td>
<td><strong>Automatic Deployment Configuration Creation for Micro Services over Kubernetes with Helm</strong></td>
<td>Amdocs</td>
<td>12</td>
</tr>
<tr>
<td>9.</td>
<td>Big Data Analytics</td>
<td><strong>Smart Sales</strong></td>
<td>Amdocs</td>
<td>13</td>
</tr>
<tr>
<td><strong>No.</strong></td>
<td><strong>Title</strong></td>
<td><strong>Link</strong></td>
<td><strong>Company</strong></td>
<td><strong>Page</strong></td>
</tr>
<tr>
<td>--------</td>
<td>---------------------------------------------------------------------------</td>
<td>---------------------------------------</td>
<td>-------------</td>
<td>----------</td>
</tr>
<tr>
<td>11.</td>
<td><strong>Machine learning</strong></td>
<td><strong>Deep cropping</strong></td>
<td>Shutterfly</td>
<td>16</td>
</tr>
<tr>
<td>12.</td>
<td><strong>Machine Learning</strong></td>
<td><strong>Algorithmic photo storytelling</strong></td>
<td>Shutterfly</td>
<td>17</td>
</tr>
<tr>
<td>13.</td>
<td><strong>Eye tracking, Human engineering, Cognitive workload, Data analysis</strong></td>
<td><strong>Online eye tracking data analysis for pilot monitoring</strong></td>
<td>Shutterfly</td>
<td>19</td>
</tr>
<tr>
<td>14.</td>
<td><strong>Web client, embedded RT systems (on the server side)</strong></td>
<td><strong>Web based debug environment for embedded systems</strong></td>
<td>Elbit Systems</td>
<td>20</td>
</tr>
<tr>
<td>15.</td>
<td><strong>Web, simulation, C4I, VR, networks</strong></td>
<td><strong>Web Scenario control VR</strong></td>
<td>Elbit Systems</td>
<td>22</td>
</tr>
</tbody>
</table>
PROJECT 1

Company: Intel

Project title: AUSTIN - Automation Usability SimpliciaTioN

Project field: User experience, web programming, data bases, design pattern

Supervisors: Amor Miri & Levi Moshe

Project Description: The goal of this project is to implement an easy to use web interface that will allow our validation engineers to plan and control their validation flows for the next Intel products.

So what is the problem?

Before it is released to the market, each Intel product goes through extensive validation processes to verify that it complies with the specifications. Functional validation is a specific aspect of validation that verifies that the product complies with the functional specification. As part of the functional validation process, the validation engineer interacts with multiple tools, each of which provides a specific capability, such as test planning, execution, debugging, analysis, etc.

Currently, all of the above tools are working independently of each other, which require the validation engineer to have a deep knowledge of each one of them, to integrate them into the validation flow. As an example, imagine that in order to drive a car, you’ll have to know how the engine operates.

In this project, you’ll develop a web application that provides the validation engineer with a single, intuitive façade to the full validation flow, abstracting away the individual tools.

The project will be considered as successful, if it will reduce by 50% the number of steps required to create a validation flow, compared to the existing solution.

Value to the company and value to student: The students that will work on this project will have the opportunity to develop using the most up to date web technologies such as Angular 4.0 and be exposed to a work with Human Factoring Engineer. Intel will have a user interface that will make our validation plan really easy to create and maintain.
**Recommend Background:**
- 234122 - Introduction to systems programming
- 236703 - Object oriented programming

**PROJECT 2**

**Company:** Qualcomm Israel

**Project title:** Optimizing machine learning on IoT/embedded Linux

**Project field:** Operating systems, internet of things (IoT), computer communications

**Supervisor:** Constantine Elster

**Project Description:** Internet of Things is a relatively new concept that defines that all human surroundings can be connected and some of them are also smart. The smartness of such devices can vary in its complexity while the most complex devices can possess Neural Network to achieve certain computational goals. For example, a flying drone (as a smart IoT connected device) can perform collision avoidance and landmark recognition basing on preprogrammed directives as well as guided by Neural Network computations.

The project will be developed on an IoT development platform – DragonBoard 410c. This device is a small board equipped with Qualcomm 4-core Snapdragon 410 processor, WiFi, Bluetooth, GPS, USB and other functionalities. DragonBoard 410c board runs Debian Linux, Open Embedded/Yocto Linux, Windows IoT and Android OSes.

In this project, the students will be asked to run the TensorFlow machine learning engine on DragonBoard 410c IoT device, suggest and define a computation goal (e.g. object recognition from a drone camera), benchmark the TensorFlow operation on DragonBoard vs traditional desktop computer and analyze, suggest and implement optimizations (in TensorFlow and/or Linux) for a more optimized neural network computation.

**Online Resources:**

1) DragonBoard 410c - [https://www.96boards.org/products/ce/dragonboard410c/](https://www.96boards.org/products/ce/dragonboard410c/), [https://www.96boards.org/forums/forum/products/dragonboard410c/](https://www.96boards.org/forums/forum/products/dragonboard410c/)
2) TensorFlow - https://www.tensorflow.org/

**Value for students:** Learn the development and debugging practices on IoT device running Linux OS. Study machine learning frameworks and applications. Experience with SW optimization problems on Linux.

**Development platform** - Linux Debian on DragonBoard 410c

**Programming language** - C/C++

**Recommend Background:** Operating Systems, Linux User space and kernel programming

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**PROJECT 3**

**Company:** Medtronic

**Project title:** *Automatic end-of-procedure detection in wireless capsule endoscopy*

**Project field:** deep learning, machine learning, pattern classification, computer vision

**Supervisor:** Eyal Dekel

**Project Description:** Wireless Capsule Endoscopy (WCE) is a cutting edge technology for examining the Gastrointestinal (GI) tract by visualizing and analyzing the recorded images from a capsule swallowed by the patient. It is used for detecting various anomalies such as polyps, bleeding, ulcers and symptoms of various inflammatory bowel diseases (such as Crohn’s disease).

In many WCE procedures, it is crucial for the physician to examine the entire GI tract. Specifically, while looking for polyps in the colon, the physician needs to know he/she did not miss a single fold. For that reason, it is important to automatically identify the end of the colon, in the rectal venous plexus, and alert the physician in cases when the capsule did not reach that landmark.

The purpose of the project is to identify the rectal venous plexus frames (images). The data consists of labeled RGB frames (positive/negative according to location). The students will need to design and train a convolutional neural network that will output a tag or a score indicating whether or not the frame indicates end of colon.
Success criteria are:

- Ability to learn machine learning basics and obtain enough understanding in deep learning (convolutional neural networks) to allow learning the requested network/s. This includes the ability to use at least one package of training and running deep learning (e.g., tensorflow or other package in coordination with the supervisor).

- A tag or score in frame level indicating whether or not the frame is from the rectal venous plexus, using deep learning.

- In case of failure in the previous task, it should be clear that the effort supports the claim that the problem is too hard; this is also an insight for Medtronic.

**Value to the company and value to student:** Using this technology, Medtronic will be able to alert the physician in cases where the capsule did not cover the entire colon, or assure him that it reached the end of the colon even if it did not leave the body during the procedure.

The students will have opportunity to work on real medical image data, and experiment with deep learning, which is the cutting edge technology in machine learning, widely used in both academia and industry. The outcome of this technology may help save lives.

**Recommended background:** Introduction to machine learning (236756) OR computer vision (236873) OR equivalent courses (e.g., machine learning (046195).

**Programming languages and development platforms:** Python, Matlab (advantage)

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**PROJECT 4**

**Company:** Medtronic

**Project title:** Segmentation of the GI tract from capsule endoscopy images using Deep Learning

**Project field:** deep learning, machine learning, pattern classification, computer vision

**Supervisor:** Dorit Baras

**Project Description:** PillCam SB is a disposable capsule that uses a miniaturized camera to visualize the small bowel. The data obtained from this procedure (capsule endoscopy) is widely...
used by doctors to detect and monitor abnormalities such as polyps, lesions, bleeding and ulcers.

The purpose of the project is to develop a deep learning system that will automatically segment the GI tract by detecting the transitions from the stomach to the small bowel and from the small bowel to the colon.

The data for this project consists of labeled RGB frames of various parts of the GI tract. The segmentation system will be composed of two parts:

1. Frame level – a score or a tag per frame indicating possible location (e.g., small bowel, colon, stomach). This score will be learned using a deep learning convolutional neural network.

2. High level – suggested transitions from the stomach to the small bowel and from the small bowel to the colon. This part should be based on analysis of the signal developed in frame level. The transition algorithm can be based on statistical characteristics of the signal or any other method the students choose.

Success criteria are:

- Ability to learn machine learning basics and obtain enough understanding in deep learning (convolutional neural networks) to allow learning the requested network/s. This includes the ability to use at least one package of training and running deep learning (e.g., TensorFlow or other package in coordination with the supervisor).

- A tag or score in frame level indicating location in the GI tract. Preferably a single network for the three segments. If not, two networks for the two transitions.

- An algorithm for transition suggestion in high level based on the score or tag in frame level.

- In case of failure in frame level or in case level, it should be clear that the effort supports the claim that the problem is too hard, which is also an insight for Medtronic.

The students will be provided with access to a cloud machine they can use for the project. The machine will be strong enough to support the computational requirements.

**Value to the company and value to student:** Medtronic can use this segmentation to assist physicians by narrowing down the segment/s that are inspected. It can also improve the automatically generated report by focusing only on the relevant segment/s. The students will
have opportunity to work on real medical image data, and experiment with deep learning which is the cutting edge technology in machine learning, widely used in both academia and industry. The outcome of this technology may improve detection of anomalies (such as lesion, bleeding, polyps) which can help save lives.

**Recommended background:** Introduction to machine learning (236756) OR computer vision (236873) OR equivalent courses (e.g., machine learning (046195))

**Programming languages and development platforms:** Python, matlab (advantage).

## PROJECT 5

**Company:** IBM

**Project title:** Adapting a trained deep neural network to new inputs using only a few samples

**Project field:** Machine learning, computer vision

**Supervisor:** Alon Hazan

**Project Description:** Deep neural networks have great strength in performing various machine learning tasks. However, a neural network that has been trained by inputs of one source (e.g. Camera) will perform poorly when trying to infer inputs from a different source (e.g. a camera from a different manufacturer). Augmentation can help to some extent, but when the amount of training data is not large enough (as it almost always is), we may want different solution that can take a DNN trained on one input source and adapt it to work with a different input source using a novel approach.

**Key steps of the project:**

I. Download Inception model that has been trained on ImageNet and test its performance in a classification task.

II. Manipulate the input data as if it were images from a camera that was not part of the training procedure (change brightness, contrast, histogram, colors, etc.) and observe how the performance of the network degrades as function of different aberrations.
III. Compare 2 methods for fine-tuning the network to work on the "new camera" and report findings:
   A. Transfer learning by fine-tuning of the last layers of the network
   B. A novel approach to be tested (currently cannot be disclosed publicly)
   C. You may suggest your own ideas and test them

IV. Prepare a report of the project steps, results, and conclusions.

Value to the company and value to student:

What you will gain:
I. Learning to design and train state of the art neural networks for imaging tasks
II. Experience with a real challenge of the industry
III. Experience with Python and Keras

What IBM will gain: at IBM Haifa research labs, we are developing an algorithm that will be used in hospitals around the world, assisting doctors to interpret medical images such as x-ray and ultrasound. Having the ability to use one algorithm and adapt it to each hospital’s imaging equipment is one of the pillars of global distribution of technology

Recommended background:
I. Computer vision
II. Machine learning
III. Python

PROJECT 6

Company: IBM

Project title: Secure multi-party Computation (MPC)

Project field: Cryptography, networks

Supervisor: Muhammad Barham & Omri Soceanu

Project Description: MPC allows multiple parties to compute a function while keeping each party’s inputs private. Andrew Yao introduced the ‘Garbled Circuits’ (GC) protocol addressing
`secure two-party computation’. The GC protocol allows to securely evaluating a function given as a `Boolean circuit’. While GC was considered infeasible and expensive decades ago, today MPC and GC have become more and more practical, due to the algorithmic improvements in MPC and increase in computational power.

Numerous applications stand to benefit from a practical MPC, in particular privacy preserving and security critical applications, including but not limited: biometric matching, face recognition, image/data classification, electronic auctions, and voting.

In this project, we will choose one of the MPC protocols, implement it, and optimize it.

**Value to the company and value to student:** An MPC tool would allow IBM to research new privacy preserving applications while also providing a benchmark for other MPC implementations and further optimizations.

The students will research and learn a new developing field in cryptography while confronting real world algorithmic and software design challenges.

**Recommended background:** Introduction to system programming (234122)
Object Oriented Programming (236703)

**Programming languages and development platforms:** Java

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**PROJECT 7**

**Company:** IBM Research – Haifa Lab

**Project title:** Basic live video streaming web service over HTTP using the Golang programming language

**Project field:** video streaming and processing, networking, HTML5, video standards

**Supervisors:** Ophir Azulai & Udi Barzelay

**Project Description:** The service will receive live video as H.264 wrapped in MPEG2-TS over multicast (UDP), convert it to a series of small MP4 segments and store it in a queue.
The web player will retrieve the MP4 segments from the queue using HTTP calls (AJAX) and deliver it to the browser’s embedded video player using the Media Source Extension (MSE) JavaScript API.

The milestones of the project are:

1. Implement the building blocks:
   1.1. Porting to Golang the MP4 creation part from the MP4Parser Java open source
       https://github.com/sannies/mp4parser
   1.2. Module for retrieving the MPEG2-TS over multicast and extract the H.264 as segments

2. Implementing the web service
   2.1. Server side in Golang
   2.2. Basic web player in JavaScript

The Golang programming language is an open source project to make programmers more productive. Golang is expressive, concise, clean, and efficient. Its concurrency mechanisms make it easy to write programs that get the most out of multicore and networked machines, while its novel type system enables flexible and modular program construction. It's a fast, statically typed, compiled language that feels like a dynamically typed, interpreted language

**Value to the company and value to student:** IBM can use it in IOT offerings for low delay streaming from video cameras.

The students will learn the emerging Golang programming language and will gain experience in video streaming and standards.

Golang was chosen as the programming language of the year, according to the long-running Tiobe Index. It has the fastest growth in popularity.

**Recommended background:**

Software Engineering Methods (234321) or Object Oriented Programming (236703).

**Programming languages and development platforms:** Golang, Gogland, JavaScript and Java
Company: Amdocs

Project title: **Automatic Deployment Configuration Creation for Micro Services over Kubernetes with Helm**

Project field: Micro Services, Kubernetes, Helm, Open Source, Docker, CI/CD

Supervisor: Vladi Ifat

**Project Description**

Developing Micro Services (MS) deployment configuration over Kubernetes (K8S) requires highly specialized domain knowledge, which is not available to all developers.

At the same time the MS deployment configuration over K8S can be encapsulated into generic templates as demonstrated by the HELM project (https://helm.sh/).

This project aims to develop a framework that can automatically generate the required K8S deployment manifests based on Helm templates, Dockerfiles and simple configuration per MS.

The goal of this project is to allow for faster MS development, by abstracting the MS deployment configuration over K8S to standard configuration files.

Criteria for success and description of work: the final delivery of the project should be a tool that:

- Parses Dockerfiles and extracts basic deployment configuration
- Accepts additional configuration in predefined format
- Creates a K8S Helm Chart based on the gathered configuration
- Tests and validates the chart usability

The students will be required to learn and understand the K8S deployment objects. And will need to code a transformation tool that can create these objects based on pre-existing configuration, with the help of the HELM template language.

**Value to company:** will enable faster development of MS with a standard and unified deployment framework

**Value to student:** will gain hands on experience with microservice development and Kubernetes. Will learn key concepts about CI/CD development methodology.

**Recommended background:**

- 234319 Programming Languages
- 236351 Advanced Topics in Distributed Systems
- 236376 Operating systems engineering
Programming languages and development platforms
- Must: Good Java or similar OO language programming knowledge.
- Must: Experience with scripting languages
- Must: Familiarity with the Linux OS.
- Advantage: Familiarity with storage and networking concepts.
- Advantage: Experience with distributed computer systems.
- Advantage: Experience with build tools like Maven, Ivy or Gradle.
- Advantage: Experience with automation and orchestration tools.
- Advantage: Geek Spirit

PROJECT 9

Company: Amdocs
Project title: Smart Sales
Project field: Big data analytics, artificial intelligence (AI)
Supervisor: Manoel Menashe
Project Description:
Project Objective: utilize the power of AI and Analytics to improve Sales team’s performance.
Short Introduction:
- Majority of the sales organizations today are using traditional Sales Force Automation (SFA) applications with clear benefits.
- In order to maintain success in this highly competitive market, sales professionals need to constantly enhance their approaches and better manage their sales activities.
- Sales Force Automation (SFA) systems, now days, must be able to utilize intelligence to support the sales people as well as the customer service representatives (CSRs) to take the right Sales decisions at the right time.
- Understanding who the most probable customers to buy, what are they looking to buy and how much they will be willing to pay, should guide the sales process.
- Business Intelligence, combining variety sources of data, will enable sales organizations to strategically plan better, identify new opportunities and prioritize better.

**Project scope expectations:** utilize AI, Analytics, Machine Learning and others platforms to develop ‘smart sales’ tools which will be able to be implemented as ‘ad-on’ to SFA applications in order to improve Sales Teams performance.

**Expected results:** following are few example for expected results by the ‘Smart Sales’ ad-on.

Students are expected to suggest few more with a sole target to achieve better sales performance:

- Automatic lead qualification
- Lead scoring – prioritization of leads based on prediction for sales closure
- Recommended products for cross sale / up sale
- Automatic lead create based on triggered events i.e. contract termination date, # of complaints etc...
- Lead nurturing – automatically add information to the lead so the sales person will be able to make better progress
- Pricing recommendations
- More...

**Success criteria:**

- Lead to Opportunity conversion rate
- Average sales cycle duration
- Win/lose ratio
- % of sales reps achieving their quota
- % of forecasted deals won
- More...

**Data sources** (can and should be expanded):

- SFA Data (leads, opportunities history, contacts, …)
- Amdocs BSS/OSS Data (CRM, Billing, Ordering, Network…)
- Social data (i.e. FB, LinkedIn, Twitter, etc…)
- User behavior data (website / browsing analytics)
Value to the company and the students:

- **Value to the Telco operator**: holistic view, Lead to Cash, increasing business growth and overall sales. Generate innovation within the sales and marketing domains so companies can better plan their go-to-markets, sales and marketing to land more profitable customers and increase overall sales.

- **Value to students**: innovation in a ‘hot’ domain that is picking up speed in recent years and is desperately looking for smart and innovative tools to support the sales force.

**Required courses:**

 Preferably students with the following background:

- Algorithms
- Statistical data processing
- Introduction to Optimization
- Introduction to AI
- Data analytics
- Machine learning

**Programming languages and development platforms**

- Python
- AWS DB, Algorithms tools set for analytics
- Or alternatively IBM Watson
- UI, HTML
- Cloud integration

**PROJECT 10**
Company: Shutterfly

Project title: Deep cropping

Project field: Machine learning

Supervisors: Omer Geiger & Omer Moussaffi

Project Description: Shutterfly as a business is constantly searching for ways to provide its users with the best photo-based products (e.g., Photobook, Poster, Coffee Mug, Pillow). The ultimate goal is to offer each user the right products with the right photos in the right context at the right timing. Each of the above loosely defined constraint holds endless algorithmic challenges.

In this project, we focus on the task of algorithmically identifying the desirable cropping in any given photo. This function is essential for proposing automated products to users, in such a way that they appear most attractive and ready for purchase by click. The students will be supplied a ground-truth set of photos with the actual crops used by users. The algorithmic challenge boils down to training a deep neural network over the data so that given a new photo will output a suggested cropping.

Value to the company: Exploration of relevant product related problems through fresh approaches. Knowledge ramp up in ML frameworks commonly used for industrial purposes.

Value to student: Opportunity to tackle an interesting algorithmic problem from the real world using modern ML frameworks in close cooperation with experienced engineers.

Recommended background: Introduction to AI or Introduction to ML

Any knowledge in neural networks / deep-learning

Programming languages and development platforms:

Python, Tensorflow/MxNet
**Project title:** Algorithmic photo storytelling  
**Project field:** Machine learning  
**Supervisors:** Omer Geiger & Omer Moussaffi  

**Project Description:** Shutterfly as a business is constantly searching for ways to provide its users with the best photo-based products (e.g., Photobook, Poster, Coffee Mug, Pillow). The ultimate goal is to offer each user the right products with the right photos in the right context at the right timing. Each of the above loosely defined constraint holds endless algorithmic challenges.

In this project, we focus on identifying the context which a selection of photos was taken from. Given a selection of photos, the challenge is to suggest a caption of text best telling their story. The first step would be to utilize a prebuilt photo-tagging capability (e.g., those supplied in the tensorflow open-source ML library) to acquire a set of tags with confidences describing any input selection of photos. Given the tags for a photo or photoset, some method of aggregating the tags is to be developed. Next, using the aggregated tags an algorithmic component is to be developed for suggesting a fitting description in natural text.

**Value to the company:** Exploration of relevant product related problems through fresh approaches. Knowledge ramp up in ML frameworks commonly used for industrial purposes.

**Value to student:** Opportunity to tackle an interesting algorithmic problem from the real world using modern ML frameworks in close cooperation with experienced engineers.

**Recommended background:** Introduction to AI or Introduction to ML  
**Programming languages and development platforms:** Python, Tensorflow/MxNet

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**PROJECT 12**

**Company:** Shutterfly  
**Project title:** Advances SVM smoothing techniques
**Project field:** Machine Learning  
**Supervisor:** Omer Moussaffi  

**Project Description:** Shutterfly utilizes SVM machine learning algorithms mainly as an improvement of our face detection services. The project we propose is an attempt at improving the open-source well known package libsvm (https://www.csie.ntu.edu.tw/~cjlin/libsvm/). The expected project stages will be:

1. Smoothing out SVM results by reorganizing labels  
2. Measuring the number of soft/hard support vector in svm-train  
3. Adding number of support vectors to the cost function, changing the optimization problem solver which is at the heart of the svm-train algorithm.  

**Value to the company:** Enhanced ML algorithm which can be used in a variety of applications. Esp. as an aid in face detection.

**Value to student:** Interesting research including improvement of an industry critical known algorithm, in close cooperation with experienced engineers.

**Recommended background:** Introduction to AI or Introduction to ML / Introduction to optimization

**Programming languages and development platforms:** C/C++

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**PROJECT 13**

**Company:** Elbit Systems  
**Project title:** Online eye tracking data analysis for pilot monitoring
**Project field:** Eye tracking, Human engineering, Cognitive workload, Data analysis

**Supervisors:** Asaf Mor & Allon Kahana

**Project Description:** The modern battlefield dictates tactical helicopter flight to be performed at low altitude, difficult weather conditions - night and day. Reducing the workload on one hand, while enabling each crew member to direct his attention to the most important task on the other, will increase the mission success probability and outcome. Pilots nowadays are overloaded by the amount of information and tasks during flights. They engage in activities that require their full concentration to perform at their best which, in times, may not be enough to complete their missions successfully. Besides designing systems that assist the pilots, there is a need for measureable data that will indicate the real time cognitive workload of the pilot in any given moment. Monitoring the pilot’s eyes using an eye tracking device is a one way of gaining an understanding about workload. The movements, jitters, fixations and diameter of the pupils may indicate whether the pilot is under duress or not. We are capable of recording this data along the time-axis, gathering insightful information that will help us to better evaluate our systems’ design. Calculating and processing the data will bring us closer towards the goal of reducing the overall workload on the pilots.

The goal of this project is to develop an application that will collect stream data from an eye tracker server and will analyze the data by performing a pre-defined set of parametric calculations.

The application shall run on Windows, communicate with the server using Python, enable the user to configure parameters for the mathematical calculations and log the results. A bonus will be given for displaying the results within a GUI.

**Note:** the students will not receive an actual eye tracker headset. They will be provided with a video of the pilot’s eye during flight. This video can be replayed on the eye tracking environment, simulating real time use.

**Value to the company:**
- Real time monitoring application for workload on the pilot based on eye tracking data.
- Making the first steps in being able to assess workload-aware systems.

**Value to the students:**
- Engaging in an innovative field such as eye tracking.
- Integrating with well-documented open source software environment.
- Taking part in a human engineering research work.

**Recommended background:**
- Numerical Analysis (234107)
- Object Oriented Programming (236703)

**Programming languages and development platforms:**
- Pupil Labs (open source eye tracking environment)
  - [https://pupil-labs.com/](https://pupil-labs.com/)
- Python

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**PROJECT 14**

**Company:** Elbit Systems

**Project title:** Web based debug environment for embedded systems

**Project field:** Web client, embedded RT systems (on the server side)

**Supervisor:** Dror Elul

**Project Description:** Embedded systems and Real Time system are hard to debug. For several reasons.

1. There is no much visibility to the input and output
2. Data is constantly changes and a single snapshot is not good enough to understand the problem

Elbit System Land Division has developed and extensive Real Time Embedded software infrastructure, that allows the developer to relatively easily develop new features and to understand data flow within the system.

We also developed development tools so we can both visualize and capture the Real time data stream. Those tools are getting old and we are looking forward to update the main
debugging tool to be a web client. This capability will improve our deployment and management of our software.

At the first stage we would like to develop a prototype that can connect to our software infrastructure and display the data in a Web Single Page application (SPA). This prototype is the project that we offer.

The project will require basic web knowledge (Angular, JS and Type Script).

Basic knowledge in C++ (for server side). Ability to learn.

We will supply a Dummy RT application and a WebServer that can run on windows/Linux and of course guidance

**Value to the company:** We would like to develop this environment to improve our visibility to our embedded environment and upgrade to an updated technology that allows us in put the Web Client code within in the Embedded target which will improve our deployment.

**value to student:** Student may gain the ability to work in a full stack environment both on client and server side. Improve skill in Web Client technology and also understand Embedded environment “under the hood”

**Recommended background:**

- Data Structure,
- Project in C++
- Basic knowledge in JavaScript (or Type Script)
- Object Oriented Programming
- Software design

**PROJECT 15**

**Company:** Elbit Systems

**Project title:** Web Scenario control VR

**Project field:** Web ,simulation ,C4I ,VR , networks

**Supervisor:** Sharon Lahav
**Project Description:** Create a Web application based on AGI’s CesiumJS, a “Google Earth like” open-source JavaScript library for world-class 3D globes and maps based on WebGL.

1. The application will enable us to create a scenario by placing entities over maps and creating waypoints and routes for them:
   - Create / Drag and Drop Entities from a palate or a popup to a Globe/Map
   - Create a flight path (Route) by adding waypoints on the Globe/Map

2. The scenario will be saved as a file to a realtime simulation engine that will run and move the entities according to their platform’s physics.
   - Saving the above data to a file in a specific XML format (Serialization)
   - Running this file (this part is provided by an existing simulation engine) now the entities will start to move on the map

3. During runtime a VR headset will enable us to attach to an entity’s observer camera and probe the scene: By selecting an entity during flight and pressing a button the application will jump to a VR mode that will show the world as if flying from the selected entity and looking around with the headset

4. Add basic a HUD (Head Up Display) symbology layer:
   - In VR mode toggling a button will show/hide a transparent green layer with Heading, Velocity, Altitude on top of the view

Achieving these tasks will be the criterion for success.

**Value to the company:**
Company will have a new WebIT service to create a scenario in 3D from any PC save and run it, in addition HMD systems will enhance the VR headset with custom symbology

**Value to student:**
The Student will learn to develop a Web application. Integrate with a realtime simulation engine, Client-Server architecture, Streaming high-resolution imagery from multiple sources, Network messaging

**Recommended background:** 236341, 234122
Programming languages and development platforms: JavaScript, NodeJS, CesiumJS, CZML (JSON), C++, WebSockets