<table>
<thead>
<tr>
<th>Company</th>
<th>project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yahoo!</td>
<td>Summer internship at Yahoo!</td>
</tr>
<tr>
<td>Check Point</td>
<td>Platforms automation framework</td>
</tr>
<tr>
<td>Check Point</td>
<td>Develop New smartphone app for check point products (iOS / android)</td>
</tr>
<tr>
<td>Check Point</td>
<td>Cloud based security feed &amp; automation channel</td>
</tr>
<tr>
<td>Check Point</td>
<td>Development of an internet simulation package</td>
</tr>
<tr>
<td>Check Point</td>
<td>Data mining</td>
</tr>
<tr>
<td>Check Point</td>
<td>Cloud Deployment Solutions software developer</td>
</tr>
<tr>
<td>Check Point</td>
<td>Document Protection for the Government and Defense industry</td>
</tr>
<tr>
<td>PTC</td>
<td>Research in area of Internet of Things / Smart Connected Products</td>
</tr>
<tr>
<td>PTC</td>
<td>Approximation of the triangulation/facets by Catmull-Clark subdivision</td>
</tr>
<tr>
<td>Rafael</td>
<td>Secure Linux Boot Loader</td>
</tr>
<tr>
<td>Rafael</td>
<td>NIOS Loader Software</td>
</tr>
<tr>
<td>Rafael</td>
<td>Embedded Linux PCIe Driver</td>
</tr>
<tr>
<td>Rafael</td>
<td>Cyber security of industrial control systems - vulnerabilities and defense</td>
</tr>
<tr>
<td>Outbrain</td>
<td>Outbrain 2015 Summer Internship Program no.1</td>
</tr>
<tr>
<td>Outbrain</td>
<td>Outbrain 2015 Summer Internship Program no.2</td>
</tr>
<tr>
<td>IBM - HRL</td>
<td>Stream pattern recognition over continuous sensor data</td>
</tr>
<tr>
<td>IBM - HRL</td>
<td>Adaptive sampling for activity recognition over continues sensor data</td>
</tr>
<tr>
<td>IBM R&amp;D Labs</td>
<td>Computer Vision</td>
</tr>
<tr>
<td>IBM R&amp;D Labs</td>
<td>Summer Internship no.1</td>
</tr>
<tr>
<td>IBM R&amp;D Labs</td>
<td>Expressive speech: parameterization &amp; transformation</td>
</tr>
<tr>
<td>IBM R&amp;D Labs</td>
<td>Expressive speech: Multi-Modal Biometric Authentication</td>
</tr>
<tr>
<td>IBM R&amp;D Labs</td>
<td>Expressive speech: Speech based Emotion Detection</td>
</tr>
<tr>
<td>IBM R&amp;D Labs</td>
<td>Summer Internship no.2</td>
</tr>
<tr>
<td>IBM R&amp;D Labs</td>
<td>Summer intern in the field of Medical Imaging</td>
</tr>
<tr>
<td>IBM R&amp;D Labs</td>
<td>Proactive Location Intelligence</td>
</tr>
<tr>
<td>IBM R&amp;D Labs</td>
<td>Analysis of Pareto Frontiers</td>
</tr>
<tr>
<td>IBM R&amp;D Labs</td>
<td>Mining User Interactions</td>
</tr>
<tr>
<td>IBM R&amp;D Labs</td>
<td>Parser for Advanced Processor Verification Template Language</td>
</tr>
<tr>
<td>IBM R&amp;D Labs</td>
<td>Social Engagement Analysis Research in Social Media Technologies Group</td>
</tr>
<tr>
<td>IBM R&amp;D Labs</td>
<td>Graph Partitioning</td>
</tr>
<tr>
<td>IBM R&amp;D Labs</td>
<td>Real-Time Trend Detection in Social Networks</td>
</tr>
<tr>
<td>IBM R&amp;D Labs</td>
<td>Social Analytics over email and social media</td>
</tr>
<tr>
<td>IBM R&amp;D Labs</td>
<td>I/Q generator at 8-15 GHz</td>
</tr>
<tr>
<td>IBM R&amp;D Labs</td>
<td>Security and Privacy Services for Bluemix</td>
</tr>
<tr>
<td>IBM R&amp;D Labs</td>
<td>BigData security analytics of Cloud Systems in the cloud</td>
</tr>
<tr>
<td>IBM R&amp;D Labs</td>
<td>Robust non-factoid question-answering</td>
</tr>
<tr>
<td>IBM R&amp;D Labs</td>
<td>Bringing Big Data, Cloud, Mobile and Human Interaction into an Holistic Cognitive Solution</td>
</tr>
<tr>
<td>IBM R&amp;D Labs</td>
<td>Research and Development in Constraint Programming</td>
</tr>
<tr>
<td>IBM R&amp;D Labs</td>
<td>Learning Process Structures for Security Oriented Anomaly Detection</td>
</tr>
<tr>
<td>IBM R&amp;D Labs</td>
<td>Semantic Mediation</td>
</tr>
</tbody>
</table>
Company: Yahoo Labs, Haifa

Position: Summer internship at Yahoo!

Job description:
Yahoo Labs is looking for exceptional PhD students to work with us in our intern program for the summer of 2015. We seek world-class graduate students in pursuit of a PhD in Computer Science, Mathematics, Statistics, or a related area. Preference will be given to PhD candidates passionate about Algorithms, Search, Information Retrieval, Machine Learning, Natural Language Processing, Computational Advertising and Distributed Systems. Ideal candidates will have completed at least 2 years of graduate work.

Interns are expected to work with our research scientists and engineers to perform original research, apply scientific thinking and techniques to improve the performance and effectiveness of our products, and solve problems for our users and advertisers by analyzing mountains of data. They will have the opportunity to publish their work and expand the horizons of web science.

Position requirements:
• Currently enrolled as a PhD student
• Experience in writing academic papers
• Development capabilities in Java/C++
• Good communication skills oral and written
Preferred but not required:
• Proven publication record in leading conferences/journals
• Scientific background in areas of interest to Yahoo
• Industrial experience
• Familiarity with MapReduce/Hadoop

Internship goals: The research interns will work with Yahoo Labs scientists and engineers on research projects stemming from real-world Web challenges. This will require both solid development skills and superior analytical skills in order to formalize novel models and approaches at the cutting edge of web research and data science. A successful summer internship will include the submission of at least one paper to a leading conference such as WWW/SIGIR/WSDM, SOSP/OSDI, KDD or ACL.

Contact details: Please send applications to: israeljobs@yahoo-inc.com
Candidates will need to submit a CV plus a letter of recommendation from their graduate advisor.

Full/part time position: 14 weeks during the summer of 2015 (start times are flexible; however employment is full-time once started)
Platforms automation framework

Company: Check Point

Position (title of the project): Platforms automation framework

Job description: Develop a new framework for automatic testing. Create an automation of testing environment, allowing developers to verify their work by a click of a button. The project is not about the specific tests, but about the framework that would allow these tests to be written and executed. The framework should provide an easy interface for tests composition, execution, and results analysis.

Requirements: Java, C knowledge

Full/part time position: Both

Contact details: Maayan Kurzweil maayank@checkpoint.com

Develop new smartphone app for check point products (iOS / android)

Company: Check Point

Position (title of the project): Develop new smartphone app for check point products (iOS / android)

Job description: Develop a new mobile app for easy operation of Checkpoint products. This new app will take our operations to the next level in terms of user-experience and simplicity.

Requirements: iOS/Android development environment, Basic networking.

Full/part time position: Both

Contact details: Maayan Kurzweil maayank@checkpoint.com

Cloud based security feed & automation channel

Company: Check Point

Position (title of the project): Cloud based security feed & automation channel

Job description: Develop a cloud based service that will receive security events from security devices around the globe via web services. The service will store the events and present them via a “Facebook-like” feed to the customer who owns the security device. In addition,
the service will provide an IFTTT channel to allow customers to create automation rules based on these events.

For example:
- Send me an Android push notification when a virus entered my network
- Blink the lights in my living room if someone in my home browses to an inappropriate site 😊

Requirements:
- Java programming – Must
- Knowledge in web services or REST services – Must
- Knowledge in SQL database - Nice to have
- Knowledge in web development - Nice to have
- Familiarity with IFTTT automation protocol - Nice to have

Full/part time position: Full

Contact details: Maayan Kurzweil maayank@checkpoint.com

Development of an internet simulation package

Company: Check Point

Position (title of the project): Development of an internet simulation package

Job description: When executing malware samples for analysis at times we see that the control servers are down and yet we will be interested to understand how the network traffic behaves. In this project we will integrate a network simulator into our malware lab infrastructure in order to harvest as much information as possible.

Requirements: Python – must, network protocol understanding – advantage

Full/part time position: Full

Contact details: Maayan Kurzweil maayank@checkpoint.com

Data mining

Company: Check Point

Position (title of the project): Data mining

Job description: when dealing with large data sets a lot of interesting information can be harvested from the data. In this internship we will handle some very big data sets in order to detect interesting correlations.
**Requirements**: Python, algorithms, familiarity with data mining / machine learning, security - advantage

**Full/part time position**: Full

**Contact details**: Maayan Kurzweil - maayank@checkpoint.com

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**Cloud Deployment Solutions software developer**

**Company**: Check Point

**Position (title of the project)**: Cloud Deployment Solutions software developer

**Job description**: Develop a reporting tool to be used by company managers for reflecting usage of deployment cloud services by Check Point customers, and for monitoring service availability

**Requirements**: C/C++, JavaScript

**Full/part time position**: Full

**Contact details**: Maayan Kurzweil - maayank@checkpoint.com

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**Document Protection for the Government and Defense industry**

**Company**: Check Point

**Position (title of the project)**: Document Protection for the Government and Defense industry

**Job description**: Research of PKI, Two factor authentication research & implementation in C++. Public Key Infrastructure research & implementation in C++

**Requirements**: Basic knowledge of Windows Internals and Network Protocols (HTTP/HTTPs), Object Oriented knowledge, C++ programming experience, Research and automatous learning skills

**Full/part time position**: Full

**Contact details**: Maayan Kurzweil - maayank@checkpoint.com
Research in area of Internet of Things / Smart Connected Products

Company: PTC

Position (title of the project): Research in area of Internet of Things / Smart Connected Products: Applications Utilizing Product Connectivity to Provide New Smart Services

Job description: Software Engineer

Requirements:
- Specialization in software engineering (Java/C#/C++ programming, Web-Client design)
- Fast learner, independent worker
- Advantage – background in one or few of following:
  - Web services, REST API
  - Database design and transactions
  - Multi-disciplinary engineering experience
  - Knowledge of drivers, communication/network protocols

Full/part time position: Part Time

Contact details: Shoval Levy – Senior HR Representative
Email: sfried@ptc.com 04-813-4542

Approximation of the triangulation/facets by Catmull-Clark subdivision surfaces within given tolerance

Company: PTC

Position (title of the project): Approximation of the triangulation/facets by Catmull-Clark subdivision surfaces within given tolerance

Job description:
Research (and development) of algorithm which should get triangulation set as input and return Control Polygon of Catmull Clark subdivision surfaces

Requirements: Knowledge of Subdivision surfaces, Computer Aided geometry design

Contact details: Shoval Levy sfried@ptc.com 04-813-4542
Rafael

Secure Linux Boot Loader

Company: Rafael

Position (title of the project): Secure Linux Boot Loader

Job description:
Development of an infrastructure software component running on ARM architecture hardware (based on Freescale IMX6 Arm processor under SMARC form factor), responsible for the secure boot of Linux OS on a mission critical system. This component will also be responsible for remote management of embedded software and firmware (burning, deleting, version management, etc.) using standard communications (such as COM ports, Ethernet, USB) via a desktop application.

Requirements:
- Knowledge in C++ (must)
- Experience in developing embedded systems with emphasis on ARM architecture (advantage).
- Experience in Linux kernel and drivers programming (advantage)

Full/part time position: Full

Contact details: Koren Krupko, korenk@rafael.co.il 050-4039503

NIOS Loader Software

Company: Rafael

Position (title of the project): NIOS Loader Software

Job description:
Development of an infrastructure software component running on NIOS architecture hardware responsible for loading software and firmware at boot time. This component will also be responsible for remote management of embedded software and firmware (burning, deleting, version management, etc.) using standard communications (such as COM ports, Ethernet, USB) via a desktop application.

Requirements:
- Knowledge in C++ (must)
- Experience in developing embedded systems with emphasis on NIOS architecture (advantage).

Full/part time position: Full

Contact details: Koren Krupko, korenk@rafael.co.il 050-4039503
**Embedded Linux PCIe driver**

**Company:** Rafael

**Position (title of the project):** Embedded Linux PCIe Driver

**Job description:** Development of PCIe driver for a Linux 3.10 kernel. This component will be responsible for allowing communication of an ARM based CPU and a FPGA firmware on a mission critical system. High reliability and throughput are mandatory.

**Requirements:**
- Knowledge in C (must)
- Experience in Linux kernel and drivers programming (advantage)
- Experience in developing embedded systems with emphasis on ARM architecture (advantage)

**Full/part time position:** Full

**Contact details:** Koren Krupko, korenk@rafael.co.il 050-4039503

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**Cyber security of industrial control systems - vulnerabilities and defense**

**Company:** Rafael

**Position (title of the project):** Cyber security of industrial control systems - vulnerabilities and defense

**Job description:**
Industrial control systems are used for monitoring and controlling critical infrastructures such as power plants, railways, water plants and so on.
Ensuring their resilience against cyber-attacks is important both on an economical and national level.
During this internship, you will be working as part of a team which studies the security vulnerabilities of industrial control systems and develops novel security solutions for such systems.
The work focuses on the communication within the system, Machine learning and cyber threat Analysis.

**Requirements:**
Knowledge in networks, programming skills (preferably C++)

**Full/part time position:** Full time.

**Contact details:** Ortal Lev, Email: ortalb@rafael.co.il Phone: 073-335-3517, Mobile: 0504039402
Company: Outbrain Inc., the Web’s leading content discovery platform, is seeking outstanding candidates for its 2015 summer internship program. The 3-month long position entails working in Outbrain's Software Group. Working out of Outbrain's offices in Netanya, you will engage in cutting-edge big data technology - and push it forward. You will discover actionable insights in user interaction data, and will leverage those insights to improve our service.

Requirements:
- Currently enrolled as a graduate student in Computer Science or a related discipline.
- Knowledge in Web applications technologies, such as HTML and Javascript – an advantage.
- Familiarity with Big Data platforms (e.g. Hadoop, Hive, Pig, Storm, Spark) is an advantage.
- Excellent communication and interpersonal skills.
- Industrial experience is an advantage.

Contact details: To apply please send your CV to kshelef@outbrain.com. Interviews will take place in early 2015.
**IBM**

**Stream pattern recognition over continuous sensor data**

**Company:** IBM – HRL

**Position (title of the project):** Stream pattern recognition over continuous sensor data

**Job description:**
The proposed research project will focus on the adaptation of on-line machine learning techniques for personalized pattern recognition over continuous data streams, with each pattern being a series of data which can be correlated with a previously observed sequence of data. For example, over excessive effort prevention may require constant learning of person's activities to minimize false positive detection while adapting to the circumstances in which the person is at. Similarly, the ability to train the system to enable interactions via hand gestures (e.g., for field operators) may require a convenient way to add and adopt the system ability to recognize various gestures being of interest to the user.

**Requirements:**
The project may be most appealing to students who are interested or who are already engaged in pursuing research that employs machine-learning/data/process-mining techniques for the purpose of on-line stream processing. The intended work in this project will start with a survey of existing techniques to be employed for the aforementioned use cases, followed by a proof-of-concept implementation that compares between the ones identified as the most prominent. The scientific work will be supervised by lead scientists in HRL, and will be planned with an aim to publish an article in a top venue.

**Full/part time position:** a full term summer internship

**Contact details:** Lior Limonad - liorli@il.ibm.com, Wearware and IoT Solution.

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**Adaptive sampling for activity recognition over continues sensor data**

**Company:** IBM – HRL

**Position (title of the project):** Adaptive sampling for activity recognition over continues sensor data

**Job description:**
Most of nowadays techniques for activity recognition are based on the partitioning of sensor data (e.g., accelerometer) into a sequence of sampling windows. Each such window is then extracted a set of features that are used as the input for the employment of various machine learning techniques for the purpose of activity recognition. Such techniques are used to develop the models that are then used to classify the various activities. As a result of this methodology, the partitioning into windows may be crucial to the entailed accuracy of these models. The focus in this work will be on the development of a proof-of-concept which employs an adaptive technique that dynamically adjusts the sampling rate to match with the actual activity at hand in order to improve the accuracy of activity recognition.
Requirements:
The project may be most appealing to students who are interested or who are already engaged in pursuing research that employs machine-learning/data/process-mining techniques for the purpose of on-line stream processing. The proposed research project will survey existing techniques for activity recognition, with a focus on their underlying technique for window partitioning. Particularly, it will explore algorithmic approaches to the determination of such windows in the context of on-line data streams, and the accuracy effects that may be attained from the adaptation of such windows to the input data. The scientific work will be directed by lead scientists in HRL and will be planned with an aim to publish an article in a top venue.

Full/part time position: a full term summer internship

Contact details: Lior Limonad - liorli@il.ibm.com, Wearware and IoT Solution.

Computer Vision

Company: IBM R&D Labs in Israel

Position: Researcher in the Video and GIS Analytics group

Project description:
The Video and GIS Analytics group – part of the Multimedia Analytics department at IBM Research – specializes in advanced real-time video technologies. This unique group focuses on novel approaches for information overload and technologies in the areas of real-time rich-content streaming and management, video communication frameworks and geo-spatial situational awareness. The group develops a scalable framework for real-time connectivity, as well as a platform for off-line rich-media tagging search & retrieval of archived rich media assets.

In the area of video analytics, our group conducts research and develops novel computer vision algorithms (also using machine learning tools) for various problems such as scene text detection and recognition in natural videos and images, video segmentation, visual recognition and scene understanding.

The goal of the project is to develop and implement novel algorithms for solving various computer vision problems related to video (such as the ones mentioned above), with a special emphasis on robustness and efficiency.

We offer an opportunity to work and conduct high-quality research with a leading research group in the area of video analytics and computer vision, on a topic that is on the cutting edge of research and technology.

Required Skills: Graduate student (preferable) with good research and self-learning skills, as well as with some background in image and video processing, and preferably also in computer vision and machine learning. Good programming skills in MATLAB and C++ are also required (prior acquaintance with Open CV is a plus).

Full/Part time position: Summer internship.

Contact details: ashour@il.ibm.com
Summer Internship no.1

Company: IBM R&D Labs in Israel

Position: Researcher at the Smart Client Platforms group, in the Mobile Enterprise Platforms domain.

Project description:
Enterprise mobility is about mobilizing the business organization. It involves the provisioning of tools, resources, and processes by the organization to allow its employees to effectively perform their tasks while on the road or away from their workstations. Typically, this involves an extension of business applications/solutions through the use of portable and mobile devices.
Mobile Enterprise Platforms deal with the technical capability to create, deploy and manage suite of enterprise apps to multiple, heterogeneous devices (iOS, Android, RIM) that connect securely to enterprise backend servers.

The Smart Client Platforms group specializes in the study and development of tools and platforms for developing, deploying, managing and analyzing enterprise applications using cutting edge Web 2.0, mobile and cloud technologies as well as advanced code analysis algorithms. The platforms we develop target skilled developers as well as knowledge workers and highlight operation simplicity, consumability, scalability, excellent user experience, while supporting high end security standards.

The intern will be exposed to frontend and backend technologies such as Ajax, REST APIs, JSON, and more.

We offer an opportunity to work and conduct high-quality research with a leading research group in the area of Mobile Enterprise Platforms on a topic that is on the cutting edge of research and the technology arena.

Required skills:
Good research and self-learning skills, excellent programming skills including knowledge of Mobile Platforms, Web technologies.

Full/Part time position: Summer internship.

Contact details: idanb@il.ibm.com

Expressive speech: parameterization & transformation

Company: IBM R&D Labs in Israel

Position: Expressive speech: parameterization & transformation

General background: one of the key challenges in human computer voice interaction systems is the ability to manipulate synthesized speech, so that it can convey desired expressiveness and affect, while preserving high speech quality. The affect in speech is expressed by its prosodic characteristics (pitch, duration & energy) as well as by other speech manipulations (e.g. spectral envelope modification/ breathiness modification, etc.). Existing prosody modification techniques usually makes a simplistic assumption of spectral envelope preservation when modifying the prosody, while emotion modification is mostly
based on prosody modification and to a lesser extent on some rule based spectral modifications.

**Project description:**
We would like to explore data-driven approaches for prosody and emotion modification of speech (in parametric domain), provided a labeled and clustered emotional speech data corpus. We will start from prosody and emotion manipulation on natural prerecorded speech (e.g., part of the given labeled single speaker data corpus), and later move to synthesized speech manipulation.

We offer an opportunity to work on an exploratory research project possibly leading to a scientific publication. Large data corpus will be provided for the research.

**Requirements:**
- PhD candidate from EE or CS (or strong MSc student in advanced stages of his Master)
- Knowledge and Research Experience in Speech/Signal processing
- Background in Speech Synthesis is an advantage.

**Full/Part time Position:** Full time student position for the summer period in the Haifa area.

**Contact details:** Please apply on line- [https://www.research.ibm.com/haifa/careers.shtml](https://www.research.ibm.com/haifa/careers.shtml)
For additional info contact: slava@il.ibm.com

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**Expressive speech: Multi-Modal Biometric Authentication**

**Company:** IBM R&D Labs in Israel

**Position:** Expressive speech: Multi-Modal Biometric Authentication

**General Background:** Multi-Modal Biometric authentication is the verification of a user’s identity by means of a its physical traits or behavioral characteristics that cannot be changed easily, such as a voice, face, handwriting and fingerprints. Multi-Modal Biometrics enables secure, robust and convenient authentication which is not available using only a single modality.

**Project description:**
We would like to explore innovative approaches to improve the robustness and accuracy of our biometric engines and detection of spoofing attacks (user liveness detection). One such approach is the usage of Deep Neural Networks and an additional possible direction is to explore synchronous analysis of voice and the video live input in order to improve accuracy, robustness and liveness detection.

We offer the opportunity to work on an exploratory research project possibly leading to a scientific publication in addition to contributing to the development of a novel mobile authentication solution.

**Requirements:**
- PhD candidate from EE or CS
- Knowledge and Research Experience in machine learning and either computer vision or speech/signal processing.
• Background in biometric identification or authentication is an advantage.

**Full/Part time position:** Full time student position for the summer period in the Tel-Aviv area (preferred) or Haifa area (possible).


**Contact details:** Hagaia@il.ibm.com

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**Expressive speech: Multi-Modal Biometric Authentication**

**Company:** IBM R&D Labs in Israel  
**Position:** Expressive speech: Multi-Modal Biometric Authentication

**General Background:**  
Multi-Modal Biometric authentication is the verification of a user’s identity by means of its physical traits or behavioral characteristics that cannot be changed easily, such as a voice, face, handwriting and fingerprints. Mutli-Modal Biometrics enables secure, robust and convenient authentication which is not available using only a single modality.

**Project description:**  
We would like to explore innovative approaches to improve the robustness and accuracy of our biometric engines and detection of spoofing attacks (user liveness detection). One such approach is the usage of Deep Neural Networks and an additional possible direction is to explore synchronous analysis of voice and the video live input in order to improve accuracy, robustness and liveness detection.

We offer the opportunity to work on an exploratory research project possibly leading to a scientific publication in addition to contributing to the development of a novel mobile authentication solution.

**Requirements:**  
- PhD candidate from EE or CS (or strong MSc student in advanced stages of his Master).
- Knowledge and Research Experience in machine learning and either computer vision or speech/signal processing.
- Background in biometric identification or authentication is an advantage.

**Full/Part time position:** Full time student position for the summer period in the Tel-Aviv area (preferred) or Haifa area (possible).

**Contact details:**  
For additional info contact: Hagaia@il.ibm.com

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**Expressive speech: Speech based Emotion Detection**

**Company:** IBM R&D Labs in Israel  
**Position:** Expressive speech: Speech based Emotion Detection

**General Background:** Affective Computing is the study and development of systems and devices that can recognize, interpret, process, and simulate human affects (emotions, mood
Detecting and monitoring emotions in speech using its non-verbal content is a key technology in affective computing and affect aware conversational systems.

**Project description:**
Our goal is to go beyond the recognition of basic emotions (anger, sadness, happiness etc.) and develop algorithms for detecting complex/secondary emotions from speech signals (e.g. disappointment, frustration, satisfaction), which are more typical in human machine dialogue.

In addition to conducting algorithmic research the work may include running lab experiments and collection of data for the research.

We offer the opportunity to work on an exploratory research project possibly leading to a scientific publication.

**Requirements:**
- PhD candidate from EE or CS (or strong MSc student in advanced stages of his Master).
- Knowledge and Research Experience in speech/signal processing and/or machine learning.
- Experience in software development in Windows environment.

**Full/Part time position:** Full time student position for the summer period in the Haifa area.

**Contact details:** Please apply on line- [https://www.research.ibm.com/haifa/careers.shtml](https://www.research.ibm.com/haifa/careers.shtml)
For additional info contact: aharonsa@il.ibm.com

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**Summer Internship no.2**

**Company:** IBM R&D Labs in Israel

**Position:** Summer Internship

General Background: In 2006 a team of researchers in IBM took upon themselves the challenge of developing a fully automatic system that will compete in the popular quiz show Jeopardy! It took them over 5 years and in 2011 the system, which was named Watson, participated in a live Jeopardy! Show competing against the all times champions. Watson won the game while demonstrating unprecedented text analytics capabilities. Since this event, IBM has been building on this technology to open new business directions for the company. At the same time researchers at IBM asked themselves what would be the next challenges for Watson.

**Project description:**
While Watson demonstrated impressive text analytics, it is still confined to answer factual questions where typically there is a right or wrong answer. However, most of the questions that we ask in life are more complex and are influenced by biases and different points if view. For example: "Should we ban smoking?", "Should I rent an apartment or buy one?", "Should IBM make a partnership with Apple?". IBM Debating Technologies is a project which aims to address such scenarios. At a very high level, we are developing a system and a set of tools, which will assist humans in situations where debate and reasoning is required. The system, given a topic under dispute, generates arguments which either support or contest the topic. A demonstration of initial capabilities can be seen here (starting around minute 45): [https://www.youtube.com/watch?feature=player_embedded&v=6fJoTAzICzw](https://www.youtube.com/watch?feature=player_embedded&v=6fJoTAzICzw)
We offer an opportunity to be part of an interdisciplinary, global team, working on a cutting edge technology which is highly exploratory.

Requirements:
- Proven background in natural language processing and/or machine learning
- Programming experience in Java is an advantage.

Full/Part time position: Summer internship.

Contact details: dannygu@il.ibm.com

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**Summer intern in the field of Medical Imaging**

**Company:** IBM R&D Labs in Israel

**Position:** Computer Vision student at the Medical Imaging Analytics Group

**Project description:**
The Medical Imaging Analytics Group – part of the Multimedia Analytics department at IBM Research – specializes in advanced image processing technologies. The project scope includes invention and design of new computer vision methods in the field of medical imaging.

We offer:
An opportunity to collaborate and publish with top researchers at IBM Research in the area of medical image processing, on a topic that is on the cutting edge of research and technology.

**Requirement:**
- We are looking for researchers in the field of computer vision and machine learning. The position will involve analysis of radiological images and clinical data.
- The position is intended for MSc or PhD students in Computer Science/Electrical Engineering/ Mathematics with focus on computer vision, machine learning or image-processing.
- Research capabilities, with strong theory/algorithm background and very good understanding on how to apply advanced knowledge to solve real problems. Fluent in MATLAB.
- Industry experience is an advantage.

Full/Part time Position: Summer internship.

Contact details: flora@il.ibm.com

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**Proactive location intelligence**

**Company:** IBM R&D Labs in Israel

**Position:** Summer internship at the Smart Decision Solutions Group.

**Project description:**
With the pervasive adoption of location aware technologies and other sensors in mobile devices, connected cars, environmental sensors, and other software and hardware
architecture, today’s smarter systems need to be able to sense, analyze, monitor, predict, and respond to space- and time- based situations. Our group aims to advance the state of the art in development of comprehensive set of technologies that facilitate building smart systems than can react, predict and take proactive actions to space-time situations. We apply our technologies for solving real-world client challenges across a wide range of industries such as Travel & Transportation, Logistics, Maritime, Insurance, Natural Resources and Retail. In addition we apply our technologies to address societal challenges in areas such as Smarter Cities, Urban Planning, Urban Mobility, Multi-modal Transportation, Environment, Open Data, and Citizen Engagement. We work in close partnership with other business units in IBM to deliver a standards based technological support for the IBM software platform, solution and services businesses.

References: https://www.research.ibm.com/haifa/dept/services/sds.shtml

We Offer an opportunity to join R&D activities in the world’s largest IT research organization.

Required skills:
Good research and self-learning skillsprogramming skills (primarily in Java) and a passion for innovation that matters.

Full/Part time Position: Summer internship.

Contact details: bnayahu@il.ibm.com

Analysis of Pareto frontiers

Company: IBM R&D Labs in Israel

Position: Student Researcher.

General Background: Pareto frontiers are an important class of multivariate datasets. Consider almost any decision-making problem: it can be modeled as a set of points, where each point represents a possible alternative for the decision maker to select from. Moreover, each alternative has its own merits and weaknesses; this is modeled by giving values for the alternative in several pre-determined criteria, so that each point is n-dimensional. All in all, the decision problem is modeled by a set of n-dimensional points. The Pareto frontier is a subset containing all those points $p^*$ that are maximal, or locally optimal – i.e., there is no other point that is greater-or-equal than $p^*$ in all coordinates (given that greater values are better). On the basis of those specific criteria, there is no reason for the decision maker to select a point that is not on the frontier. However, mathematically, all the alternatives on the frontier are equally attractive.

Project description:
We believe that in some cases, some of the points on the frontier can be understood to be more attractive than others. The aim of this project is to develop a rigorous mathematical model and devise mathematical and algorithmic methods to assess which are the more attractive points on the frontier. The project also requires implementing these ideas in a high-level programming language such as Python.

We offer an exploratory research project possibly leading to a scientific publication, in addition to participating in developing a novel solution with a clear productization roadmap.
**Mining user interactions**

**Company:** IBM R&D Labs in Israel

**Position:** Student researcher

General Background: from the interactions of users with an application or website one can learn certain things about the user, e.g., his goals and needs, and about the application’s quality and characteristics. Moreover, in the context of applications that handle data, one can sometimes implicitly infer certain things about the underlying dataset – solely from the way that users manipulate it.

**Project description:**
This project aims at devising ways for making valuable insights from the interactions of users with a certain type of applications (the exact nature of these applications, and the insights that we expect to extract cannot be announced at this stage). The project includes determining exactly which interaction features to collect for the problem at hand, and applying machine learning algorithms and data mining techniques for the extraction of valuable insight from the collected data. The project also requires implementing these methods in a high-level programming language such as Python or R.

We offer an exploratory research project possibly leading to a scientific publication, in addition to participating in developing a novel solution with a clear productization roadmap.

**Requirements:**
- Strong analytical thinking.
- Strong background in data mining and machine learning.
- Experience in data analysis is an advantage.

**Full/Part time Position:** Full-time student position for the summer period.

**Contact details:** amirka@il.ibm.com

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**Parser for advanced processor verification template language**

**Company:** IBM Research Labs – Haifa.

**Position:** Parser for Advanced Processor Verification Template Language

General background: Random-based stimuli generators are widely used in the hardware industry for the verification of hardware components such as processors. The input to a processor-level stimuli generator is a test template, which describes at a high level the
desired characteristics of the test cases to be generated. Given a test template as input, the
stimuli generator produces a large set of architecturally valid tests that satisfy the template
request by randomly filling in all unspecified details. These test-cases are then executed on
the design under test to verify that it works as expected.
At the heart of this approach lies a sophisticated template language for defining test
templates. This language must be sufficiently expressive to allow users to specify details of
what they would like to see in the generated tests on the one hand, as well as allow users to
omit all irrelevant details that they would like to be filled in by the stimuli generator. This
second requirement is what makes template languages more complex than standard
programming languages and demands new algorithms to ensure correct parsing and
handling of templates.

**Project description:**
In this project we will explore and implement advanced parsing techniques which can handle
the complexities introduced by template languages. We will investigate using constraint
satisfaction (CSP) for disambiguating various language constructs, as well as sophisticated
graph-based approaches to handle language inter-dependencies. Successful results of this
research may be submitted for publication.

**Requirements:**
- Good research and self-learning skills.
- Good programming skills (preferably C++).
- Graduate student is preferred. Outstanding undergraduate can also apply.

(March 2012).
verification plans in processor designs. Proceedings of the 8th Haifa Verification

**Full/part time position:** Full time summer internship.

**Contact details:** marcus@il.ibm.com

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**Social engagement analysis research in Social Media technologies group**

**Company:** IBM Research Labs – Haifa.

**Position:** Researcher at the Social Technologies group - IBM Haifa Research Lab.

General background: Social networks such as Twitter, Facebook, Instagram etc., have
become very dominant communication tools among people. Similarly to their counterparts
on the Web, social media applications have also emerged inside organizations. Yammer,
Chatter, and IBM Connections are a few prominent examples. Through functionality like
personal walls, forums, wikis and blogs, they provide a rich engagement platform through
which employees can interact, share their experience and knowledge, learn new insights and
widen their acquaintance network. Moreover, it opens an additional window of opportunity
for employees to get a voice within the organization.
Recent studies prove the importance for companies to have their employees socially engaged.

Internship proposal:
In this project, the goal is to develop *engagement analytics* over the enterprise social network activity graph. Such analytics can include identifying employees’ social behavior patterns, providing recommendations to employees on how to engage in a more efficient manner, identifying insights to management from the company social network, etc. Our goal would be to both to develop a working prototype and to publish a scientific paper.

**Requirements:**
Graduate students with strong engineering skills and excellent research skills who can work as part of a team. Java programming knowledge is a must, due to the short term of the project. In-depth knowledge of statistical analytics and/or machine learning is an advantage.

**Full/part time position:** The project fits a 3-month internship on a full position basis.

**Contact details:** Shiri Kremer-Davidson, Social Technologies group. shiri@il.ibm.com

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**Graph partitioning**

**Company:** IBM Research Labs – Haifa.

**Position:** Researcher at the Social Technologies group - IBM Haifa Research Lab.

**General background:**
In recent years graph databases are drawing more and more attention from both industry and academia mostly due to the proliferation of Online Social Networks (OSNs) and Linked Data. Due to the sheer volume of data, in many examples, it is no longer possible to effectively store the entire graph on a single machine. As a result the graph needs to be partitioned across multiple machines. Hence the issue of balancing the graph partitioning in a streaming setting is a key problem to enable scalable and efficient computations. Yet many graph database systems provide only basic partitioning strategies such as randomized partitioning or partitioning based on transactional affinity. More advanced partitioning techniques are based on a heuristics which either places the newly arrived vertex in the cluster with the largest number of neighbors or alternatively, in the cluster with the least number of non-neighbors or some combination thereof. These methods provide suboptimal partitioning resulting in poor query processing as each query may issue traversals that require data residing on multiple machines or unevenly balancing the workload among the different machines.

**Project description:**
In this project we will implement, using an open source graph database called Titan, a method which performs live migration of vertices between machines based on actual traversal queries issued to the system. The goal will be to show that our proposed method reduces query processing time when compared to other known techniques for partitioning such as those mentioned above.
We offer an opportunity to work and conduct high-quality research in one of the world's leading research groups in the area of Social technologies and Information Retrieval on a topic that is in the bleeding edge of research and technology.

**Requirements:**
Graduate students with strong engineering skills and excellent research skills who can work as part of a team. Java programming knowledge is a must, due to the short term of the project. Web development skills are an advantage and so is existing publication experience.

**Full/part time position:** Summer internship - 3-month internship on a full position basis.

**Contact details:** Roy Levin, Social Technologies group, royl@il.ibm.com Haggai Roitman, Information Retrieval group, haggai@il.ibm.com

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**Real-time trend detection in Social Networks**

**Company:** IBM Research Labs – Haifa.

**Position:** Researcher at the Social Technologies group - IBM Haifa Research Lab.

General background: Detecting trending events in online social media streams has become a very popular topic in recent years. However, since the same set of trends may not interest all users to the same degree, solutions have also begun to emerge for the problem of promptly recommending trending entities within some predefined personalized context. However, the problem of finding trends related to a search query which is NOT known in advance has not yet been studied. Such a setting would allow users to promptly get relevant trends as they issue a new search query over a dataset of documents. For example, recommending trending applications when a user searches for `"children games"`. This presents a new challenge as, unlike existing methods, there is no predefined context for which relevant trends can be calculated in advance.

**Project description:**
We have designed the outline of an algorithm for detecting such trends, in real time, over streaming social media data within the context of a search query. For our purposes we define an entity as trending if it is expected that it will be more frequently mentioned within the near future, indicating that it is becoming more important. Hence, using real data from an online social network, we wish to evaluate the algorithm based on its ability to predict an actual increase in the level of activity within entities that are found to be trending in the given search context.

We offer an opportunity to work and conduct high-quality research in one of the world's leading research groups in the area of Social technologies and Information Retrieval on a topic that is in the bleeding edge of research and technology.

**Required skills:**
Graduate students with strong engineering skills and excellent research skills who can work as part of a team. Java programming knowledge is a must, due to the short term of the project. Web development skills are an advantage and so is existing publication experience.
Full/Part time Position: Summer internship - 3-month internship on a full position basis.

Contact details: Roy Levin, Social Technologies group, royl@il.ibm.com

Social analytics over email and social media

Company: IBM Research Labs – Haifa.

Position: Researcher at the Social Technologies group - IBM Haifa Research Lab.

General background: Social media sites such as Twitter and Facebook are becoming more and more dominant on the web. Users share their activities, opinions, photos, and videos, and in parallel get similar updates from their social environment. Moreover web mail sites such as Google and Yahoo add more and more social features to their sites. Similarly to their counterparts on the Web, social media applications have also emerged inside organizations. Yammer, Chatter, and IBM Connections are a few prominent examples.

Project description:
In this project, the goal is to develop social analytics over the corporate’s mail or social media sites. Such analytics can include prioritizing and categorization of a user’s mail, identifying to-do’s in mails, recommending related context and people to the user’s current work context and more. Machine learning and Information retrieval would be among the core algorithms in this project. Our aim is to both develop a working prototype and publish a scientific paper.

We offer an opportunity to work and conduct high-quality research in one of the world’s leading research groups in the area of Social technologies and Information Retrieval on a topic that is in the bleeding edge of research and technology.

Required skills:
Graduate students with strong engineering skills and excellent research skills who can work as part of a team. Java programming knowledge is a must, due to the short term of the project. Web development skills are an advantage and so is existing publication experience.

Full/Part time Position: Summer internship - 3-month internship on a full position basis.

Contact details: Inbal Ronen, Social Technologies group, inbal@il.ibm.com

I/Q generator at 8-15 GHz

Company: IBM Research Labs – Haifa

Position: I/Q generator at 8-15 GHz

General Background:
Our team designs and develops silicon based transceivers at E-band and V-band frequency range for communication applications. A single silicon based transceiver chip offers high integrability and low cost products. The I/Q generator is a basic building block for such transceivers used to generate high order quadrature amplitude modulations.
**Project description:**
The intern will be responsible of designing an I/Q generator at 8-15 GHz frequency range. The technology used in the project will be SiGe8HP (Silicon–Germanium Heterojunction Bipolar transistors). The project includes all design stages, starting from schematic, physical design, and implementation for testing.

We offer:
The project demands high level of analog and RFIC circuit design. The versatility of the circuit may require innovation, while physical implementation might lead to a scientific publication.

**Requirements:**
- Background in analog circuit design or RFIC design.
- Experience in analog circuit design environment.

**Full/Part time Position:** Full time student position for the summer period.

**Contact details:** Please apply online - [https://www.research.ibm.com/haifa/careers.shtml](https://www.research.ibm.com/haifa/careers.shtml)
For additional info contact: Danny Elad ([dannye@il.ibm.com](mailto:dannye@il.ibm.com)) and Oded Katz ([katzo@il.ibm.com](mailto:katzo@il.ibm.com))

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**Security and privacy services for Bluemix**

**Company:** IBM R&D Labs in Israel

**Position:** Security and privacy services for Bluemix

General Background: IBM Bluemix is a cloud platform as a service (PaaS) developed by IBM. It supports several programming languages and services as well as integrated DevOps to build, run, deploy and manage applications on the cloud.

**Project description:**
The project goal is to learn Bluemix environment and understand how to extend it with Security/Privacy related technologies developed at HRL. The anticipated outcome of the project would be:
- Adding one of the security/privacy related technologies developed at HRL as a service in Bluemix
- Report with guidance/best practices for leveraging Bluemix for developing secure applications

We offer exploratory Research project leading to developing a novel solution with a clear productization roadmap.

**Requirements:**
- Good research and self-learning skills.
- Strong background in Java, Unix/Linux.

**Full/Part time Position:** Full time student position for the summer period.

Please apply online - [https://www.research.ibm.com/haifa/careers.shtml](https://www.research.ibm.com/haifa/careers.shtml)

**Contact details:** [borisr@il.ibm.com](mailto:borisr@il.ibm.com)
**BigData security analytics of Cloud Systems in the cloud**

**Company:** IBM R&D Labs in Israel  
**Position:** BigData security analytics of Cloud Systems in the cloud

**General Background:**  
Any computer system and cloud services in particular, produces logs which are a great source of understanding the system: who did what? when? where? and how? BigData real-time analysis of these logs is important in order to audit the system for security, monitoring and other purposes. Moreover, logs of cloud systems are considered today a canonical example for BigData, hence analyzing this data requires highly scalable storage and analytics infrastructure.

**Project description:**  
The project purpose is to perform an advanced analytics of logs produced by various cloud services using large scale cluster computing (such as Apache Spark and Hadoop), and develop a new solution that will be combined in the cloud to audit the logs in order to enhance the cloud security. The project will focus on OpenStack, which is today’s most popular cloud open source project.  
We offer: An opportunity to conduct high-quality research possibly leading to a scientific publication in addition to participating in developing a new solution. We also offer an opportunity to explore with state-of-the-art scalable cloud systems as well as cloud analytics tools.

**Requirements:**  
- Strong algorithmic background.  
- Programming skills (in Python, Scala or Java).  
- Familiarity with scalable clustered systems.  
- Experience in machine learning and data mining is an advantage.

**Contact details:** shelly@il.ibm.com, yaron@il.ibm.com

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**Robust non-factoid question-answering**

**Company:** IBM R&D Labs in Israel  
**Position:** Robust non-factoid question-answering  

In recent years considerable attention has been given to the problem of question answering. However, most of the work has focused on automatic question answering frameworks for factoid questions rather than non-factoid questions. This task of automatically answering non-factoid questions is still open for deep investigation.

In this project we develop a robust and scalable methodology for non-factoid QA using machine learning and natural language processing techniques which are applied to big data sets to improve search, ranking, question-answering and many other tasks.

We are looking for talented and motivated graduate students who will examine new directions for this project, specifically in the domain of word embedding and neural networks. One possible direction is to enrich the data set by creating paraphrases of the questions.

**Requirements:**  
- If you are a computer science or engineering PhD/MSc student.
• If you master programming languages – Matlab / R / Python / Java
• If you are creative.
• And ready for hard work in a pleasant environment :-(

Some more details:
• 3-4 months of a PhD / MSc student during the summer.
• Computer Science / Engineering students.
• Proficiency in machine learning and data analytics.
• Background in Natural Language Processing - an advantage.
• Project involves research and development of methods in cognitive computing and machine learning and applying them to real world data.
• An option for submitting the work as a paper in the weeks following the internship.
• Get to know IBM’s recent tools such as BlueMix.

Contact details: oferl@il.ibm.com

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**Bringing Big Data, Cloud, Mobile and Human Interaction into an holistic cognitive solution**

**Company**: IBM R&D Labs in Israel

**Position**: Bringing Big Data, Cloud, Mobile and Human Interaction into an Holistic Cognitive Solution

**Background:**
Big Data, Cloud, Mobile and Human-Computer Interaction (HCI) are all important ingredients in the formation of an end-to-end machine learning and cognitive solutions.
However, creating a solution that consists all of these components requires variety of skills and proficiencies.

**Project Goal:** In this project, we will construct a re-usable modular framework that allow a fast development and deployment of end-to-end cognitive solutions by minimizing the overhead associated with selection of technologies, learning curve, integration and deployment.

**Method:** We will first review and analyze alternative technologies and tools for the different framework tasks (Server Side, Client Side, Machine Learning, Visualization, Cloud, etc...) - 4 weeks
Then we select the appropriate components and validate them by creating a sample end-to-end cognitive application - 4 weeks
In the next step, we will convert the application into a modular template by decoupling and isolating the application logic from the framework - 2 Weeks
And document our work by writing a step-by-step guide on how to use and configure the framework for fast creation and deployment of future cognitive solutions - 2 Weeks

**Requirements:**
We are looking for a talented and motivated graduate students who will take the major role in the execution of this project,
The candidate does not need to be an expert in any of the above mentioned technologies,
Nevertheless a background in development of both client and server side is required and a broad perspective of modern technologies and software development environments is a big advantage.
Join in:
- 3-4 months of a PhD / MSc student during the summer
- Computer Science / Engineering students
- At least two year of past software development experience out of the academy.
- Good Java programming capabilities.
- Master both client side and server side software development.
- Good problem solving and self-learning capabilities.
- Broad perspective of modern technologies and software tools - Big advantage
- During the project, you will get to know IBM’s recent tools such as SPSS Modeler, Bluemix, etc...
- Possibility to work either in Haifa or in Tel-Aviv.
- Ready for hard work in a pleasant environment :-)  

Contact details: oferl@il.ibm.com

Research and Development in constraint programming

Company: IBM Research Labs – Haifa.

Position: Research and Development in Constraint Programming

General background:
The Constraint Satisfaction team focuses on research and development in the area of constraint satisfaction problems (CSPs). Our main asset is the IBM Constraint Solver, a robust, general-purpose, state-of-the-art tool that has been used for more than a decade in modeling and solving many complex constraint problems. Our department has long-standing expertise in CSP algorithms and modeling. Our aim is to provide value to IBM through the application of constraint solving to various domains along with close interaction with the academic community. We work closely with our IBM partners to find the best constraint or optimization model for their domain and to apply the best heuristics when solving this model.

More details about our activities can be found on our website: https://www.research.ibm.com/haifa/dept/vst/csp.shtml

Proposal for internship project: The goal of the project is to research in the area of constraint satisfaction problems, by enhancing our solver with new capabilities. Examples include:
- Developing novel algorithms for solving constraint problems.
- Experimenting with various types of solving heuristics.
- Exploring algorithms to find unsatisfiable cores.
- Exploring invocation of a SAT solver from the CSP solver.

Project deliverable / Publications:
A successful realization of the project will produce a C++ implementation of the new algorithms, integrated with our solver. In addition, the project may produce a paper that will describe the conducted research. The paper will be submitted to one of the top conferences in the area of Constraint Programming.

Required skills:
- Good research and self-learning skills.
- Good programming skills (preferably C++).
Graduate student is preferred. Outstanding undergraduate can also apply.

Full/Part time position: Full time summer internship.

Contact details: Yael Ben-Haim yaelbh@il.ibm.com

Learning Process Structures for Security Oriented Anomaly Detection

Company: IBM Research Labs – Haifa.


General Background:
Cyber security is a field of ever growing demand and sophistication. Machine-learning and specifically anomaly detection techniques are commonly used tools in this domain. The typical behavior of the system is learned and deviations from this behavior (i.e. anomalies) can be highlighted as possible security breaches. However, most current techniques focus on creating statistical models over a given set of features and the detected correlation of these features, or on modeling the flow of these features over time. We would like to focus on the processes that the changes in the features exhibit and then measure the deviation of an observed process from the modeled process.

Project description:
We will analyze existing structured logs that list database accesses made by applications for the purpose of detecting anomalies in these logs that potentially indicate security breaches. We will study an open tool (ProM) developed by a research team at the Eindhoven University of Technology that can create models of processes given logs that report the events related to the process. We will then use the process models to assess the probability and hence the anomaly of observed events.

We offer exploratory Research project in collaboration with researchers at the IBM research Labs at Haifa and also at the Eindhoven University of Technology. The research will possibly lead to a scientific publication in addition to participating in developing a novel solution with a clear productization roadmap in the domains of both security and in Internet-Of-Things.

Requirements:
- Background in Software-Engineering and Java.
- Basic background in data analytics / machine learning.

Full/Part time position: Full time student position for the summer period.

Please apply on line- https://www.research.ibm.com/haifa/careers.shtml

Contact details: adir@il.ibm.com

Semantic Mediation

Company: IBM Research Labs – Haifa.
**Position:** Semantic meditation

**Problem domain:**

Semantic Web proposes to assign semantics to resources on the internet whereby the resources are defined as graphs in RDF (Resource Description Framework) format, and semantics are defined as ontologies in OWL (Web Ontology Language) specifications, also using RDF format. OWL applies first order logic axioms so as to infer new facts from the given facts of an RDF dataset.

We in IBM have through our participation in several EU projects in complex model based systems engineering (MBSE), have developed a platform on which MBSE models for cyber-physical systems (e.g., aerospace and automotive products) use these semantic web approaches to enable sharing of models among different tools. That is a serious problem in this domain and it applicable to many other domains in modern IT where information must be shared across domains.

Semantic mediation is a simple principle where an RDF model can be mediated from one representation which complies with one ontology, to another RDF model that matches a different ontology. In the tool interoperability case, each tool can export and import its internal model representation to and from RDF, using semantic terms based on its own OWL ontology. The platform transforms that RDF to another RDF that is compliant with another tool working similarly to the first one. Thus, a model in one tool is shared with another tool.

The semantic mediator interprets rules written as OWL axioms, and on which it reasons to produce the mediated output model from the input one.

**Project description:**

The student will work with our researchers to study the rules specifications that are used by the IBM system, and help us to understand the theoretical foundation of this process, where it matches the standards of the OWL logic system, and where it may need more sound foundation to support it. As a practical system, we know that the pure OWL reasoning approach is inefficient, and we have developed a very efficient engine to do the job, and the student will help us to define the foundation of this practical approach and match it to the pure logic theory on which OWL is based.

**Required Background:**

The student is expected to have background as theoretical logician, where the study of OWL and RDF can be completed while on board. Yet, programming ability in Java by which implementation of ideas as well as experimenting with a working alternatives is a plus we will consider.

**Contact:** Dr. Uri Shani, shani@il.ibm.com, 0546976282. For the SET group in HRL (Manager: Henry Broodney)