Agenda for Week 5:

Mon June 27:

Group Meeting – 9:00am RI 104
Mid Project Presentations – 1:00pm RI 104

Tuesday June 28:
Visit to Videobank – 8:30 departure

Wednesday June 29:
Individual Research Work

Thursday June 30:
Visit to Vision Research – 9:30 departure

Friday July 1:
Individual Research Work

Videobank Visit!
Tuesday June 28th,
leave campus by 8:30am

Mid Program Presentations
Monday June 27th
1:00 pm

Vision Research Visit!
Thursday June 30th,
leave campus by 9:30am

IBM Research Visit!
July 12th or 13th
leave campus by 12:00pm
### iMagine NSF - Participating Students

<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
<th>Contact</th>
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<tr>
<td>Lauren Aguilera</td>
<td>Kean University</td>
<td><a href="http://www.kean.edu/">http://www.kean.edu/</a></td>
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<tr>
<td>Lashonda Bell</td>
<td>University of Southern Mississippi</td>
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<tr>
<td>Kimberly Pirate</td>
<td>Montclair State University</td>
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<tr>
<td>Kristin Soriano</td>
<td>University of Central Florida</td>
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<td>Theerapan Oonlamom</td>
<td>Washington State University</td>
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<tr>
<td>Terrance Hall</td>
<td>Lincoln University</td>
<td><a href="http://www.lincoln.edu">http://www.lincoln.edu</a></td>
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<tr>
<td>Douglas Taggart</td>
<td>Rowan University</td>
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<tr>
<td>Ramy Gerges</td>
<td>Montclair State University</td>
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### iMagine NSF – Weston Scholars

1. Nyah Campbell  
2. Mete Erdi      
3. Shannon Hardy  
4. Ryan Lin
### Participating Faculty and Staff

<table>
<thead>
<tr>
<th>Name</th>
<th>Office Location</th>
<th>Role</th>
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<tr>
<td>Stefan Robi</td>
<td>RI 312</td>
<td>Project Director</td>
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<td>Mentor (Kimberly Pirate, Terrance Hall)</td>
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<tr>
<td>Jerry Fails</td>
<td>RI 309</td>
<td>Mentor (Lashonda Bell, Ramy Gerges)</td>
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<tr>
<td>Bogdan Nita</td>
<td>RI 243</td>
<td>Mentor (Kristin Soriano, Theerapan Oonlamom)</td>
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<tr>
<td>Jing Peng</td>
<td>RI 309</td>
<td>Mentor (Doug Taggart, Lauren Aquilera)</td>
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<tr>
<td>James</td>
<td>Rollins College</td>
<td>Site Evaluator</td>
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<td>Zimmerman</td>
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<td>Sanjeev Wahi</td>
<td>RI 320</td>
<td>Industrial Advisor</td>
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<td>George</td>
<td>RI 306</td>
<td>Participating Faculty</td>
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<td>Antoniou</td>
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<tr>
<td>Beverly</td>
<td>RI 301</td>
<td>Department Assistant</td>
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<td>Macaluso</td>
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### Please Complete the following evaluation surveys!!!

Various activities have passed and we have to receive feedback from you. Please access the surveys below and provide your feedback. Thank you.

**Graduate Studies:**
- [Surveys Link](https://surveys.montclair.edu/survey/entry.jsp?id=1309019725935)

**Image Processing**
- [Surveys Link](https://surveys.montclair.edu/survey/entry.jsp?id=1307361002298)

**Web Design**
- [Surveys Link](https://surveys.montclair.edu/survey/entry.jsp?id=1307361132127)

**Matlab**
- [Surveys Link](https://surveys.montclair.edu/survey/entry.jsp?id=1307360814199)

**Pwd:** iMagine11
Summary of Activity: Visit to Sarnoff

On Wednesday June 15 the REU participants, accompanied by Dr. Stefan Robila, visited the labs of SRI Sarnoff located in Princeton New Jersey. We spent the majority of the day at Sarnoff where we saw several presentations about the research currently underway at the facility. All of the presentations revolved around imaging and computer vision, several of which were similar to some of the REU research projects.

Founded in 1942 as RCA Laboratories, Sarnoff Corporation has been a foundation in the technology field by delivering vision, video and semiconductor innovations that empower clients to see, sense, understand and control complex environments.

Sarnoff Corporation is one of the leading developers of new technology in the United States. The company began as the research and development arm of RCA Corporation, and produced the first viable color television system. Sarnoff is now involved in a broad array of technological research, which it carries out under contract to client companies. The company has considerable expertise in electronic communications, and it has doubled up this into ventures in on-demand video, pharmaceutical information processing, advanced medical and genetic diagnostics, and many other fields.

Sarnoff is one of the major patent holders in the United States. It collects income from licensing its technology as well as from contracting its researchers. Sarnoff also acts as an incubator for new technology companies. For more information on Sarnoff and its integration into SRI, please see the end of this report.

Presentation Summary

Welcome (Peter Burt):

Dr. Peter Burt welcomed us to Sarnoff by giving a preview of the company’s history and areas of research and introduced some of the scientists. Dr. Burt also gave an overview of image processing, as it plays an important part in a majority of the research at Sarnoff. Overall there are three levels to image processing:

- Level 0: Image capture (2D Domains)
- Level 1: Image processing (2D Domain)
- Level 2: Scene Structure (3D Domain analyze the world and modeling it)
- Level 3: Scene Understanding

3D Mapping (Raia Hadsell):

Dr. Hadsell demonstrated for us a robot she was been working on that is able to render a 3D model of the surrounding area. The robot was built on the chassis of a Segway scoter and utilized a wide array of sensors to map the surrounding area. Dr. Hadsell demonstrated this by driving the robot around the outside of the building as we watched a 3D model of the area outside of the building was generated.
Different colors were used in the model to simulate depth. Dr. Hasell used, what looked like, a video game controller to operate the robot from a distance.

**Vision Guided Compression (Sek Chai, Arkady Kopansky):**

Dr. Chai and Dr. Kopansky gave us a presentation on how video data is transferred, with an emphasis on video conferencing. Their research aims at improving the speed and quality of a video by sacrificing image quality in irrelevant parts of the picture. As an example the demonstrated how a video chat session would look using their process. In it most of the frame with the exception of the face was blurred out. By reducing the image quality they promised that this would use less bandwidth and prevent image lag and distortion commonly seen on live streaming videos.

**Wide Area tracking (Amir Tamrakar):**

Dr. Tamrakar gave a presentation on image tracking and detection. He showed sample data where several people are identified and tracked in a parking lot. He discussed the difficulties of object tracking in images and discussed the methods he uses to track and identify people in the frame from background clutter. Dr. Tamrakar used edges to identify people from background clutter. His method had difficulties detecting individuals in large groups. Dr. Tamrakar’s research is very similar the research Doug and Lauren are doing with Dr. Peng.

**Augmented Reality (Lu Wang):**

The technology being developed by Dr. Wang inserts people into a virtual environment that they can interact with. The environment is displayed on a small monitor, Sarnoff has developed a set of glasses that perform a similar function but we were not allowed to see them. He demonstrated his work using the Microsoft Kinect. By performing simple gestures we were able to alter the virtual environment. Some of the REU participants, along with Dr. Wang, interacted with the environment demonstrating the ability to try on different purses.

**Vision “front end” video processing (David Zhang):**

Dr. David Zhang showed us what hardware they use for processing images, a microchip called ACADIA II. They use this for image stabilization. ACADIA does this by decomposing the image into many smaller images It them fuses them tighter to get a better result. By doing this we can gather more
information from a single picture. Dr. Zhang also discussed more of the microchip design aspic of computer vision.

**Food Assessment by smart phone (Qian Yu):**

This project is about detecting the volume of food by taking a picture of the food and submitting it to an app. The app then detects the volume of the food and generates nutritional information about it. This project is being undertaken by Qian Yu and an intern, and was a refreshing change of pace from the more serious research being conducted at Sarnoff most of which revolves around security.

**Low Light image sensors for night vision and biotech (Tom Vogelson):**

Dr. Vogelson explained what kind of sensors they use in low light images. One of them was CMOS which is a low noise image sensor. This sensor is used together with ACADIA to capture better images when there is low light.

**Overview of the Sarnoff Corporation**

*Historical Timeline*

1919: RCA is incorporated: Sarnoff Corporation was originally conceived as the research and development department of RCA Corporation. RCA was established in 1919 as the Radio Corporation of America. This was a successor company to the early radio pioneer American Marconi, which had been bought by General Electric.

1942: The company founds RCA Laboratories as a separate facility: RCA’s research made several inventions such as television in 1939, electron microscope and the facsimile machine. Also when the United States entered World War II, RCA researchers bent their skills to many military applications of electronics. In 1942 RCA founded a separate RCA Laboratories facility on 260 acres of land in Princeton, New Jersey. The new lab was farther from the corporate headquarters in Manhattan.

1951: RCA Laboratories is renamed the David Sarnoff Research Center: In 1951 The RCA Laboratories was renamed the David Sarnoff Research Center, in honor of Sarnoff’s enormous contribution to RCA and to the consumer electronics industry.

1986: GE buys RCA: In 1975 Sarnoff Corporation change the e-board, under the power of a new president the company falls on hard times economically. In 1986 the company is abruptly sold to GE(General Electrics).

1987: GE gives Sarnoff Research Center to SRI International because GE was not able to continue supporting Sarnoff’s research.

1997: The company is renamed Sarnoff Corporation: Its business plan called for spinning off two new companies every year some of them are: Sarif Inc. (a Vancouver, Washington-based company that manufactured liquid crystal optical systems). Another was Orchid Biocomputer Inc.(which developed a medical screening device the size of a business card, which could conduct thousands of chemical tests simultaneously.)
Present: Sarnoff is fully integrated into SRI and it is totally focused on research.

*Sarnoff Corporation Research Areas*

The Sarnoff Corporation currently has several research projects related to computer imaging. Currently they are researching new technologies and techniques in Aerial Video Surveillance, 3D Modeling, Security and Force Protection, Medical and Embedded Vision, and Data Handling and Object Recognition.

Sarnoff is making many strides in the field of Object Recognition. They are developing new technologies and processes to make examining and processing data faster and more efficient, as well as giving users the ability to manipulate large amount of raw video data in new and exciting ways. This new technology extends to ground, aerial, and even seismic data. This has helped not just the private sector but also the Federal Government. The new advancements in UAS (unmanned aerial systems) technologies along with the object tracking a detection algorithms have given both the Department of Homeland Security and The United States Military the ability to keep Americans at home and aboard safe.

Sarnoff’s large set of image processing algorithms and technologies has been used for more than just defense. The field of medical imaging has benefited greatly from the many advances Sarnoff has made. Particularly the stabilization techniques developed to help with a jittery or shaky camera during an operation. Ophthalmology (the study of the eye), MRI analysis, and dentistry have all been affected by Sarnoff’s research.

*Sarnoff Corporation Production Products*

Although there primary focus is in research Sarnoff has a small, but impressive product line of imaging technologies. Currently Sarnoff has available a robust range of cameras, CDC/CMOS sensors and spectrometric instruments. Sarnoff’s spectrometric instruments are very versatile in that they can be manufactured to almost any specification and are able to detect light from the UV to NIR. The current line of CDC/CMOS cameras currently being produced by Sarnoff boasts a number of innovative features.

For anyone looking for more information on Sarnoff, it’s history, or its products and research areas the following links contain a plethora of information, much of which was used in the writing of this document.

http://www.sarnoff.com/
http://www.time.com/time/magazine/article/0,9171,989773,00.html

**Industry Trips Update**

As of yesterday four industrial partners have indicated willingness and ability to host us. The visits will start this week and will usually last 2-3 hours. If you are in charge of one of them, please make sure you provide an introduction to the companies and that you also provide a complete report at the end.
The following are the task leaders for each trip. For everybody’s convenience I also added links to the companies’ websites. The current dates for the visits are also provided where available:

- **SRI – Sarnoff**, June 15th, Doug, Lauren – DONE –
- **Vision Research** – June 30th, Kimberly, Terrance
  - [http://www.visionresearch.com/](http://www.visionresearch.com/)
- **Videobank** - June 28th, Ramy, LaShonda
- **IBM Research**, July 12 or 13, Kristin, James

**Tshirt**

I have received an update on the Tshirt. We expect the shirts to arrive this week. *The cost of the Tshirts was covered by the Department of Computer Science. Many thanks!*

**Upcoming Activity – Mid-Period Symposium**

**On Monday June 27th, at 1pm** the REU students will present their work to their peers. This constitutes of a short (20 minutes on average per team or 10 minutes individually) presentation followed by discussions on the progress of work. In addition a draft report is expected. The event allows everybody to get an insight on the various directions undertaken by the REU students and also a good sanity check on the progress. Please work with your mentors on this. All mentors are strongly encouraged to attend.

**iMagine REU Welcomes Weston Science Scholars**

Starting with June 27, the REU program is enhanced by the participation of four Weston scholars that will work with Dr. Robila. According to the program description “The Weston Science Scholars Program, now in its 12th year, offers specially selected ninth, tenth and eleventh graders from Montclair High School the opportunity to learn science "by doing science". The program recognizes high achieving students with significant potential in science, mathematics and related fields.” Montclair High School is a comprehensive four-year public high school located in Montclair, in Essex County, New Jersey, United States, as part of the Montclair Public Schools. The school serves residents from all parts of the Township of Montclair. Each year, following a rigorous application and selection process, forty students are selected to participate in the Weston Science Scholars program. While in the program, the scholars work closely with a Montclair State University faculty mentor on a research project, presenting their work at an end of the summer symposium. The scholars also participate in various seminars and workshops throughout the summer, aimed at enhancing their experience. In a sense, the Weston Science Scholars provides an experience similar to the REU program, with the focus being on high school students. The program is generously supported by funds from Judy and Josh Weston and Family, Inc.