

## **Basic Information**

Name: Arezou Keshavarz  
Institution: Stanford University  
Department: Electrical Engineering  
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## **Education**

- M.S. in Electrical Engineering, First Year, Stanford University  
- B.A.Sc. in Electrical Engineering from University of Toronto  
CGPA: 3.98  
Rank: 2 out of 132 (in all semesters)  
Dean's Honor Roll

## **Honors and Awards**

- |   |                |
|---|----------------|
| • Vice chair of the IEEE branch at University of Toronto  | 2006 – 2007    |
| • Adel S . Sedra Outstanding Student Award*   | 2006           |
| • Wallberg Undergraduate Scholarship  | 2006           |
| • NSERC Undergraduate Student Research Award (USRA)<br>(rejected the award for an internship at Stanford) | 2006           |
| • Adel S . Sedra Outstanding Student Award*   | 2005           |
| • NSERC Undergraduate Student Research Award (USRA)   | 2005           |
| • Adel S . Sedra Outstanding Student Award*   | 2004           |
| • University of Toronto Scholar   | 2004-2005      |
| • Member of the Golden Key International Honor Society  | 2004 – present |
| • IEEE member   | 2003 – present |

\* The Adel S. Sedra Outstanding Student Award is presented to the top three students during each academic year.

## **Research Experience**

### **B.A.Sc Design Project**

2006 – 2007

University of Toronto, Electrical Engineering Department

Research Field: Face and Feature Detection, Image Processing

Project: “Modiface: An Automatic Method for Virtual Cosmetic Surgery”

Description: This project consists of two components. The first component, which is implemented in MATLAB, is developing an algorithm to automatically detect the human face within an image as well as its facial features. Given a model face and a patient face the algorithm creates the desired look which would be composed of the desired facial features on the desired model face. This requires a smooth facial-feature detection and blending algorithm for each of the facial features. The second component consists of a web application that would serve as an interface for the system. The users upload two photos and select the desired face and the desired features to obtain the results of a cosmetic surgery in a virtual environment. The web interface is interactive (available at [www.modiface.com](http://www.modiface.com)) and allows the user to make adjustments to the automatic results and re-iterate the program. This module is implemented using HTML, JavaScript and PHP.

### **Summer Research Internship**

Summer 2006

Stanford University, Electrical Engineering Department

Research Field: Image Processing and Object Detection

Project: “Smart Home Care Networks”

Description: This project was aimed to design a smart home care network using wireless sensor networks to monitor the accidental fall of elderly patients in their home environment. Several cameras mounted on low-power motes were installed on the walls and the patient worn a small accelerometer. When the accelerometer data exceeded a certain threshold, the surveillance cameras were triggered to capture images from the scene to identify whether a hazardous situation was at hand. I developed the processing and decision making module in this project which processed the images to arrive at a final report to be sent to the central health care monitoring station. I designed the system to detect the objects in the scene, identify the human objects, and determine the posture of the human in the scene as well as the location of the head in the image. This procedure was repeated for each of the cameras mounted on the wall and each camera came to a preliminary understanding of the scene. The essential data from this distributed network was then fused together to arrive at a final conclusion about the status of the patient and create a report for the central monitoring station.

**Summer Research Internship**

Summer 2005

University of Toronto, Electrical Engineering Department

Research Field: Object Tracking

Project: "Acoustic Object Tracking"

Description: In this project I conducted research on acoustic object tracking techniques as a part of a larger hardware-based all-in-one system aimed to perform sound localization, speech enhancement, and speech recognition. The system used the Time Delay Of Arrival (TDOA) information obtained at each time instance to derive some information about the trajectory of movement of the speaker and predict the future position of the speaker.

**Summer Research Internship**

Summer 2005

University of Toronto, Electrical Engineering Department

Research Field: Sound localization

Project: "Sound Localization-based adaptive user interface"

Description: This project entailed developing a user interface that responded to voice commands from different parts of the environment to browse a web page, load different slides in a presentation, or control a lighting system in a concert hall. The system used sound information to locate the position of the speaker in the room and used this spatial information as a guide to the user's requested navigational operation.

**Summer Research Internship**

Summer 2004

University of Toronto, Electrical Engineering Department

Research Field: Sound localization and speech processing

Project: "Sound Localization and Speech Separation using Microphone Arrays"

Description: In this project, I enhanced the performance of the sound localization algorithm implemented in the Artificial Perception Laboratory using a 24-microphone array. I also worked on the application of this algorithm on a palm pilot, which was used to select the location of the speaker of interest. The microphone array was steered to "listen" to that speaker and cancel other sources of noise in the room. I worked on this system, which was initially developed by a design student, to enhance its performance and fine-tune some of its bottlenecks.

**Summer Research Internship**

Summer 2004

University of Toronto, Electrical Engineering Department

Research Field: Robotics

Project: "Remote real-time robot communication"

Description: In this project, the robots were designed to be controlled by a remote controlling center through TCP/IP connection. An interface was designed for the control center as well that would allow the operator to control the speed, direction and distance of the robot movement. Furthermore, a camera was installed on the robot which sent visual updates on the request of the control center. This project

was the basis of the ECE-APL robotic competition, in which 19 students participated and used this platform.

### **Summer Research Internship**

Summer 2004

University of Toronto, Electrical Engineering Department

Research Field: Robotics

Project: "Remote virtual helicopter navigation"

Description: In this project, a toy helicopter was wired up to a controlling computer and was controlled remotely through the TCP/IP connection. A 3D mouse was used that allowed basic hand movements to control the navigation of the helicopter, creating a virtual piloting environment. This project was tested in an open-field environment as well, during which a helicopter controlling competition was held.

### **Publications and Presentations:**

- Aarabi, P., Lam, J., **Keshavarz, A.**, *Face Detection using Information Fusion*, The 10<sup>th</sup> International Conference on Information Fusion, July 9-12, Quebec City, Canada, 2007.
- **Keshavarz, A.**, Aarabi, P., *Sound Localization-based Navigational User Interfaces*, IEEE International Symposium on Multimedia (ISM06), December 11-13, San Diego, United States, 2006.
- **Keshavarz, A.**, Maleki Tabar, A., Aghajan, H., *Distributed Vision-Based Reasoning for Smart Home Care*, Workshop on Distributed Smart Cameras (DSC06) October 31, United States, 2006.
- Maleki Tabar, A., **Keshavarz, A.**, Aghajan, H., *Smart Home Care Network using Sensor Fusion and Distributed Vision-based Reasoning*, 4th International Workshop on Video Surveillance and Sensor Networks (VSSN06), October 22-28, Santa Barbara, United States, 2006.
- Sensory Communication Symposium at University of Toronto – Title: *Sound Localization: Man vs. Machine*, 2006.
- University of Toronto ECE Summer Research Conference – Poster Presentation titled *Speech Enhancement & Object Tracking*, 2005.
- IEEE Student Congress, Toronto, ON, September 2006.

### **Professional Activities**

- **Vice Chair of the IEEE Student Branch at the University of Toronto**  
As the vice chair of the IEEE student branch, I have been leading a team of student members at the university to organize various events and communicate with the faculty and the industry. More specifically, I have been the main organizer of the following events:

- IEEE Wine & Cheese Recruitment Session, September 2006.
  - IEEE Graduate Information Conference (A one-week long ECE Graduate Department Recruitment Event), October 2006.
  - Student Professional Awareness Conference, January 2007.
- **Chair of the Publication Committee at International Conference for Upcoming Engineering (ICUE2007)**  
I am the sole chair of the publication committee for ICUE2007, which will be held in May 2007.

## **Course Projects**

- **Sound Localization: Man vs. Machine**  
*Course: Sensory Communication*  
A thorough investigation was performed to analyze the variables affecting the performance of sound localization performed using a microphone array with that performed by human ear. The analysis was performed for varying noise levels to compare the robustness of the human ear and the algorithm to increasing noise levels.
- **Optical Telephone**  
*Course: Analog Electronics*  
In this project, an optical telephone was designed and implemented composing of a transmitter, a receiver, and an optical transmitting unit.
- **Sound and Speech Processing Unit**  
*Course: Computer Organization*  
A sound and speech processing unit was designed completely using Assembly which recorded and performed various operations on sound signals. Some features of this project include up-sampling, down-sampling, and reverse playback.
- **Server Design and Implementation**  
*Course: Engineering Design II*  
Using C++, an HTTP/1.1 compatible server was successfully designed and implemented in collaboration with a team of three other students.
- **FPGA Implementation of Tic-Tac-Toe**  
*Course: Digital Circuit Design*  
An FPGA version of the Tic-Tac-Toe game was implemented using Verilog, which used a VGA screen to display the game progress and announce the winner.
- **Scanner Robot**  
*Course: Secondary School Computer Engineering Course*  
A scanner robot was built using Lego Mindstorms and programmed in Java to scan a black-and-white image and send the results to a computer.

### **Skills and Strengths**

- Extensive programming experience with C, C++, Visual Basic, Java, Assembly, MATLAB, Microprocessor programming (Motorola 68000)
- Advanced knowledge of circuit design with Verilog, Spice, Orcad, PISCES.
- Advanced knowledge of web application development using PHP, JavaScript, Perl, HTML, Adobe Photoshop, Macromedia Dreamweaver.

### **Languages**

Fluent in English and Farsi

### **Additional Interests**

- Cognitive Sciences, Philosophy of Mind, Artificial Intelligence
- Swimming, Tennis, Skiing
- Macro Photography

### **References**

Available upon request