

# TEACHING STATEMENT

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**"The art of teaching is the art of assisting discovery."**

–Mark Van Doren

**"The mediocre teacher tells. The good teacher explains. The superior teacher demonstrates. The great teacher inspires."**

–William Arthur Ward

One of the primary reasons I am seeking an academic position is the fact that as a teacher one can motivate, inspire and instill in students, the love for learning and self-discovery. During my undergraduate and graduate education, I have had the opportunity to be taught by several exceptional teachers who have been successful in imparting in me a sense of wonder and fascination for the subjects that they taught. I have learnt a lot about the fundamental principles for good teaching from my experiences as a student, teaching assistant and a substitute lecturer.

## TEACHING PHILOSOPHY AND STYLE

Teaching qualifies to be both an art and a science. Nevertheless, it is the specific style of teaching and the teacher's enthusiasm and child-like wonder that provides him/her with the ability to inspire and motivate students to embark on this process of discovery. As with all of science meticulous preparation is the key to delivering good lectures. My teaching style will include a judicious mix of basic theoretical principles, lots of example problems and connections to real world scenarios where the techniques/tools have been used. I will supplement the use of board with the use of technological tools such as powerpoint presentations, web-based explorative content, and graphical visualizations of the material. I have found that student involvement and active participation in a class often serves both as an inspiration and as a learning experience sometimes enhancing the course content. Therefore, I will always strive towards engaging the students in class by encouraging them to share their thoughts and ideas in class and participate in discussions.

### Teaching Experience

As an undergraduate student at the Indian Institute of Technology, Madras, I was involved in a voluntary teaching program aimed at the under-privileged students studying in the low-income neighbourhood of the campus (Taramani). As a part of this program, I taught highschool students mathematics, science and english thrice a week for a total period of 2 years. This was an immense learning experience and I realized that each student was different and was more receptive to a slightly different style of teaching. I also realized that a teacher needs to have a certain sense of wonder for the subject that they are imparting and any effort to impart knowledge without this will be futile. This was my first foray into the world of teaching and this partly played a role in my decision to enter a Graduate program.

As a Graduate student at the University of Maryland, College Park, I have been a Teaching Assistant for several courses (both formally and informally). In Fall 2002,

I was a tutor for undergraduate level courses Signals and Systems and Probability Theory. In Spring 2005, I was a Teaching Assistant for the Image Processing course offered by Prof. Rama Chellappa. I was actively involved in planning, organizing and preparing lecture notes for this course. Moreover, I also had the opportunity to deliver 6 lectures for the course. These lectures spanned varying topics like Human and Animal Vision, color space, JPEG compression, motion compensation, wavelet decomposition etc. During these lectures I used both powerpoint presentations and the board jointly and found that to be an effective way to teach courses like Image processing.

In Fall 2005, I delivered two lectures as a part of the course 'Pattern Recognition'. The first lecture was on hypothesis testing, the min-max rule and Neyman-Pearson criterion, while the second lecture was on linear discriminant methods for pattern classification. I ended each of these lectures with concrete example problems that highlight the fundamentals of the methods involved and this was well received. In Fall 2006, I was actively involved in redesigning and updating the course curriculum for the course 'Image Understanding' offered by Prof. Rama Chellappa. We updated the course with several new topics including graph theoretic methods for image segmentation, multibody structure from motion, generalized principal component analysis and non parametric belief propagation. The updated curriculum was well received and Prof. Chellappa is planning to offer this course once every two years.

### **Teaching Large Classes**

In my undergraduate school, I have attended several classes with about 100 students and have realized some of the important necessities of teaching a large class. While teaching large classes it is always very important to remember that there exist a wide variety of students. It becomes necessary to ensure that all these students are able to appreciate the course content. Providing the students with well articulated course notes supplemented with adequate illustrations and examples before each lecture significantly helps the students follow the material presented in class. The emphasis in such large classes should be on the basic principles and the underlying theory. Moreover, such classes must be adequately supplemented with course projects and well thought out assignments that highlight the important principles.

### **Teaching Small Classes**

While teaching small classes the teacher has significant freedom to engage the students in creative ways. When I teach small classes, I always make sure that there is significant student participation. Encouraging student participation and involvement in a class is critical to inculcating the joy of self discovery in the course content. The evaluation methodologies for these courses should also be based on both exams and some research projects that are in line with the theme of the course.

## **MENTORING EXPERIENCE**

### **Mentoring Undergraduate Students**

The University of Maryland conducts the Maryland Engineering Research Internship Teams (MERIT) program, which is a program to expose undergraduates to Engineering research. As a part of this program, I have mentored two undergraduate students,

in Summer 2006 and 2007. One of the students, Ian Tagge from the University of Portland worked on psf estimation and blind deblurring algorithms in the context of motion blur. The second student, Michael Kuhlman from Rensselaer Polytechnic Institute (then at Clarkson University) worked on identification of gender from gait. As a part of the program I got them to read scientific articles, critique them and implement them. They also presented their work in the MERIT fair at the end of summer.

The University of Maryland Gemstone program (<http://www.gemstone.umd.edu/index.html>) is a unique multidisciplinary four-year research program for selected undergraduate honors students of all majors. Under guidance of faculty mentors and Gemstone staff, teams of students design, direct and conduct significant research exploring the interdependence of science and technology with society. As a part of this program I am co-mentoring (with Prof. Chellappa and 2 other graduate students) 'Team Vision' (<http://teams.gemstone.umd.edu/classof2009/vision/>) a group of 13 honors undergraduates. 'Team Vision' is developing a system that will enable the visually impaired individuals to navigate freely. The system uses inputs from GPS, cameras and has an innovative audio interface. This is a very exciting effort and I have found that the undergraduate students enjoy the effort while also learning critical tools such as teamwork, independent thinking, system design and the process of research. If given an opportunity, I will strive to establish and maintain similar efforts at the University of California, San Diego.

### **Mentoring Graduate Students**

During my graduate research, I have been fortunate enough to work closely with other graduate students. In fact, during the last 3 semesters, Prof. Chellappa provided me with the opportunity to mentor two graduate students ( Pavan Turaga and Mahesh Ramachandran ). Pavan Turaga and I worked closely in a project whose aim was activity perception and activity based video mining. This work resulted in several papers in leading conferences and journals (CVPR 2007, CVIU submitted, CVPR 2008). I also worked closely with Mahesh Ramachandran in the study of bilinear forms and their applicability for the problem of structure from motion in the presence of additional inertial sensors. This work appeared as a paper in a leading international vision conference (ICCV 2007) and we are currently working towards a an extension of this work for a journal publication. This unique experience of mentoring some graduate students in their projects helped me understand the importance of several aspects of mentoring and I thoroughly enjoyed the process.

During the first couple of years as a Graduate student, I was fortunate enough that my advisor Prof.Rama Chellappa and many of the other researchers and Professors at the University of Maryland spent time and effort into teaching me about the principles of performing good research. I look upon mentoring Graduate students as a great opportunity to instill in them the same sense of value, ethics and quality in research that were cornerstone of what my mentors at UMD taught me.

## **COURSES I CAN TEACH**

### **Undergraduate courses**

Since my academic interests are broad, I am qualified to teach a wide variety of courses. At the undergraduate level, I can teach the following courses.

- Engineering Probability and Statistics ( 109 )

- Probability and Random Processes for Engineers ( 153 )
- Linear Systems Fundamentals ( 101 )
- Introduction to Digital Design ( 25 )
- Communications Systems I,II,III ( 154A, 154B, 154C )
- Introduction to DSP, DSP I, and Applications of DSP ( 161A, 161B, 161C )
- Linear Control System Theory ( 171A, 171B )
- Introduction to Intelligent Systems:Robotics and Machine Intelligence( 172A )
- Machine Intelligence: Pattern Recognition and Machine Learning ( 175 )
- Physical Optics and Fourier Optics ( 181 )
- Introduction to Biomedical Imaging and Sensing ( 187 )

Apart from these, I would also be interested in offering some advanced level undergraduate courses like Image processing and multidimensional signal processing.

#### Graduate courses

At the graduate level, I can teach the following UCSD courses.

- Optical Information Processing ( 240B )
- Random Processes ( 250 )
- Digital Signal Processing I, II ( 250AN,250BN )
- Filter Banks and Wavelets ( 251CN )
- Fundamentals of Digital Image Processing (253A)
- Digital Image Analysis ( 253B )
- Detection Theory ( 254 )
- Information Theory ( 255AN )
- Time Series Analysis and Applications ( 256A-B )
- Statistical Learning I,II ( 271A, 271B )
- Parameter Estimation I,II ( 275A, 275B )

Apart from these graduate level UCSD courses, I will also be able to teach several advanced level graduate courses that are directly related to my research.

- Statistical Methods in Computer Vision and Video Processing (Monte Carlo Markov Chains, Variational methods, Energy minimization )
- Group Theoretic and Information Theoretic methods for Multi-View geometry (Projective geometry, Invariants, Sufficient statistics for multi-view geometry )
- Computational Photography ( Light Modulation, Fourier Optics and Light-Field photography)