

# BHARATH AMBALE V

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## OBJECTIVES

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Utilize my expertise in image processing, signal processing, algorithm development and programming skills to contribute to your institution's research activities.

## EDUCATION

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<b>Auburn University, Auburn, AL, USA</b>	<b>GPA:3.94/4.00</b>	
<b>Ph.D.</b> , Electrical and Computer Engineering		Expected Dec 2009
<b>M.E.E.</b> , Electrical and Computer Engineering		Jul 2007

<b>BMS College of Engineering, Bangalore, India</b>	<b>First Class Distinction</b>	
<b>B.E.</b> , Electronics and Communication Engineering		Jun 2004

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GRADUATE RESEARCH ASSISTANT August 2005 – Present

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*Department of Electrical and Computer Engineering, Auburn University, AL*

### **Cardiac Motion Estimation by Unwrapping the Harmonic Phase (HARP) MR Image**

- Utilized spectral analysis and filter design techniques to obtain the HARP image (wrapped).
- Formulated automated phase unwrapping algorithm based on simulated annealing to unwrap the HARP image.
- Built MATLAB-based user interface for error-free phase unwrapping using selective manual intervention.
- Applied motion estimation techniques to determine the displacement between timeframes.
- Implemented procedures to obtain 4D strain and torsion measurements.

### **Cardiovascular Magnetic Resonance (MR) Image Analysis**

- Processed cine and tagged MR images using in-house software.
- Created tools for time series analysis and contour approximation in above mentioned software.
- Implemented procedures for torsion and shear angle computation.
- Calculated geometric and functional parameters.
- Analyzed 3D strain and volume models of left ventricle.
- Studied anatomy and physiology of the heart.
- Performed statistical analysis for comparison of parameters for hearts of different pathologies.

### **Nonlinear Optimization Using MATLAB for Image Processing Applications**

- Solved memory utilization problems in MATLAB programming to efficiently implement 2D and 3D model reconstruction algorithms.
- Utilized image processing and optimization toolboxes in MATLAB.

### **Reviewer**

- Journal paper for IEEE Transactions in Image Processing.
- Conference papers for International Society for Magnetic Resonance in Medicine.

## OTHER RESEARCH PROJECTS

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*Department of Civil Engineering, Auburn University, AL*

### **Error Estimation in Measuring Concentrations using Image Analysis**

- Measured system properties such as concentration and water in porous media experiments using image analysis.
- Proposed statistical error estimation method to quantify errors.

*Department of Mechanical Engineering, Auburn University, AL*

### **Calculation of Full-Field Deformation Using Digital Image Correlation in Dynamic Fracture**

- Examined correlation techniques to match deformed and undeformed images.
- Optimized affine transformations to get sub-pixel displacement estimates.
- Evaluated strain from resulting displacement field.

*Indian Institute of Science, Bangalore, India*

### **An ADSP2181 Based Display -Undergraduate Project**

- Interfaced ADSP-2181 processor with a computer, memory and keyboard.
- Explored simple image processing applications (programmed in C++).

## CLASS PROJECTS

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- An introduction to phase unwrapping algorithms and theory. (MATLAB)
- Face recognition using correlation filters. (MATLAB)
- Minimize response time by optimizing the number of processors: a queue-based approach. (C, OpenMP)
- Performance comparison of a supercomputer and a cluster of processors. (C, OpenMP, MPI, MATLAB)
- Solution to a heat equation posed on a 2-dimensional spatial domain. (C, MATLAB)
- The 2D Poisson Equation: Solutions and applications. (MATLAB)

## GRADUATE COURSEWORK

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Digital Signal Processing, Stochastic Signal & System Analysis, Computed Imaging Systems, Digital Image Processing, Numerical Analysis, Optimization Theory, Neural Networks, Parallel Processing, High Performance Computing, Computation & Scientific Visualization, Applied Computation in Signals & Systems, Detection & Estimation Theory.

## INTERN

August 2004- May 2006

*Thomas Walter Center for Technology Management, Auburn University, AL*

- Assisted Auburn University Office of Technology Transfer in commercializing inventions.
- Evaluated claims of inventors and conducted technological assessment. Searched for prior patents.
- Located potential markets in the US and outside.
- Identified list of companies, individuals and organizations that might have an interest.
- Prepared non-technical flyers on technologies for distribution.
- Researched technical and economic implications of scaling the invention to commercial size.
- Worked with cross-functional teams.

## COMPUTER SKILLS

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**MATLAB:** Image processing, signal processing, optimization & GUIDE toolboxes used extensively  
**Language proficiency:** C, C++, HTML (basic)  
**Electronic software:** MPI, OpenMP, VHDL, Pspice, Electronic Workbench  
**Platforms:** DOS, Windows, UNIX  
**Data presentation:** Adobe (Illustrator, Photoshop), IBM Visualization Data Explorer, Microsoft Office

## PUBLICATIONS

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- Goswami, R. R., Ambale, B., Clement, T. P., "Estimating Errors in Concentration Measurements Obtained from Image Analysis," *Vadose Zone J*, 2009 8: 108-118.
- *Submitted/Under Review*
- Ambale, B, Denney Jr., TS, Lloyd, SG, Dell'Italia, LJ, Gupta, H, "3D Left Ventricular Strain from Unwrapped Harmonic Phase Measurements."
- Gupta, H, Desai, VR, Ambale, B, Ahmed, MI, Lloyd, SG, Calhoun, D, McGiffin, D, Denney, Jr TS, Dell'italia, LJ, "Left Ventricular Torsional Hysteresis: A Global Parameter for Diastolic Function."
- Ahmed, MI, Desai, VR, Gladden, JD, Inusah, S, Gaddam, KK, Ambale, B, Lloyd, SG, Denney, TS, Calhoun, D, and Gupta, H, "Torsional Deformation Compensates for Depressed Systolic Myocardial Strains in Hypertensive Concentric Left Ventricular Hypertrophy."

## CONFERENCE PROCEEDINGS

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- Ambale, B, Denney Jr., TS, Lloyd, SG, Dell'Italia, LJ, Gupta, H, "3D left ventricular strain by phase unwrapping: a simulated annealing based branch-cut placement method," *2009 International Symposium on Biomedical Imaging*, Boston, June 2008.
- Ambale, B, Lloyd, SG, Denney Jr., TS, Dell'Italia, LJ, Benza, R, Gupta, H, "Comparison of 2D and 3D Torsion Measured from Tagged MRI," *17th Meeting of the International Society for Magnetic Resonance in Medicine*, April 2009.
- Ambale, B, Denney Jr., TS, Lloyd, SG, Dell'Italia, LJ, Gupta, H, "Measuring 3D left ventricular strain from unwrapped harmonic phase," *2008 International Symposium on Biomedical Imaging*, Paris, France, April 2008.
- Ambale, B, Lloyd, SG, Denney Jr., TS, Dell'Italia, LJ, Benza, R, Gupta, H, "3D Right Ventricular Strain and Geometry in Pulmonary Hypertension and Normals," *16th Meeting of the International Society for Magnetic Resonance in Medicine*, May 2008.