

Pushkar Godbole

Personal Details

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Education

Dual Degree

Expected completion: Jun' 14

Indian Institute of Technology - Bombay
Bachelor of Technology – Aerospace Engineering
Master of Technology – Aerospace Engineering

CGPA: 8.47/10

Research Interests

- Computational Optimization
- Scientific Computing
- Operations Research
- High Performance Computing

Publications

- **P. Godbole**, K. Puri, P. Ramachandran, “Load-balancing strategies for parallel Smooth Particle Hydrodynamics”, 8th International SPHERIC workshop 2013 – Trondheim, Norway (Presenter)
- K. Puri, **P. Godbole**, P. Ramachandran, “Dynamic Load-balancing for particle methods”, PARTICLES 2013 – Stuttgart, Germany
- J. Jha, D. Thakur, T. Jadhav, **P. Godbole** “Design of data acquisition, collection, processing and archiving system for Pratham^[1]”, 62nd International Astronautical Congress (IAC) 2011 – Cape Town, South Africa, (IAC-11, 11503)
- K. Puri, P. Ramachandran, P. Pandey, C. Kaushik, **P. Godbole**, “PySPH: A Python framework for Smooth Particle Hydrodynamics”, 8th International SPHERIC workshop 2013 – Trondheim, Norway

Research Experience

Routing and Scheduling algorithm for Aircraft Ground movement Optimization (Jul'13 – Present)

Master's Thesis

Guides: Prof. Abhiram Ranade, Computer Science Engg; Prof. Rajkumar Pant, Aerospace Engg – IIT-Bombay

- Working in collaboration with MIAL^[2] to develop a decision support tool for efficient routing and scheduling of aircraft at the Mumbai International Airport
- Developed and implemented an MILP^[3] based algorithm to capture the global best solution for a snapshot Aircraft scheduling problem; ratified by MIAL^[2] and submitted for AIAA^[4] Aviation 2014
- Currently working on developing an approximation strategy using A* to identify the lower-bound on a particular flight-path allocation and achieve near-optimal scheduling within a short run-time

¹ Pratham: IIT-Bombay Student satellite

² MIAL: Mumbai International Airport Limited

³ MILP: Mixed Integer Linear Programming

⁴ AIAA: American Institute of Aeronautics and Astronautics

Parallel Framework for PySPH^[5]

(Jul'12 – Jun'13)

Bachelor's Thesis

Guide: *Prof. Prabhu Ramachandran, Aerospace Engg – IIT-Bombay*

- Investigated and identified the most suitable message passing strategy for parallelizing PySPH
- Evaluated various geometric and graph-based algorithms and integrated them with PySPH for application agnostic load balancing
- Proposed a new neighbor-particle search algorithm which achieved a speedup of 25%
- The parallel module achieved a near linear scale-up for up to 128 processors

Parametric Analysis of Multi-target PSO^[6]

(Jan'12 – Apr'12)

Supervised Learning Project

Guide: *Prof. Ashok Joshi, Aerospace Engg – IIT-Bombay*

- Abstracted single target Particle Swarm Optimization algorithm to multiple targets
- Investigated and formulated the impact of driving parameters on speed and optimality of PSO
- Developed and evaluated a new technique of dynamic parameter correction for improved search

Design of data-management system for Pratham^[1]

(May'11– Jul'11)

Summer Internship

Guides: *Prof. Prof. Philippe Lognonne, Pierdavide Coisson – IPGP, University of Paris Diderot*

- Selected from the IIT-Bombay Pratham^[1] team for designing Pratham's data-management system at IPGP as part of the collaboration
- Conceptualized the detailed design of the downlink data-management system at central server (IIT-Bombay) and participating Ground Stations
- Prototyped and validated the design with critical test-cases for a hub and spoke configuration

Key Academic Projects

SMS Interface for IIT-Bombay Academics website

(Jul'11 – Nov'11)

Software development for Engineers, course project

Guides: *Prof. Prabhu Ramachandran, Aerospace Engg; Prof. Madhu Belur, Electrical Engg – IIT-Bombay*

- Worked in a team of 4 to develop an SMS interface for the IIT-Bombay Academics website that would enable students to receive notifications, check course information and grades over SMS
- The application received 2000+ hits within a month; the idea was later implemented institute-wide

Remote I/O interface for FlightGear

(Jul'10 – Nov'10)

Supervised Learning Project

Guide: *Prof. Prabhu Ramachandran, Aerospace Engg – IIT-Bombay*

- Developed an application to remotely fetch and set the flight parameters of FlightGear (an open-source flight simulator) in real-time, as a tool to evaluate the performance of a flier or a control law
- Implemented a Python based GUI to dynamically plot and analyze the necessary flight parameters

Design Optimization projects

Guides: *Prof. Scott Eberhardt, Prof. Rajkumar Pant, Aerospace Engg – IIT-Bombay*

Conceptual design of twin aisle civil aircraft: Aircraft design course project, team of 6 (Jul'12 – Nov'12)

- Developed an optimizer for weight minimization of the aircraft while satisfying all aerodynamic and operational constraints

⁵ PySPH: (Open-source in-house) Python framework for Smooth Particle Hydrodynamics

⁶ PSO: Particle Swarm Optimization algorithm

Conceptual design of UHLHAV^[7]: Aircraft design lab project, team of 6 (Jan'13 – Apr'13)

- Optimized the cargo bay configuration and envelope sizing of the UHLHAV as a packing problem

Professional Experience

Quant Capital Pvt Ltd, Mumbai (May'12 – Jul'12)
Summer Internship

- Implemented an Implied Risk Premium model for improved Developed to Emerging market investment risk-ratio projections
- Tested on real data to achieve 20% better predictability over standard risk premium model
- Developed a tool to generate, visualize and analyze the broking-performance index of a stock-broker over time; slated to be incorporated into the firm's framework

Positions of Responsibility

Ground Station Head: Pratham (*IIT-Bombay Student Satellite*) (Jul'12 – Apr'13)
Communications subsystem member (Aug'10 – Apr'13)

- Implemented the downlink data decoding of the beacon and telemetry signal of Pratham
- Reduced beacon circuit power consumption by 50% by minimally redesigning & reprogramming it
- Set up the IIT-Bombay Ground Station that has tracked and decoded over 20 satellites including the International Space Station
- Mentored 12 universities in replicating IIT-Bombay Ground Station as part of the social outreach
- Cleared the Detailed Design Review of the Communications subsystem at ISRO Satellite Centre

Coordinator Electronics Club IIT-Bombay (Jul'10 – Apr'11)
One amongst six coordinators of the Electronics Club

- Executed and mentored 18 events spanning competitions, tutorials and lectures over entire tenure
- Ideated and executed institute's first ever microcontroller coding contest with 200+ participants
- As the web-manager, redesigned the Electronics club website and collaboratively setup the IIT-Bombay tech Wiki and contributed 7 articles to it

Teaching Assistant (*Prof. Avijit Chatterjee*)

- Introduction to Aerodynamics (Jul'13 – Nov'13)
- Numerical Methods for conservation laws (Jan'14 – Apr'14)

Additional Courses

- Data-structures and Algorithms
- Design and Analysis of Algorithms
- Software development for Engineers
- Advanced programming with C++

Technical Skills

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|--------------------------|--------------------------------------|
| Programming | C++, Python, Shell, php, HTML/CSS |
| Software Packages | CPLEX, OpenMPI, Matlab, Scilab, SAGE |

Extra-Curricular Activities

- Selected in a team of 40 for National Sports Organization–Football, during freshman year (2009-10)
- Avid Astronomy enthusiast and active member of Krittika – Astronomy Club IIT-Bombay; won the Astronomy Quiz Contest in Techfest 2010
- State level Mallakhamb player with 3 years of training (2003-05)

⁷ UHLHAV: Ultra Heavy Lift Hybrid Aerial Vehicle