Kumudha KN

Personal Details

Date of Birth:	4 December 1990
Address / Contact:	Mobile: +91 9591847397
Portfolio / Blog:	http://clweb.csa.iisc.ernet.in/res15/kumudha.kn/
email:	kumudhakn@gmail.com
	kumudha@iisc.ac.in

Education

Current **Indian Institute Of Science**, Bangalore, India
M.Sc Engineering | Dept of Computer Science and Automation (In Progress)
Research: *High Performance Computing & Compilers* | Advisor: Uday Reddy
GPA: 7.0/8.0 | List of Courses

May 2012 **M S Ramaiah Institute of Technology**, Bangalore, India
Bachelor of Engineering | Dept of Computer Science and Engineering
GPA: 9.92/10.0 | List of Courses

June 2008 **Vidya Mandir Pre-University College**, Malleshwaram, Bangalore, India
Karnataka Pre-University Course (PUC)
Percentage: 90.83 (PCM: 95.33) | List of Courses

July 2006 **B P Indian Public School**, Malleshwaram, Bangalore, India
ICSE 10th
Percentage: 90.16

Work Experience

June 2012 to July 2015 (3 years 1 month)
Technology Analyst at Goldman Sachs, Bangalore, India
Investment Banking Division, Technology
Application Infrastructure Team under the Investment Banking Division (IBD) Tech
Focused on building and standardizing frameworks in C# .NET and Java for applications developed in the division

June 2011 to August 2011 (3 months)
Summer Analyst at Goldman Sachs, Bangalore, India
Re-architected and enhanced the UI of a Reporting application.
Received Pre-Placement offer for "*distinctive*" Performance

Publications

Optimizing Geometric Multigrid Method Computation using a DSL Approach
Vinay Vasista, Kumudha KN, Siddharth Bhat, Uday Bondhugula
The International Conference for High Performance Computing, Networking, Storage and Analysis.
SuperComputing 2017 (To Appear)

An Empirical Comparative Study and Optimization of the Hadoop Scheduler
Jayalakshmi DS, Kumudha KN, Tejala T, Veena Pilli
International Conference on Emerging Trends in Electrical, Electronics and Communication Technologies
ICECIT, 2012, pgs 350-356,2012

Software & Hardware Proficiency

SOFTWARE

- *Compiler Tools:* isl, Barvinok, Pluto
- *DNN Frameworks:* Caffe, Latte
- *Architectural Simulators:* gem5-gpu, gem5
- *Development Platforms:* Eclipse, VI / VIM, Visual Studio, gedit, TexStudio
- BuildFramework: Gradle,Maven
- *Web Technology:* HTML5, CSS3, AngularJS, ExtJS, XML
- *Operating Systems:* Linux (CentOS, Ubuntu), Windows
- *Libraries:* CUDA, OpenMP, OpenGL
- *Tools:* LaTeX , git, svn, gdb, Intel VTune
- *Database:* MySQL, Oracle, SQL Server
- *Programming Languages:* C, C++, Python, Java, Hibernate, Spring, C#, .NET, ASP, WPF, WCF, shell scripting

HARDWARE

- Programming and Architecture of Accelerators
  Intel MIC (XeonPhi KNC) and NVIDIA Fermi and Volta GPGPUs, Google TPU
- Micro-Architecture and Efficient Programming of Modern x86 CPUs
  Intell Xeon (SandyBridge, IvyBridge, Haswell)
- 8051 based Micro-controller Programming

Projects

Projects at INDIAN INSTITUTE OF SCIENCE

Optimizing Geometric Multigrid Method Computation using a DSL Approach
[To Appear in SC 2017]

The Geometric Multigrid (GMG) method is widely used in numerical analysis to accelerate the convergence of partial differential equations solvers using a hierarchy of grid discretizations. However, multiple grid sizes and recursive expression of multigrid cycles make the task of program optimization tedious. A high-level language that aids domain experts (productivity) for GMG with effective optimization and parallelization support (performance) is thus valuable.

Optimizing Dense Linear Algebra Kernels for Scientific Applications
[Work in Progress]

Linear algebra kernels constitute an important part of the computation in domains like deep neural networks, scientific computing, media processing and many others. A Domain specific language which provides high performance and aids in productivity is thus very useful.

Evaluating Performance Overheads in Program execution of Scripting Languages under Virtual Machine Environment

Scripting languages are widely used among statisticians and data miners for developing statistical software and data analysis. They are run on virtual machines which are either interpreted or compiled just-in-time during execution. This work evaluates the overheads associated with the execution of MATLAB scripting languages under McVM virtual machine environment.

Parallelize and optimize the CAFFE DNN framework on a multicore CPU

CAFFE is one of the early frameworks for deep neural networks. CAFFE accepts a configuration containing the neural network topology and can perform training, testing and inference. CAFFE has support for executing on both CPUs and GPUs. We optimize the CPU version of Caffe to improve its performance using loop transforms for extracting parallelism.

Optimizations for Image Processing Pipeline

Hand optimization of image processing pipelines like unsharp mask, harris corner detection, max_filter, etc on multi-core CPUs. These optimization included loop permutation, tiling for cache locality and parallelism.

Projects

Projects at IISc

Integrated Heterogeneous System (IHS) Architecture with shared Die Stacked DRAM Cache

Modern processors chips integrate multi-core CPUs and general purpose accelerator GPUs on the same die. These IHS processors have high bandwidth requirement and large working sets.

Die-stacking technology allows high bandwidth and large capacity DRAM to be integrated close to the processor. Using this memory as shared cache brings novel challenges in resource sharing and request scheduling due to the architectural heterogeneity. This has varied implications on performance of the latency sensitive CPUs vs throughput oriented GPGPUs.

Projects at GOLDMAN SACHS

Re-architecting of resource discovery system

- Technologies used: WPF, WCF, .NET 3.5, SQL Server, IIS7, VS2010
- WPF for the front end with complete MVVM model
- WCF service hosted on IIS7 to act as the model layer
- Framework application to display, store & edit other app config data

Entitlements System

- Technologies used: .NET 3.5, Windows Form, WCF, Windows Service
- Project followed strict OOP principle
- Central system to store the entitlements information for various apps

AngularJS Customization

- Technologies used: AngularJS, Jasmine, REST Service
- Developed custom directives and providers which have a common use case across all the applications (like person lookup)

Framework Library

- Technologies used: Spring, jdk 1.7, Eclipse
- POJO and Spring java client for the various REST services

Inherited several C# projects and was responsible for all the sustenance and continued development / enhancements of the same

Projects at M S Ramaiah Inst of Tech

A comparative Study and Optimization of Hadoop Scheduler [ICECIT 2012]

Hadoop is a general-purpose system that enables high-performance processing of data over a set of distributed nodes. This work focuses on an empirical comparison of the default Hadoop scheduler with Fair scheduler and Capacity scheduler for data intensive applications. We determine suitable schedulers for different class of workloads. Further, we propose improvements over the above schedulers and evaluate the same.

Mini project on "Walking Robot" in OpenGL under Prof. DS Jayalakshmi (2011)
Mini project of "File Transfer in C#, .NET" under Prof. Kavitha Jayaram (2010)
Database project "Tourism Information system" under Prof. Arul Kumar (2010)

Positions Held

- Teaching Assistant for Compiler Design (E0256,) IISc — Jan 2016 - Apr 2016
- Member of Department Curriculum Committee — 2016 - 2017
- Representative for Student Welfare Committee — 2016 - 2017
- Member of Women in Technology (WiT), Goldman Sachs — 2013 - 2015
- Technology Analyst at Goldman Sachs Nov 2013 - Jul 2015 — Nov 2013 - Jul 2015
- New Analyst Technology Associate at Goldman Sachs — Jun 2012 - Nov 2013

Achievements

- Secured distinction in Bharatanatyam Junior Exam (2015)

- Awarded the *"First rank and Gold medal of 2012 batch"* from the Department of Computer Science, M S Ramaiah Institute of Technology.

- Lead the Blood Donation Camp event at MSRIT which achieved the largest volume of blood collected in the Bangalore region (2011)

- Certificate course in Web Development conducted by IEEE

- Undertaken a course on "Supply Chain Management" from Mechanical Dept. of MSRIT

Co and extra curricular activities

- Routinely performed in several stage dance events including concerts at Bugle Rock Park Basavanagudi, Our School Auditorium, Banashankari Temple, Sripuram Golden Temple Vellore, Andal Temple Srivilliputhur

- Conducted technology and networking events for Interns at Goldman Sachs (2015)

- Routinely organized activities and events like Blood Donation, notebook drive, school camps for the underprivileged etc, as part of National Service Scheme (NSS) at MSRIT

- Delegated at various conferences and Workshops

Miscellaneous

Languages	English (fluent), Tamil (native), Kannada (native), Hindi (intermediate)
Strengths	• Adaptability, Quick learner, Hardworking and Dedicated • Effective communicator and good leadership skills • Updated with latest technology and trends of market. • Analytical and Mathematical Problem Solving, Designing Algorithms and practical Solutions to given problems
Hobbies	• An avid classical dance enthusiast and practitioner • A genuine penchant for reading novels from crime, thriller and drama genre • Programming, Solving challenging problems either conceptually or programmatically
Other Links	github.com/kumudhan in.linkedin.com/in/kumudha-narasimhan
References	**Academic References** Dr. Uday Reddy, Guide Assistant Professor CSA, IISc uday@iisc.ac.in Mrs. D S Jayalakshmi, Mentor / Guide Associate Professor Dept. CSE, MSRIT jayalakshmids@msrit.edu **Industry References** On Request

Master of Science in Engineering (IISc, Bangalore)

Grades

Course	Grade	Credit
Computer Architecture	A	4
Design and Analysis of Algorithms	B	4
Advanced Compilers	S	4
Final Thesis	In	Progress
	Total	12
	GPA	**7.0**

Bachelors in Engineering (M S Ramaiah Inst. of Tech, Bangalore)

Principal Courses

- Engineering Mathematics
- Data Structures
- Operating Systems
- Engineering Design
- Web Programming
- Unix System Programming
- Compiler Design
- Discrete Mathematics
- Design & Analysis of Algorithms
- Computer Organization
- Computer Graphics and Visualization
- Advanced Computer Architecture
- Computer Networks
- Software Engineering

Electives

- .NET and C#
- Advanced Mathematics I
- Supply Chain Management
- Advanced Mathematics II

Higher Secondary (Vidya Mandir PU College, PUC Board)

Primary Courses

Physics, Chemistry, Mathematics, Computer Science

Languages in Curriculum

Hindi, English
