

Project Summary

- **Application of Soft Computing Techniques to Cache Replacement Algorithms for Caching on the World Wide Web.** (Jan - April 2004)

I took up this project on web caching in the second semester of my third year. It aimed at devising a novel method for cache replacement for Proxy Caching using Fuzzy Logic, and assessing its suitability with respect to other methods. I implemented the Fuzzy Algorithm, using various rule sets and then tested it exhaustively for different log files of URLs. The performance analysis gave an insight into inferences about the conditions under which the Fuzzy Method supersedes the existing conventional replacement techniques like LFU, LRU and SLRU. Additionally, I also did a study of Genetic Algorithm based techniques for cache replacement. I also co-authored a research paper describing the above work.

- **Multi-Resolution Image Analysis and Image Compression Using Wavelets** (May – July 2003)

This project was undertaken during my **Practice School I (summer internship) at Bhabha Atomic Research Centre (BARC), Mumbai**. It involved a study of the exciting new field of Wavelets and its application to Multi-Resolution Analysis (MRA) and Image Compression. The project involved 2 modules-a) implementation of an efficient algorithm for construction of “Image Pyramids” and b) development of software to perform Image Compression (as well as original image reconstruction) by applying the “Discrete Wavelet Transformation”, and making use of the earlier module. With my teammates, I also performed a comparative analysis of the effects of using different filters (like Haar, Debychev etc.) and specifying different degrees of compression. We also experimented with different kinds of thresholding and quantization, including a self-devised fan-in strategy, applied to the image after its decomposition into ‘tiles’ by MRA. Finally, as an extension of this project, we performed texture analysis by applying wavelet techniques to texture images and retrieving texture components based on measures of properties such as smoothness, coarseness and regularity. Efforts were also made to implement Gabor Filters for texture discrimination.

- **Survivable Networks : Active and Backup Path Computation** (Aug – Dec 2004)

This project, which is currently in progress, deals with the important issue of restoration in networks, specifically, the provision of survivable multicast sessions. It is an investigation of methods to compute active and backup paths to overcome single-link and single-node failures in Mesh Networks, with maximum sharing of backup paths to minimize bandwidth reservation on each link. We are trying to adopt a segment-disjoint restoration path computation approach, in favour of link-disjoint or arc disjoint algorithms. We are solving the path-pair computation problem using Integer Linear Programming (ILP), as well as using an algorithmic approach. The aim is to extend this for multi-link failures also.

- **Face Recognition** (Aug – Dec 2004)

In this project, which I am currently working on, we are delving into human identification by matching faces using Image Processing Techniques. The process involves image pre-processing and edge detection, followed by face recognition using a modified Hausdorff Distance measure. The method involves matching dominant points that are extracted from the face curves, rather than matching binary pixels on the edges. We are slightly modifying the original approach which uses Dynamic two-strip algorithm for dominant point detection and are instead using an improved version of the Rosenfeld-Johnston Algorithm for the same, to reduce computational overheads.

- **The Chase** (Jan - March 2003)

My contribution to the Computer Science exhibition during **APOGEE 2003 (the All-India academic festival of BITS)** was this project, done during my second year. It was a network-based game, done using socket programming features of Java. Basically, the game was an online timer-based quiz with special features such as giving 3 'lifelines' to the players - elimination of wrong choices, 'chat' with another player for help and asking the computer for a hint. The networking feature was built into the fact that any number of players could simultaneously play the game with random questions to each player, yet they competed against each other, could interact with each other without knowing the other's score, and a winner would be decided in the end.

- **Trainee Information System** (May – June 2004)

I completed this project during my one-month summer internship at the **Information Technology Services (ITS) department of Tata Steel, Jamshedpur**. It proved a great learning experience by expanding my knowledge of databases and whetting my skills on web-based programming. It involved the development of an online trainee information system that allows easy maintenance of details of Vocational Trainees. The system developed facilitated all the functions associated with the training process- insertion, deletion, updation, retrieval of both trainee-specific as well as generic information, display of various kinds of statistics based on master databases as well as secondary databases. The system was noted for being highly interactive and a simple ready-to-use tool that is deployed to be used by the ITS department.

- **Text-to-Speech Conversion : Implementation of the Instruction Set for the Voice Chip** (Sep – Dec 2004)

I took up this project informally this semester at the **Central Electronics Engineering Research Institute (CEERI), Pilani** after being inspired by the ongoing work there in this domain. I am working on a small module of the Text-to-Speech Project that involves implementation of an instruction set of 27 instructions for the Voice Chip, which takes in 60 parameters characterizing input text and accordingly sets appropriate filter parameters characterizing the vocal cord. I am implementing this instruction set as C subroutines, and coding the Text-to-Speech program as an Assembly level program. A subsequent module would involve converting the ALP to a machine language implementation.

**Projects
Completed as
Course
Requirements**

1. Design of a Security Alarm System on the 8086 processor (Microprocessors course)
2. Study of NACHOS (a teaching-purpose oriented operating system) and implementation of various new scheduling algorithms into its kernel. (Operating Systems course)
3. An implementation of a specified set of operations on Binary Search Trees and AVL trees, followed by a relative performance evaluation associated with a random sequence of operations applied on both kinds of trees (Data Structures course)
4. A comparative study of the QNX and E-COS Real-Time Operating Systems, based on features such as threads and processes, scheduling methods, inter-process communication methods, synchronization primitives etc. and suggesting suitability of each of these OS s for specific applications. (Real Time Systems course)
5. Development of a full-working compiler for the language Crib, complete with all components- lexical analyzer, symbol table, parser, syntax analyzer etc. (PLCC course)
6. Study of Interconnecting Devices, Setting Up an IEEE 802.3x LAN, DHCP and DNS servers and clients, FTP Servers, Web servers and Network Analyzing Tools for Windows and Linux systems. (Computer Networks Course)
7. Implementation of the Delta Learning Rule and its application to Keyword-Based Semantic Prefetching Approach in Internet News Services (Neural Networks Course)
8. Implementation of HTTP Proxy Server and client (with inbuilt cacheability feature), Multicast Chat, Concurrent TFTP Server and TCP Port Mapper. (Network Programming course)
9. Implementation of Averaging and Median Filters on a given input image, with computationally most efficient techniques, along with a method for noise removal. (Image Processing Course)
10. Implementation of a parallel algorithm to find for the Traveling Salesman Problem (Parallel Computing Course)

**Extra
Curricular
Activities and
Hobbies**

- Placement Volunteer for B.E. Computer Science, for Campus Recruitments at BITS, Pilani during the current semester.
- Senior Member of the Poetry Club at BITS, Pilani.
- Member of the Network Security Forum (NSF) at BITS, Pilani.
- Member of the National Service Scheme (NSS) at BITS, Pilani during my second year.
- Member of the Indian Physics Association, BITS Pilani Chapter.
- Enjoy music. Won the first prize in my city for Carnatic Vocal at the Annual Music Competition conducted by the National Council of Women in India.
- Basketball Player at the school level.