PREFACE

The thesis entitled “Nature Inspired Computation (NIC): Methods and their application in function optimization” is submitted for the award of the degree of doctor of philosophy in Computer Science, Faculty of Engineering and Technology, Jagannath University, Jaipur. It embodies the investigations carried out under the guidance and supervision of Dr. Vivek Kumar Sharma, Assistant Professor, Department of Mathematics, Faculty of Engineering and Technology, Jagannath University, Jaipur.

The entire work reported in the present thesis consisting of six chapters including the introduction chapter, is based on the following research papers:


The references have been indicated in thesis by serial number and listed in the order in which they are used. The tables, figures and algorithms are numbered in such a way that the number shows their serial number. The equations are numbered in such a way that the digit before period refers to chapter number and digits after period shows their serial number. Practical implementation of proposed algorithms has been carried out through C programming language and results are depicted through graphs and tables.

This thesis intended to present the state of art Nature Inspired Computing (NIC) techniques and their applications in the field of optimization. Here this concern research focuses on three well known Nature Inspired Algorithms (NIAs) which are namely Artificial Bee Colony (ABC) Algorithm, Differential Evolution (DE) algorithm and Spider Monkey Optimization (SMO) algorithm and also finds their application in engineering optimization.

Firstly, it focuses on the Artificial Bee Colony algorithm. Artificial Bee Colony algorithm mimics intelligent food foraging behaviour of honey bee insects. It tries to balance exploration and exploitation of local search space in the ABC algorithm as it sometimes shows the premature convergence and stagnation. Here this thesis suggest some modified hybrids of basic ABC algorithm like, randomized memetic ABC (RMABC) by adding two new
parameters in memetic ABC, improved onlooker bee phase in ABC (IoABC), improved memetic search in ABC (IMeABC), fitness based position update in ABC (FPABC), memetic search in FPABC (MFPABC), new local search strategy in ABC (NLSSABC) by introducing a new local search phase on ABC inspired by golden section search and a hybrid of levy flight search and memetic search strategy in ABC (LFMABC).

Secondly this thesis concerns with Differential Evolution (DE) an evolutionary algorithm. This thesis suggests three modifications in basic DE. First, memetic search inspired by golden section search incorporated in basic DE (MSDE). Second, levy flight search in fitness based DE (LFBDE). Third, opposition based levy flight search in DE (OLFDE).

Finally, it focuses on newly developed population based nature inspired algorithm named Spider Monkey Optimization (SMO). SMO algorithm is inspired by fusion-fission social structure based on intelligent social behaviour of spider monkeys. This thesis suggests three modifications in basic SMO algorithm. First, it proposed a modified position update in SMO (MPU-SMO) algorithm by enhancing position update strategy in both local leader phase and global leader phase. Second, a fitness based position update in SMO (FPSMO) and third opposition based learning in SMO (OBSMO) algorithm.

In order to establish superiority of proposed algorithms over basic algorithms and their recent variants, they are tested over a set of benchmark functions and some real world optimization problems.