

BIOLOGICALLY INSPIRED COMPUTING

COURSE DESCRIPTION:

Biological organisms cope with the demands of their environments using solutions quite unlike the traditional mathematical approaches to problem solving. Biological systems tend to be adaptive, reactive, and distributed. Bio-inspired computing is a field devoted to tackling complex problems using computational methods modeled after design principles encountered in nature. The goal is to produce informatics tools with enhanced robustness, scalability, flexibility and which can interface more effectively with humans. Students will be introduced to fundamental topics in bio-inspired computing, which gives students a chance to observe and compare different natural behaviors that can be utilized for computation. Students will build up their proficiency in the application of various algorithms in real-world problems. Through the study of animal behaviors, students will be interested in the beauty of natural phenomena, which are in essence highly excellent optimizers.

PRE-REQUISITE:

Calculus, Linear algebra, probability and statistics

REQUIRED TEXTBOOK:

Lecture notes

REQUIRED EQUIPMENT:

No

TOPICS AND SCHEDULES:

Weeks	Course content	Type
1	Introduction	Lecture
2	Artificial Immune Systems	Lecture
3	Artificial Immune Systems	Lecture
4	Artificial Immune Systems	Lecture
5	Genetic Algorithms	Lecture
6	Genetic Algorithms	Lecture
7	Ant Colony Optimization	Lecture
8	Ant Colony Optimization	Lecture
9	Mid-term Exam Week	Paper Presentation
10	Particle Swarm Optimization	Lecture
11	Particle Swarm Optimization	Lecture
12	Bacterial Foraging Optimization	Lecture
13	Bacterial Foraging Optimization	Lecture
14	Honey Bee Algorithm	Lecture
15	Honey Bee Algorithm	Lecture
16	Firefly Optimization	Lecture

17	Firefly Optimization	Lecture
18	Final Exam Week	Paper Presentation

WORKLOAD:

There will be two paper presentations. Prior to each presentation, students should select at least two SCI journal papers related to the course topics and turn in to the instructor for final selection. Methodology is the most important part of your presentation.

GRADING:

Mid-term Presentation 35%
Final Presentation 35%
Class Participation 30%