ABHISHEK BHATIA

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EDUCATION

Bachelor of Technology (Information Technology)   (August 2011- June 2015)
University School of Information and Communication Technology,
Guru Gobind Singh Indraprastha University, Delhi.
Thesis: A Hybrid Autonomic Computing-Based Approach to Distributed Constraint Satisfaction Problems. [Link]
CPI: 75.35

PUBLICATIONS

Accepted publications:
- Sharma, I., Chourasia, B., Bhatia, A. and Goyal, R., 2016. On the role of evangelism in consensus formation: a simulation approach. *Complex Adaptive Systems Modeling*, *4*(1), p.16.[Link]
- Bhatia A, Singh A, Goyal R. A Hybrid Autonomic Computing-Based Approach to Distributed Constraint Satisfaction Problems. *Computers*. 2015;4(1):2-23. [Link]
- Singh A, Thapar S, Bhatia A, Singh S, Goyal R. Disk Scheduling using a Customized Discrete Firefly Algorithm. *Cogent Eng*. 2015;2(1):1011929. [Link]
- Bhatia A, Johari R. Genetically optimized ACO inspired PSO algorithm for DTNs. In: *3rd International Conference Reliability, Infocom Technologies and Optimization (ICRITO).* 2014:1-6. [Link]
- Bhatia A, Singh D, Gyan Deep, P. Jangam Annie, R. Pathak Ravi and Raghuram N. Pathway and Motif Analysis of G-protein (α subunit) Regulated Genes in Rice. In: *Advances in Stem Cell Research 2014, SelectBio.* [Link]

Communicated publications:
- Bhatia A, Singh A, Singh A, Kaur A. Analysis of Characteristic Parameters for Convergence in Swarm Intelligence Algorithms.

Working publications:
- Bhatia A, Butail S. Differential crowd response to sudden alarm based on emotional intensity and organization.
- Bhatia A, Butail S. The role of perceptual angle in pedestrian evacuation tendency.
- Bhatia A, Gyandeep, Singh D, Soman S, Jayadeva. Machine learning with low complexity for EEG data.

RESEARCH WORK EXPERIENCE

IIT, Delhi   (January 2016 - Present)
Project Assistant under Dr. Jayadeva, Professor, IIT Delhi
- Developed a cross-platform collaborative note-making application with audio conferencing. It uses on-line handwritten mathematical expression recognition to convert hand-written text into LaTeX. The audio transmitted is compressed by extracting common patterns in each user's speech.
- Developed an ant-colony algorithm namely Eigen-ant for game playing. The algorithm is one of the few ant-colony algorithms to have a mathematical proof for convergence.
- Implemented and deployed a wireless Linux multi-touch calibrated driver to interface with infrared interactive whiteboard.
- Developed an EEG signal based recognition module with low computation load for recording brain signals to aid in diagnosis of epileptic seizures among patients.

IIIT, Delhi   (June - December 2015)
Research Assistant under Dr. Sachit Butail, Visiting scholar, Johns Hopkins University
- ➤ Project Title- *Differential crowd response to sudden alarm based on emotional intensity and organization.*
  - Built a kinematic model to explain how emotional intensity and organization in human crowds affects the spread of panic. Different crowd psychologies were simulated by varying speed, initial orientation and interaction radius.
  - News reports related to each crowd-disaster since 1900 were scraped. For each disaster, witness comments were used to extract cues for emotional intensity and organization of the human collectives. Further, each event was summarized using tf-idf and subsequently classified according to an established system in social psychology.
  - The study provided new insights into how certain psychologies are more prone to specific triggers in crowd disasters.

- ➤ Project Title- *Identifying features of group membership in crowds for natural robot navigation*
  - A repository of video samples of crowd movement encompassing a variety of social situations was created. These videos were analyzed with the help of extracted silhouettes to determine the social condition of individuals in the crowd.

- Isomap algorithm was used for visualization by determining a low dimensional embedding from the high dimensional dataset.

RESEARCH INTERNSHIPS AND WINTER SCHOOLS

Emergent and Autonomous Systems Laboratory, IIITD (July 2014 - March 2015)
Research Intern under Dr. Sachit Butail, Visiting scholar, Johns Hopkins University
- Developed a dynamical model to simulate changes of perceptual vision field in human crowds.
- Conducted 10 experimental trails with over 200 participants by giving each individual one of the two specific instructed behaviors to exit the room.
- The tracks were obtained with the help of a Kalman filter, and subsequent statistical comparison of similar observables from simulations were performed to verify the mathematical model. The simulation results revealed how contrary to the belief, the distance covered increases and queuing tendency reduces for crowds with wider vision field.
- Developed cross-platform application to assist in gathering data from subjects travelling in subway stations. The collected empirical data was used to calibrate the simulation parameters of a dynamical model.[Link]

LASTEC, Defense Research & Development Organization (June - July 2014)
Research Intern under Dr. Indu Gupta, Senior Research Scientist, DRDO
- Completed the setup and configuration of a HPC cluster with Open MPI for running large-scale simulations.

Bioinformatics Lab, University School of Biotechnology, GGSIPU (March - June 2014)
Research Intern under Dr. Raghuram, Professor and Dean, USBT, GGSIPU
- Subjected the whole transcriptome microarray data from a natural knockout mutant to pathway and motif analysis. The aim was to understand genome wide role of G-protein (alpha subunit) in plants.
- The results suggested that at least 64 KEGG pathways were affected in the mutant as compared to the wild type, most of which belong to ribosomal machinery and phenylpropanoid biosynthesis pathways.
- The extensive role(s) for the only known G-protein (alpha subunit gene) in rice was confirmed.

Complex Systems Winter School, Santa Fe Institute (December 2015)
- Attended interdisciplinary research school in complex behavior of mathematical, physical, living and social systems.

RESEARCH PROJECTS

Optimization and Application Development in Brain Interface Computing (December 2014 - March 2015)
Advisor- Dr. Jayadeva, Professor, IIT Delhi
- Developed low complexity classification framework for EEG signals which achieved lower error rates compared to previous approaches such as SVMs. The proposed methodology learns simpler representations which is illustrated by the lower number of support vectors used.
- Designed a brain-control interface for interacting with an infrared whiteboard through EEG signals. The user is able to use different intents to control movements on the board.

An Agent Based Model Illustrating the Usage of Deferred Acceptance Algorithm in the Admission Process (January - February 2015)
Advisor- Dr. Rinkaj Goyal, Asstt. Professor, USICT, GGSIPU
- Developed an agent based model in the Netlogo, which advocates fully centralized procedure and simulates customized version of the deferred acceptance algorithm. [Link]
- The simulation results in a strategy-proof, optimum and stable allocation of available seats in the admission process.

Modelling activity of the Indian Spiny-tailed Lizard (September 2014 - January 2015)
Advisor- Dr. Sanjay K. Das, Asstt. Professor, USBT, GGSIPU
- Developed a mathematical model from Ecological observations of the Indian Spiny-tailed Lizard. The model was calibrated with parameters relating to prevailing weather conditions such as temperature and pressure from experimental field data.

Elitist Non-dominated Sorting Genetic Algorithm for Routing in Ad-hoc Networks (May - August 2014)
Advisor- Dr. Soumya Kanti Ghosh, Professor, IIT Kharagpur.
- Formulated an algorithm that forms a set of Pareto-optimal solutions for routing packets between nodes in ad-hoc networks.
- The optimization parameters considered are distance and residual energy while constraints include inter-node communication link capacities and buffer sizes. The approach is aimed at eliminating the problem of local optima in choosing the next-hop node.

Modelling Stochasticity in the stem cells dynamics (April - May 2014)
Advisor- Dr. Kannan, Professor, USBT, GGSIPU
- Developed a stochastic model to study the self-renewal and differentiation of stem cells. Numerical solutions to the system of stochastic differential equations were obtained using 4th order runge kutta.
- The aim of the project was to study effects of stochastic noise that influences the death rate, proliferation rate and the fraction of self-renewal at every stage of differentiation in stem cells.

SELECTED SELF-CONDUCTED PROJECTS

Track and Summarize Top News Trends (May 2015)
- Built a project that generates abstractive summaries of news-articles related to top-trending topics on twitter. [Link]

Extract Data from Social Networks Related to Disasters (April 2015)
- Created a web scraper for extracting data related to a search query from social networks: Reddit and Twitter. It uses constantly changing proxies through a headless WebKit scriptable to avoid any upper-limits set by the network. [Link]

INDUSTRIAL INTERNSHIPS

Intern, WeChat (June - July 2014)
- Worked as an intern contributing to WeChat's overall product improvement. Activities involved feature testing, networking and providing feedback of the android application for mobile phone operations.

Trainee Network Engineer, Gestetner Ricoh, Sugandha Infonet (January - February 2014)
- Assisted service engineers at customer locations wherein the companies' MFD's and other reprographic auxiliary devices were installed in a networked environment.

Technical Executive, HCL Infosystems Ltd, Siddhartha Computers International (July – August 2013)
- Involved with systems installation, commissioning and network troubleshooting at various client locations.

ADDITIONAL

Online contributions to Community Models:
- Implemented a particular 2-D cellular automata named Day and Night using NetLogo. The model can be used to observe dependence of population dynamics upon initial conditions and notice how the chaotic structures gradually consolidate into large regions with constantly shifting boundaries.[Link]
- Modelled the motion in animal groups with respect to reflective obstacles using NetLogo. The model can be used to simulate different closed multi-agent group scenarios and analyze how differences among individuals influence group structure.[Link]

Online Courses Completed:
- Introduction to Complexity (Santa Fe Institute), Advanced Game Theory (Stanford University), Convex Optimization (Stanford University) and Computational Neuroscience (University of Washington).

Certifications:
- Certified Ethical Hacking Expert Workshop- IIT Bombay Techfest.
- Java Programming Language using Java SE6, NIIT.

Technical skills:
- *Languages*: Java, C++, C, NetLogo, Matlab, R, Python,, Julia, Awk, Scala, JavaScript, CoffeeScript, Shell scripting.
- *Operating Systems*: GNU/Linux(Ubuntu 16.04, Cent OS 6.5, Arch Linux, Debian 8), Windows.
- *Tools*: GitHub, Heuristic Lab, Keel, Cytoscape, Joomla 2.5, Openvibe, EEGLAB.
- *Database*: SQL, JDBC, MongoDB.
- *Libraries* : Cuda, OpenMP, MPI, Boost, Django, Flask, Twisted, Hadoop, Spark, TensorFlow, Theano.

Symposiums, competitions and conferences:
- Participated in the 2nd Security and Privacy Symposium on February 19th–22nd, 2014 at IIT Kanpur. (*Received Travel and Accommodation Grant from IIT- Kanpur.*)
- Solely presented *"Genetically Optimized ACO Inspired PSO Algorithm For DTNs"* at IEEE's 3rd International Conference on Reliability, Infocom Technologies and Optimization (ICRITO) 2014.
- One of the few undergraduate contestants in International General Game Playing Competition 2014, Stanford University.

Community service:
- *Sewartha, Expandable Housing Welfare Society*
  Worked as a volunteer to collect data and carry out surveys on the shortage of blood at government and private hospitals. Also, helped to set-up blood donation camps for creating awareness in rural and urban areas.
- *Sampurna, Social Welfare Organization*
  Worked as a volunteer for community based services in the sphere of Student Self-help, Health Awareness, Community Mobilization and Social work. This encompasses generation of self-employment projects for the unaware and depressed sections of the society.
- *Jan Gyanodaya, NGO*
  Performed social activities in education camps for imparting education to the unprivileged children. Additionally, motivated people to participate in short term jobs to raise their standard of living.

Achievements/Leadership:
- General Secretary of IEEE student council of USICT and part of organized community for various technical events.
- Secured a rank of 1064 among 150,000 applicants in IPU-CET(Common Entrance Test), 2011.

- Head of content team in Bi-annual newsletter of USICT. Published two articles titled "*Cloud Computing and Artificial Intelligence*" and "*Cellular Automata*" in IEEE 2014-*Techvada*.
- Represented Springdales School in National Mathematical Olympiad 2005, National Mathematical Olympiad 2006 and inter school Math contests during high school.
- Received Certificate of Academic Merit for Good Academic Performance in Standard XIth, Springdales School.
- Received Certificate of Outstanding Performance in appreciation of achievement in Academic Field in class Xth by Naraina Vihar Social Welfare Society.

Cultural:
- Part of the organizing committee and Event Discipline Coordinator, at University Fest Anoogoonj 2013 and Anoogoonj 2014.
- Active member of the Arts Club of GGSIPU during undergraduate studies. Organized and coordinated all the leading activities and events related to the Club.