RITAM GUHA

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WHO AM I?

I am a final-year student at Jadavpur University pursuing Bachelor of Engineering degree in Computer Science and Engineering. Based on my academic records and active contributions to the research community, I have been selected by Michigan State University and University of South Florida to pursue my Ph.D. in Artificial Intelligence starting from Spring, 2021. Recently, I have received recognition from the esteemed London Journal Press (UK) in the form of an honorary Rosalind Membership. The notions of machine learning, data science and intelligent information systems have deeply inspired me to pursue a research-oriented career. Working for Implementation of innovative engineering ideas into reality has always been my passion.

Special Interests: Optimization (Engineering functions, Portfolio), Nature-inspired evolutionary algorithms, Feature Selection, Image Enhancement, Machine Learning etc.

ACADEMIC QUALIFICATION

Bachelor of Engineering (Computer Science and Engineering),
Jadavpur University, Kolkata, India
CGPA: 9.2/10 (Departmental Rank-2nd)
Final Year Project: Application of nature-inspired evolutionary algorithms in feature selection, image enhancement and engineering function optimization.

AISSCE 2016 (12th Std.)
Delhi Public School, Ruby Park
95.4%, 7th in West Bengal (as depicted by local news channel ABP Ananda)

Madhyamik 2014 (10th Std.)
Ramakrishna Mission Boys' Home High School, Rahara
95.86% (100% in all 3 science subjects, School Topper, 12th in West Bengal)

ACADEMIC PROJECTS

Title: Groundwater Flow Algorithm: A Novel Hydro-geology based Optimization Algorithm

- Development of a novel optimization algorithm getting inspiration from the flow of groundwater from recharge areas to discharge areas following Darcy's Law.
- Application over 23 benchmark objective functions and several standard engineering problems.

Title: A Wrapper-Filter Feature Selection Technique based on Ant Colony Optimization

- Modification of Ant Colony Optimization (ACO) algorithm to reduce its time complexity by the use of filter-based subset evaluation instead of its wrapper variant along with the introduction of a feature dimension dependent pheromone update policy.
- The proposed method has been evaluated over datasets collected from UCI machine learning repository and NIPS2003 feature selection challenge.

Title: Introducing Clustering-based Population in Binary Gravitational Search Algorithm for Feature Selection

- Addresses the problem regarding pre-mature convergence of solutions due to improper initialization. The proposed model uses a clustering scheme based on hamming distance and classification similarity to properly distribute the initial set of solutions over the entire search space thereby reducing the chances of solutions getting converged too soon.
- The clustering scheme has been applied on top of Binary Gravitational Search Algorithm (GSA) to exhibit its applicability. But this scheme can be used to boost the performance of any feature selection algorithm.

Title: Embedded Chaotic Whale Survival Algorithm for Filter-Wrapper Feature Selection

- Whale Optimization Algorithm (WOA) does not ensure proper distribution in the selection of the movements followed by humpback whales and it lacks some of the real-life characteristics of whales. With the motive to solve these problems, Embedded Chaotic Whale Survival Algorithm (ECWSA) has been modeled.

- ECWSA uses chaos to guide the selection of movement followed by the whales which brings ergodicity to the deterministic dynamic system or in simpler terms, it provides some restricted randomness in the selection process. It also implements a death mechanism to expedite the process of convergence and uses a new local search procedure to enhance the exploitational ability.

Title: CGA: A New Feature Selection Model for Visual Human Action Recognition

- Human Activity Recognition (HAR) is a time-sensitive application of computer vision systems used in live-tracking applications, fitness routines, health analysis systems. Feature Selection (FS) may become a very important tool in HAR systems because of its ability to reduce time requirement potentially.
- CGA, short for Co-operative Genetic Algorithm, uses coalition (or co-operative) game among different features in conjunction with GA to provide a both-way reinforcement mechanism which improves the quality of the entire FS model.

Title: Image Contrast Enhancement using Selfish Herd Optimizer

- Image contrast enhancement (ICE) can be easily treated as an optimization problem where the objective is to improve some measure of image contrast subject to constraints on image pixel intensities or parameters of a transformation function.
- Selfish Herd Optimizer (SHO) has been modified to make it applicable to image contrast enhancement. The modified algorithm has been applied in two ways: Direct application over the pixel intensity values of the original image, application on the parameter values of Incomplete Bate function (Transformation function).

Title: Introduction of a Pearson Correlation Coefficient and Mutual Information Dependent Feature Ranking Technique

- Development of a new feature ranking technique combining the statistical interpretations of Pearson Correlation Coefficient and Mutual Information.

Title: A Hybrid Swarm and Gravitation Based Feature Selection Algorithm for Handwritten Indic Script Classification Problem

- Developed a hybridized model which uses Particle Swarm Optimization's (PSO) local searching capabilities to overcome GSA's low exploitation ability. It has been applied to Indian script-based features like DHT, HOG, MLG, etc.

RESEARCH PUBLICATION CONTRIBUTION

Table 1: Summary of publications as of July 28, 2020

Journal papers	7
Conference papers	3
Book chapters	1
Preprints	11

Table 2: Google scholar citations data as of July 28, 2020

Total Citations	61
H-index	4
I10 index – papers with 10 or more citations	3

PAPER PRESENTATIONS

- **Conference Name:** International Conference on Emerging Technologies for Sustainable Development (ICETSD), 2019.
  Place: Government College of Engineering and Leather Technology, Kolkata, West Bengal, India.
  Title: Contrast Enhancement of Degraded Document Image using partitioning based Genetic Algorithm.

- **Conference Name:** Frontiers of Intelligent Computing: Theory and Applications (FICTA), 2017.
  Place: Kalinga Institute of Industrial Technology, Bhubaneswar, Odisha, India**.**
  Title: Feature Selection using Histogram based Multi-Objective Genetic Algorithm for Handwritten Devanagari Numeral Recognition.

- **Conference Name:** IEEE Kolkata Conference (CALCON), 2020.
  Place: Senses Hotel, Kolkata, West Bengal, India.
  Title: Mutually Informed Correlation Coefficient (MICC)-a New Filter Based Feature Selection Method

PUBLICATIONS

- **Guha, Ritam**, Manosij Ghosh, Akash Chakrabarti, Ram Sarkar, and Seyedali Mirjalili. "Introducing clustering based population in Binary Gravitational Search Algorithm for Feature Selection." *Applied Soft Computing* (2020): 106341.
- Ghosh, Manosij, **Ritam Guha**, Ram Sarkar, and Ajith Abraham. 'A wrapper-filter feature selection technique based on ant colony optimization' Neural Computing and Applications, 1-19.
- **Guha, R**., Ghosh, M., Mutsuddi, S. *et al.* Embedded chaotic whale survival algorithm for filter–wrapper feature selection. *Soft Comput* (2020). https://doi.org/10.1007/s00500-020-05183-1
- **Guha, Ritam**, Manosij Ghosh, Souvik Kapri, Sushant Shaw, Shyok Mutsuddi, Vikrant Bhateja, and Ram Sarkar 'Deluge based Genetic Algorithm for feature selection' Evolutionary Intelligence (2019): 1-11
  Journal Name: Evolutionary Intelligence, Springer, 07 March 2019
- **Guha, Ritam**, Manosij Ghosh, Pawan Kumar Singh, Ram Sarkar, and Mita Nasipuri. 'M-HMOGA: A New Multi-Objective Feature Selection Algorithm for Handwritten Numeral Classification' Journal of Intelligent Systems.
  Journal Name: Journal of Intelligent Systems, De Gruyter (2018 SNIP: 0.533, 2018 Cite Score: 1.03), 14 June 2019
- Ghosh, Manosij, **Ritam Guha**, Riktim Mondal, Pawan Kumar Singh, Ram Sarkar, and Mita Nasipuri. "Feature selection using histogram-based multi-objective GA for handwritten Devanagari numeral recognition." In Intelligent Engineering Informatics, pp. 471-479. Springer, Singapore, 2018
  Journal Name: Intelligent Engineering Informatics, Springer, 11 April 2018
- Ghosh, Manosij, **Ritam Guha**, Pawan Kumar Singh, Vikrant Bhateja, and Ram Sarkar. "A histogram-based fuzzy ensemble technique for feature selection." Evolutionary Intelligence (2019): 1-12.
  Journal Name: Evolutionary Intelligence, Springer, 27 August 2019
- Ghosh, Manosij, **Ritam Guha**, Imran Alam, et al. 2019. Binary Genetic Swarm Optimization: A Combination of GA and PSO for Feature Selection. *Journal of Intelligent Systems*. 0(0): -. Retrieved 17 Sep. 2019, from doi:10.1515/jisys-2019-0062
  Journal Name: Journal of Intelligent Systems, De Gruyter, 17 September 2019
- **Guha, R**., Ghosh, M., Chakrabarti, A., Sarkar, R., & Mirjalili, S. (2020). Introducing clustering-based population in Binary Gravitational Search Algorithm for Feature Selection. *Applied Soft Computing* (2019 Impact Factor: 4.873), 106341.

PREPRINTS

- **Guha, Ritam**, Imran Alam, Suman Kumar Bera, Kushal Kanti Ghosh, Neeraj Kumar, and Ram Sarkar. "Image Contrast Enhancement using Selfish Herd Optimizer." (2020).
- Ghosh, Kushal Kanti, **Ritam Guha**, Suman Kumar Bera, Ram Sarkar, and Seyedali Mirjalili. "BEO: Binary Equilibrium Optimizer Combined with Simulated Annealing for Feature Selection." (2020).
- **Guha, Ritam**, Soulib Ghosh, Kushal Kanti Ghosh, and Ram Sarkar. "Groundwater Flow Algorithm: A Novel Hydro-geology based Optimization Algorithm." (2020).
- Ghosh, Kushal Kanti, **Ritam Guha**, Suman Kumar Bera, Neeraj Kumar, and Ram Sarkar. "S-Shaped versus V-Shaped Transfer Functions for Binary Manta Ray Foraging Optimization in Feature Selection Problem." (2020).
- **Guha, Ritam**, Ali Hussain Kha, Pawan Kumar Singh, and Ram Sarkar. "CGA: A New Feature Selection Model for Visual Human Action Recognition." (2020).
- Ghosh, Kushal Kanti, **Ritam Guha**, Soulib Ghosh, Suman Kumar Bera, and Ram Sarkar. "Atom Search Optimization with Simulated Annealing--a Hybrid Metaheuristic Approach for Feature Selection." *arXiv preprint arXiv:2005.08642* (2020).
- Kar, Devroop, Manosij Ghosh, **Ritam Guha**, Ram Sarkar, Laura García-Hernández, and Ajith Abraham. "Fuzzy Mutation Embedded Hybrids of Gravitational Search and Particle Swarm Optimization Methods for Engineering Design Problems." *arXiv preprint arXiv:2005.04599* (2020).
- **Guha, Ritam**, Manosij Ghosh, Pawan Kumar Singh, Ram Sarkar, and Mita Nasipuri. "A Hybrid Swarm and Gravitation based feature selection algorithm for Handwritten Indic Script Classification problem." *arXiv preprint arXiv:2005.04596* (2020).
- **Guha, Ritam**, Anik Sengupta, and Ankan Dutta. "Sewage Pooling Test for SARS-CoV-2." *arXiv preprint arXiv:2005.07269* (2020).

TECHNICAL SKILLS

- Programming Language: C, C++, MATLAB, Java, Python.
- Operating System: Windows and Linux.
- Article writing tools: LaTeX, Word, Excel, PowerPoint.

INDUSTRIAL VISIT

Probe Information Services Pvt. Ltd., Bangalore, June – July 2019

- Worked as a part of the team responsible for automating the company workflow most of which were previously done manually.
- Using Java Selenium framework, automated the process of web-scrapping trademark-registry information of every Indian company associated with the Ministry of Corporate Affairs.

- Visited the company's data warehouse in Salem, Chennai which enhanced my knowledge about the company workflow and its implementation.

SCHOLASTIC ACHIEVEMENTS

- Currently holding the 2nd position in the Department of Computer Science and Engineering of Jadavpur University with an overall CGPA of 9.2 out of 10 (till 7th semester of the curriculum)
- Secured 1st rank in 4th semester with a CGPA of 9.63, Jadavpur University
- Ranked 68th in West Bengal Joint Entrance Examination among nearly 1.5 lakh students, WBJEE, 2016
- Secured 23rd rank in the National Cyber Olympiad in West Bengal, Andaman & Nicobar Zone in class 12
- In 12thstandard board examination, secured 7th position in the state of West Bengal
- In 10thstandard board examination, secured 1st position in school and 12th position in the state level
- At 6th standard, received INSPIRE award from Government of India, Ministry of Science & Technology for best performance in the school in science group

EXTRACURRICULAR ACTIVITIES

- Member of IEEE student sector since August 2019.
- Honorary Rosalind Member of London Journal Press (UK) from July, 2020.
- Participated in college fresher inter-departmental robotics competition 'JontroTontro' and built a parent following bot which always tracked a yellow circle attached to the back-end of the parent bot and followed it (organized by Mechanical Engineering department of Jadavpur University in February 2016).
- Participated in many competitive coding contests hosted by some popular platforms like Codechef, Hackerrank, etc. Codechef Monthly challenge, lunchtime, cook-off and Hackerrank week of code, HourRank, 101 Hack are to name a few competitions in which I have participated during 2017-18.
- Mentored two groups of juniors to complete two different projects on feature selection in my third year (2018).

ADDITIONAL CONTRIBUTION

- During the pandemic situation due to the outbreak of **SARS CoV-2**, I wanted to somehow help in the research of corona detection. Along with two of my friends, I developed an algorithm named Sewage Pooling Algorithm which uses wastewater samples from sewage systems to track the corona density in a particular area. If implemented properly, the workflow can recursively pinpoint the highly contaminated areas. The method depends on very low human intervention and can successfully monitor the virus situation in an area. With this idea, our team participated in a start-up competition named **Techstars start-up weekend** and the idea won the first prize in the competition. The idea of the algorithm is publicly available in arXiv repository: https://arxiv.org/abs/2005.07269.

- I have shared my project codes and numerous hand-engineered datasets in my Github account. Many students and researchers have used my code and organized data format to pursue their research. I am in full support of code reusability and thus love to contribute to the open source community.

MOOC COURSES COMPLETED

I am always hungry for learning new things. Online courses are the best ways to armor yourself with various tools and hands-on experiences. I have successfully completed and earned a certificate for each of the following MOOC courses:

- **Neural Network and Deep Learning**, Coursera
  Instructor: Andrew Ng
- **Improving Deep Neural Networks: Hyperparameter tuning, Regularization and Optimization**, Coursera
  Instructor: Andrew Ng
- **Structuring Machine Learning Projects**, Coursera
  Instructor: Andrew Ng
- **Convolutional Neural Networks**, Coursera
  Instructor: Andrew Ng
- **The Complete Foundation Stock Trading Course**, Udemy
  Instructor: Mohsen Hassan, Montreal Trading Group