Shibbir Ahmed

· PHD CANDIDATE, IOWA STATE UNIVERSITY

Department of Computer Science, Laboratory for Software Design, 115-2 Atanasoff Hall, Ames, IA 50011

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Computer science researcher focusing on improving state-of-the-art research in the aspect of Artificial Intelligence, Data Science, and Software Engineering; analyzing data science software faults, and designing novel techniques to improve the reliability and trustworthiness of Artificial Intelligence and Data Science software in real life.

Research Interest

Software Engineering: Software Engineering (SE), programming languages (PL) for Artificial Intelligence,
Data Science: SE & PL for data-intensive systems, and data-driven SE
Other Broad Interests: Trustworthy Machine Learning

Academic Qualifications

PH.D. IN COMPUTER SCIENCE   *Ames, Iowa, USA*
Iowa State University   *August 2017 - Present*
Advisor: Dr. Hridesh Rajan

MS IN COMPUTER SCIENCE   *Ames, Iowa, USA*
Iowa State University   *June, 2022*
- **Advisor:** Dr. Hridesh Rajan; **Thesis Title:** Semantics and Anomaly Preserving Sampling Strategy for Large-Scale Time Series Data;
  https://doi.org/10.1145/3511918

B.SC. IN COMPUTER SCIENCE AND ENGINEERING (CSE)   *Dhaka, Bangladesh*
Bangladesh University of Engineering and Technology (BUET)   *Mar. 2009 - July 2014*
- **Advisor:** Dr. A.S.M. Latiful Hoque; **Thesis Title:** Knowledge Discovery from Academic Data using Association Rule Mining;
  DOI: 10.1109/ICCITechn.2014.7073107

Professional Experience

Iowa State University   *Ames, Iowa, USA*
RESEARCH ASSISTANT, LABORATORY OF SOFTWARE DESIGN, DEPARTMENT OF COMPUTER SCIENCE   *June. 2019 - Present*
- **Projects funded by National Science Foundation (NSF) and other federal agencies:**

  - CI-EN: Boa: Enhancing Infrastructure for Studying Software and its Evolution at a Large Scale (NSF Award: 15-13263, 21-20448)
  - HDR TRIPODS: D4 (Dependable Data-Driven Discovery) Institute (NSF Award: CCF-1934884)
  - Seed grant from US Census Bureau through Central Plains Federal Statistical Research Data Center (CPRDC: Subaward No: 22-1222-0001-ISU3)

Iowa State University   *Ames, Iowa, USA*
TEACHING ASSISTANT, DEPARTMENT OF COMPUTER SCIENCE   *Aug. 2017 - Present*
- **Course:** COM S 309: Software Development Practices (Class Size~250), COM S 319: Software Construction & User Interfaces (Class Size~200), COM S 342: Principles of Programming Languages (Class Size~90), COM S 513: Foundations and Applications of Program Analysis (Class Size~50)
  - Responsibilities: Project Supervising and Mentoring Students, Performing Recitation, Proctoring Exam, Grading, Preparing Course Contents, Assignments, Exam Questions
  - **Awarded Graduate College Teaching Excellence Award for outstanding achievement in teaching**

Primeasia University   *Dhaka, Bangladesh*
INSTRUCTOR, DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (CSE)   *June 2015 - July 2017*
Responsibilities: Primary instructor · Design courses · Create tests · Conduct programming lab sessions

- **Courses Instructed(Theory):** Object Oriented Programming, Structured Programming Language, Database System Design, Operating System, Introduction to Computer, Computer Application
- **Courses Instructed(Laboratory):** Object Oriented Programming, Database System Design, Structured Programming Language Lab

Independent University Bangladesh (IUB) *Dhaka, Bangladesh*
ADJUNCT FACULTY, DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (CSE) *Jan 2017 - Apr 2017*
- **Courses Instructed(Theory):** Data Communication and Computer Networking, Fundamental of Computer Systems
- **Courses Instructed(Laboratory):** Data Communication and Networking Lab, Fundamental of Computer Systems Lab

Infosys Limited *Mysore, India*
SUCCESSFULLY COMPLETED THE INTERNSHIP PROGRAM ON DEVELOPMENT AND MAINTENANCE OF JAVA-BASED APPLICATIONS IN INFOSYS GLOBAL EDUCATION CENTER

Jan. 2015 - Mar. 2015
- *Focus Areas*: **IT Foundation:** Programming and Database (OOP & RDBMS)
- **JavaStream:**Business Tier of an Enterprise Application using POJO, Persistence Tier of an Enterprise Application using JPA, Presentation Tier of an Enterprise Application using JSP & JSF **[Certificate]**

Research Experience

- Research Group: Laboratory for Software Design, Iowa State University [January 2019- Present] [Supervisor: Dr. Hridesh Rajan]
- Research Group: BigData@BUET [April 2016- June 2017] [Supervisor: Dr. Mohammed Eunus Ali]
- DMILAB: Research Lab @CSE,Primeasia University [June 2015- June 2017][DMILab@Primeasia]
- Research Activities for Higher Education Quality Enhancement Project(HEQEP) funded by World Bank [Feb 2013- July 2014]

Publications *Feb. 2013 - Present*
PEER-REVIEWED INTERNATIONAL CONFERENCE AND JOURNAL PAPERS *[Google Scholar]*

- **[C8] Shibbir Ahmed,** Hongyang Gao, and Hridesh Rajan, "Inferring Data Preconditions from Deep Learning Models for Trustworthy Prediction in Deployment," ICSE'2024: The 46th International Conference on Software Engineering, April, 2024, Lisbon, Portugal. https://conf.researchr.org/details/icse-2024-icse-2024-research-track/51/Inferring-Data-Preconditions-from-Deep-Learning-Models-for-Trustworthy-Prediction-in-
- **[C7] Shibbir Ahmed**, Sayem Mohammad Imtiaz, Breno Dantas Cruz, Samantha Syeda Khairunnesa, and Hridesh Rajan, "Design by Contract for Deep Learning APIs", ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE2023), December 3–9, 2023, San Francisco, CA, USA. https://dl.acm.org/doi/abs/10.1145/3611643.3616247
- **[J3] Shibbir Ahmed**, Mohammad Wardat, Hamid Bagheri, and Hridesh Rajan. "Are Data Science Bugs in R and Python Different?", Empirical Software Engineering Journal (2023) [Under review] https://arxiv.org/pdf/2306.08632.pdf
- **[J2]** Samantha Syeda Khairunnesa, **Shibbir Ahmed**, Sayem Mohammad Imtiaz, Hridesh Rajan, and Gary Leavens. "What Contracts Do ML APIs Need? An Empirical Study", Empirical Software Engineering Journal (2023) https://link.springer.com/article/10.1007/s10664-023-10320-z
- **[J1] Shibbir Ahmed**, Md Johirul Islam, and Hridesh Rajan. "Semantics and Anomaly Preserving Sampling Strategy for Large-Scale Time Series Data", **ACM/IMS Transactions on Data Science**, Article 41 (March 2022), 25 pages. https://doi.org/10.1145/310511918
- **[W3] Shibbir Ahmed**, "Towards Deep Learning Specification", ACM SIGPLAN conference on Systems, Programming, Languages, and Applications: Software for Humanity, Doctoral Symposium - SPLASH (October, 2021) https://2021.splashcon.org/details/splash-2021-Doctoral-Symposium/4/Towards-Deep-Learning-Specification
- **[C6]** Rangeet Pan, Md Johirul Islam, **Shibbir Ahmed**, Hridesh Rajan, "Identifying Classes Susceptible to Adversarial Attacks", arXiv preprint arXiv:1905.13284 (2019).
- **[C5]** Anika Tabassum, Mahamudul Hasan, **Shibbir Ahmed**, Rahnuma Tasmin, Deen Md. Abdullah and Tasnim Musharrat, "University Ranking Prediction System by Analyzing Influential Global Performance Indicators", *In the Proceedings of 9th International Conference on Knowledge and Smart Technology* (KST 2017), 1-4 February, 2017, Pattaya, Thailand. https://ieeexplore.ieee.org/document/7886119
- **[C4] ShibbirAhmed**, MahamudulHasan, Md. NazmulHoq, and Muhammad Abdullah Adnan, "User Interaction Analysis to Recommend Suitable Jobs in Career-Oriented Social Networking Sites", *In the Proceedings of 3rd International Conference on Data and Software Engineering* (ICoDSE 2016), 26-27 October, 2016, Bali, Indonesia. https://ieeexplore.ieee.org/document/7936143
- **[C3]** Mahamudul Hasan, **Shibbir Ahmed**, Deen Md. Abdullah, Md. Shamimur Rahman, "Graduate School Recommender System: Assisting AdmissionSeekerstoApplyforGraduateStudiesinAppropriateGraduateSchools", *IntheProceedingsof5thInternationalConferenceonInformatics, Electronics and Vision* (ICIEV 2016), 13-14 May, 2016, Dhaka, Bangladesh. https://ieeexplore.ieee.org/document/7760053
- **[C2] Shibbir Ahmed**, Rajshakhar Paul, Abu Sayed Md. Latiful Hoque, "Knowledge Discovery from Academic Data using Association Rule Mining", *In the Proceedings of 17th International Conference on Computer & Information Technology* (ICCIT 2014), 22-23 December, 2014, Dhaka, Bangladesh. https://ieeexplore.ieee.org/document/7073107?arnumber=7073107
- **[C1]** Md. Nazmus Sadat, **Shibbir Ahmed**, Muhammad Tasnim Mohiuddin, "Mining the Social Web to Analyze the Impact of Social Media on Socialization", *In the Proceedings of 3rd International Conference on Informatics, Electronics and Vision* (ICIEV 2014), 23-24 May, 2014, Dhaka, Bangladesh. https://ieeexplore.ieee.org/document/7135995?arnumber=7135995
- **[W2] Shibbir Ahmed**, Abu Sayed Md. Latiful Hoque, Mahamudul Hasan, Rahnuma Tasmin, Deen Md. Abdullah, Anika Tabassum, "Discovering Knowledge regarding Academic Profile of Students Pursuing Graduate Studies in World's Top Universities", *In the Proceedings of International Workshop on Computational Intelligence (IWCI 2016)* , pages 6, 12-13 December 2016, Dhaka, Bangladesh. https://ieeexplore.ieee.org/document/7860351
- **[W1]** Mahamudul Hasan, **Shibbir Ahmed**, Md. Ariful Islam Malik and Shabbir Ahmed , "A Comprehensive Approach towards User-Based Collaborative Filtering Recommender System", *In the Proceedings of International Workshop on Computational Intelligence (IWCI 2016)* , pages 6, 12-13 December 2016, Dhaka, Bangladesh. https://ieeexplore.ieee.org/document/7860358

Honors & Awards

- **Iowa State University Publication Awards (Award for publishing in ICSE 2024, ESEC/FSE 2023)** *2023*

- **NSF travel grant to attend and present poster at Midwest PL Summit** at University of Michigan, Ann Arbor *2023*

- **ACM SIGPLAN Professional Activities Committee grant** for attending 44th ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI'23) and Federated Computing Research Conference *2023*

- **ACM Travel Grant Award** for attending ACM SIGPLAN conference on Systems, Programming, Languages, and Applications: Software for Humanity (SPLASH), Doctoral Symposium *2021*

- **Teaching Excellence Award:** Awarded by Iowa State University recognizing outstanding teaching *2019*

- **PLMW Scholar @ PLDI'19:** Awarded by Programming Language Mentoring Workshop (PLMW) at PLDI *2019*

- **ACM Travel Grant**: Awarded to attend IMA Workshop organized by the Institute for Mathematics & its Applications

- **Distinguished Participant of IT Training Program** (Jan-Mar 2015) at Infosys Global Education Center, Infosys Limited Infosys, Mysore, India funded by World Bank *2015*

- **Education Board Scholarship**, for good results during all the undergraduate academic sessions 2008-09, 2009-2010, 2010-2011, 2011-12 *2009-2014*

- **Higher Secondary Board Scholarship**, for outstanding result in Higher Secondary (class 12) Certificate Examination in Dhaka Education Board, Notre Dame College, Dhaka *2008*

- **Secondary Board Scholarship** Secondary School Board Scholarship, for extraordinary result (Stood 89th among ninety thousand students) in Secondary (class 10) School Certificate Examination in Dhaka Education Board, Dhaka *2006*

- **Award for Perfect Attendance**, for demonstrating sincerity & 100% attendance in activities during high school studies *2007-08*

Services

Reviewer & Other Services to Research Communities

- Junior Reviewer of 21st International Conference on Mining Software Repositories (MSR 2024) *2023*

- Subreviewer at 46th International Conference on Software Engineering and 38th IEEE/ACM International Conference on Automated Software Engineering (ASE 2023) *2023*

- The 35th International Conference on Software Engineering and Knowledge Engineering, San Francisco, USA. *2021*

- IEEE Access Open Access Journal *2020*

- Student Volunteer at ACM SIGPLAN conference on Systems, Programming, Languages, and Applications: Software for Humanity (SPLASH 2021), Chicago, USA *2021*

- Student Volunteer at ACM SPLASH 2020, Virtual

Affiliation

- ACM: Student member of Association for Computing Machinery (ACM) *2019–23*

- SIGSOFT & SIGPLAN: Member of the ACM SIGSOFT and ACM SIGPLAN *2020–23*

Professional Activities

- **Midwest PL Summit 2023:** Attended and presented a poster at Midwest PL Summit at University of Michigan, Ann Arbor, October 2023

- **PLDI 2023:** Attended and volunteered 44th ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI 2023)

- **SPLASH 21**: Contributed to ACM SIGPLAN conference on Systems, Programming, Languages, and Applications: Software for Humanity (SPLASH 2021), Chicago, USA

- **PLDI'19 and PLDI'20**: Attended Programming Language Design and Implementation Conference PLDI 2019 at Phoenix, Arizona and PLDI 2020 (virtual)

- **ICSE'20-21, ASE'20**: Attended International Conference on Software Engineering ICSE 2020-21 (Virtual), Automated Software Engineering (ASE) Conference (Virtual)
- **Summer School**: Completed professional development program in Midwest Big Data Summer School *Ames, Iowa*
- **IMA Workshop**: Attended 4-day workshop on "*Recent Themes in Resource Tradeoffs: Privacy, Fairness and Robustness*" organized by Institute for Mathematics & its Applications (IMA), University of Minnesota, 2019. *Minneapolis, MN*
- **Turing Lecture**: Attended Turing Lecture at FCRC 2019 by Geoffrey Hinton and Yann LeCun on *Deep Learning Revolution*". *Phoenix, AZ*

Technical Skills

Programming Language:	C, C++, Java, Assembly (Intel 8086), SQL, PL/SQL, Python
Scripting Language:	Shell Script, Prolog, L^{A}TEX
J2EE Technologies:	POJO, JDBC, JPA, Hibernate, Servlet, JSP, JSF, Struts, Spring
Web Development & Database Tools:	PHP, HTML, CSS, JavaScript, Oracle, MySQL, Microsoft SQL Server
IDEs & Development Tools:	Eclipse, NetBeans, Microsoft Visual Studio, Android Studio
Version Control & Project Management Tools:	GitHub, GitLAB, Trello, AgileFant, BitBucket
Data Mining & Big Data Analytics Tools :	RapidMiner, Neo4J, IPython, Amazon Web Service(AWS):EC2,S3,Apache Hadoop, Spark
Machine & Deep Learning Tools :	Weka, TensorFlow, Keras, PyTorch, Caffe, NVIDIA DIGITS
Other Software Skills:	Microsoft Office, MikTex, Packet Tracer, Proteus, XAMP / WAMP, Prezi, AVR Studio, Inkscape

Academic & Skill-Based Software Projects

Software Development Projects Mentored during Graduate Teaching Assistantship at ISU   *TA, Project Supervisor*
PROJECTS [SELECTED] SUPERVISED   *Aug, 2017-May 2019*
• Online Multiplayer Mahjong Game, Dungeon Game, Raise Hand, Tribes of CYdonia, Cy's Rides, Nerds Battle

Database & Research Projects Mentored during Teaching at Primeasia University   *Instructor, Project Supervisor*
PROJECTS [SELECTED] MENTORED   *June, 2015-July, 2017*
• Smart Parking Sharing System, Train Locator, Online Medicine Shop, Shopping Mall Management, Vehicle Selling Management System, Train Ticketing App, Teachers Rating App, Bus Service Evaluation App, Online Book Sharing Website

A Reinforcement Learning Algorithm using Q-learning with Function Approximation   *Keras, TensorFlow, PyTorch*
DEEP LEARNING:THEORY AND PRACTICE COURSE   *Aug, 2018- Dec, 2018*
• A reinforcement learning algorithm using Q-learning algorithm with function approximation i.e., A multi-layer **DeepNeuralNetwork** (DQNN) has been designed and implemented with environment Acrobot-v1 from the OpenAI Gym package;

Tweet Data Augmentation using DBSmote   *Python, NLTK, Google Word2Vec, R*
PRINCIPLES AND INTERNALS OF DATABASE SYSTEMS COURSE   *Aug, 2017-Dec 2017*
• To improve an existing algorithm which is related to data augmentation and showing the improvement through experiments; Focus on augmentation method -performed in feature space using **tweetsAndTopics Dataset**;Creating new tweets from existing tweets to improve the balance between classes;

Predicting Airbnb Listing's Prospects by Analyzing its Architectural Features   *Data Analytics, Rapidminer*
HIGH DIMENSIONAL DATA MANAGEMENT COURSE   *Oct, 2016-Febr 2017*
• Developing Airbnb listing's prospects prediction system by analyzing all the significant architectural features of a property and other features e.g., location, review and host; using **large dataset of** *Inside Airbnb*; built prediction model using SVM, Linear SVM and Vector Linear Regression and generated predicted revenue, occupancy rate, review using the model.

User Interaction Analysis to Recommend Suitable Jobs in CareerOriented Social Networking Sites   *Java, Amazon EC2,S3, EMR Apache Spark*
DATA MANAGEMENT IN THE CLOUD M.SC. COURSE, ACM RECSYS CHALLENGE   *May, 2016-Aug 2016*
• The goal of this job recommendation system is to predict those job postings that are likely to be relevant to the user considering users' interaction (e.g., click, bookmark, apply for job/reply to recruiters, delete shown job recommendations); **Handling big Dataset of XING** which was provided in ACM RecSys Challenge 2016; [Published Paper: https://ieeexplore.ieee.org/document/7936143]

Co-Curricular & Extra-Curricular Activities

- Committee member, International Student Council, Iowa State University, Ames, IA, USA (2023)

- Cultural Ambassador, International Students and Scholars Office, Iowa State University, Ames, IA, USA (2023)

- Website co-chair, Laboratory for Software Design, Department of Computer Science, Iowa State University, Ames, Iowa (2019-Present)

- Committee member, Bangladesh Student Association, Ames, IA, USA (2019-2020)

- Participant and volunteer at Midwest Big Data Summer School, Ames, IA, USA (2019)

- Participant of several Workshops, Tutorial Sessions, Invited Talk, Keynote Talks, Seminars, held at different local and international conferences e.g., WADM'13, MoHCI'14, iCEEiCT'14, ICCIT'14, NSysS'16 etc. (2013-2017)

- Participant of Career Talks, Future Goal Oriented Seminars, Sports activity, arranged as a part of providing regular enthusiasm to trainees and interns at Global Education Center by Infosys, Mysore, India (2015)

- Participant of 3rd EESTEC Competition for Android, the contest of innovation, programming and design dedicated for Android developers, London (2014)

- Active Participant of Android, iPhone App Development Workshop, arranged as a part of Higher Education Quality Enhancement Project (HEQEP) funded by World Bank, Dhaka (2014)

- Participant & Volunteer at Workshop on Advances in Data Management: Applications and Algorithms BUET, Dhaka (2013)