

SARAH MASUD PREUM

Email: spreum@dartmouth.edu , Phone: +1 434 466 4416
Website: <https://web.cs.dartmouth.edu/people/sarah-masud-preum>
[Google Scholar](#) || [LinkedIn](#)

RESEARCH INTERESTS

Data Mining, Natural Language Processing, Applied Machine Learning, Cyber-Physical Systems, Computer Systems

EMPLOYMENT

- **Assistant Professor** July 2021-Present
Department of Computer Science
Dartmouth College
- **Post-Doctoral Fellow** July 2020-June 2021
School of Computer Science
Carnegie Mellon University, Pittsburgh, PA
- **Artificial Intelligence Research Intern** May 2018-August 2018
Bosch Research and Technology Center, Pittsburgh, PA
- **Lecturer** March 2013-July 2013
Department of Computer Science and Engineering
Bangladesh University of Engineering and Technology

EDUCATION

- University of Virginia, Charlottesville, VA August 2020
Ph.D. in Computer Science
Advisor: Professor John Stankovic
Thesis: *Information Extraction and Fusion for Improving Health Safety*
Awards: Commonwealth fellowship,
NSF Smart and connected health student award
- University of Virginia, Charlottesville, VA May 2015
M.Sc. in Computer Science, CGPA: 3.97/4.00
Thesis: *Personalized model for temporal human behavior prediction*
Awards: Big data fellowship, Adobe Research Scholarship
- Bangladesh University of Engineering & Technology, Bangladesh Feb 2013
B.Sc. in Computer Science & Engineering, CGPA: 3.95/4.00
[Double Major Equivalent in Computer Science & Computer Engineering]
Class Rank: Summa Cum Laude (2nd in a class of 141 students)
Thesis: *Maximum visibility queries in spatial databases*
Awards: Best undergraduate thesis, Google student grant

SELECTED HONORS AND AWARDS

- **EECS Rising Stars, 2020**, for academic excellence, interest in a faculty career in the EECS discipline, and commitment to advancing equity and inclusion
- **NSF student award** to attend and present research at 2017 Smart and Connected Health (SCH) PI meeting [**1 of 10 graduate students from the USA**]
- **Commonwealth Fellowship**, Department of Computer Science, UVA, 2013-2014
- **Adobe Research Scholarship** as a Grace Hopper Scholar, 2014
- **Big Data Fellowship** by **Data Science Institute**, UVA, 2014
- **Computing Research Association (CRA) grants** for CRA-W grad cohort in 2014, 2016
- **Best Undergraduate Thesis Award**, Department of Computer Science & Engineering, Bangladesh University of Engineering & Technology (BUET), 2013
- **First place**, National Software Project Contest, Bangladesh, 2011 [*Team leader*]
- **Finalist** (Top 5 out of 121 teams), **Microsoft Imagine Cup**, Bangladesh, 2011 [*Team leader*]
- **University Merit Scholarship** for each semester of B.Sc. studies for academic excellence at BUET, 2009-2012
- **Dean's Award** for each year of B.Sc. studies for academic excellence at BUET, 2009-2012
- **Conference Travel Grants:**
 - **AAAI** student travel grant to present paper at AAAI 2020
 - **NSF** student travel grant to present paper at PerCom 2017
 - **SIGIR** conference grant to present paper at CIKM 2015
 - **Google student grant** to present paper at ICDE 2013

PUBLICATIONS

PEER-REVIEWED CONFERENCE and JOURNAL PUBLICATIONS

1. **Sarah M. Preum**, Sirajum Munir, Meiyi Ma, Mohammad Yasar, David J. Stone, Ronald D. Williams, Homa Alemzadeh, and John Stankovic. *A Review of Cognitive Assistants for Healthcare: Trends, Prospects, and Future Directions*. **ACM Computing Surveys**, 2020 [**impact factor: 6.131**]
2. **Sarah M. Preum**, Homa Alemzadeh, and John Stankovic. *EMSContExt: EMS Protocol-driven Concept Extraction for Cognitive Assistance in Emergency Response*. The Thirty-Second Annual Conference on Innovative Applications of Artificial Intelligence (AAAI/IAAI), 2020
3. **Sarah M. Preum**, Sile Shu, Mustafa Hotaki, Ron Williams, John Stankovic, and Homa Alemzadeh. *CognitiveEMS: A Cognitive Assistant System for Emergency Medical Services*. ACM Special Interest Group on Embedded Systems Review, 2019
4. **Sarah M. Preum**, John Stankovic, Yanjun Qi, *MAPer: A Multi-Scale Adaptive Personalized Model for Temporal Human Behavior Prediction*, ACM International Conference on Information and Knowledge Management (CIKM), 2015 [**CORE rank: A, Qualis rank: A1, acceptance rate 26%**]
5. **Sarah M. Preum**, Rizwan Parvez, Kai-Wei Chang, John Stankovic, *A Corpus of Drug Usage Guidelines Annotated with Type of Advice*, International Conference on Language Resources and Evaluation (LREC), 2018 [Qualis rank: A2]
6. **Sarah M. Preum**, Md A. Mondol, Meiyi Ma, Hongning Wang, John Stankovic, *PreCluDe2: Personalized Conflict Detection in Heterogeneous Health Applications*, Pervasive and Mobile Computing Journal, Volume 42, 226-247, 2017 [**Impact factor: 2.769**]

7. **Sarah M. Preum**, Md A. Mondol, Meiyi Ma, Hongning Wang, John Stankovic, *PreCluDe: Conflict Detection in Textual Health Advice*, IEEE International Conference on Pervasive Computing and Communications (PerCom), 2017 [**CORE rank: A***, **acceptance rate 16.5%**]
8. **Sarah M. Preum**, Farhana Choudhury, Mohammed Ali, Sarana Nutanong, *Maximum Visibility Queries in Spatial Databases*, International Conference on Data Engineering (ICDE), 2013 [**CORE rank: A***, **Qualis rank: A1**, **acceptance rate 21.4%**]
9. **Sarah M. Preum**, Monjura Afrin, Syed I. Ahmed, *VizResearch: Linking the Knowledge of People and the People with Knowledge*. Procedia Computer Science, Volume 9, 1416-1425, 2012
10. Nur Yildirim, John Zimmerman, **Sarah M. Preum**. *Technical Feasibility, Financial Viability, and Clinician Acceptance: On the many challenges to AI in Clinical Practice*. Human partnership with Medical Artificial Intelligence, AAAI Fall 2021 Symposium
11. Sile Shu, **Sarah M. Preum**, Haydon M. Pitchford, Ronald D. Williams, John Stankovic, and Homa Alemzadeh. *A Behavior Tree Cognitive Assistant System for Emergency Medical Services*. IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2019. [**CORE rank: A**, **Qualis rank: A1**]
12. John Stankovic, Meiyi Ma, **Sarah M. Preum**, and Homa Alemzadeh. *Challenges and Directions for Ambient Intelligence: A Cyber Physical Systems Perspective*. The Third IEEE International Conference on Cognitive Machine Intelligence (IEEE CogMI), 2021.
13. Brooke M. Bell, Ridwan Alam, Abu Mondol, Meiyi Ma, Ifat Emi, **Sarah M. Preum**, Kayla Haye, John A. Stankovic, John Lach, Donna Spruijt-Metz. *Validity and Feasibility of the Monitoring and Modeling Family Eating Dynamics (M2FED) System to Automatically Detect In-Field Family Eating Behavior*. Journal of Medical Internet Research (JMIR), 2021
14. Brooke M. Bell, Donna Spruijt-Metz, Ridwan Alam, Abu Mondol, Meiyi Ma, Ifat Emi, **Sarah M. Preum**, John A. Stankovic, John Lach, Kayla Haye. *Investigating the Dynamics of In-Home Family Eating Behavior: A Relational Event Modeling Approach*. Special issue in the Network Science journal, 2021.
15. M Arif Rahman, **Sarah M. Preum**, Homa Alemzadeh, Ronald D. Williams, and John Stankovic. *GRACE: Generating Summary Reports Automatically for Cognitive Assistance in Emergency Response*. The Thirty-Second Annual Conference on Innovative Applications of Artificial Intelligence (AAAI/IAAI), 2020
16. Meiyi Ma, **Sarah M. Preum**, Mohsin Ahmed, William Turneberg, Abdeltawab Hendawi, John Stankovic, *Data Sets, Modeling and Decision Making in Smart Cities: A Survey*, Transactions on Cyber Physical Systems (TCPS), 2019
17. Meiyi Ma, **Sarah M. Preum**, John Stankovic, *CityGuard: A Watchdog for Safety-Aware Conflict Detection in Smart Cities*, ACM/IEEE International Conference on Internet-of-things Design and Implementation (IoTDI), 2017 [acceptance rate 29%]
18. Meiyi Ma, **Sarah M. Preum**, William Tarneberg, Mohsin Ahmed, John Stankovic, *Detection of Runtime Conflicts among Services in Smart Cities*, IEEE Smart Computing, 2016 [H-Index 8]
19. Enamul Hoque, Robert Dickerson, **Sarah M. Preum**, Mark Hanson, Adam Barth, John Stankovic, *Holmes: A Comprehensive Anomaly Detection System for Daily In-home Activities*, International Conference on Distributed Computing in Sensor Systems (DCOSS), 2015 [**acceptance rate 31%**]
20. Farhana Choudhury, Mohammed Ali, **Sarah M. Preum**, Suman Nath, Ishat Rabban, *Scalable Visibility Color Map Construction in Spatial Databases*, Information Systems Journal, Volume 42, 89-106, 2014 [**Impact factor: 4.267**]

PEER-REVIEWED ABSTRACTS

21. M. Arif Rahman, **Sarah M. Preum**, John A. Stankovic, Leon Jia, Eimara Mirza, Ronald Williams, and Homa Alemzadeh. "IMACS-an interactive cognitive assistant module for cardiac arrest cases in emergency medical service: demo abstract." In Proceedings of the 18th Conference on Embedded Networked Sensor Systems, pp. 621-622. 2020.
22. Elizabeth Shelton, Annie Chapman, **Sarah M. Preum**, Sile Shu, Arif Rahman, John Stankovic, Homa Alemzadeh, Poster abstract: *An Assessment of a Cognitive Assistant System Under Diverse Noise Profiles in the Context of Emergency Medical Services*, SRC TECHCON, 2019
23. **Sarah M. Preum**, Sile Shu, Jonathan Ting, Vincent Lin, Ron Williams, John Stankovic, Homa Alemzadeh, Poster abstract: *Towards a cognitive assistant system for emergency response*, ACM/IEEE International Conference on Cyber-Physical Systems (ICCPs), 2018
24. **Sarah M. Preum**, Md A. Mondol, Meiyi Ma, Hongning Wang, John Stankovic, Demo Abstract: *Conflict Detection in Online Textual Health Advice*, International Conference on Information Processing in Sensor Networks (IPSN), 2017
25. Meiyi Ma, **Sarah M. Preum**, John Stankovic, Demo Abstract: *Simulating Conflict Detection in Heterogeneous Services of a Smart City*, IEEE/ACM Second International Conference on Internet-of-Things Design and Implementation (IoTDI), 2017
26. Md A. Mondol, Ifat Emi, **Sarah M. Preum**, John Stankovic. Poster abstract: *User authentication using wrist mounted inertial sensors*. ACM/IEEE International Conference on Information Processing in Sensor Networks (IPSN), 2017.

SELECTED MENTORING EXPERIENCE

Fall 2020-present	Joseph Gatto, CS PhD student, Dartmouth College, <i>Multimodal machine learning, natural language inference</i>
Fall 2021-present	Matthew Wallace, CS PhD student, Dartmouth College, <i>Information extraction, natural language processing</i>
Fall 2021-present	Garrett Johnston, CS undergraduate student, Dartmouth College, <i>Information extraction, natural language processing</i>
Fall 2018-present	Md Arif Rahman, CS Ph.D. Student, UVA, <i>Automatic incident reporting for emergency response [Results published in AAAI/IAAI 2020]</i>
Fall 2019-Spring 2020	Michael Tang, Senior CS student, UVA, <i>Domain-specific negation detection for decision-support in emergency response</i>
Fall 2019-Spring 2020	Eimara Mirza, Senior CS student, UVA, <i>Developing training resources and effective interface for decision-support in emergency</i>
Summer 2019	Jessica Wang, CS Undergraduate, UVA, <i>Personalized information extraction from the web for health safety</i>

Summer 2019	Viviana Rossa, Senior CS student, UVA, <i>Filtering safe health intervention suggestion from Alexa Skills</i>
Spring 2019	Makonnen Makonnen, Senior CS student, UVA, <i>Utilizing web search for textual data augmentation</i> [Manuscript under preparation]
Spring 2019	Annie Chapman, Senior CS student, UVA, <i>Information extraction from emergency response narration</i> [Results published in SRC TechCon 2019]
Fall 2017	Vincent Lin, Senior CS student, UVA, <i>Transcription of noisy speech data for emergency response</i> [Results published in ICCPS 2018]
Spring 2017- Summer 2017	Rizwan Parvez, CS M.Sc. Student, UVA, <i>Semi-automatic annotation of textual medication guidelines</i> [Results published in LREC 2018]

TEACHING EXPERIENCE

Professor/Instructor , Computer Science Department, Dartmouth College CS 89/189, Transforming Healthcare with Machine Learning, Opportunities and Challenges	Fall, 2021
Guest Lecturer, Department of Computer Science, University of Toronto, Preparation for Research through Immersion, Skills, and Mentorship	Spring 2021
Guest Lecturer, Department of Computational Linguistics, Dartmouth College, Accelerated Computational Linguistics	Spring 2021
Guest Lecturer, Department of Psychology, University of Virginia Graduate seminar on Design and Data Analysis	Spring 2018
Guest Lecturer, CS Department, University of Virginia Special topics in computer science: Smart Homes, Phones & Beyond	Spring 2016
Teaching Assistant , CS Department, University of Virginia	
<ul style="list-style-type: none"> • CS 1112: An Introduction to Digital Problem Solving and Programming Conducted lab sessions for a class of over 100 students, graded weekly assignments, quizzes, and final exams, held weekly office hours, 	Spring 2014, Fall 2013
<ul style="list-style-type: none"> • CS 1111: Introduction to Programming Held weekly office hours, graded weekly assignments, quizzes, and final exams [class of 80 students] 	Spring 2014
<ul style="list-style-type: none"> • CS 4750: Database Systems Held weekly office hours, graded weekly assignments, quizzes, and final exams [class of 80 students] 	Fall 2013
Lecturer/Instructor , CSE Department, Bangladesh University of Engineering & Technology	2013
<ul style="list-style-type: none"> • CSE 304 - Database Sessional Delivered lectures, conducted lab sessions, designed and graded weekly 	

assignments and quizzes, supervised and evaluated term projects
[class of 60 students]

- **CSE 210 - Digital Electronics and Pulse Techniques Sessional**
Conducted lab session, graded weekly assignments and quizzes, designed and evaluated final exams [class of 60 students]
- **CSE 206 - Digital Logic Design Sessional**
Conducted lab session, graded weekly assignments and quizzes, evaluated final exams [class of 30 students]
- **CSE 404 - Digital Systems Design Sessional**
Evaluated term project [class of 30 students]

SELECTED RESEARCH EXPERIENCE

Personalized Medical Decision Support for Health Safety [CIKM 2015, DCOSS 2015, PerCom 2017, IPSN 2017, Pervasive & Mobile Computing Journal 2017, LREC 2018]

- **[System]** *PreCluDe*: Intercepts the health information and interventions an individual receives from smart health applications and websites and detects potential conflicts among them in an interpretable and personalized manner.
- **[System]** *ActSafe*: Reliably predicts hundreds of safety violation events for self-management of chronic diseases. It also assigns severity to a potential violation.
- Designed and implemented NLP solutions for deep semantic inference of medical text.
- Developed personalized, interpretable machine learning models for predicting activities of daily living (ADLs) that can accurately predict less-frequent and short-spanned activities. They are more useful for unsafe health activity prediction than existing ADL prediction solutions.
- **[Funding]** Contributed to an external funding grant from the U.S. Department of Commerce, National Institute of Standards and Technology (NIST).
- **[Resources]** Developed and released three novel datasets and a data annotation tool for online textual health information.

Intelligent Assistants [ICCPS 2018, SIGBED Review 2019, IROS 2019, IAAI 2020]

- **[System]** *EMSContExt*: Automatically extracts safety-critical and relevant information from the speech data collected at an emergency incident to drive a real-time intelligent assistant for first responders. *EMSContExt* is robust to noise and resource constraints.
- Designed and implemented a knowledge-integrated, data-driven NLP pipeline to automatically create and expand domain knowledge base from unstructured textual data with minimal supervision and domain expertise.
- Combined NLP and knowledge engineering to enable a task-oriented chatbot to improve health insurance customer service.
- **[Resources]** A comprehensive survey of intelligent assistants for healthcare. It reviews interactive, context-aware, and adaptive assistants for healthcare, and summarizes existing research according to their underlying sensing, actuation, control, and computational components. It identifies the limitations of existing systems and presents a set of practical design recommendations and research challenges for the next of generation intelligent assistants.

Big Data and Large-scale CPS Applications [ICDE 2013, Information Systems 2014, SmartComp 2016, IoTDI 2017, Transaction of CPS 2019]

- Developed data-driven models for visibility computation in large-scale spatial databases by leveraging innovative data engineering and computational geometry methods.
- **[System]** Contributed to developing a system to detect conflicts in different Spatio-temporal data-streams from simulated smart city applications, e.g., traffic, weather, air pollution.
- **[Resources]** Co-authored a survey reviewing the challenges of modeling and decision making in smart-city applications in the context of cyber-physical systems and data mining.

INDUSTRY EXPERIENCE

Artificial Intelligence Research Intern

May 2018 to August 2018

Bosch Research and Technology Center, Pittsburgh

Developed a knowledge extraction pipeline using novel natural language processing (NLP) in order to drive an AI-powered chatbot for effective and scalable customer support in health insurance. The NLP pipeline enables constructing a topical ontology from heterogeneous unstructured textual documents with minimal supervision and domain knowledge.

SELECTED INVITED TALKS

- September 2020 *Future Directions for Clinical Decision Support*, Clinical Decision Support (CDS) Workshop (virtual) hosted by the **Office of the National Coordinator for Health Information Technology (ONC)**
- July 2020 *Towards a cognitive assistant for emergency response*, **Public Safety Broadband Stakeholder Meeting** (virtual) by NIST
- April 2020 *Information Extraction & Fusion for Improving Personal & Public Health Safety*,
 - Senseable City Lab, **Massachusetts Institute of Technology (MIT)**, Cambridge, MA
 - Department of Computer & Information Science, University of Delaware, Newark, DE
- March 2020 *Information Extraction & Fusion for Improving Personal & Public Health Safety*,
 - **Human-centered Artificial Intelligence**, **Stanford University**, Stanford, CA
 - Department of Computer Science, **Dartmouth College**, Hanover, NH
 - School of Electrical, Computer and Energy Engineering (ECEE), Arizona State University, Tempe, AZ
 - Department of Computer Science & Engineering, University of Connecticut, Storrs, CT
- July 2019 *Towards a cognitive assistant for emergency response*, Public Safety Broadband Stakeholder Meeting by NIST
- April 2018 *CognitiveEMS: A Cognitive Assistant System for Emergency Medical Services*, **CPS week 2018**

- March 2018 *Data-driven, resource-constrained, resilient decision support systems*, **Bosch Research and Technology Center**, Pittsburgh
- February 2018 *Increasing health safety using timeseries analysis and natural language processing*, Department of Psychology, University of Virginia
- February 2018 Presented multiple posters on my research focusing on decision support for health safety at the UVA Link Lab open house
- July 2017 Presented poster and demo on health safety using NLP and knowledge extraction at the CS UVA open house
- March 2017 *Preclude: Conflict Detection in Textual Health Advice*, IEEE International Conference on Pervasive Computing and Communications (**PerCom**), 2017
- March 2017 *Conflict Detection from online information using NLP*, Student mentoring session of **Smart and Connected Health PI meeting**
- October 2015 *MAPer: A Multi-Scale Adaptive Personalized Model for Temporal Human Behavior Prediction*, ACM International Conference on Information and Knowledge Management (**CIKM**), 2015
- June 2015 *Holmes: A Comprehensive Anomaly Detection System for Daily In-home Activities*, IEEE International Conference on Distributed Computing in Sensor Systems (**DCOSS**), 2015
- April 2013 *Maximum Visibility Queries in Spatial Database*, International Conference on Data Engineering (**ICDE**), 2013

SELECTED DEMONSTRATIONS

- **NIST Public Safety Broadband Stakeholder Meeting, 2019:** *CognitiveEMS: Towards a Cognitive Assistant for Emergency Response*
- **IPSN 2017:** *Personalized Conflict Detection in Online Textual Health Advice*
- **Smart and Connected Health PI meeting, 2017:** *Personalized Conflict Detection in Online Textual Health Advice*
- **Cyber-physical Systems PI meeting, 2016:** *Conflict Detection in Online Textual Health Advice*
- **IoTDI 2017:** *Simulating Conflict Detection in Heterogeneous Services of a Smart City*

PROFESSIONAL SERVICES AND ORGANIZATIONS

Organizer Workshop on Advances in Data Management, Bangladesh, 2013

Technical Program Committee

- AAAI Conference on Artificial Intelligence (AAAI), 2022, 2021
- PerIoT, Co-located with PerCom, 2021

Reviewer

- Journal of American Medical Informatics Association (JAMIA), 2021
- Language Resources and Evaluation Conference (LREC) 2020
- IEEE Transactions on Knowledge and Data Engineering (TKDE), 2019
- American Medical Informatics Association (AMIA), 2019
- ACM Health Journal, 2020, 2019
- NCWIT Collegiate Award 2014

Member

- ACM student member, 2015-present
- AAAI student member, 2019-present
- IEEE student member, 2013-present
- Bangladeshi Women in Computer Science and Engineering, 2015- present