SANJAY SAHA

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About me

I am a Machine Learning Engineer at TikTok (ByteDance), working in the Content Intelligence team on large-scale multimodal video understanding, video deduplication, and real-time content moderation for livestreaming systems. My PhD in Computer Science at the National University of Singapore encompasses research spanning deepfake generation and detection, biometric cybersecurity, and the societal impact of AI-generated media. I have published in leading venues including Pattern Recognition, IEEE Transactions on Biometrics, KDD, WACV, ICCV, Behavior and Identity Science, Computers in Human Behavior, and others. My work focuses on turning research into reliable, real-world Multimodal AI systems, facial biometric analysis and deepfakes.

Research and Industry Experience

- **TikTok Pte. Ltd. [🌐]** *Jul 2024 – Present*
  Machine Learning Engineer Singapore
  - Develop and maintain large-scale video deduplication services as part of the Content Intelligence team, supporting real-time content moderation on TikTok LIVE.
  - Design and deploy computer vision and multimodal learning models for duplicate and near-duplicate video detection across visual, audio, and textual signals.
  - Build scalable inference and retrieval pipelines to analyze high-volume livestream data, improving moderation accuracy and user experience.
  - Collaborate closely with product, infrastructure, and trust & safety teams to productionize research ideas into robust ML systems.

- **Department of Computer Science, National University of Singapore [🌐]** *Jan 2024 – Jul 2024*
  Research Associate Singapore
  - Conducted research under the iGyro (Information Gyroscope) project on detecting and assessing AI-generated and manipulated visual media.
  - Developed algorithms for analyzing deepfakes and AIGC content, contributing to research on trustworthy and responsible media analysis.
  - Supported dataset construction, experimental evaluation, and publication preparation for peer-reviewed venues.

- **Centre for Trusted Internet and Community, NUS [🌐]** *May 2022 – Jan 2024*
  Research Assistant Singapore
  - Worked on the project *Deep and Cheap-Fakes – Effects on Audience's Attitudes, Knowledge, and Literacy*.
  - Studied diverse deepfake generation and face synthesis techniques to create controlled experimental stimuli.
  - Produced large-scale, curated deepfake datasets used in user studies to analyze the impact of manipulated media on audience perception and media literacy.
  - Collaborated with interdisciplinary teams across computer science and social science research.

- **Invigilo Technologies [🌐]** *Jun 2020 – Apr 2022*
  Research Engineer (Part-time) Singapore
  - Developed computer vision solutions for automated safety violation detection in construction work sites.
  - Implemented state-of-the-art video analytics techniques including object detection, multi-object tracking, human action recognition, pose estimation, and proximity analysis.
  - Contributed to end-to-end deployment of vision-based monitoring systems in real-world industrial environments.

- **National University of Singapore [🌐]** *Aug 2018 – May 2022*
  Graduate Teaching Assistant (Part-time) Singapore
  - Conducted tutorial sessions for undergraduate and graduate modules including Discrete Mathematics, Database Systems, Biometric Authentication, Applied Machine Learning for Business Analytics, Advanced Analytics and ML, Visual Computing, and SCALE AI & ML.
  - Mentored students in assignments, projects, and exam preparation across multiple semesters.
  - Awarded a place on the Department's *Teaching Assistant Honors' List* in 2022.

- **ByteDance [🌐]** *May 2021 – Jul 2021*
  Research Intern (PhD) Singapore
  - Contributed to a TikTok video duplication detection project during PhD internship.
  - Worked with transformer-based model variants and image-matching algorithms for large-scale video similarity analysis.
  - Generated analytical reports and insights using SQL to support model evaluation and decision-making.

Teaching Experience

- **National University of Singapore (NUS)** *Aug 2018 – May 2022*
  Graduate Teaching Assistant (Part-time) Singapore
  - Responsibilities included preparing tutorial materials, conducting tutorial sessions, grading, exam preparation and occasionally designing assignments. I also provided one-to-one consultations after class to address students' questions and strengthen core understanding, for mostly introductory (Level-1) modules. Awarded a place on the Department's *Teaching Assistant Honors' List* in 2022.
    * Discrete Mathematics (CS1231S: AY2019-20-sem1, AY2020-21-sem1; TIC1201: AY2019-20-sem2).
    * Database Systems (CS2102: AY2018-19-sem2).
    * Biometric Authentication (CS5332: AY2021-22-sem2).
    * Applied Machine Learning for Business Analytics (BT5153: AY2020-21-sem2, AY2021-22-sem2).
    * Advanced Analytics and Machine Learning (BT5151: AY2021-22-sem2).
    * SCALE AI&ML (AY2021-22-sem1, AY2021-22-sem2, AY2022-23-sem2).
    * SoC Visual Computing Workshop (AY2021-22-sem1).

- **University of Asia Pacific (UAP)** *Oct 2017 – Jul 2018*
  Assistant Professor Dhaka, Bangladesh
  - Responsibilities included designing curricula, preparing course materials, and delivering core lectures for foundational computer science courses. I also provided dedicated mentorship to final-year students, guiding their undergraduate research projects to completion, which included leading one group to successfully achieve a peer-reviewed publication.
    * Structural Programming Language (2014 to 2018).
    * Algorithm Design (2015 to 2018).
    * Object Oriented Programming (2015 to 2017).
    * Guided students in Final Year research projects (2017 to 2018).

- **United International University (UIU)** *Jul 2014 – Sep 2017*
  Lecturer Dhaka, Bangladesh
  - Responsibilities included developing comprehensive course materials and conducting lectures across a wide range of foundational theoretical and programming modules. Alongside my daily teaching duties, I actively engaged in undergraduate academic mentoring and consistently contributed to the ongoing development of the department's curriculum.
    * Structural Programming Language (2014 to 2018).
    * Algorithm Design (2015 to 2018).
    * Object Oriented Programming (2015 to 2017).
    * Theory of Computation (2015 to 2017).
    * Discrete Mathematics (2014 to 2015).
    * Contributed to curriculum development and undergraduate academic mentoring.

Education

- **National University of Singapore** *Dec, 2024*
  PhD in Computer Science Singapore
  - GPA: 4.00/5.00
  - Thesis: Digital Face Synthesis: Safeguarding Against Threats (link)

- **University of Dhaka** *Feb, 2016*
  Master of Science in Computer Science Dhaka, Bangladesh
  - GPA: 3.54/4.00

- **University of Dhaka** *Mar, 2014*
  Bachelor of Science in Computer Science Dhaka, Bangladesh
  - GPA: 3.86/4.00

Professional Memberships

- **Inst. of Electrical and Electronics Engineers (IEEE)**, ID: 97892456, Member, Singapore (R10) *Active, 2021 – Present*
- **IEEE Biometrics Council**, Society Membership *Active*
- **IEEE Computational Intelligence Society**, Society Membership *Active*
- **Association for the Advancement of Artificial Intelligence (AAAI)**, ID: 648056 *Active Member*
- **AAAI Subgroups / Affiliates** AIIDE, EAAI, HCOMP, IAAI, ICAPS, KR *Member*

Technical Skills

- **Programming Languages:** Python, Java, SQL
- **Machine Learning:** PyTorch, Keras, other ML libraries
- **Database Systems:** HIVE, PostgreSQL, MySQL
- **Other Tools & Technologies:** AWS, Docker

Publications

C=Conference, J=Journal, S=In Submission

[C.11] Yew, Wei Chee; Xu, Hailun; **Saha, Sanjay**; Fan, Xiaotian; Ong, Hiok Hian; Wang, David Yuchen; Sarkar, Kanchan; Yang, Zhenheng; Guan, Danhui. (2025). **Dynamic Content Moderation in Livestreams: Combining Supervised Classification with MLLM-Boosted Similarity Matching**. Manuscript (arXiv preprint: arXiv:2512.03553).

[J.10] Chen, Ken; Seneviratne, Sachith; Wang, Wei; Hu, Dongting; **Saha, Sanjay**; Hasan, Md Tarek; Rasnayaka, Sanka; Malepathirana, Tamasha; Gong, Mingming; Halgamuge, Saman. (2025). **AniFaceDiff: Animating stylized avatars via parametric conditioned diffusion models**. *Pattern Recognition*, pp. 112017.

[J.9] Stragapede, Giuseppe; Vera-Rodriguez, Ruben; Tolosana, Ruben; Morales, Aythami; DeAndres-Tame, Ivan; Damer, Naser; **Saha, Sanjay**; et al. (2025). **KVC-onGoing: Keystroke Verification Challenge**. *Pattern Recognition*, Vol. 161, pp. 111287.

[J.8] Soto-Sanfiel, María T.; Angulo-Brunet, Ariadna; **Saha, Sanjay**. (2025). **Deepfakes as narratives: Psychological processes explaining their reception**. *Computers in Human Behavior*, Vol. 165, pp. 108518.

[J.7] Soto-Sanfiel, María T.; Angulo-Brunet, Ariadna; **Saha, Sanjay**. (2025). **Motivations for (not) sharing deepfakes on social media**. *The Communication Review*, pp. 1–26.

[S.4] Bahavan, Nadarasar; **Saha, Sanjay**; Chen, Ken; Seneviratne, Sachith; Rasnayaka, Sanka; Halgamuge, Saman. (2025). **Unmasking the Unknown: Facial Deepfake Detection in the Open-Set Paradigm**. Manuscript (arXiv preprint: arXiv:2503.08055).

[C.10] Kung, Han-Wei; Varanka, Tuomas; **Saha, Sanjay**; Sim, Terence; Sebe, Nicu. (2025). **Face anonymization made simple**. In *2025 IEEE/CVF Winter Conference on Applications of Computer Vision (WACV)*, pp. 1040–1050. IEEE.

[S.3] **Saha, Sanjay**; Hussain, Syed Ali; Soto-Sanfiel, María T.. (2025). **The role of nostalgia in the credibility of deepfakes featuring deceased artists: A narrative persuasion approach**. Manuscript (OSF preprint).

[S.2] Fu, Gina Junhan; Soto-Sanfiel, María T.; **Saha, Sanjay**. (2025). **When Seeing Is Not Believing: Reassessing the Persuasive Power of Deepfakes as Opposed to** Text-Based First-Person Narratives of Historical Figures. Manuscript (OSF preprint).

[J.6] Nguyen, Kim-Ngan; Rasnayaka, Sanka; Wickramanayake, Sandareka; Meedeniya, Dulani; **Saha, Sanjay**; Sim, Terence. (2024). **Spatio-temporal dual-attention transformer for time-series behavioral biometrics**. *IEEE Transactions on Biometrics, Behavior, and Identity Science*, Vol. 6(4), pp. 591–601.

[C.9] Soto-Sanfiel, María T.; **Saha, Sanjay**. (2024). **Predicting deepfake enjoyment: A machine learning perspective**. In *International Conference on Human-Computer Interaction*, pp. 384–402. Springer.

[J.5] **Saha, Sanjay**. (2024). **Digital Face Synthesis: Safeguarding Against Threats**. PhD Thesis, *National University of Singapore*.

[C.8] **Saha, Sanjay**; Perera, Rashindrie; Seneviratne, Sachith; Malepathirana, Tamasha; Rasnayaka, Sanka; Geethika, Deshani; Sim, Terence; Halgamuge, Saman. (2023). **Undercover Deepfakes: Detecting Fake Segments in Videos**. In *IEEE/CVF International Conference on Computer Vision (ICCV) Workshops)*, pp. 415–425. IEEE.

[C.7] Stragapede, Giuseppe; Vera-Rodriguez, Ruben; Tolosana, Ruben; Morales, Aythami; DeAndres-Tame, Ivan; Damer, Naser; Fierrez, Julian; Garcia, Javier-Ortega; Gonzalez, Nahuel; Shadrikov, Andrei; et al. (2023). **IEEE BigData 2023 keystroke verification challenge (KVC)**. In *2023 IEEE International Conference on Big Data (BigData)*, pp. 6092–6100. IEEE.

[C.6] **Saha, Sanjay**; Sim, Terence. (2020). **Is Face Recognition Safe from Realizable Attacks?**. In *2020 IEEE International Joint Conference on Biometrics (IJCB)*, pp. 1–8. IEEE.

[C.5] Rasnayaka, Sanka; **Saha, Sanjay**; Sim, Terence. (2019). **Making the most of what you have! Profiling biometric authentication on mobile devices**. In *2019 International Conference on Biometrics (ICB)*, pp. 1–7. IEEE.

[C.7] Ahmed, Shahjalal; Islam, Md; Hassan, Jahid; Ahmed, Minhaz Uddin; Ferdosi, Bilkis Jamal; **Saha, Sanjay**; Shopon, Md. (2019). **Hand Sign to Bangla Speech: A Deep Learning in Vision based system for Recognizing Hand Sign Digits and Generating Bangla Speech**. In *SUSMCOM 2019*.

[J.4] Rahman, M Saifur; Rahman, Md Khaledur; **Saha, Sanjay**; Kaykobad, M; Rahman, M Sohel. (2019). **Antigenic: an improved prediction model of protective antigens**. *Artificial Intelligence in Medicine*, Vol. 94, pp. 28–41.

[J.3] Rahman, M Saifur; Shatabda, Swakkhar; **Saha, Sanjay**; Kaykobad, Mohammad; Rahman, M Sohel. (2018). **DPP-PseAAC: a DNA-binding protein prediction model using Chou's general PseAAC**. *Journal of Theoretical Biology*, Vol. 452, pp. 22–34.

[J.2] Islam, Md Mofijul; **Saha, Sanjay**; Rahman, Md Mahmudur; Shatabda, Swakkhar; Farid, Dewan Md; Dehzangi, Abdollah. (2018). **iProtGly-SS: Identifying protein glycation sites using sequence and structure based features**. *Proteins*, Vol. 86(7), pp. 777–789.

[C.4] Ali, Muhammad; Taniza, Farzana Afrin; Niloy, Arefeen Rahman; **Saha, Sanjay**; Shatabda, Swakkhar. (2018). **Prediction of bacteriophage protein locations using deep neural networks**. In *IEMIS 2018*, pp. 29–38. Springer.

[J.1] Shatabda, Swakkhar; **Saha, Sanjay**; Sharma, Alok; Dehzangi, Abdollah. (2017). **iPHLoc-ES: identification of bacteriophage protein locations using evolutionary and structural features**. *Journal of Theoretical Biology*, Vol. 435, pp. 229–237.

[C.3] Ahmed, Al Amin Neaz; Haque, HM Fazlul; Rahman, Abdur; Ashraf, Md Susam; **Saha, Sanjay**; Shatabda, Swakkhar. (2017). **A participatory sensing framework for environment pollution monitoring and management**. Manuscript (arXiv preprint: arXiv:1701.06429).

[C.2] **Saha, Sanjay**; Elahi, Md. Mamun; Islam, Md. Mahfuzul; Ahmed, Shabbir. (2017). **An efficient successive authentication scheme for vehicular ad-hoc networks**. In *2017 20th International Conference of Computer and Information Technology (ICCIT)*.

[C.1] Md Shakil Hossain; Sk. Shariful Islam Arafat; S M Al-Hossain Imam; Md. Mahmudul Hasan; Md. Mofijul Islam; **Saha, Sanjay**; Shatabda, Swakkhar; Tamanna Islam Juthi. (2017). **VIM: A Big Data Analytics Tool for Data Visualization and Knowledge Mining**. In *2017 IEEE International Women in Engineering (WIE) Conference on Electrical and Computer Engineering (WIECON-ECE 2017)*.