

# SIKHA PENTYALA

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## EDUCATION

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### Ph.D. in Computer Science and Systems

University of Washington Tacoma

from Spring 2022

### Master of Computer Science

University of Washington Tacoma (GPA: 4.00)

2019 - 2020

### Post Graduate Diploma in Nuclear Engineering

Homi Bhabha National Institute (GPA: 4.00)

2010 - 2011

### Bachelor of Computer Science

Jawaharlal Nehru Technological University, Anantapur (Gold Medalist - GPA: 4.00)

2005 - 2009

## EXPERIENCE

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### University of Washington, Tacoma

*Pre-doctoral Instructor (Fundamentals of OOPs)*

from Dec 2022

Tacoma, WA

### Mila - Quebec AI Institute

*Research Intern (Research on privacy preserving fair item rankings)*

Jul 2022 - Sep 2022

Remote

### University of Washington, Tacoma

*Research Assistant (Privacy-preserving machine learning)*

from Mar 2022

Tacoma, WA

### Mila - Quebec AI Institute

*Research Intern*

Oct 2021 - Mar 2022

Remote

- Research on training machine learning models in a federated environment while preserving privacy of the users and achieving group fairness.

### University of Washington, Tacoma

*Research Assistant*

Mar 2021 - Sep 2021

Tacoma, WA

- Participation in IDASH Track III Challenge.
- Privacy-preserving fairness auditing.

### University of Washington, Tacoma - Microsoft

*Graduate Research Student*

Jul 2020 - Oct 2020

Tacoma, WA

- Studied and designed system to automatically fix connectivity issues in existing Open Street Maps (OSM) dataset for its efficient use in routing services using C# in Visual Studio.
- System detected wrongly connected roadways to nodes for each country - 11% in New Zealand, 8% in the Fiji Islands, 19% in Venezuela and 8% in Serbia.

### Nuclear Power Corporation of India Ltd.

*Scientific Officer*

Sep 2011 - Apr 2018

Kudankulam, TN, India

- Led a team of 2 developers to implement and re-design the intranet website to automate and achieve 50% faster process-lines, reducing labor and time costs.
- Estimated and managed cost, work scope, manpower, schedule and delivery for the intranet website while leading a team of 2 software developers.
- Designed business specific applications for website such as online tender preparation, a complaint management system, a works and contracts management system and a chemistry data management system.
- Increased up-time by 20% by moving 10 legacy systems to new hardware and software while administering 14 server hardware as well as 27 software applications.

## RELEVANT PUBLICATIONS

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- Jia Ao Sun, **S. Pentyala**, M. De Cock and G. Farnadi Privacy-Preserving Fair Item Ranking, 45th European Conference on Information Retrieval 2023.

- M. Pereira, **S. Pentyala**, et al. *Secure Multiparty Computation for Synthetic Data Generation from Distributed Data*, SyntheticData4ML Workshop@NeurIPS 2022
- **S. Pentyala**, et al. *Privacy-Preserving Group Fairness in Cross-Device Federated Learning*, Proceedings of Algorithmic Fairness through the Lens of Causality and Privacy (AFCP2022) - NeurIPS 2022 workshop
- **S. Pentyala**, et al. Towards private and fair federated learning WiML@NeurIPS 2022
- **S. Pentyala**, D. Melanson, M. De Cock and G. Farnadi *PrivFair: a Library for Privacy-Preserving Fairness Auditing*, PPAI-2022 (AAAI-22 Workshop on Privacy-Preserving Artificial Intelligence (8 pages))
- **S. Pentyala**, R. Dowsley and M. De Cock *Privacy-Preserving Video Classification with Convolutional Neural Networks*, 38th International Conference on Machine Learning, PMLR 139, 2021.
- **S. Pentyala**, M. De Cock and R. Dowsley *Privacy-Preserving Video Classification*, WiCV 2021 (poster in Women in Computer Vision Workshop at CVPR, 2021)
- F. Tabet and **S. Pentyala**, B. Patel, et al. *OSMRunner: A System for Exploring and Fixing OSM Connectivity*, 22nd IEEE International Conference on Mobile Data Management (MDM) 2021.

## AWARDS

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- WiML travel funding award (WiML@NeurIPS 2022)
- Carwein-Andrews Endowment award for 2022-2023, UW Tacoma, School of Engineering and Technology
- 2021-2022 School of Engineering & Technology's Outstanding Graduate Research Award, UW Tacoma
- Winner of Track III of the iDASH2021 secure genome analysis competition
- Gold Medalist at Jawaharlal Nehru Technological University, Anantapur in the Branch of ECM, Class of 2009

## SERVICES

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- Pre-doctoral Instructor for TCSS 143 (Fundamentals of Object-Oriented Programming)
- Volunteer in Women in Machine Learning @NeurIPS 2022
- Member of WiDS
- Roundtable Lead on Privacy at the Algorithmic Fairness through the Lens of Causality and Privacy (AFCP2022) Workshop, NeurIPS 2022
- Co-Reviewer for NeurIPS 2022
- Reviewer for SyntheticData4ML Workshop@NeurIPS 2022

## SKILLS

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<b>Programming Languages</b>	Java, Python, C#
<b>Frameworks</b>	MP-SPDZ, FairLearn, Flower
<b>Tools and Technologies</b>	Keras, Sklearn, Pandas, TensorFlow, Pytorch, OpenCV, Docker, Git (Github), Jupyter
<b>Databases</b>	MS-SQL, ORACLE DB, MySQL
<b>Cloud Technologies</b>	Amazon Web Services (AWS - EC2, S3), Azure
<b>Servers</b>	Apache-Tomcat, WAMP/LAMP, MS AD-DC and Exchange, BlueCoat

## RELEVANT PROJECTS

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### Synthetic Data Generation - Privacy and Fairness

- Ongoing thesis on generating privacy-preserving and fair synthetic data.

### Private Financial Crime Detection - Privacy

- Ongoing project on designing privacy-preserving federated learning solution to train models on with vertical and horizontally partitioned data to detect anomalies in financial transactions.

### Recommendation system - Privacy and Fairness.

- Devised techniques to preserve consumer (users) privacy while achieving fairness for producers (items).

### Private and Fair ML training - Federated learning, Privacy and Fairness.

- Devise techniques to achieve group fairness in the federated learning while preserving privacy of the users and their sensitive attributes.

- Developed MPC protocols for existing central pre-processing and post-processing techniques to adapt in a FL setup in privacy-preserving way.
- Evaluated proposed techniques using Flower framework with 100+ clients.

#### **Privacy preserving fairness auditing - MPC and Fairness.**

- Built first MPC protocols to compute statistical notions of group fairness such as equalized odds, demographic parity and subgroup accuracy for multi-class and binary classification in MP-SPDZ.
- Developed and deployed a demo web-based service that takes images or tabular data from one user and model parameters from the other user and performs secure auditing of the model using above MPC protocols. Audited a CNN with 1.48 parameters with 56 images in 30 secs in a 3PC passive setting.

#### **Confidential Computing - Federated learning, MPC and Differential privacy.**

- Built a solution where two parties individually train a DP logistic regression (LR) model and obtain aggregated  $\epsilon$ -DP LR model. Achieved a test accuracy of 85.79% with the model trained in 0.27s in the competition.
- Built a solution where multiple parties collaborate to train a DP LR model using MPC, suitable for multiple scenarios of data splits. Achieved a test accuracy of 87.98% in 76s in a 3PC passive setting.

#### **Privately classifying a video using Convolutional Neural Networks - MPC.**

- Built first end-to-end secure multi party computation protocol (MPC) for private video classification in Python using MP-SPDZ benchmarking software and Tensorflow.
- Designed and trained a CNN with 1.5 million paramters to detect 7 emotions in a video from RAVDESS dataset.
- Deployed solution in cloud (AWS, Azure) & classified 4s video in 8.5s (passive 3PC) by keeping content of video and model parameters private to the owners in different adversarial models.