

# AYUSH KUMAR SHAH

Ph.D. student in Computer Science

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## SUMMARY

- Extensive theoretical and practical background in machine learning and computer vision, with experience in research and experimental design.
- Proficient in the deep learning pipeline: data analysis and cleaning, pre-processing, model design and training, and model evaluation, usually in PyTorch.
- Excellent teamwork, communication, and writing skills developed through previous industry experience, research publications, poster presentations, and talks.
- **Research Interests:** Pattern recognition, computer vision, detection and recognition of graphical structures, speaker understanding, multi-modal deep learning, natural language processing, visual scene parsing.

## WORK EXPERIENCE

### Amazon - Alexa AI

*Applied Scientist Intern*

Sunnyvale, California

*May 2022 – Aug 2022*

- Reduced annotation costs and training time, with competitive speaker identification results in voice assistants (e.g., Alexa) using semi-supervised techniques, while working on the Alexa Speaker Understanding team.

### Fusemachines

*Machine Learning Engineer*

Kathmandu, Nepal

*June 2019 – Aug 2020*

- Optimized a client's business decisions for chemical products that go unsold using boosting classifiers.
- Built a 95% accurate handwritten text (English & Nepali) recognition system, used to automate bank entries.
- Increased a subscription-based e-commerce client revenue by 6% creating a recommendation system.
- Democratized AI by preparing course materials for Fusemachines AI Education Programs.

## EDUCATION

### PhD in Computing and Information Sciences, CGPA: 3.92/4

Rochester Institute of Technology (RIT)

*Aug 2020 – Present*

*Rochester, NY, USA*

**Research Group:** Document and Pattern Recognition Lab (DPRL)

**Area of focus:** extraction and visual parsing of graphical structures and notations, focusing on mathematical formulas and chemical diagrams in documents.

**Relevant Courses:** Pattern Recognition, Computer Vision, Mathematics for Deep Learning, Natural Language Processing, Software Engineering.

### Bachelors in Computer Engineering, CGPA: 3.96/4

Kathmandu University

*Aug 2015 – Oct 2019*

*Kavre, Nepal*

**Relevant Courses:** Artificial Intelligence, Data Structures and Algorithms, Algorithm and Complexity, Software Engineering, Probability and Statistics, Machine Learning, Speech and Language Processing, C, C++.

## RESEARCH EXPERIENCE

### Document and Pattern Recognition Lab (DPRL), RIT

*Graduate Research Assistant*

Rochester, New York

*Aug 2020 – Present*

- Improved accessibility of mathematical information by creating innovative search engines, interfaces, and algorithms for extracting and recognizing math, including a new open-source math formula extraction pipeline for PDF documents.
- Accelerated the math formula recognition system by 6 times by implementing a custom dataloader with dynamic batch size for full GPU utilization in a distributed parallelization framework.
- Helped the document recognition community to visualize and evaluate graphical recognition results and errors, including specific type of errors in place, by building a new open-source visualization tool.

## PUBLICATION

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- **A. K. Shah**, A. Dey, and R. Zanibbi, “A Math Formula Extraction and Evaluation Framework for PDF Documents,” in Document Analysis and Recognition – ICDAR 2021, Cham, 2021, pp. 19–34. doi: 10.1007/978-3-030-86331-9\_2

## TEACHING EXPERIENCE

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### Rochester Institute of Technology

Graduate Teaching Assistant

Rochester, New York

Aug 2022 – Dec 2022

- Course: Introduction to Machine Learning

### Samriddhi College

Computer Science Instructor

Kathmandu, Nepal

Jan 2020 – June 2020

- Educated undergraduate Computer Science students about “Foundations in AI: Computer Science and Mathematics” including topics like Introduction to AI, CS Fundamentals, Python, Data Structure, DBMS.

## TECHNICAL SKILLS

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### Programming Languages

Python, R, Matlab, C, C++, JAVA

### Python Packages

Pytorch, Tensorflow, Scikit-Learn, OpenCV, Nltk, Pandas, Numpy, Matplotlib, Fastapi, BeautifulSoup, Regex, NetworkX, Jupyter

### Database

MySQL, MongoDB

### Miscellaneous

Git, Github, Bash, L<sup>A</sup>T<sub>E</sub>X, Jira, Linux, Arduino, Raspberry-pi

## HONORS AND AWARDS

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**RIT Ph.D. Merit Scholarship/Assistantship.** Financial Support for Ph.D. at RIT. 2020 – Present

**Kathmandu University Merit-based scholarship (4x).** \$440 worth scholarship awarded for securing the highest GPA in the Computer Engineering cohort (4/7 semesters). 2015 – 2019

**Fusemachines Artificial Intelligence Scholarship Program.** Selected among thousands of candidates nationwide for fuse.ai Artificial Intelligence Scholarship Online Course. Nov 2018

**American Society of Nepalese Engineers Merit Award.** A merit worth \$200, rewarded to the entrance topper of each university in Nepal, seeking admission for undergraduate degrees. May 2016

**46<sup>th</sup> International Physics Olympiad (IPhO) Contestant.** One of the largest olympiads for high school Physics enthusiasts with 5 contestants, each from 100 participating countries. June 2015

## TALKS

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**Poster presentation** on “Reconstructing the Structure of Molecular Diagrams in PDF Documents using a CNN-Attention-Based Parsing Model” at the Molecule Maker Lab Institute (MMLI) All-Institute Retreat at **University of Illinois Urbana-Champaign (UIUC)**. Sept 28, 2022

**Guest lecture** on “Bayesian Decision Theory” for RIT’s undergraduate course - Intro to Machine Learning (40 students). Sept 5, 2022

**Research Idea Ring (RIR) talk** on “A Fast and Interpretable Context-aware Parser for Isolated Formulas and Chemical Diagrams” at RIT. April 7, 2022

**Poster presentation** on the MathSeer extraction pipeline at the 16<sup>th</sup> International Conference on Document Analysis and Recognition ICDAR 2021, Lausanne, Switzerland virtually. Sept 9, 2021