KAMAL SHRESTHA

M. Tech. Student in Computer Science and Engineering

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Research Interests: Natural Language Processing (NLP) - with a focus on the application in Conditional Language Generation(for better turn representations in dialogue systems), Multilingual NLP (for low resource languages) and Hostility Detection (for content moderation) along with different applications in Deep Learning and traditional Machine Learning algorithms.

WORK EXPERIENCE

Fusemachines Kathmandu, Nepal
Machine Learning and Curriculum Engineer *July 2020 – Dec 2021*

- Worked on **clients based (US, Germany) and in-house projects** that involved all stages of **applied ML, DL and NLP** in real world data (from collection, cleaning and EDA to model building, deployment and maintenance).
- Worked as a **lead curriculum engineer** to design, create, review and refine course materials (reading materials, presentation slides, audio transcripts, auto-graded assignments, hands-on implementations, quizzes) for Fusemachines AI Education Programs: "Foundations in AI: Computer Science for AI, Micro Degree™ in Artifcial Intelligence, Machine Learning, Deep Learning, and Natural Language Processing, Strategy for implementing AI, AI for agriculture and AI in Healthcare.
- Designed and Developed fully **automated Video and Text-to-Speech(TTS) Generation System** for Fusestudio(in-house project), which focuses on creating a entire video given Google Slides presentation and audio transcript mimicking how a person presents with the same using Tacotron2, GlowTTs and MelGAN.
- Remodeled and optimized **Questions Answering and Difficulty Ranking Model** along with **Content Recommendation System** (in terms of better representations, raking, and recommendations) for quizzes, assignments, and exams using BERT, Ensemble models, Elastic Search, MongoDB, and FastAPI.

Q. I. Roberts Jr-Sr High School & Herald International College Florida, USA & Kathmandu, Nepal
Computer Science Instructor *June 2021 – Dec 2021*

- Designed, planned, implemented and instructed **daily lesson plans, coding sessions and online lectures** for the course "Computer Science for AI" to high school students of US and undergraduate BSc.CSIT final year students of Nepal.
- The class was of size **60** in Nepal and **18** in the US
- Received an **overall rating of 4.65/5** from Nepal students and **4.35/5** from US students
- The course topics include Introduction to AI, Fundamentals of CS, Python Programming, Scientifc Python(Numpy, Pandas and Matplotlib), Data Structure, Database Management, and Web Application Basics.

EDUCATION

M. Tech. in Computer Science and Engineering *Aug 2021 – Present*
Indian Institute of Technology, Hyderabad (IITH) *Hyderabad, India*
CGPA: 9/10
Advisor: Dr. Maunendra Sankar Desarkar
Area of focus: conditional natural language generation for dialogue systems and hostility detection on online social media conversation threads
Relevant Courses: Natural Language Processing, Information Retrieval, Multilingual NLP, Deep Learning, Fundamentals of Machine Learning, Software Engineering.

Bachelors in Computer Engineering *Aug 2016 – Nov 2020*
Kathmandu University *Dhulikhel, Kavre, Nepal*
CGPA: 92.30%
Relevant Courses: Artificial Intelligence, Data Structures and Algorithms, Algorithm and Complexity, Software Engineering, Probability and Statistics, Machine Learning, Speech and Language Processing, C, C++

AWARDS AND ACHEIVEMENTS

Dr. Homi Jahangir Babha Scholarship Scheme-HJBSS. **Fully Sponsored by Ministry of External Affairs, Government of India** with EdCIL and provided by the Embassy of India, Nepal to study M.Tech in Computer Engineering at IIT, Hyderabad. **1 (in CSE) of** 3 **selected out of** 10,000+ students per year through embassy screenings and college interviews, and the scholarship is worth **12 lakhs INR (self-sponsored)**. *2021 – 2023*

Golden Jubilee Scholarship (GJS). 1 of 200 out of 20,000+ recipients of the prestigious GJS awarded by Embassy of India for Nepalese students based on B.Tech academic certifications with a monthly stipend of **NPR 4,000 for 4 years.** *2016 – 2020*

Fuse Machines Artificial Intelligence Fellowship Program. 1 of 15 recipients in 2,000+ applications of Micro Degree™ in Artificial Intelligence continued to Micro Degree™ in Machine Learning and Deep Learning, worth **NPR 58,000 each**[1][2]. Selections were based on knowledge in in-person exams, interviews, and coding sessions. *2019 – 2020*

Kathmandu University Merit-based scholarship (2x). 1 out of 60, awarded for securing the highest SGPA in the Computer Engineering in the 2^{nd} and 6^{th} semesters respectively each worth of **NPR 60,000**. *2016, 2017*

POSITION OF RESPONSIBILITIES

ACM - IIT Hyderabad Student Chapter - Machine Learning Moderator 2022-2023
Indian Institute of Technology Hyderabad *Telangana, India*

- Responsible for all in college **AI/ML/NLP** discussion groups, paper reading sessions, blogs, writing groups, implementation workshops.

IT MEET v8.0 Documentation Lead and Marketing Representative 2020
Kathmandu University *Kavre, Nepal*

- **Lead of documentation team** and member of the marketing team of one of Nepal's premier annual IT events, IT Meet v8.0 with **25 different events** and participation of more than **50 tech. companies** with internships and full-time career opportunities.
- Directed **a team of 25** through multiple documentation stages for sponsorship (proposals, cost analysis, contracts, MoU) and collaboration with **10-20** companies to successfully bring in **8** different companies with total funding of **NPR 110,000**, **20%** of total funding.

IT MEET v7.0 Photography Event Organizer 1, 2 2019
Kathmandu University *Kavre, Nepal*

- Organized **all Nepal Photography Competition** (open theme), which was judged by the president of Nepal Photography Association (NPA) and the Dean of Engineering at Kathmandu University
- A collective prize pool of **NPR 25,000** was shared among the top three winners with scholarships to a photography workshop, 14*20 inch framed winning photos, and cash prizes.

Executive Board Member 2018 –2019
Kathmandu University Computer Club *Kavre, Nepal*

- An active student-run club of the Department of Computer Science and Engineering at Kathmandu University solely responsible for the majority of extracurricular activities like LTSP (Linux Terminal Server Project) and Software Freedom Day.
- Conducted **20+ workshops** (on varied topics) in collaboration with multiple guests from premium companies like **A Yomari Company**, **Fusemachines**, **Deerwalk**, F1Soft International, MIDAS and more every year.

Ambassador 2017
Em-Blood Android Application with Nepal Red Cross Society *Kathmandu, Nepal*

- Supervised a **team of ten volunteers among five different teams** in spreading awareness of the need for fresh emergency blood within different blood donation centers, hospitals, universities, schools, and blood banks.

· Involved in creating awareness posters, **an indexable database (using Google Firebase)** for health professionals, and managing help desks in every hospital **(in a distributed network of hospitals)** that patients can contact in need of fresh blood/blood donors.

RESEARCH EXPERIENCE

Conditional Natural Language Generation for Dialogue Systems IIT, Hyderabad
M. Tech. Thesis *May 2022 – Present*

· Currently working on generating better representations for in-turn conversational history for a more accurate, diverse, and human-like response in dialogue systems.
· Worked on finetuning DialoGPT-medium (Toward Human-Quality Conversational Response Generation via Large-Scale Pretraining) from Microsoft Research on the DailyDialog Dataset. [code], [Details]

Hostility Detection in Online Hindi-English Code-Mixed Conversations IIT, Hyderabad
14^{th} *ACM Web Science Conference* 2022 *(WebSci'22)* *June 2022*

· Proposed **a novel hierarchical neural network architecture** to identify hostile posts/comments/replies in online Hindi-English Code-Mixed conversations as a part of HASOC'2021.
· Adapted multilingual pre-trained models like **mBERT, XLMR, and MuRIL** to generate contextual representations for natural abstraction and selection of the relevant context by exploiting the hierarchy of the conversations.

Fake News Detection Kathmandu University
PMIS Review, Volume 1, No 1 *June 2020*

· Focused on applying NLP sentence classification to generate contextual sentence representations passed over classical machine learning classification heads to predict whether the provided sentence is fake or not with a certain degree of confidence.
· Evaluated using lexical/syntactical/grammatical/factual features based only on raw text and semantic features based on contextual representations with attentive weights.

PUBLICATION

Aditi Bagora, **Kamal Shrestha**, Kaushal Kumar Maurya, and Maunendra Sankar Desarkar. 2022. Hostility Detection in Online Hindi-English Code-Mixed Conversations. In Proceedings of 14th ACM Web Science Conference 2022 (WebSci '22). ACM, New York, NY, USA, 11 pages doi: 10.1145/3501247.3531579

Shrestha, K. , Poudyal, P. , Karki, J. , Ranabhat, D. (2022). A Machine Learning Approach to Identify Fake News. Center for Project Management and Information Systems (PMIS) Review, 1–13. http://journal.pmis.du.ac.bd/journaldetails.php?pid=2203281648465920

TECHNICAL SKILLS

Programming Languages	Python, C, C++, PHP, HTML, CSS, Bootstrap, SQL
Libraries	Pytorch, Hugging Face Transformers, Scikit-Learn, Keras, Pandas, Numpy, SciPy, Matplotlib, Flask, FastAPI, BeautifulSoup, Docker, Pytest, NLTK, Jupyter, Loguru, Poetry, Commit-Hooks
Database	MySQL, MongoDB, Firebase, Elasticsearch
Management	Git, Github, JIRA, HRM Suite, Trello, Notion, Slack
Miscellaneous	Linux, Bash, Arduino, Anaconda, Latex (Overleaf), MLFlow, Tensorboard, SSH, nbgrader, Wireshark, Visual Studio Code

PROJECTS

Natural Language Processing (NLP) Lab
IIT Hyderabad *Ongoing*

· Currently working on the design, development, and maintenance of NLP Lab of IITH hosted with Github Pages

Conditional Natural Language Generation (NLG) for Dialog Systems IIT Hyderabad
M. Tech. Thesis, supervisor: Dr. Maunendra Sankar Desarkar *Ongoing*

- Currently working on generating better representations for in-turn conversational history for a more accurate, diverse, and human-like response in dialogue systems.
- Implemented the TransferTransfo: A transfer learning approach for Neural Network-based Conversational Agents on Persona-chat dataset with training and inference pipeline
- Worked on fnetuning DialoGPT-medium (Toward Human-Quality Conversational Response Generation via Large Scale Pretraining) from Microsoft Research on the DailyDialog Dataset.
- [Details]

Zero Reference Low-Light Image Enhancement with Attention IIT Hyderabad
Dr. Sumohana Channappayya, Deep learning, AI5100 *2022*

- A low-light image enhancement task using a deep learning-based Zero-Reference Deep Curve Estimation(Zero-DCE). The idea is to use carefully formulated non-reference loss functions to convert the light enhancement as an image-specific curve estimation task.
- [Code], [Project Report], [Project Presentation]

Hostility Detection in Online Hindi-English Code-Mixed Conversations IIT Hyderabad
Dr. Maunendra Sankar Desarkar, Information Retreival, CS6370 *June, 2022*

- Proposed a novel hierarchical neural network architecture to identify hostile posts/comments/replies in online Hindi-English Code-Mixed conversations as a part of HASOC'2021
- Adapted multilingual pre-trained models like mBERT, XLMR, and MuRIL to generate contextual representations for natural abstraction and selection of the relevant context by exploiting the hierarchy of the conversations.
- [URL], [PDF], [Presentation], [Video], [Code],

Federated Semi-Supervised Medical Image Classification via Inter-Client Relation Matching IIT Hyderabad
Dr. C. Krishna Mohan, Visual Computing, CS6450 *April, 2022*

- Remodeled and evaluated **medical image classification** with the addition of Self Attention mechanism in every convolutional block: using CBAM to obtain better classification results.
- Outperformed the official implementation given a reduced dataset (only 2%) because of computational limitations
- Ranked with the best **Top 2%(A+) of the class** on the basis of two project presentations.
- [Paper], [Official Implementation], [Modification], [Presentation 1], [Presentation 2]

Cracking WPA2-PSK Wi-Fi Passphrase and Defenses IIT Hyderabad
Dr. Bheemarjuna Reddy Tamma, Network Security, CS6903 *May, 2022*

- Focused on de-authenticating and eavesdropping on the connection between an AP and clients to capture 4-way handshake messages used to brute force the passphrase using aircrack-ng tools
- Involved complete understanding of handshake protocols, wireless MITM attacks, and understanding potential defenses.
- [Project Details], [Report],

Creating a two-way frewall using raw sockets IIT Hyderabad
Dr. Kotaro Kataoka, Network Security, CS6903 *May, 2022*

- Designed and implemented a bidirectional firewall system using raw sockets with extended rules set adaptable for all protocol layers, detection of DDoS attacks, and unbiased performance examination and evaluation
- [Project Details], [Report],

Secure chat communication with Openssl and Man-in-the-middle attacks IIT Hyderabad
Dr. Bheemarjuna Reddy Tamma, Network Security, CS6903 *April, 2022*

- Implemented and demonstrated **a secure peer-to-peer chat application using openssl** along with how evil Trudy(user) cab intercept the chat messages to launch various attacks(Downgrade Attack by rejecting the request for TLS Encryption and MITM attack with two TLS connections at either end and Fake Certifcates)
- [Project Details], [Application], [Interceptor]

Network Intrusion Detection System (NIDS) using Machine Learning Techniques IIT Hyderabad
Network Security, CS6903 *March , 2022*

- A machine learning approach to detect different anomalies and **attacks like DDoS, MITM, Probing attacks, and R2L**, in network systems using classical machine learning techniques like Support Vector Machine, Decision Tree, Random Forest, Naive Bayes, K-Means, and Neural Networks with sampling techniques like SMOTE to report weighted F1 score
- [Project Details], [Dataset], [Checkpoints], [Code]

Fuse Studio, Video Automation Kathmandu, Nepal
Fusemachines Nepal *July, 2020*

- Designed and Developed **a fully automated Video and Text-to-Speech(TTS) Generation System** for Fusestudio (an in-house project), which focuses on creating a complete lecture video with subtitles given google presentations slide and audio text transcript mimicking how a person presents in a virtual presentation.
- The best sounding Mozilla TTS models used were **Tacotron2, GlowTTs, and MelGAN** with different vocoders.
- [Slide], [Script] ,[Video]

A Machine Learning Approach to Identify Fake News Kathmandu University
Semester Project, Dr. Prakash Poudyal *June, 2020*

- Focused on applying NLP sentence classification to generate contextual sentence representations passed over classical machine learning classification heads to predict whether the provided sentence is fake or not with a certain degree of confidence.
- Evaluated using **lexical/syntactical/grammatical/factual features** based only on raw text and **semantic features** based on contextual representations with attentive weights.

A Machine Learning Approach to Detect Click baits in Online News Kathmandu, Nepal
Microdegree in Deep Learning, Fusemachines Annual Journal *2020*

- Characterization of the raw textual data using multiple hand-crafted attributes combined with the contextual word vector representations and modeled using RNN and LSTM with attention to the classification of click-bait headlines in online news portals.

Self Diagnosis, Computer-Aided Diagnosis (CAD) Kathmandu University
Semester Project, Dr. Dhiraj Shrestha *2019*

- A computer-aided diagnosis approach to detect potential diseases based on symptoms.
- Users were asked a series of dynamic questions (the next question depended on the previous answer) that were converted to a feature set for making inferences.
- Baseline models were Naive Bayes, multi-layered (four) deep neural networks, and Ensemble Techniques like Gradient Boosted Tree(XG-Boost) trained in detecting Tuberculosis and Hepatitis.
- [Proposal], [Code], [Report]

Automatic Obstacle Avoidance Four wheeler
Kathmandu University *2019*

- Designed and created **an obstacle avoiding self-driving car** that uses ultrasonic sound sensors directed motor modules for detection, navigation, and avoidance using Arduino.
- [Video], [Hardwares]

Generation of National Flags using GAN
Microdegree in Deep Learning, Fusemachines *2019*

- Scrapped 600 national fags of 60 different countries to train DC-GAN using Keras API for the generation of unique national fags of our own.

Simulation of the sorting algorithms using OpenGL
Kathmandu University *2018*

- Created a simple desktop application to visualize sorting algorithms like the **Bubble sort, Insertion sort, and Merge Sort** in C++ using SDL/SFML.

RentSpace, a rental solution Kathmandu University
Semester project, Dr. Gajendra Sharma *2017*

· An android application that acts as a mediator for customers (Customer to Customer approach) to address the need to rent, lease and sell available spaces like rooms, apartments, lands, hotels, conference halls, etc., online.
· [Proposal], [Presentation], [Report]

COURSE WORK

1. **B. Tech.** 2016-2020
   Machine Learning, Artificial Intelligence, Data Structures and Algorithms, Algorithm and Complexity, Software Engineering, Probability and Statistics, Linear Algebra, Computer Architecture, Operating Systems, Human-Computer Interaction, Digital Signal Processing, Compiler Design, Speech and Language Processing, C, C++
2. **M. Tech.** 2021-2023
   Fundamentals of Machine Learning, Natural Language Processing, Information Retrieval, Deep Learning, Computer Vision, Network Security, Computer Networks, Advanced Data Structure and Algorithms
3. **Supplementary**
   - **Stanford course CS224N**: Natural Language Processing with Deep Learning 2022
   - **Hugging Face Course** (Datasets, Dataloaders, Transformers, NLP Tasks) 2022
   - DeepMind x UCL, **Introduction to Reinforcement Learning, 2015** 2019
   - **Technical Writing One**, Google Developers 2019

CERTIFICATION

1. **Deep Learning Institute(DLI), NVIDIA**
   - Fundamentals of Deep Learning — April 6, 2022
   - Accelerating Data Engineering Pipelines — February 12, 2022
   - Fundamentals of Accelerated Data Science with RAPIDS — February 5, 2022
   - Accelerated Computing with CUDA Python — January 29, 2022
   - Accelerated Computing with CUDA C/C++ — January 22, 2022
2. **AWS Certified Machine Learning – Specialty**, Amazon AWS — August 31, 2021
3. **Complete Google Slides Course** -Create Stunning Slides, Udemy — May 23, 2021
4. **Machine Learning from Begineer to Advance**, Udemy — May 27, 2021
5. **Python for Machine Learning with Numpy, Pandas and Matplotlib**, Udemy — May 27, 2021
6. **How to win Data Science Competition: Learn from Top Kagglers**, Coursera — October 1, 2020
7. **Effective Client Communication**, Fusemachines, Nepal — July 23, 2020

PARTICIPATION

1. Symposium on Artificial Intelligence for Sustainable Development — January 29, 2022
2. Online Research Paper Writing Training conducted by NIRC — May 17, 2020
3. 3^{rd} National Workshop on Machine Learning and Data Science — 30 July - 3 August, 2020
4. Webinar on cyber security and cyber space organised by Oxford Stem, Code For Change — June 28-30, 2020
5. Arduino Workshop, K.U. Robotics Club — April 25-28, 2018
6. Prixa Excellence Award for Project RentSpace, Android Application — June, 2017
7. Effective Manuscript Writing, Ethics and Plagarism by ACS — 22 July, 2022

VOLUNTEERING

1. Worked as a medical volunteer for first aid in Inter College Basketball Tournament organized by Kathmandu University Student Welfare Council 2017

2. Worked as a volunteer in all Nepal Counter Strike Competitions at IT MEET 2018, organized by Kathmandu University Computer Club 2018
3. Worked as a volunteer in Annual General Meeting of Kathmandu University Youth Red Cross Circle (KUYRCC) 2019