Yubraj Bhandari

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Education

- **BS in Physics and Mathematics, Duke University** Expected May 2027
  Relevant Courses: Physics I, Physics II, Modern Physics, Linear Algebra, Advanced Multi-variable Calculus, Differential Equations, Advanced Probability, High Dimensional Data Analysis, Data Structures and Algorithms
  Current GPA: 3.866 / 4

Skills Summary

- **Programming:** Python, Javascript, C++, Java, Data Structures and Algorithms, Github, Linux, Docker
- **Web Development:** Full stack; HTML, CSS, Tailwind, ReactJS, Django, Flask, FastAPI
- **Data and ML:** Pytorch, Pytorch-ignite, scikit-learn, Numpy, Pandas, Matplotlib, Plotly, Selenium, BeautifulSoup
- **Medical Imaging:** Monai, Nibabel, simpleITK, ITKsnap
- **Quantum Computing:** Qiskit, IBM Quantum, Pennylane

Experience

- **Center for Virtual Imaging Trials** Duke University, USA
  Undergraduate Researcher, Part-time *Oct 2023 - Present*
  - **CT-Images Segmentation Using Deep Learning:** Created nnUnet-based Deep Learning model to label organ structures in CT-images, which facilitates improvement in imaging methods used for modeling human bodies to optimize cancer and anomaly detection.
  - **3D Structures Generation Using Generative Diffusion Model:** Working independently on voxel-based 3D generation Deep Learning models to replicate organ structures in virtual human body models. Used generative diffusion to create approximations of organs using constraints of surrounding organ structures.
- **Ecstatic Paradox** Butwal, Nepal
  Backend Developer *Sept 2020 - Dec 2022*
  - **Django Developer** Built Wagtail Django backend for the website, which included content management and HR management system. Designed and Implemented MySQL database using Django ORM. Github: https://bit.ly/3u01txO

Projects

- **XCAT-3 Phantoms:**
  - Collaborated on the segmentation model and Developed a WebGL webapp using threejs to display 3D-mesh of simulated human body.
  - Published a pip package (obj2gltf) to convert obj file into gltf format for WebGL rendering.
  - *Co-author of the research paper available at: https://xcat-3.github.io/*
- **WiggleRNG (Quantum Random Number Generator):**
  - Developed a quantum random number generator using IBM's quantum computers, implementing a 100-qubit system with Hadamard gates and conducting comprehensive analysis using PCA, FFT, and various randomness tests.
  - Investigated error sources, proposed mitigation strategies, and explored methods to enhance entropy and fidelity, gaining hands-on experience with quantum computing technologies and advanced data analysis techniques.
  - Github: https://bit.ly/3Y94hV3
- **ShapeAtlas-UNet:**
  - Proposed a novel architecture integrating shape atlas information into U-Net models for improved organ segmentation in CT images.
  - Achieved significant performance gains for smaller models with minimal parameters increase at inference time
  - Demonstrated enhanced data efficiency and computational efficiency, particularly beneficial for resource-constrained environments and limited training data scenarios. Github: https://bit.ly/4iJxIq3
- **Easemed (Medical Mobile App):**
  - Built backend using FastAPI and integrated frontend mobile app to the chatbot and database.
  - Features include medical chatbot, online doctor consultation, news summary, and nearest hospital recommendation
  - Absolute winner at OIthon 2022(Kathmandu based physical hackathon). Github: https://bit.ly/46JlA1V
- **GunasoBot (Mental health relief chatbot):**
  - Built Django server, with Facebook API to build messenger chatbot with GPT-3 API and deployed to Heroku.
  - A messenger chatbot to provide services for mental health, disaster relief, and violence prevention.
  - CockroachDB Category prize at Creatica 2022 (New york based MLH hackthon with 463 international participants.) Devpost: https://bit.ly/406FjG9

Honors and Awards

- **Bronze Medalist -** International Olympiad on Astrophysics and Astronomy, 2021
- **Silver Medal -** American Mathematics Olympiad, 2021

Conferences and Workshops

- **Virtual Imaging Trials in Medicine (VITM24)** CVIT, Duke University
  Volunteered as part of Center for Virtual Imaging Trials, Duke University *2024*