ALAN DEVKOTA

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PROFILE

- Strength in Wireless Communication, RIS and Relay-assisted Massive MIMO Systems, Signal Processing, Signal Detection and Estimation, Transformer Neural Networks, Information Theory, VLSI Systems Implementation with HDL, and Embedded Systems
- Programming experience in C, C++, Python and program solving skills using OOP principles
- Self-motivated, problem-solving, analytical and collaborative individual with excellent communication skills
- Interested in Design of Physical-layer Transmission Technologies for Next-generation Wireless Systems, Massive-MIMO, IRS and Relay Networks, Simultaneous Wireless Information and Power Transfer, mmWave Communication, AI and Machine Learning, statistical signal processing, Information theory, Estimation theory, and mmWave communication systems

EDUCATION

University of Houston, Houston, TX **Running GPA: 3.802**

PhD, Electrical and Computer Engineering | Advisor: Dr. Xin Fu *Aug 2022 - Present*

- **Coursework:** Advanced Machine Learning, Advanced Computer Architecture, GPU/Heterogeneous Programming, Advanced Hardware Design, VLSI Design

Southern Illinois University Carbondale, Carbondale, IL **GPA: 3.83**

M.S. Electrical and Computer Engineering | Advisor: Dr. Gayan Amarasuriya Aruma Baduge *Jan 2020 - Aug 2022*

- **Coursework:** Advanced Wireless Communication, Digital Communications, Introduction to Information Theory, Signal Detection and Estimation, Probability and Stochastic Processes, Wireless Networks, Communication Systems, Digital Signal Processing, Implement VLSI Systs w/HDL

TECHNICAL SKILLS

- **Programming:** C, C++, Python, Core Java and Web Basics
- **Scripting:** MATLAB, Python
- **HDL, Synthesis and Verification:** Verilog RTL, SystemVerilog, VHDL, Xilinx Vivado
- **Version Control:** Git
- **Libraries:** numpy, pandas, Matplotlib
- **Machine Learning:** Pytorch, Tensorflow
- **Developer Tools:** Visual Studio Code, Jupyter Notebook, Anaconda
- **Operating Systems:** Linux, Windows

WORK EXPERIENCE AND RESEARCH

Efficient Computer Systems (ECOMS) Lab **University of Houston**

Graduate Research Assistant *Aug 2022 - Present*

- Transformer Neural Networks Attack and Defense, Multimodal Neural Networks, Convolutional Neural Network, Object Detection Transformers, Vision Transformers, Machine learning and AI, Computer Architecture, Computer vision, and Object Detection
- Adversarial Attack and Defense on Vision Transformers, Noised based Adversarial Training (Gaussian and Undervolting Noise)

Department of Electrical and Computer Engineering **University of Houston**

Graduate Teaching Assistant *Spring 2023, Fall 2023, Spring 2024*

- ECE 5357 Intro to Cybersecurity: Grade assignment and reports
- ECE 6373 Adv Computer Arch: Basic Cache Configuration Parameters Using SimpleScalar, grade assignment, and reports

Office of Information Technology **Southern Illinois University**

Technical Student, Network Security (Part time) *Jan 2022 to May 2022*

- Working with various customers, end-users, and vendors to troubleshoot issues pertaining to wired and wireless network access, DHCP, DNS, firewalls, VPN, subnetting, routing, and other network services

Wireless Communication and Information System Laboratory **Southern Illinois University**

Graduate Research Assistant *Spring 2021 - Summer 2022*

- Intelligent Reflecting Surface-Assisted Relay Networks, Simultaneously Transmitting and Reflecting Reconfigurable Intelligent Surface (STAR-RIS), and Simultaneous Wireless Information and Power transfer technology (modeling, simulation, statistical characterization, performance analysis, study of phase-shift quantization, Energy Harvesting, and achievable rate-energy trade-off).
- Modeling and simulation of Relay Assisted Cooperative Communication System, RIS-aided NOMA, and Massive MIMO systems

Department of Electrical and Computer Engineering **Southern Illinois University**

Graduate Teaching Assistant *Spring 2020, Fall 2020*

- *Electronics ECE-345:* Lab instructor, design and simulation of Electronics circuits, grade assignment and reports
- *Intro to Biomedical Imaging ECE-467:* Lab instructor, image processing, 3D image projection, grade assignment and reports
- *Digital Signal Processing ECE-468:* Lab instructor, signal processing and analysis, filter design, grade assignment and reports

Datalytics Pvt. Ltd. **Kathmandu, Nepal**

Electronics Engineer/ Graduate Researcher *Jan 2018-Jan 2019*

- Guiding, and supervising fresh graduate engineers in electrical, optical fiber communication, and telecommunication projects. Preparing technical reports. Conducting routers, switches, and cable installation projects for wired and wireless networks. Design and analysis of electrical circuits, PCB fabrication, coding of microcontrollers, system modeling and simulations.

PUBLICATIONS

- Diluka Loku Galappaththige, **Alan Devkota**, and Gayan Amarasuriya, "On the Performance of IRS-Assisted Relay System", 2021 IEEE Global Communications Conference (GLOBECOM). IEEE, 2021. (Link)
- **Alan Devkota**, " Performance Analysis of RIS-Assisted Relay Systems", Southern Illinois University at Carbondale, 2022. (Link)

NOTABLE COURSE PROJECTS

Advanced Machine Learning
- Implemented a DETR transformer for Multispectral Object Detection with ResNet50 backbone, concatenation of RGB and thermal tokens for early fusion, DETR encoder and decoder, and a MLP block is used to predict the object with bounding box.

Introduction to Information Theory
- Realized entropy in terms of the asymptotic behavior of independent and identically distributed sequence and verified the weak asymptotic equipartition property through simulation in MATLAB.

Signal Detection and Estimation
- Generated random variates, derived statistical properties, and determined the asymptotic properties of the MLE estimator, and CRLB estimator via MATLAB.

Digital Communications
- Designed and analyzed digital receivers, error control coding using MATLAB, realized communication over a bandlimited channel.

Digital Signal Processing
- Designed and realized digital and analog filters via MATLAB, Digital signal processing and analysis.

GPU/Heterogeneous Programming
- Simulated the gravitational force between n bodies in space with Python-based serial and a C++/Cuda-based parallel implementation, exploiting the massively parallel architecture provided by GPGPUs.
- Implemented a ray-tracing algorithm in C++ to perform direct illumination of spheres with parallelism using the C++ std::thread library for latency reduction.

Advanced Computer Architecture
- Investigated the performance impact of several basic cache configuration parameters, such as the L1, L2, and TLB cache size, associativity, and block size using the SimpleScalar "sim-outorder" model and the SPEC 2000 benchmark suite.

Advanced Hardware Design
- Designed a Vehicular Robotic Arm using ESP32 microcontroller and developed an Android app for control using Android Studio.

CONFERENCE PRESENTATIONS AND POSTERS

- **Conference Presentation:** "On the Performance of IRS-Assisted Relay System" at 2021 IEEE Global Communications Conference: Wireless Communications Conference (GLOBECOM), held in Madrid, Spain [Presented Online]
- **Poster Presentation:** "Harnessing Heterogeneous Healthcare Data: An Attention Neural Network Approach" at 2023 AI in Health Conference (AIHC), Hosted by the Ken Kennedy Institute at Rice University

AWARDS

- Graduate Research Assistant (Fall 2022 - Present), Graduate Teaching Assistant (Spring 2023, Fall 2023, Spring 2024), UH
- Graduate Research Assistant (Spring 2021 - Summer 2022), Graduate Teaching Assistant (Spring 2020, Fall 2020), SIUC
- High Achiever Scholarship (Undergraduate), Kathmandu Engineering College, Tribhuvan University

OTHER PROGRAMMING PROJECTS

Multimodal Object Detection Transformer with Cross-Attention across Modalities
- Developed a transformer model that integrates the information from different modalities together to enhance the prediction as well as address the challenges posed by missing modalities via cross-attention encoders.

Harnessing Heterogeneous Healthcare Data: An Attention Neural Network Approach
- I will be developing an attention neural network-based model to fuse heterogeneous healthcare data, emphasizing cross-modality attention transformer blocks for modality integration. Moreover, prompt learning will be utilized to effectively address the challenge of missing modalities in the dataset.

Performance Analysis of IRS-Assisted Relay Systems
- Investigated the performance of intelligence reflective surface (IRS)-assisted relay systems via modeling, simulation, and statistical characterization in MATLAB.

Energy Harvesting in RIS-Assisted Relay Networks
- Investigated the performance of intelligence reflective surface (IRS)-assisted relay systems for Simultaneous Wireless Information and Power transfer (SWIPT) technology, Energy Harvesting, effects of phase-shift quantization and achievable rate-energy trade-off in SWIPT technology via modeling, simulation, statistical characterization in MATLAB.