Lu, Yen-An

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Education

- **National Taiwan University** Taipei, Taiwan
  Bachelor of Science in Electrical engineering; GPA: 3.73/4.0 *Sep 2018 - Present*
  Courses: Computer Architecture, Computer-aided Vlsi System Design,Integrated Circuit Design, Machine Learning, Electronics, Switching Circuit Design, Electrical Engineering Lab (Digital Circuit)

Research Interest

My research interests involve the design of **Ultra-low-power circuits** and **Energy-efficient ML algorithms and architectures for AI.**

Research Experience

- **Academia Sinica, Taiwan**
  Summer intern & Research Assistant *April. 2022 - Sep. 2022*
  - **Recommendation system training**: Develop Process-in-memory architecture to accelerate training of recommender system.
- **Energy-Efficient Circuits and Systems Lab, NTU**
  Research Student *Mar. 2021 - Present*
  - **Keyword spotting neural network accelerator**: Implemented an energy-efficient keyword spotting accelerator that can identify 10 keywords.
- **Nanoelectronics Research Lab, NTU**
  Research Student *Mar. 2021 - Sep. 2021*
  - **Simulation of ferroelectric FET**: Researched the correlation between ferroelectric material domain size and coercive field.

Project

- **Energy-efficient keyword spotting accelerator**:
  - **Advisor**: Prof. Tsung-Te Liu
  - **Position**: Research student at Energy-Efficient Circuits and Systems Lab
  - **Skill**: Machine learning, Depthwise separable convolution neural network (DSCNN), Fold batch-norm, Post-sim& Verification
  - Designed a low-power circuit that can identify 10 keywords from one-second long utterances.
  - The design was taped out in August 2022.
- **Optimizing keyword spotting accelerator by applying quantization aware training**:
  - **Advisor**: Prof. Tsung-Te Liu
  - **Position**: Research student at Energy-Efficient Circuits and Systems Lab
  - **Skill**: Tensorflow, Quantization-Aware Training
  - Utilizing quantization-aware training on keyword spotting to minimize model weights.
- **MFCC feature extraction circuit**:
  - **Advisor**: Prof. Tsung-Te Liu
  - **Position**: Research student at Energy-Efficient Circuits and Systems Lab
  - **Skill**: Frame blocking, Hamming window, Fast Fourier Transform, Triangular Bandpass Filters, Discrete cosine transform, Log energy, Delta cepstrum
  - Designed a low-power circuit that can extract MFCC features from one-second long utterances.
  - The extracted MFCC features can be utilized to recognize keywords.

- **Training Personalized Recommendations in heterogeneous memory devices**:
  - **Advisor**: Prof. Cheng, Hsiang-Yun
  - **Position**: Research Assistance & Summer intern at Research Center for Information Technology Innovation
  - **Skill**: Ramulator, Process in memory, Recommender system
  - Applied process-in-memory architecture and heterogeneous memory(HBM and DIMM) to accelerate the training time of the recommender system.
  - Collaborated with professor in Chang Gung University.
- **FPGA Voice Recorder**:
  - **Course**: Electrical Engineering Lab (Digital Circuit)
  - **Skill**: FPGA, WM8731, I^2C & I^2S interface, On-board SRAM, PLL
  - Implemented I2C to initialize the WM8731 chip.
  - Controled the DAT/CLK signals of the WM8731 chip to make a recorder.
- **Investigating Ferroelectric Minor Loop Dynamics and History Effect**:
  - **Advisor**: Prof. Vita Pi-Ho Hu
  - **Position**: Research student at Nanoelectronics Research Lab
  - **Skill**: TCAD, Preisach model, Landau–Ginzburg framework, history effect
  - Constructed multiple phase-field models based on the time-dependent Landau–Ginzburg framework to simulate phase-field multidomain switching model.
- **Gauss-Seidel Iteration Machine**:
  - **Course**: Computer-Aided VLSI System Design(graduate level course)
  - **Skill**: Gauss-Seidel method, Clocking gating
  - Designed a low power, low latency, and low area circuit to solve a linear equation with sixteen unknown.
  - Utilized the Gauss–Seidel method and iterates 16 times to acquire the final answer.
- **Image Processing Filter**:
  - **Course**: Integrated Circuit Design
  - **Skill**: Pipeline, Synthesis, Auto place and route
  - Designed an Image Processing Filter that can process data with three different operations.
  - Area * Timing ranked third among 26 groups.

Extracurricular Activities

- **Calligraphy Club**: General Affairs Department
  - **The 26th Nine Schools of North District**: Hosted an inter-school calligraphy exhibition, attracting students from nine schools in attendance.
  - **The 12th Jinshi Group Exhibition**: Invited famous calligraphers to attend Jinshi Group Exhibition and my calligraphic works were exhibited in the exhibition.

Teaching & Volunteer experience

- **Taiwan Fund for Children and Families' volunteer**:
  - **Volunteer experience**: Organized 3-hour tutorials on school subjects every two weeks for rural children.
- **Student-Faculty Tea Party & Ancestral Thanksgiving Celebration**:
  - **Number of participants**: 720 participants including the principal.
  - **Teaching experience**: Taught overseas Chinese students, international students, and students from China how to write Spring Festival couplets to celebrate the end of the semester while giving thanks to our ancestors.

Skills Summary

- **Programming Languages**: Python, C++, Java, MATLAB, Verilog, SystemVerilog
- **Simulation Tools**: Innovus, Quartus, EPS, Lint, Primetime, TCAD
- **Framework**: Pytorch, Tensorflow
- **Operating System**: Linux, Windows
- **Languages**: English, Mandarin Chinese