

Longwei Yang

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EDUCATION

North Carolina State University

Raleigh, NC

Ph.D. in Electrical Engineering, Department of Electrical and Computer Engineering

Aug 2024 – May 2028 (Expected)

Advisor: Prof. Ali C. Gurbuz

Tsinghua University

Beijing, China

M.Eng. in Electronic and Communication Engineering, Department of Electronic Engineering

Sep 2018 – Jun 2021

Advisor: Prof. Wei Chen

University of Electronic Science and Technology of China (UESTC)

Chengdu, China

B.Eng. in Network Engineering, School of Information and Communication Engineering

Sep 2014 – Jun 2018

Probability & Statistics: Stochastic Processes, Random Signal Analysis, Detection and Estimation Theory, Elements of Information Theory

Optimization & Machine Learning: Convex Optimization, Machine Learning, Theoretical Foundations of Large-Scale Machine Learning, Big Data Analytics, Computer Vision

Signal Processing & Communications: Signals and Systems, Digital Signal Processing, Digital Imaging Systems, Principles of Communication, Advanced Digital Communications, Wireless Communications Engineering, Computer Communication Network, Digital Logic Design and Applications

SKILLS

Programming: Python (NumPy, pandas, SciPy, PyTorch, Keras), C++, SQL/MySQL, MATLAB, LaTeX, Git, Shell, web crawling

AI-Assisted Development: Heavy daily use of AI coding agents (Claude Code, Codex) for implementation, debugging, experiment automation and writing

Stochastic Calculus & Probability: Itô's lemma, Fokker-Planck equation, Anderson's reverse-time SDE, probability-flow / neural ODE, large deviation theory, extreme value theory, saddle-point approximation, Monte Carlo simulation

Statistics & Time Series: Sequential change-point detection (CUSUM, Rao test, quickest detection), time-series forecasting (ARMA, LSTM, attention), estimation theory, causal inference (uplift modeling)

Optimization: Convex optimization, derivative-free optimization (PSO, CMA-ES), sparse recovery (OMP), non-convex parameter estimation

LLMs: Tokenization (BPE), Transformer pretraining, scaling laws, data filtering and deduplication, SFT, GRPO, vLLM inference

Machine Learning: Diffusion models, classifier guidance, equivariant GNNs (EGNN), multi-task networks, LSTM/attention, reinforcement learning (Q-learning, DQN), CNN, SVM

Signal Processing: Unlimited sampling / modulo ADCs, compressed sensing, spectral estimation (MUSIC, Root-MUSIC, FFT, power delay profile), geometric positioning

Languages: Mandarin (native), English (fluent, TOEFL 96)

WORK EXPERIENCE

Huawei Technologies Co., Ltd.

Shanghai, China

Algorithm System Engineer

Oct 2021 – Jun 2023

Wireless localization and engineering-parameter calibration

- Estimated angle and time of arrival (AoA, ToA) of incoming signals from channel state information of commercial 5G base stations using MUSIC, Root-MUSIC, power-delay-profile spectrum and FFT methods.
- Since AoA and TDOA measurements across users and cells are redundant, built multiple geometry-based loss functions and searched for the optimal cell parameters (azimuth, height, location) with evolutionary algorithms (PSO, CMA-ES).
- Validated the azimuth calibration algorithm in real-world field trials in Seoul, Chengdu and Hangzhou: calibrated cell azimuth to within 10° for 80% of cells.
- The algorithm was integrated into a commercial platform and replaced costly manual drive tests for customers.

JD.com

Beijing, China

Algorithm Intern, User Growth Algorithms

Jul 2021 – Sep 2021

- Studied how red-packet and coupon incentives lift user retention and spending: analyzed large-scale user data with SQL and applied uplift (causal inference) models to estimate the incremental effect of each incentive.

RESEARCH EXPERIENCE

Robust Neural Reconstruction for Unlimited Sampling

NC State University

First author, submitted to *IEEE Transactions on Signal Processing*

Sep 2025 – Present

- Classical unlimited-sampling (modulo ADC) reconstruction assumes exact knowledge of the modulo threshold, sampling density, bandwidth and signal model, and degrades sharply under mismatch.
- Designed a single network that jointly predicts a direct unfolded waveform and auxiliary folding information (modulo threshold, reset-count sequence); a parameter-free structured branch recombines them through the physical modulo relation.
- Added a physical refinement that re-estimates the threshold, projects the structured estimate onto the known signal band, and adopts it only when it agrees with the direct estimate; its gate score identifies unreliable reconstructions.
- On a mixed benchmark spanning three signal families, one mixed-trained model achieved $6\times$ lower family-averaged NMSE than the best classical method ($12\times$ under observation noise), never diverged, and matched separately trained family-specific models.
- More accurate under folding-density changes, threshold mismatch and low-to-moderate sampling rates; reported that classical methods remain preferable for densely oversampled, nearly noiseless signals. Ablation and reliability studies support the multi-output design.

Compressive Unlimited Sampling with Integer-Aware OMP

NC State University

First author, submitted to *ICASSP 2027*

Jan 2026 – Present

- In compressed sensing, random linear measurements cause frequent folding jumps that make the difference-domain correction less sparse; proposed an ordered smooth-coded sensing operator that suppresses folding jumps.
- Proposed a two-stage OMP that rounds folding corrections to the modulo lattice and re-estimates the signal on a fresh support, unlike augmented-dictionary recovery that leaves corrections unconstrained.
- With a DCT dictionary, achieved a 71.5% recovery rate at a 10^{-3} relative-error threshold vs. 49.6% for the strongest OMP baseline.

On the Robustness of Unlimited Sampling: An Empirical Study

NC State University

First author, *IEEE Radar Conference 2026 (accepted)*

Jan 2026 – Present

- Conducted the first systematic empirical robustness study of unlimited sampling using a radar mixed-output (LFM) signal model.
- Evaluated how sampling rate, modulo threshold, threshold mismatch, additive noise, SNR and quantization bit depth jointly affect reconstruction stability.
- Found a consistent phase transition separating near-lossless reconstruction from catastrophic failure; the sampling rate needed for reliable recovery is far below the classical theoretical bound, while recovery is extremely sensitive to threshold mismatch and noise.
- Translated the findings into design guidelines for radar and other high-dynamic-range sensing systems.

Hierarchical Diffusion for Molecule Generation (S2-HDM)

NC State University

First author, unpublished manuscript

May 2024 – May 2025

- Studied the continuous-time SDE/ODE theory of diffusion models, including Itô's lemma, the Fokker–Planck equation, Anderson's reverse-time SDE and the probability-flow / neural ODE view.
- Proposed a differentiated noise schedule for scaffold and substituent atoms so that the scaffold is denoised earlier and provides a stable context for substituent exploration, unifying scaffold hopping and lead optimization end to end without pre-defined functional groups.
- An EGNN jointly predicts the noise and each atom's scaffold/substituent role (S2 classifier); a frozen property predictor supplies classifier-guidance gradients, disabled at high noise ($t > 0.4T$) where predictors are unreliable, with a time-dependent weighting factor and prediction momentum for stability.
- On QM9: atom stability 99.2%, molecular stability 91.7% (EDM 82.0%, best baseline GeoBFN 90.9%), validity 97.5%, valid & unique 96.8%. On GEOM-Drugs: best valid & stable rate (84.0%); atom stability 85.4% and validity 98.4% were below the best baselines (87.0%, 99.3%).
- Converged faster than EDM: 80% validity in 46 vs. 123 epochs (14 vs. 31 hours); 80% molecular stability in 208 vs. 631 epochs (63 vs. 159 hours). Ablations covered the noise-difference ratio, model depth and weighting schedule.

Delay Analysis of Wireless Federated Learning

Tsinghua University

IEEE JSAC (2nd author) and IEEE ICC (1st author)

Jun 2020 – Jun 2021

- Established a unified federated-learning model over wireless fading channels to characterize the training delay caused by wireless communication.
- Approximated the delay distribution via saddle-point approximation, and used extreme value theory and large deviation theory to reveal its asymptotic (tail) properties.

- Analytical and simulation (Monte Carlo) results matched within 3% error. Tools: MATLAB, CNN, SVM.

A Content Caching Strategy in Edge Computing Systems

Collaboration with Lenovo, PCT patent WO2021159304A1

Tsinghua University

Feb 2019 – Feb 2020

- Crawled and monitored hot topics across Google, Twitter and Weibo; applied quickest-detection algorithms (CUSUM, Rao test) to detect as early as possible when a monitored topic goes viral.
- Designed a caching strategy that pre-stores potentially viral videos to maximize the cache hit ratio.
- Studied the relation between infection counts and information spread in the early stage of the COVID-19 outbreak. Tools: Python, HTML, MySQL.

Radio Resource Management with Reinforcement Learning

Project owner, collaboration with Sony

Tsinghua University

Feb 2019 – Jun 2020

- Devised a two-step transmission strategy, a DQN-based active-or-sleep decision followed by beamforming weight optimization, to maximize energy efficiency in Coordinated Multi-Point (CoMP) scenarios. Tools: PyTorch, Q-learning, DQN, convex optimization.

INDEPENDENT PROJECTS

Language Modeling from Scratch (Stanford CS336)

Self-study of Stanford CS336 (Spring 2025); all assignments implemented independently

Self-directed

Dec 2025 – May 2026

- **Basics:** implemented a byte-level BPE tokenizer (training and encoding), a Transformer LM with RoPE, SwiGLU, RMSNorm and causal multi-head attention, cross-entropy, AdamW, cosine learning-rate schedule with warmup, gradient clipping, checkpointing and top- p decoding, all from scratch in PyTorch.
- Trained a 35M-parameter model (6 layers, $d_{\text{model}} = 512$, 10K vocabulary) for 1M steps (4.1B tokens, about 29 GPU hours) on TinyStories: final training loss 1.33, validation loss 1.483 (perplexity 4.41) on the full 5.5M-token validation set; also tokenized OpenWebText (11.9 GB) with a parallel tokenizer.
- **Scaling:** reproduced the Chinchilla IsoFLOPs method, then queried a training API under a 2e18-FLOP budget (choosing depth, width, heads, batch size and learning rate) to fit scaling laws predicting the compute-optimal model size, hyperparameters and training loss for a 1e19-FLOP run.
- **Data:** built a Common Crawl (WARC/WET) pretraining-data pipeline: HTML-to-text extraction, fastText language identification, PII masking (emails, phone numbers, IPs), NSFW and toxicity classifiers, Gopher quality rules, a fastText quality classifier trained on Wikipedia-referenced pages vs. random Common Crawl pages, exact line deduplication and MinHash + LSH fuzzy deduplication; tokenized the filtered data and trained a GPT-2-small-shaped model evaluated on C4 100 domains.
- **Alignment:** built SFT and vLLM evaluation for Qwen2.5-Math-1.5B on MATH with the r1-zero prompt; zero-shot answer accuracy was 2.9% (16.1% format compliance), and SFT accuracy on the 5,000-problem validation set rose from 34.9% to 41.8%, 42.6% and 48.5% with 128, 256, 512 and 1,024 examples; GRPO with clipped policy-gradient loss further raised accuracy to 63%.

PUBLICATIONS AND PATENTS

- [1] **L. Yang**, A. C. Gurbuz, F. Ahmad, “Compressive Unlimited Sampling with Smooth-Coded Measurements and Integer-Aware OMP,” submitted to *ICASSP 2027*.
- [2] **L. Yang**, A. C. Gurbuz, F. Ahmad, “Robust Neural Reconstruction for Unlimited Sampling,” submitted to *IEEE Transactions on Signal Processing*.
- [3] **L. Yang**, A. C. Gurbuz, F. Ahmad, “On the Robustness of Unlimited Sampling: An Empirical Study,” *IEEE Radar Conference*, 2026.
- [4] **L. Yang** et al., “Scaffold-Substituent Differentiated Diffusion for Hierarchical Molecule Generation,” manuscript.
- [5] L. Li, **L. Yang**, X. Guo, Y. Shi, H. Wang, W. Chen, K. B. Letaief, “Delay Analysis of Wireless Federated Learning Based on Saddle Point Approximation and Large Deviation Theory,” *IEEE Journal on Selected Areas in Communications (JSAC)*, vol. 39, no. 12, pp. 3772–3789, 2021.
- [6] **L. Yang**, L. Li, X. Guo, Y. Shi, H. Wang, W. Chen, “Saddle Point Approximation Based Delay Analysis for Wireless Federated Learning,” *IEEE International Conference on Communications (ICC)*, 2021.
- [7] **L. Yang**, X. Guo, H. Wang, W. Chen, “A Video Popularity Prediction Scheme with Attention-Based LSTM and Feature Embedding,” *IEEE Global Communications Conference (GLOBECOM)*, 2020.
- [8] W. Chen, Z. Xie, Z. Lin, **L. Yang**, X. Guo, H. Wang, “Method and Apparatus for Controlling Content Caching in Edge Computing System,” PCT patent WO2021159304A1, published Aug 2021.

POSITIONS

Research Assistant , NC State University	Aug 2024 – Present
Algorithm System Engineer , Huawei Technologies	Oct 2021 – Jun 2023
Algorithm Intern , JD.com	Jul 2021 – Sep 2021
Research Assistant , Prof. Wei Chen’s lab, Tsinghua University	Sep 2018 – Jun 2021