

# **Yixin Zhang**

 [zyxcambridge@gmail.com](mailto:zyxcambridge@gmail.com)

 +86 17521398109

 Shanghai, China

## **Algorithm Engineer**

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### **Work Experience**

**VLN Deployment Algorithm Engineer** | Robotics Subsidiary of a Listed Company | Sep. 2025 - Present

- **Project:** Vision-Language Navigation (VLN) Algorithm Deployment and Autonomous Following Robot System
- **Core Algorithm Capabilities:**
  - **Long-range Planning:** Support navigation over 150 meters, enabling path planning in complex environments
  - **Zero-shot Generalization:** Achieve autonomous adaptation in unfamiliar environments, stable operation in new scenarios without pre-training
  - **Dense Obstacle Navigation:** Break through dense obstacle challenges, safely pass through extreme scenarios with obstacle spacing less than 50cm
  - **Dynamic Obstacle Avoidance:** Real-time perception and avoidance of moving obstacles, ensuring safe robot operation
- **Model Deployment & Optimization:**
  - Successfully deployed VLN models on NVIDIA Thor and Orin platforms, achieving end-to-end inference optimization
  - Significantly reduced latency through model quantization, operator fusion, memory optimization, and other technical means
  - Completed autonomous following robot functionality development, achieving stable and reliable following performance
  - Successfully completed 42 critical test verifications, system stability and reliability reached mass production standards
  - Embodied Intelligence Algorithm Research & Deployment: Achieved engineering deployment of embodied intelligence algorithms on NVIDIA Thor and Orin platforms
- **Project Achievements:**
  - Independently completed full-stack hardware-software integration from almost "zero foundation", including Thor hardware configuration, algorithm video tuning, and all related work
  - Successfully achieved stable following functionality, overcoming the most challenging technical difficulties in the project
  - Established complete deployment processes and verification standards, laying the foundation for subsequent large-scale applications
- **Dec. 18 Demo Rescue:**
  - In an emergency situation where the voice network completely crashed during the demo, leveraged Plan B and complete control environment backup
  - Coordinated the team on-site, stabilized team morale, ensuring the second demo passed successfully
  - Demonstrated excellent project control and emergency handling capabilities under high-pressure conditions
- **Project Planning & Team Building:**
  - Developed Thor project scale-up plan based on successful demo operation
  - Applied for team expansion, planned basic work division, focused on core technology breakthroughs

- Transitioned from "solo operation" to "group army charge", pursuing greater technical breakthroughs and business value

#### **Agent Algorithm R&D (Competition Period)** | Freelance | Feb. 2025 - Sep. 2025

- **Competition Achievement:** NeurIPS 2025 Agent Tool-Augmented Reasoning Workshop - CureBench International Agent Evaluation Competition Global 2nd Place (Top 2)
- **Publication:** Co-first author of paper "CureAgent: A Training-Free Executor-Analyst Framework for Clinical Reasoning" (arXiv:2512.05576)
- **Project Background:** Participated in NeurIPS 2025 top-tier conference Workshop, built professional Agent system in biomedical field. Addressed Context Utilization Failure in small LLM-based clinical agents by proposing Executor-Analyst Framework
- **Technical Architecture:** CureBench + TxAgent RL Framework - ART Training
- **Core Work:**
  - Designed and implemented Executor-Analyst modular architecture, decoupling tool execution from clinical reasoning, mitigating reasoning deficits in monolithic models
  - Proposed Stratified Ensemble strategy, addressing information bottleneck by preserving evidentiary diversity
  - Discovered critical scaling insights including Context-Performance Paradox and Curse of Dimensionality in action spaces
  - Built medication assistant agent using Agent and Test-time Scaling technologies
  - Integrated biomedical tools (FDA, OpenTargets, PubMed) for agent tool-augmented reasoning
  - Completed initial draft of book "Self-Evolving Agents - Architecture Practice of Dynamic Memory and Continuous Operation"

#### **Deep Learning Algorithm Engineer** | Aptiv Central Electrical (Shanghai) Co., Ltd. | Aug. 2024 - Feb. 2025

- **Project:** General Obstacle Perception Algorithm R&D and End-to-End Mass Production Pre-research
- **Model Deployment Work Hierarchy:**
  - Deploy a single network
  - Deploy multiple networks, optimize performance on a single chip:
    - \* 2 backbones + 3 heads, multi-task pipeline
    - \* Shared memory and queues, instance bank
  - Unified adaptation to multiple chip frameworks (GPU+ASIC+FPGA):
    - \* Multi-chip platform scheduling framework
    - \* One codebase adapts to multiple chips
- Participated in L2++ mapless end-to-end network design, led network structure design and optimization of general obstacle OCC branch
- Responsible for chip selection, completed benchmark testing of three chip types, designed end-to-end network multi-task scheduling framework
- Established deployment work standards SOP and workflow, independently completed AI model deployment of OD and OCC branches on 2 chip types
- **Asynchronous Scheduling:** Designed asynchronous pipeline, maximizing overlap between CPU and multiple AI acceleration cores (NPU/VP), reducing total completion time
- **Race to Idle:** Compressed 1000ms tasks to 28ms (14ms\*2), enabling chips to enter low-power idle state faster
- **System-level Optimization - Multi-task Scheduling Framework:** Designed Pipeline orchestrating multiple model execution sequences in serial, parallel, or pipelined parallel modes
  - Stage A (Stage 1): Feature extraction center, equipped with two parallel machines computing Backbone\_1 (BEV) and Backbone\_2 (Temporal) respectively
  - Stage B (Stage 2): Perception analysis department, equipped with two parallel machines computing Head\_1 (OD) and Head\_2 (Map) respectively
  - Stage C (Stage 3): Decision fusion station, responsible for final Head\_3 (Predict) computation
- **Deployment & Verification Workflow (Mass Production Standards):**

- Model export & segmentation: Export PyTorch models to ONNX and segment into independent files by DAG nodes (backbone1.onnx, head1.onnx, etc.)
- Model compilation: Use hardware vendor toolchains to compile ONNX to binary bin files, complete operator fusion and quantization optimization
- Phased verification:
  - \* IO alignment: Ensure bit-by-bit consistency between deployment program and simulation script inputs
  - \* Single node verification: Compare bin file outputs with PC-side ONNX results
  - \* Multi-frame end-to-end alignment: Verify complete APP business metrics (mAP, IoU) consistency with golden reference model
- **Final Integration & Delivery:** Encapsulated as 5 core APIs conforming to standards (Init/Run/Release/GetResult/GetStatus)
- Core optimization metrics: Time latency, throughput, memory bandwidth (reduced usage), power consumption (W4A4), compute utilization (software-hardware integration)
- Adapted to automotive chips: NVIDIA Orin, Horizon J5/J6, CV3

**Model Deployment Lead / Senior Software Architect** | Innovusion Intelligent Technology (Shanghai) Co., Ltd.

| Jun. 2022 - Apr. 2024

- Recruited and built efficient deep learning deployment team, improved algorithm engineering implementation processes
- Achieved real-time AI LiDAR model inference on Jetson platform, reduced latency by 4x
- Developed ADAS code completion VSCode plugin, improved autonomous driving algorithm development efficiency
- Explored large model inference deployment, successfully deployed Ollama, llama.cpp, vllm, TensorRT-LLM, mlc-llm and other frameworks
- Successfully ran yi-34B model on Mac M1, ran llama3-8b model on Android platform using mlc-llm
- Improved MLOps process based on NVIDIA Drive Sim, generated 100K frame simulation dataset
- Achieved joint training of simulation and real data, improved accuracy by 10 percentage points
- **[Model Deployment]**
  - Performance analysis tool application: Used Nsight Systems and Nsight Compute to locate deployment bottlenecks, solved critical performance issues
  - LiDAR vehicle-side framework construction: Achieved LiDAR point cloud detection and semantic segmentation network deployment iteration, including rangeimage and pillar voxel network real-time inference, designed end-to-end unified detection-segmentation framework
  - NVIDIA technical collaboration: Established direct communication channel with Jetson team, analyzed model bottlenecks and obtained optimization support, reduced overall latency by 75% (one quarter) through task dependency optimization
  - Horizon ecosystem integration: Secured hardware and software development support for Horizon J5 platform, completed full perception algorithm migration
  - Technical challenge breakthrough: Collaborated with SPConv core development team to solve custom sparse convolution operator deployment challenges

**Senior Algorithm Engineer** | Shanghai Xuehu Technology Co., Ltd. | May 2019 - May 2022

- Built algorithm team from scratch, constructed V2X perception algorithm engineering implementation process
- Designed FPGA hybrid quantization scheme, refined to multiplication and addition operation levels
- Successfully mass-produced 100+ MEC devices, achieved 5M+ RMB in software-hardware revenue, served nearly 10 customers
- **[Challenges & Solutions]**
  - Accuracy loss issue: Proposed hybrid quantization strategy for 30-point accuracy loss caused by quantization
  - Quantization scheme: Implemented PTQ (Post-training Quantization), referenced QAT (Quantization-aware Training) full process
  - Quantization algorithm comparison: Systematically evaluated error distribution characteristics of minmax, KL divergence, and MSE quantization methods

- Tool development: Independently developed accuracy comparison tool, visualized error heatmaps under different quantization parameters
- Training-inference consistency: Solved training/inference accuracy deviation from quantization principle formulas
- Customer trust building: Resolved latency concerns through theoretical derivation and measured data dual verification

- **[Implementation Method]**

- Core optimization flow: Build hash table → Generate Rulebook → Gather input features into dense matrix M\_in → Execute GEMM → Scatter output results

- **[LiDAR MLOPS]**

- Layered strategy: Key feature extraction layers retain floating-point precision, classification head and post-processing layers quantized to INT8
- Quantization algorithm: Adopted KL divergence calibration method, used calibration set for data distribution matching
- Network decomposition: Decomposed complex convolution operations into basic multiply-add operations, adapted to FPGA integer computation architecture
- Built deep learning deployment process based on ZCU104 IP domain controller, achieved 10x speed improvement

- **[Technical Implementation]**

- Created V2X solution documents based on projects and existing company solutions, provided on-site explanations, acquired 10+ customers
- Conducted on-site development at project locations, implemented 10+ pilot projects in various cities across China
- Promoted FPGA LiDAR acceleration IP adaptation to RoboSense, Hesai, Ouster, Livox and other LiDAR companies

- **[Project Revenue Proof]**

- Mass-produced 100+ MEC devices based on AMD Xilinx ZCU104, achieved 2M+ RMB in software-hardware revenue
- Maintained nearly 10 customers with long-term cooperative relationships

**Algorithm Engineer** | DeepBlue Technology (Shanghai) Co., Ltd. | May 2018 - Feb. 2019

- **Reporting to:** Technical Manager

- **Keypoint-based Object Detection Algorithm Engineering:**

- Implemented OpenPose-based human keypoint detection algorithm, independently completed C++ inference pipeline
- Algorithm improvements included Gaussian response enhancement, Heatmap radius adjustment, and intermediate supervision mechanism
- Innovatively implemented peak-based NMS method replacing traditional IoU approach

- **Model Deployment & Optimization:**

- Deployed models on P100 GPU, single card supported 28 models for parallel inference
- Optimized OpenPose inference latency to within 500ms

- **Algorithm Validation:**

- Built dense scene test set, achieved 99% keypoint recognition accuracy in complex environments

- **Other Achievements:**

- Obtained 3 invention patent authorizations
- Developed cloud-based product recognition service based on keypoints

**Deep Learning Engineer** | Youbang Network Technology Co., Ltd. | Dec. 2017 - Apr. 2018

- **Reporting to:** Technical Manager

- **ADAS System Development:**

- Developed pedestrian and vehicle object detection algorithms, combined with image segmentation technology to achieve lane detection
- Optimized networks on embedded platforms such as RK3399, significantly improved detection speed
- Used TensorFlow Lite for Android model migration and quantization optimization

- **Human Pose Recognition:**

- Implemented lightweight human keypoint detection based on MobileNet architecture
  - Completed algorithm implementation using Caffe2 and TensorFlow frameworks respectively
  - Successfully ported to Android devices, supporting real-time inference
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## Education

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**Bachelor of Network Engineering** | North China Institute of Aerospace Engineering | Sep. 2010 - Jun. 2014

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## Highlights & Publications

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### Publications:

- **CureAgent: A Training-Free Executor-Analyst Framework for Clinical Reasoning** (arXiv:2512.05576). Ting-Ting Xie, Yixin Zhang. NeurIPS 2025 Workshop - CURE-Bench Competition 2nd Place Solution. [arXiv:2512.05576](https://arxiv.org/abs/2512.05576)

### Book:

- Authored book "Self-Evolving Agents - Architecture Practice of Dynamic Memory and Continuous Operation", currently completed initial draft and entered publisher's three-review and three-proofreading stage, planned to be published by Publishing House of Electronics Industry

### Competition Achievement:

- NeurIPS 2025 Agent Tool-Augmented Reasoning Workshop - CureBench International Agent Evaluation Competition Global 2nd Place (Top 2)
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## Selected Projects

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### [Project: General Obstacle Perception Algorithm R&D and End-to-End Mass Production Pre-research]

- **Project Goal:** Develop general obstacle detection algorithm, achieve open-scene generalized perception based on physical laws (depth distribution and semantic constraints), pre-research end-to-end deployment solution for automotive-grade low-power platform (16W)

- **Core Technical Breakthroughs:**

- Paradigm shift: From 'learning object shapes' to 'verifying physical laws', achieving 'perceiving existence without recognizing shapes' generalization capability through depth distribution modeling and semantic constraint verification
- Scene optimization: Enhanced vertical edge gradient constraints in building areas, reduced false detection risk of suspended objects
- Negative obstacle detection: Utilized geometric features such as height mutations and point density anomalies to achieve detection of negative obstacles like potholes and ditches

- **Core Challenges & Solutions:**

- Challenge: Contradiction between end-to-end perception (OD+Map+Predict+Plan) computation and 16W power consumption limit
- Solutions:
  - \* 1) Model lightweighting: Optimized OD and Map model parameter structures
  - \* 2) Hybrid quantization strategy: FP16+INT8 hybrid quantization, combined offline initialization with online calibration, accuracy loss <2%
  - \* 3) Custom operators: Developed key operators such as voxelization and deformable aggregation, improved computational efficiency

- **Key Results:**

- End-to-end inference speed improved 10x, successfully deployed to target platform
- Hybrid quantization method applied for technical patent
- Verified feasibility of physics-based perception paradigm in open scenes

- **Forward-looking Research:**

- Solutions for gradient mismatch issues in mixed precision training
- Operator fusion solutions under edge-side memory bandwidth constraints

### [Project: LiDAR Inference Framework]

- **Challenges & Solutions**

- **Accuracy Loss Control:** Proposed hybrid quantization strategy for 30-point accuracy loss caused by quantization
- **Quantization Scheme Implementation:** Built PTQ/QAT full process, supported minmax, KL divergence, MSE three calibration algorithms
- **Error Analysis Tool:** Independently developed accuracy comparison platform, visualized error heatmaps under different quantization parameters
- **Training-Inference Consistency:** Solved floating-point/integer computation deviation from quantization principle formulas
- **Customer Trust Building:** Reduced latency to 1/3 of customer requirements through theoretical derivation + measured data dual verification

- **Technical Implementation**

- Core optimization flow: Build hash table → Generate Rulebook → Gather input features → Execute GEMM → Scatter output results
- Quantization algorithm comparison: Systematically evaluated error distribution of three methods across different layers, selected optimal combination strategy

- **Business Value**

- Mass-produced 100+ MEC devices based on AMD Xilinx ZCU104
- Achieved 2M+ RMB in software-hardware revenue, served nearly 10 customers
- Mass production for Shaanxi Heavy Duty Automobile

### [Project: NeurIPS 2025 CureBench Medical Agent System (CureAgent)]

- **Project Role:** NeurIPS 2025 Workshop Project Lead / Core Developer, Co-first Author

- **Project Background:** Participated in NeurIPS 2025 top-tier conference Workshop, built professional Agent system in biomedical field. Addressed the **Context Utilization Failure** problem in current clinical agents built on small LLMs (e.g., TxAgent), where models successfully retrieve biomedical evidence but fail to ground their diagnosis in that information. Proposed the Executor-Analyst Framework that decouples syntactic precision of tool execution from semantic robustness of clinical reasoning.

- **Technical Architecture:** CureBench + TxAgent RL Framework - ART Training

- **Executor-Analyst Framework:** Modular architecture orchestrating specialized TxAgent Executors with long-context foundation model Analysts, mitigating reasoning deficits in monolithic models

- **Stratified Ensemble Strategy:** Significantly outperforms global pooling by preserving evidentiary diversity, effectively addressing the information bottleneck
- **Training-free Architectural Engineering:** Achieves state-of-the-art performance on CURE-Bench without expensive end-to-end finetuning

#### • Core Technical Breakthroughs:

- **Context-Performance Paradox:** Discovered that extending reasoning contexts beyond 12k tokens introduces noise that degrades accuracy
- **Curse of Dimensionality in Action Spaces:** Expanding toolsets necessitates hierarchical retrieval strategies
- Integrated biomedical tools (FDA, OpenTargets, PubMed) for agent tool-augmented reasoning
- Implemented Test-time Scaling technology to improve agent performance during testing phase
- Conducted agent training and optimization based on reinforcement learning framework (TxAgent RL Framework)

#### • Project Results:

- Achieved global 2nd place (Top 2) in CureBench International Agent Evaluation Competition
- Published paper to arXiv (arXiv:2512.05576), code released open-source
- Successfully built practical biomedical field agent system, providing scalable, agile foundation for next-generation trustworthy AI-driven therapeutics

### **Large Model Fine-tuning & Deployment Projects**

- Deployed Baichuan2 model on AWS as OpenAI-compatible format, achieved LoRA fine-tuning
  - Used LLaMA-Factory on Alibaba Cloud platform for large model fine-tuning and optimization
  - Deployed Start Code model to HuggingFace as API service
  - Optimized 8B model performance to equivalent of 671B model level
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### **Academic & Competition Experience**

- 2025: NeurIPS 2025 Agent Tool-Augmented Reasoning Workshop - CureBench International Agent Evaluation Competition Global 2nd Place (Top 2)
  - Oct. 2021: CVPR Workshop - 3D Object Detection Algorithm (9th Place)
  - Multiple Hackathon Awards:
    - Oct. 2023: Baichuan Hackathon - US Traditional Chinese Medicine Customer Acquisition Agent Project (Special Award)
    - Sep. 2023: Google I/O Hackathon - Stable Diffusion Computing Sharing (3rd Place)
    - Jul. 2023: World AI Hackathon - Leadership Tracking & Training (2nd Place)
    - Sep. 2019: AngelHack Shanghai - Leadership Tracking & Training (1st Place)
    - Jul. 2017: Global AI Hackathon - Fake News Detection (Champion)
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### **Technical Community Involvement**

- Google Machine Learning Developer Expert, conducted 4 technical lectures annually for 5 consecutive years, impacted 11,874 people