NING KANG, Ph.D.

Research Fellow | Intelligent Hardware Systems

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PROFESSIONAL SUMMARY

Hardware systems engineer with 10+ years designing embedded systems from concept to human-validated prototypes. Delivered a portable MedTech cryotherapy device achieving clinical-grade performance on consumer power banks within 6 months in Singapore; invented a world-first planar omnidirectional wireless charging system featured on IEEE TPEL cover. Expert in system-level design, power electronics, thermal management, and embedded control algorithms. Experienced in full-stack development from PCB design to STM32 and FPGA platforms—wrote 10,000+ lines of firmware code for a single algorithm before ChatGPT existed. Combines solid traditional programming skills with AI tool mastery, accelerating development cycles using AI-powered tools (Claude Code, Cursor, Gemini) integrated into daily workflow.

PROJECT EXPERIENCE

Portable Smart Cryotherapy System | Research Fellow & Project Leader
Nanyang Technological University | 2025–2026

Led team from concept to clinical-ready prototype: designed a battery-powered therapeutic cooling device for clinical rehabilitation, achieving power bank operation while commercial systems require 200W+ wall power and weigh 2× more.

- Built complete system **from scratch**: thermal modeling, circuit design, PCB layout, firmware development, and clinical validation—demonstrating full-stack hardware engineering leadership
- Developed novel dynamic thermal model incorporating human thermoregulatory response, reducing design power requirements by **79%** (exceeding 60% theoretical prediction)
- Engineered custom control system: **STM32G4** MCU, **PT100 RTD** sensors (±0.1°C accuracy), **USB-C PD 89W**, dual TEC modules with closed-loop thermal control
- Achieved **11.9°C** therapeutic skin temperature with **50+ min** battery life on 25000 mAh power bank—exceeding 30-min clinical requirements by **67%**
- Validated through human trials with IRB approval; paper submitted to **IEEE EMBC 2026**

FluxFlow: Omnidirectional Wireless Power System | Researcher & Project Leader
NTU & Shanghai Jiao Tong University | 2019–2024

Invented 3D Magnetic Field Shaping technology enabling wireless power transfer to devices in any position and orientation—world's first planar-transmitter omnidirectional charging system, prototypes and patents filed.

- Pioneered 2D planar coil array control algorithms for 3D magnetic field synthesis; programmed **10,000+ lines** of C code for STM32 and FPGA **before LLMs existed**
- Achieved **97.0%** rectifier efficiency and **91.6%** system efficiency at **120W** output; **82%** dc-dc efficiency at **45W** for perpendicular receivers
- Designed real-time **6-DoF** receiver position detection and power optimization system completing in **25ms**
- Delivered 1W wireless power to capsule robots with full spatial freedom; transmitted high-resolution images in ex vivo digestive system via Wi-Fi (**IEEE RAL**, Jan 2025)
- **IEEE TPEL Cover Feature** (Sept 2024)—first among 50+ papers; received **9/10 reviewer rating**, highest among lab's fifty journal papers
- **Top 10 Award** in IEEE Global Wireless Power Competition; reviewer comment: "very strong research contribution"

AI-Powered Engineering & Productivity Tools | Developer

corning-ai.com | 2024–Present

Built suite of AI-powered tools demonstrating rapid cross-domain skill acquisition and AI-era productivity:

- AI Legal Assistant: Intelligent document processing with Python, OCR, and real-time AI Q&A tailored for Singapore Small Claims Tribunals—like a lawyer with perfect memory across thousands of pages
- cooling_mcu: STM32G474 firmware for cryotherapy system—developed, verified, and tested 10+ modules in 2 weeks with Claude Code
- claude-code-wrapped: Analytics dashboard for Claude Code usage statistics with wrapped-style annual reports; showcases data visualization and full-stack development skills

TECHNICAL SKILLS

Embedded Systems: STM32 (C/C++), FPGA (Verilog), USB-C PD protocol, I2C/SPI/UART, PWM, ADC/DAC

Hardware Design: Altium Designer, Ansys HFSS, SolidWorks, Keysight ADS

Programming: Python, C/C++, MATLAB, Verilog, PyTorch

Algorithms: Control Systems, Thermal Modeling, Signal Processing, Machine Learning, Deep Learning

AI-Powered Workflow: Claude Code, Cursor, Antigravity, Nano Banana Pro, Manus—daily integration for accelerated prototyping, code generation, and documentation

Domain Expertise: Wireless Charging, Thermal Management, MedTech, Robotics

EDUCATION

Ph.D., Electronic Science and Technology

Shanghai Jiao Tong University (SJTU) | 2017 – 2022 | GPA: 3.55/4.0

B.E., Information Engineering

Nanjing University of Aeronautics and Astronautics (NUAA) | 2013 – 2017 | Core GPA: 4.3/5.0 | Ranking: 2/139

SELECTED PUBLICATIONS

- **Kang N**, Liu M, Ma C, et al. "Analysis and Implementation of 3D Magnetic Field Shaping via a 2D Planar Transmitting Coil Array." **IEEE Transactions on Power Electronics (TPEL)**, Apr. 2021. *[9/10 reviewer rating—highest in lab]*
- **Kang N**, Lee CHT, et al. "Magnetic Field Projection and Current Phase Control in a 2-D Planar Transmitting Coil Array." **IEEE Transactions on Power Electronics (TPEL)**, Sept. 2024. *[Cover Feature]*
- **Zheng T, Kang N**, Lee CHT, et al. "Wireless Powered Capsule Robots with a Wide Locomotion Range and Random Orientation via Planar Transmitting Coils." **IEEE Robotics and Automation Letters (RAL)**, Jan. 2025.

HONORS & AWARDS

- 194 Google Scholar Citations with rapid growth trajectory (14% increase in 2 months)
- IEEE TPEL Cover Feature (Sept 2024)—first among over 50 papers in the issue
- Top 10 Award, IEEE Global Wireless Power Competition (2022)
- NTU College of Engineering Annual Magazine (2024)—First 3D magnetic field visualization in wireless charging
- National Scholarship, Ministry of Education, China