

# Sungwon Kim

## AI Research Scientist

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## Experience

July. 2020 – present : **AI Research Scientist, Intel path finding group.** Lead many AI/ML projects

-Graph Neural Network model in EDA design

Developed circuit design tools based on GNN. Present in 2021 Design Automation Conference

-Rotary Embedding Transformer based IP contents optimization

-Machine Learning based design technology co-optimization model

-Deep learning based computer vision/design-validation software development

Jan. 2012 – July. 2020 : **Modeling Engineer, Intel Advanced Design**

-Intel transistor compact model development

-Intel Dev Model/Calibration CAD software development (currently used in production line)

-Machine learning based device optimization tool development

-Machine learning based noise analysis and signal processing (owner of noise model)

Jan. 2005 – Dec. 2011 : **Research Scientist, Intel Design Technology Solution**

-Large scale CAD/Scientific software development

-Computational imaging/EM modeling and software development

-Computational geometry/Numerical optimization tool development

## Research Interests

- Graph Neural Network based Circuit design (2021 DAC conference)
- Computer vision and machine learning.
- Machine learning based multi-scale optimization.

## Education

Ph.D - *Pennsylvania State University, PA*

M.S - *Korea Advanced Institute of Science and Technology, Korea*

B.S - *Yonsei University, Korea*

## Research Publications in Intel

1. Dual Feature Vector Hetero Graph Neural Network (DFV-GNN) based Post-Layout Parasitic Estimation, 2021 Design Automation Conference.
2. CMOS-based cryogenic control of silicon quantum circuits, *Nature* volume 593(2021), pp 205–210

(2021)

3. A Scalable Cryo-CMOS Controller for the Wideband Frequency-Multiplexed Control of Spin-Qubits and Transmons, 2020 IEEE Journal of Solid State Circuits, Vol 55(2020), 11, pp 2930-2946

4. A Scalable Cryo-CMOS 2-to-20GHz Digitally Intensive Controller for  $4 \times 32$  Frequency Multiplexed Spin Qubits/Transmons in 22nm FinFET Technology for Quantum Computers, 2020 IEEE International Solid-State Circuits Conference. Selected as the ISSCC 2020 Jan Van Vessel Award for Outstanding European Paper

5. Roy, Ananda; kim, Sungwon; Mudanai Siva; “An Improved Flicker Noise Model for Circuit Simulation”, IEEE Transactions on Electron Devices, Vol 64 (2017), No 4, pp. 1689-1694

### **Other Publications**

1 Malkova, Sungwon Kim, and V. Gopalan “Symmetrical analysis of the defect level splitting in two-dimensional photonic crystals,” Journal of Physics: Condensed Matter as a Topical review, 15, 4535 (2003)

2 Kun-Wook Chung, Sungwon Kim, and Shizhuo Yin “Design of a highly nonlinear dispersion-shifted fiber with a small effective area by use of the beam propagation method with the Gaussian approximation method”, Optics Letter. 28, 2031 (2003)

3 D. Scrymgeour, N. Malkova, Sungwon Kim, and V. Gopalan “Electro-Optic control of Superprism in Photonic Crystal”, Appl. Phys. Lett, 82, 3176 (2003)

4 N. Malkova, Sungwon Kim, and V. Gopalan “Strain tunable light transmission through a  $90^\circ$  bend waveguide in a two-dimensional photonic crystal,” Appl. Phys. Lett, 83, 1509 (2003)

5 N. Malkova, Sungwon Kim, and V. Gopalan “Jahn-Teller Effect in Two-Dimensional Photonic Crystals,” Physical Review B, 68, 045105 (2003)

6 N. Malkova, Sungwon Kim, and V. Gopalan “Symmetrical Analysis of Complex Two Dimensional Hexagonal Photonic Crystals,” Physical Review B, 67, 125203 (2003)

7 Sungwon Kim and Venkatraman Gopalan “Strain-Tunable Photonic Bandgap Crystals,” Appl. Phys. Lett. 78, 3015 (2001)

### **Skill Set**

Software:

NLP/RAG/LangChain/LlamaIndex/C++/C/Python/Pytorch/Tensorflow/Java/Unix/OpenCV/Go/MIPS

Developing mathematical AI/ML software for solving complex multi scale real world problems