Sunpill Kim **Last update: Sep 27, 2022**

CONTACT INFORMATION

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RESEARCH BACKGROUND

- **Deep Learning**: Deep Learning based Biometric, Face Recognition.
- **Cryptography**: Zero-Knowledge Proofs, Verifiable Computing.

EDUCATION

Hanyang University, Seoul Mar 2020 - Present

- Ph.D. Department of Mathematics, GPA: **3.93/4** – via 52 credits.
- Advisor: Prof. Jae Hong Seo.

Hanyang University, Seoul. Mar 2015 - Feb 2020

- B.S. Department of Mathematics, GPA (Major): **3.53/4** (**3.63/4**)– via 130 credits.
- Thesis: *Fuzzy Extractor for Face Recognition.*

RESEARCH PROJECTS

Deep Learning based Biometric

- **Development of Encrypted Face Template DB Search Technology**
  Supported by CRYPTOLAB, Researcher, July 2022 - June 2023.
- **Research on Biometric Information Extraction Threats and Protection Methods in Deep Learning-based Face Recognition**
  Supported by Korea Institute of Information Security & Cryptology (KIISC), Researcher, Mar 2022 - Nov 2022.
- **Development of Fuzzy Extractor Based on Real Numbers**
  Supported by Samsung Electronics, Research Associate, Dec 2018 - Dec 2019.

Zero-Knowledge Proofs & Verifiable Computing

- **A Study on Cryptographic Primitives for SNARK**
  Supported by Institute of Information & Communications Technology Planning & Evaluation (IITP), Research Associate, Apr 2021 - Dec 2026.
- **Research on Incrementally Verifiable Computation Design Technique and Application Method**
  Supported by National Security Research Institute (NSR), Researcher, Apr 2021 - Oct 2021.
- **Research on Post-Quantum Non-Interactive Zero-Knowledge Proofs**
  Supported by National Research Foundation of Korea (NRF), Research Associate, Mar 2020 - Feb 2025.
- **Research on Post-Quantum Zero-Knowledge Proofs Design Technique and Application Method**
  Supported by National Security Research Institute (NSR), Research Associate, Apr 2020 - Oct 2020.
- **Research on Lattice-Based Zero-Knowledge Proofs Design Technique**
  Supported by National Security Research Institute (NSR), Research Associate, May 2019 - Oct 2020.

Others

- **Secure Multi-party Approximate Computation**
  Supported by Samsung Science & Technology Foundation, Researcher, Sep 2021 - Aug 2024.
- **A Study of Functional Encryption and Its Core Techniques**
  Supported by Institute of Information & Communications Technology Planning & Evaluation (IITP) & National Research Foundation of Korea (NRF), Research Associate, Aug 2018 - Jul 2021.
- **Cryptographic Properties of Lattices**
  Supported by National Research Foundation of Korea (NRF), Research Associate, Jul 2018 - Feb 2020.

Publications

1. **Sunpill Kim**, Yunseong Jeong, Jinsu Kim, Jungkon Kim, Hyung Tae Lee, and Jae Hong Seo, IronMask: Modular Architecture for Protecting Deep Face Template, In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, pages 16125-16134, 2021. (acceptance rate 23.4%)
2. Seunghun Paik, **Sunpill Kim**, and Jae Hong Seo, Analysis on Locality Sensitive Hashing-Based Biometric Template Protection Schemes, *IEEE Transactions on Information Forensics & Security*. (submitted)
3. Bora Jeong, **Sunpill Kim**, Seunghun Paik, and Jae Hong Seo, Attack on Secure Triplet Loss, *IEEE Access*. (submitted)
4. **Sunpill Kim**, Hoyong Shin, and Jae Hong Seo, Deep Face Template Protection in the Wild, *Pattern Recognition*. (submitted)

Experience

Work Experience

- **Ph.D. Student Researcher** Starting Jan 2023
  Computer-Aided Cryptography for Zero-Knowledge Proofs and Verifiable Computing
  Agency for Science, Technology and Research (A*STAR), Singapore
- **Graduate Assistant Representative** Jul 2021 - Present
- **Teaching Assistant**
  - Fall 2021: Math Capstone PBL, Math Lab Internship 3
  - Fall 2020: Math Capstone PBL
  - Spring 2020: Number Theory
- **Research Intern** Jul 2018 - Feb 2020
  Development of Fuzzy Extractor Based on Real Numbers
  Cryptology & Algorithm Laboratory
  - Fuzzy Extractor (FE) is a cryptographic algorithm that generates the same output for the input with a slight noise coming from the fuzziness of input. Typical Fuzzy data include biometric information such as a face, fingerprint, and iris. We develop FE based on real number and apply to ArcFace, which is a state-of-the-art face recognition algorithm.

Others

- **Academic Seminar** Apr 2019 - Nov 2019
  "Security of Biometric Authentication"
  College of Natural Science, Hanyang University
  - We investigate the security of the face authentication system in terms of cryptography. Using MXNet based DCGAN and modified NbNet, it succeeded in restoring the image from the template of ArcFace, proving that the current face recognition system is unsafe.
- **Summer/Winter Schools**
  - Summer School on Cryptography 2018, 2019*
    National Institute for Mathematical Sciences, Korean Mathematical Society*
- **Coursera Certificate**
  - Getting Started with AWS Machine Learning (Amazon Web Services) Feb 2022
  - Convolutional Neural Networks (DeepLearning.AI) Jun 2019
  - Improving Deep Neural Networks (DeepLearning.AI) May 2019
  - Structuring Machine Learning Projects (DeepLearning.AI) May 2019
  - Neural Networks and Deep Learning (DeepLearning.AI) May 2019
  - Machine Learning (Stanford University) Mar 2019

Technical Skills

- *Programming Languages*: Python, Numpy, Pytorch, MXNet.
- *Technical Softwares*: MATLAB, LaTeX.

Talks & Presentations

Conference

- IronMask: Modular Architecture for Protecting Deep Face Template
  1. 2021 KAIC Fall Meeting, Virtual, 5 Nov 2021
  2. CVPR 2021, Virtual, 25 June 2021
- Deep Face Template Protection in the Wild
  1. 2022 KMS Spring Meeting, Virtual, 28 Apr 2022

Honors & Awards

Awards

- ***Special Prize***, National Cryptographic Technology Contest. Sep 2022
  National Intelligence Service, Republic of Korea
  "Deep Face Template Protection in the Wild"
  $1000
- ***CUM LAUDE***, Graduate Honors. Feb 2020
  Hanyang University
- ***Excellence Prize***, Academic Seminar. Nov 2019
  College of Natural Science, Hanyang University
  "Security of Biometric Authentication"
  $300
- ***Dean's list*** 2018 (Spring, Fall), 2019 (Spring)
  Hanyang University

Scholarships

- **The Samil Scholarship** Mar 2022 - Feb 2023
  The Samil Foundation
  $10000
- **Teaching Assistant Scholarship** Mar 2021 - Present
  Hanyang University
  $6000/year
- **HY-IN Scholarship** Mar 2020 - Present
  Hanyang University
  Half Tuition for 2 years (≈$6000/year)
- **Hyung Namjin Scholarship** Mar 2019 - Feb 2020
  Hyung Namjin Scholarship Foundation
  $4000
- **Wooin Scholarship** Sep 2018 - Aug 2019
  Wooin Scholarship Foundation
  $4000
- **CSAT Scholarship** Mar 2015 - Feb 2020
  Hanyang University
  Half Tuition for 4 years (≈$4000/year)

Services

External Reviewer

- ASIACRYPT 2021; ProvSec 2020