INFINEON TECHNOLOGIES

ABOUT INFINEON

Infineon is a one of the largest semiconductor manufacturers worldwide headquartered outside of Munich, Germany.

INFINEON'S MAIN PRODUCTS

- Integrated circuits
- Microcontrollers
- Communications technologies
- Power electronics

INFINEON'S CHALLENGE

Integrating fingerprint recognition technology onto credit cards, thereby increasing the security of the card via authenticating the identity of the credit card holder.

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We are always looking at what's the leading edge of what's possible. When you have your chip-enabled smart card, we're looking at: how can we provide the best product for our customers? What could the leading edge of innovation be there? What is everybody going to be doing 5-10 years from now? We have to get out in front of that."

–Steve Hanna, Distinguished Engineer
 Infineon Technologies

BACKGROUND ON INFINEON'S FINGERPRINT RECOGNITION CHALLENGE

Infineon produces 40-50 percent of the market share of payment chips in credit cards today. Many believe that the next generation of credit cards could have the ability to perform fingerprint recognition to ensure that the card holder is indeed the owner or approved user of the credit card. A successful system would reduce instances of fraud.

Bringing this idea to fruition involves several challenges. First, a credit card-based fingerprint recognition system must be able to perform on extremely low amounts of power. Such a system would have to be able to scan one's fingerprint and compare it with the fingerprints of approved card users that have been onboarded to the credit card, all while utilizing very small amounts of power. This is because the payment chip in a credit card only receives a very small amount of power via induction, when it is inserted into credit card payment machines. Second, given the size of credit cards, the fingerprint recognition system would need to operate on a very limited amount of circuitry.

CyLab | Carnegie Mellon University
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Lightweight quantized neural networks:
A POTENTIAL SOLUTION TO MEET INFINEON'S CHALLENGE

Professor Shawn Blanton's research team is exploring the possibility of using neural networks to perform fingerprint recognition. Given the constraints of Infineon's target application — credit cards that receive very low amounts of power and provide very limited physical space to work with — Blanton's group is particularly focusing on "lightweight" neural networks, which require smaller amounts of energy to operate than typical neural networks.

Inside a typical neural network, massive amounts of mathematical operations are being executed, requiring an abundance of energy. To work around this, Prof. Blanton's group has come up with a mathematical approximation scheme that still achieves the required accuracy. These "lightweight" neural networks perform much simpler math, and thus require significantly less energy to operate.

CYLAB RESEARCHERS INVOLVED
Shawn Blanton, professor, Ken Mai, professor, Department of Electrical and Computer Engineering

IMPACT OF THE CYLAB-INFINEON PARTNERSHIP

With support from Infineon Technologies, Prof. Blanton's group has shown that, indeed, it is possible to perform fingerprint recognition at high accuracy using lightweight neural networks.

We're still able to achieve fingerprint recognition with the required accuracy, but our approximation allows us to do it at much lower power. That's our secret sauce."

– Shawn Blanton, professor
  Electrical and Computer Engineering

Infineon came to us and said, 'We think your low-power technologies in deep neural networks may be a solution for us. See if you can explore this particular application and see if you can meet our requirements on power, how much memory we can provide, and how much compute power we can provide."

– Shawn Blanton, professor, Electrical and Computer Engineering

For assistance in designing the collaborative engagement that best fits your needs, please contact us at: partnerships@cylab.cmu.edu

I really, really appreciate the engagement with CyLab researchers. It is always useful to Infineon to get outside perspectives and creative ideas on how to solve important problems. I think this particular project is at a good junction of CMU's strengths -- CMU's engineering strength and its strength in AI. CMU is a place where different disciplines come together and work in a really unique manner. In this case, it's security, semiconductor design, and AI combined in a single project and all three of these at the cutting-edge of the field."

– Steve Hanna, Distinguished Engineer, Infineon Technologies

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