Popular Science Summary

Human civilization has always moved forward with new inventions. From the steam engines of the first industrial revolution to the spread of electricity, from the birth of computers to the rise of artificial intelligence (AI), each wave of innovation has changed how people understand and shape the world.

As technology developed, the way we handle information also changed from continuous analog signals, like sound or temperature, to digital signals made of zeros and ones. Together, these two types of signals form the foundation of the modern information world.

Today, AI is entering every corner of life: smart factories, self-driving cars, and medical devices all rely on collecting and understanding large amounts of data. To make this possible, we need a bridge between the real world and the digital world. This bridge is the analog-to-digital converter (ADC), a tiny but essential circuit that turns natural signals into numbers computers can understand.

This thesis explores a new ADC design that combines speed, accuracy, and low power. It also introduces a learning algorithm that helps the circuit automatically correct small internal errors.

By making this key interface more efficient and reliable, the work contributes to the technology that allows AI systems to sense and respond to the world more precisely and intelligently.