

# 语音识别中卷积神经网络的 FPGA 实现

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**摘要:** 针对应用于语音识别中的卷积神经网络, 为了提高能耗比, 将网络在 FPGA 中进行定制化实现, 并通过 PCIe 完成了 FPGA 与主机的交互. 对该网络定点仿真结果表明, 整体采用 16 位定点计算可以在保证精度的情况下有效地减少数据存储量和带宽要求. 采用多种复用方式进行卷积层与全连接层的速度优化, 并与流水线结构相结合, 提高了系统的吞吐率, 在系统 150 MHz 的时钟频率下达到了 3 715 fps 的速度.

**关键词:** 语音识别; 卷积神经网络; 现场可编程门阵列; 硬件加速

## FPGA Implementation of Convolutional Neural Network in Speech Recognition

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**Abstract:** A convolutional neural network used in speech recognition is customized in FPGA in order to improve the energy efficiency. PCIe is used to transfer data between the FPGA and PC. A 16-bit fixed data quantization is adopted after analysis and simulation. A variety of data multiplexing methods is used for speed optimization in convolutional layer and fully-connected layer. Pipe-line helps to improve the throughput of the system. This FPGA programs with 150MHz frequency and achieves the speed of 3715fps.

**Key words:** speech recognition; convolutional neural network; FPGA; hardware acceleration

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