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|  | Maxim Integrated |

## MScA Capstone Problem Statement

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| Company Background/Description/Profile |

Maxim Integrated, founded in 1983, is a leading edge-computing technology company that manufactures and sells a wide portfolio of high-performance analog and mixed-signal products and technologies. Today, Maxim is a $2.2B company, with approximately 7,100 employees in 34 locations worldwide.

Maxim’s expertise is solving design challenges such as (a) Power efficiency – getting the most of the battery life in everything from cars to smartphones to wearable devices, (b) Ever-increasing data rates: designers need to move more data, faster, (c) Miniaturization: equipment is getting more compact and, at the same time, requires more functionality– circuits must shrink in physical size while reducing their power budget. (d) Harsh environments: circuits must work in environments that have thermal challenges, unpredictable voltage transients, RFI and/or EMI interference, (e) Security: more systems must be secured for device/data authenticity and against improper usage

Maxim’s application-specific solutions are focused on the Automotive, Industrial, Healthcare, Communications & Data Center, and Consumer end markets.

Local calculation of CNN on accelerators solving face recognition, now on speech enhancement

Speech enhancement waste computing powers, use the chip to take audio and calculate the speech enhancement

Has datasets to work on

Can cancel different kinds of noise step by step

Noise + speech to predict speech

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| Project Title |

Speech enhancement and source separation for wearable devices

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| Business Problem/Opportunity Statement |

Speech enhancement is the problem defined as enhancing the speakers voice by cleaning the background noise. Recently developed deep learning-based speech enhancement systems provide higher performance solutions that the conventional signal processing-based approaches. However, such deep learning-based applications that involve architectures like recurrent neural networks and convolutional neural networks introduce an undesirable latency in operation and consume much battery power. Maxim’s embedded technologies that conduct deep convolutional neural network operations on low-bit and low-power accelerators (MAX78000) became an attractive potential solution to this problem. The goal of this project is to train a deep learning system that fits Maxim’s MAX78000, takes noisy speech as input and produces an enhanced and noise-cancelled version of it at the output.

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| Data Description |

The model is going to be trained and developed on publicly available NISQA and Common Voice datasets, with more than 60 hours of speech. The goal is to start with additive white Gaussian noise, also address periodic noises like motorcycle/helicopter and finally develop systems for non-stationary noises like cafeteria/restaurant/baby-crying etc. The noise samples are to be obtained from publicly available DEMAND dataset, and YouTube clips.

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| Expected results (Deliverables, Outputs) from Student Data Science team(s) |

The expected output of the project is a (or a series of) speech enhancement neural network(s) compatible with the MAX78000 device. The goal is to design and implement a system with minimal latency (less than 10msec) and produce and enhanced SNR.

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| Company Point of Contact |

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