Energy Efficient and Reliable Computer Vision Processing on Multi-core Processors (Ref CSEE/APR18/07)

The School of Computer Science and Electronic Engineering at the University of Essex is pleased to announce a PhD studentship available in "Energy Efficient and Reliable Computer Vision Processing on Multi-core Processors".

This studentship will start from 23 April 2018 and once awarded, you'll receive the scholarship for three years of your PhD (subject to satisfactory progression).

The studentship includes:

- a fee waiver equal to the Home/EU fee (for 2017/18, £4,120). International students will need to pay the balance of their fees.
- a stipend equivalent to the Research Councils UK National Minimum Doctoral Stipend (£14,553 in 2017-18)

Modern robotics and embedded systems operate under tight power constraints, however still have to deliver significant performance with the advent of AI in Robotics usage. In particular computer vision applications are increasingly relevant and excellent field to make novel contribution and build up a strong reputation that can lead to significant fundraising success both from EPSRC/EU and non-traditional industry funders in the embedded processor space (ARM) and robotics industry.

Specifically, energy and power density concerns in modern multi-core processors need significant research efforts in power-aware and temperature-aware run-time management (RTM) of computing resources, such as CPUs and GPUs present in modern multi-core processors. Examples of such a multi-core processor is Samsung Exynos 5422 SoC containing 4 ARM Cortex-A15 (big) CPU, 4 ARM Cortex-A7 (LITTLE) CPU and 6 ARM Mali T628 GPU cores, which powers popular Samsung Galaxy series of smart. The energy consumption needs to be optimized to increase battery lifetime of such multi-core systems so that they can operate for a long time without the need of recharge. This will also lead to less usage of electricity for charging and thus low electricity cost and high environment friendly. Further, they should operate at low temperature to perform reliable operations and have higher life of the device itself.

Computer vision applications are key candidates to exploit these multi-core processors as they provide parallel processing capability, which can help to achieve the desired levels of performance, e.g., frames per second (fps) requirement needs to be satisfied for a video processing, especially when implementing deep learning architecture to provide state of the art computer vision capabilities. These applications are potential candidates for several systems such as industrial robots and autonomous vehicle. However, management of application(s) on multi-core processors impose several challenges when trying to optimize for both energy consumption and temperature while satisfying the requirements at the same time. This PhD topic plans to address these challenges and some of them are as follows:

- Finding appropriate number and types of cores to be used for different computer vision tasks such as acquiring, processing, analysing and understanding digital images using deep learning and convolutional neural networks.
- In case of multiple applications, finding appropriate number and types of cores to be used for each of them.

- Identification of appropriate operating voltage/frequency of the cores as the multi-core processors also support dynamic voltage and frequency scaling (DVFS)
- Appropriate partitioning of application (or task) threads between CPU and/or GPU cores in case the application (or task) needs to jointly exploit the CPU and GPU.

Devising solutions in terms of algorithms to address these and other identified challenges will be the main focus of the PhD. The solutions will need to be evaluated by considering a set of applications, mainly computer vision domain, and a suitable multi-core platform such as Samsung Exynos 5422 SoC and other platforms available in the EIS Laboratory.

The successful applicant will be supervised by Professor Klaus McDonald-Maier, and Dr Amit Singh.

Additional questions and queries about the studentship to be addressed to:
Professor Klaus McDonald-Maier kdm@essex.ac.uk, and Dr Amit Singh a.k.singh@essex.ac.uk .

Entry requirements

At a minimum, the successful applicant will have a good honours BSc degree (1st class or high 2:1, or equivalent) in computer science or related subjects. An MSc with Merit or Distinction is desirable (but not essential for students with a first class degree). Strong analytical and mathematical skills are required, as well as good programming skills. Knowledge of natural language processing and machine learning are desirable but not essential.

How to Apply

- To be considered for this Scholarship applicants are required to apply for their PHD course in the usual way via the University of Essex online admissions application process here: website, (including uploading all supporting documents required) by the deadline of: **Friday 23 February 2018**.

- Please note on your PG Admissions application form in the 'Proposed research topic or area of research' field that you wish to apply for this scholarship, quoting Ref CSEE/APR18/07.

- In addition to your main online PHD application, you are also required to submit a separate application form, which can be accessed here and submit separately to: csee-schooloffice@essex.ac.uk by the deadline of **Friday 23 February 2018,** quoting Ref CSEE/APR18/07.

- Applicants will be informed of the outcome of their application for their PHD course and the scholarship award by the end of March 2018.

For further information on our current areas of research please refer to our research interests and staff profiles.

If you have a disability and would like information in a different format telephone (01206) 873521/874588.