

DURF 2023-2024 Project Posting

(Last update: 29 March, 2023)

Posting 1

Prof. K L CHAN

Object detection and recognition in the wild

Project Description

With the increasing number of cameras and the advancement of image and video processing technology, intelligent monitoring systems have been developed that detect and recognize objects, easing the demand for human input. Research in image processing has advanced rapidly through the use of deep learning. This project aims to develop object detection algorithms to detect and recognize specific objects such as vehicles and pedestrians in images. Object detection in the real world faces challenges such as complex background, varying object appearance, etc. Deep learning object detection and recognition models will be developed with the use of positive and negative examples.

Particulars:

- We seek 1-2 undergraduate students who have strong interest in image processing and deep learning research.
- Please contact Prof. K. L. Chan at itklchan@cityu.edu.hk

Posting 2

Prof. Ray C C CHEUNG

Hardware Methods for Bit-width Optimization for Financial Applications

Project Description

This project aims to develop new ideas, methods and applications of bit-width optimization for financial modelling and applications. Student will learn how to use Lagrange multiplier and automatic differentiation in computing the precision of fixed-point variables and floating-point arithmetic, including the improvement of time consumption, power consumption. New case studies using Verilog / High-level Synthesis (HLS) will be conducted and implemented on FPGAs. It is an on-going joint research project with CALAS PhD scholars, and with the Mathematics Department, Oxford University, in the UK.

Some works involved include

- Research on ASIC/FPGA Design Methodology such as bitwidth optimization
- Research on reconfigurable financial models on FPGA hardware
- Research on CPU, RISC-V, ARM, and Computer Architecture
- Developing solid skills in the state-of-the-art ARM/AMD/Intel Software/Hardware Co-design platforms

Particulars:

- We are looking for 1-2 students who are passionate in Software / Hardware / FPGA programming and System-level Architecture. Strong problem-solving skills are essential for this project, and good communication skills are a vital asset. The preferred candidate should have performed satisfactorily in the course (EE2000, EE2004, EE3220), or with industry internship experience. We are looking for diversified backgrounds with students from different countries.
- Please contact Prof. Ray Cheung at r.cheung@cityu.edu.hk on or before April 15, 2023

Posting 3

Prof. L M PO

Advanced Thought Chain Thought Prompting for Large Language Models and Its Application

Project Description

Recent advances in large language models (LLMs) such as OpenAI's ChatGPT and Google's LaMDA have enabled a new approach to question answering which involves providing intermediate reasoning steps in the form of a 'Chain of Thought' (CoT) prompting paradigm. There are two main approaches to CoT prompting, one of which utilizes simple prompts such as "Let's think step by step" to encourage step-by-step thinking, and the other which involves manually constructing a sequence of demonstrations, each consisting of a question and a chain of reasoning leading to an answer. Research has found that the latter approach is superior; however, manually designing demonstrations can be a time-consuming and error-prone process. In this work, we explore automated CoT prompting methods which sample questions with diversity and generate reasoning chains to generate demonstrations. We conduct experiments on ten public benchmark inference tasks using ChatGPT and other well-known LLMs to evaluate the effectiveness of this advanced CoT prompting approach. The results obtained could potentially be used by a US start-up company to develop a new mobile AI application.

Particulars:

- We seek 1-2 undergraduate researchers with motivation and strong aptitude for practical AI and deep learning research.
- Please indicate your interest to Prof. Lai-Man Po and eelmpo@cityu.edu.hk **on or before 14 April, 2023** to be considered for the position. The post may still be available after this date, but strong preference will be given to candidates who reply in timely fashion.

Posting 4

Prof. Rosa H M CHAN

We welcome applications from students, who are interested in computational neuroscience, sports science, art/tech, or next generation human-computer interaction technology. You are welcome to email Prof. Chan at rosachan@cityu.edu.hk to discuss potential project.

Posting 5

Prof. Cheng WANG

Motivated students are welcome to work with Prof. WANG Cheng in the area of integrated photonics field (check out more information at <http://www.ee.cityu.edu.hk/~cwang/>). Please contact Prof. Wang at cwang257@cityu.edu.hk directly if you are interested. Project specifics will be discussed with suitable applicants.

Posting 6

Prof. Leanne L H CHAN

APP development on mental health monitoring

Project Description

Smartphone is a skyrocketing product which gains popularity among all age groups, especially the younger generation. This may lead to serious and much earlier eye diseases such as macular degeneration or retinopathy. Pupil size can reveal the fatigue of a person. This project aims to develop a low-cost pupil/iris segmentation system in mobile application for stress management. Motivated and qualified summer students are welcomed to work within my research group, in the general direction of mental health monitoring and APP development.

Particulars:

- We are looking for students who have a strong interest in computer vision and mobile APP development. Strong problem-solving skills are essential for this project and communication skills are a strong asset.
- Please contact Leanne Chan at leanne.chan@cityu.edu.hk by 31st March 2023 if you are interested to apply. Project specifics will be discussed with suitable applicants.

Posting 7

Prof. Leanne L H CHAN

Development of an interactive application for human brain

Project Description

Augmented reality (AR), virtual reality (VR), and mixed reality (MR) are the interactive technologies that have the high potential to aid physicians and neurosurgeons before and during operations. It will work like a GPS inside the head, allowing physicians and neurosurgeons to study a patient's brain and acquire a better understanding of tumors, nerves, blood vessels and brain regions prior to surgery. Real-time visualization of 3D brain anatomy using AR/VR/MR help neurosurgeons during preoperative planning and maximize safety. It also provides a valuable education platform to obtain preoperative training for medical students on the human avatar.

Particulars:

- We are looking for students who have a strong interest in image processing and programming. Strong problem-solving skills are essential for this project and communication skills are a strong asset.
- Please contact Leanne Chan at leanne.chan@cityu.edu.hk by 31st March 2023 if you are interested to apply. Project specifics will be discussed with suitable applicants.

Posting 8

Prof. Haoliang LI

Motivated and qualified summer students (with strong math and coding background) are welcomed to work within my research group, in the general direction of Large Language Model (e.g., ChatGPT, GPT4) for education. Some topics include:

- Prompt engineering
- Reinforcement learning
- In-context learning

Please contact Prof. Haoliang LI at haoliang.li@cityu.edu.hk by 14 April if you are interested to apply. Project specifics will be discussed with suitable applicants.

Posting 9

Prof. Alex M.H. WONG

Motivated and qualified summer students are welcomed to work within my group, in the general direction of applied electromagnetics. Some works involved include:

- Research on electromagnetic metasurfaces
- Research with FPGAs
- Laboratory instrumentation

Particulars:

- We are looking for students who have strong mathematical ability, strong interest, strong problem-solving skills and strong communication skills.
- The preferred 3rd year candidate should have taken (or should be taking) and have performed satisfactorily in courses such as EE2104 and EE3109. Strongly prepared and motivated junior (1st and 2nd year) undergraduate students are also welcomed to apply.
- Please contact Prof. Alex WONG at alex.mh.wong@cityu.edu.hk by 10th April 2023 if you are interested to apply.