

# Graduate Application Form



Graduate Admissions Office

**Chen, Mr Junjin (Rick)**

**Course** MPhil in Advanced Computer Science

**Department** Faculty of Computer Science and Technology

**Course start date** 01 Oct 2018 (MT 2018)

**Date submitted**

**Mode of study** Full Time

## Academic History

Sep 2015 - Jul 2018 Bsc in Computer Science  
(Not yet obtained) (Computer Science)

Class 1 The University of Sheffield (*United Kingdom*)

## Research

**Proposed supervisor**

**Proposed title of research** Improving machine learning by improving image processing

## Research Summary

498/1500 chars

Image processing becomes important for machines to learn from the environment in the real world. Nowadays, image processing by machine still has many differences from how human vision works. These differences can block the way to achieve high performance of machine learning from the real-world environment. The proposal is to find a way to maximize simulation of human vision and apply it into machine learning and hence allows the robot to learn from the real-world environment in a possible way.

## Immigration

**Nationality** China (1st)  
**Country of birth** China  
**Country of OR** China  
**Visa** Required

## Language

I have recently studied for 3 years at a level equivalent to a UK Bachelor degree in a list A country.

## Scholarships

**Apply for Cambridge Scholarships** No

## Research Experience

761/1500 chars

One research I have done is to apply reinforcement learning (RL) in the game Starcraft2. From this research I have learned some RL methods such as Q-learning and Temporal difference learning. I also learned to use the Convolutional neuron network i.e. designing the layers and filters to reduce the state space in StarCraft2, since it is a very complex RTS game.

I also studied Adaptive Intelligence. I learned how human brain learn, forget and recall stuff following Hebb rule and how to use algorithm to simulate it.

I did a bit research on how human vision work, what functions do cornea and retina have. I am looking forward to join the Course of Computer vision by Prof John Daugman, Dr Christopher Town and Dr Marwa Mahmoud, to study this in more depth.

## Career Goals

169/1000 chars

To construct an intelligent robot that learns from real-world experience mainly by vision, such that allows robots to be made in many applications to serve human better.

## Additional Information to Support Application

996/1000 chars

I am passionate about Computer Science. I often attend events that relates to programming. One event I attended was 30 hours game jam, where we spent 30 hours to program our games. I successfully designed a puzzle game with 5 map, the work includes coding and art designing. Another event that made me proud was that in the Hiveminder competition, I won the 2nd prize with £2,000 reward, as the winner and 3rd place are both from Oxford University. Hiveminder is briefly a board game that player needs to control bees to collect nectars and build hives. Here is a link about the competition: (<https://www.ahl.com/coderprize>). I would also like to mention that I am now doing a placement about Robot Art and I am glade to have the opportunity to work with swarm robots, the Kilo-bots.

I love the idea from movie San Junipero where in the future, we can store our mind in computers so that we can 'live' even our body is dead. I think this will be achieved as Computational Neuroscience develops.

## Course Specific Questions

### Computer Laboratory - research

Image processing becomes important for machines to learn from the environment in the real world. Nowadays, image processing by machine is still quite different from how human vision works. The differences may limit machine learning. One difference is that human seeing the world in continuous time and a research shows that our brains process the visual information in a delay of one-tenth of a second. In order to track a moving object, our brains predict the path of the object. However, the image input for a machine is frame by frame; and the frames are sampled in a fixed time step, which may include noises and hence may confuse the machine. The second difference is that human sees the world in controllable detail, while machine stores the image in pixels of an indexed 2d array. And we can track an object even if we are rotating our eyes, while machine only knows the indices of pixels of an object, and it requires many complex algorithms to track an object when moving the camera. Although we have the convolutional neuron network algorithms that can extract features from images, this method may not track the identity/reference of an object very well. The third difference is that human can intentionally focus on an object or environment, while the machine has to scan whole image pixels in order to detect an object by detecting edges of the object, which consumes lots of computing power. The proposal is to find a way to maximize simulation of human vision and apply it into machine learning and hence allows the robot to learn from the real-world environment in a possible way. Approach: initially do some research about how our brains process the visual information and how computer simulates this process currently (studying computer vision). Experiments can be conducted to find out some evidence that supports the theory. An example

hypothesis can be: human vision does not care about the colour but the difference of colours to identify an object. Then, models can be built to simulate how our brains process the visual information. A simple algorithm that simulates human paying attention can be: Get input image, divide it into small parts; Compute which part should be focused by using some algorithm simulating how eyes are attracted by objects; For each part of the image: If it is focused part: Pay More attention to this part by getting more precise image input value only for this part; Else if it is not focused part: Ignore it, or take only a few sample of it; Final Evaluation: we can build a dancing robot using the developed model and put it in a mall or train station and invite visitors to 'teach' the robot how to dance. Robots from 0 knowledge will 'watch' performers through the camera and make some moves. Performers then give feedback on how well the robot learns. Currently, robot Baxter learns to dance by 'teacher' moving its arms, not by vision.

**Computer Laboratory - module 5** R230, Interaction with machine learning. prerequisite subjects taken: Data Driven Computing. This module is intended to serve as an introduction to machine learning and pattern processing, but with a clear emphasis on applications. prerequisite subjects being taken currently: Adaptive Intelligence. This module examines the theme of Unsupervised and Reinforcement Learning in Neural Networks.

**Computer Laboratory - qualifications** I achieved 90 out of 100 in Math and overall 82 in Sheffield International College.

**Computer Laboratory - interests** I always appreciate the benefit that computer bring to us. Computer is so powerful, from simple painting app to VR games, from simple calculator to learning algorithms, there are so many things that computer can do. I am good at math, especially in logic, and I love solving puzzles. Computer Science provides a way to solve problems by writing algorithms, which interests me the most. I love to solve problems that are challenging, which I believe would be in Artificial Intelligence. And I love the concept of learning robot, I always want to build a robot that is as smart as human beings.

**Computer Laboratory - experience** The languages I have used most frequently are Python and Java. Python is a powerful tool to manage data, I have used Python for programming Forest Fire simulator, the Cellular Automata; programming the algorithm in Hiveminder Competition; applying supervise learning in image recognition; and applying reinforcement learning algorithms in StarCraft2. Java in the other hand is verbose but more structured. I have used Java for programming the Lego robot to achieve a certain task; programming 3D animation of American Sign Language using OpenGL; and etc. I also have experiences in using other languages such as Html, JavaScript, Ruby, Haskell and C.

**Computer Laboratory - module 1** LE48, Computer Vision. prerequisite subjects taken: Data Driven Computing. This module is intended to serve as an introduction to machine learning and pattern processing, but with a clear emphasis on applications. prerequisite subjects being taken currently: Adaptive Intelligence. This module examines the theme of Unsupervised and Reinforcement Learning in Neural Networks.

**Computer Laboratory - module 2** L44, Affective Computing. prerequisite subjects taken: Text Processing. This module introduces fundamental concepts and ideas in natural language text processing, covers techniques for handling text corpora, and examines representative systems that require the automated processing of large volumes of text, including sentiment analysis.

**Computer Laboratory - module 3** R228, Deep learning for natural language processing. prerequisite subjects taken: Text Processing. This module introduces fundamental concepts and ideas in natural language text processing, covers techniques for handling text corpora, and examines representative systems that require the automated processing of large volumes of text.

**Computer Laboratory - module 4** E4F8, Image Processing and Image Coding. prerequisite subjects taken: Text Processing. This module introduces fundamental concepts and ideas in natural language text processing, covers techniques for handling text corpora, and examines representative systems that require the automated processing of large volumes of text.

Application Information

Academic Awards

Faculty Undergraduate Scholarship for Academic Achievement in the First Year	the student demonstrate academic excellence	30 Sep 2016	£2,500.00
Faculty Undergraduate Scholarship for Academic Achievement in the Second Year	the student demonstrate academic excellence	30 Sep 2017	£2,500.00

Employment History

Oct 2017 - Jul 2018	Robot Art	Andreas Giovanni (Sheffield, United Kingdom)
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Other Applications Made

No other applications entered

Personal Information	
Identifying Information	
Full name	Chen, Mr Junjin (Rick)
Previous name	
Date of birth	02 Mar 1997
Legal gender	Male
Contact	
Email	1099404025@qq.com
Skype address	
Phone	07340241601 (1st)
Contact address	86 Weston Street, Sheffield, South Yorkshire, S37NQ, United Kingdom
Home address	Same as contact address
Valid until	01 Sep 2018
Valid until	
Dependants	
Partner	WILL NOT bring partner
Child	WILL NOT bring children
Disability	
Disability	No disability
Further information	
Adjustment for interview	
Adjustment required	No
Details	
College Preferences	Current Membership
College	No college preference
College	Not college member

## Funding Application

### Funding Sources

No funding sources entered

Not circulated to department

The information in this section will not be circulated to departments.

Protected

EthnicityChinese.

Criminal Convictions

Any criminal convictions?No

Visa Requirement

Visa typeI hold a Tier 4 visa

Passport

Passport numberE26646195  
Expiry date14 Jul 2024

Study Visas

Applicant previously **STUDIED** in the UK

Visa typeStudent Visa (Tier 4 or Pre-Tier 4)

Start date25 Sep 2015

Qualification levelLevel 06: Undergraduate degree (e.g. Bachelor's),  
Grad Certificate, Grad Diploma

End date09 Oct 2018

Declaration

The information you have provided forms the legal basis of your application to the University of Cambridge. We reserve the right to refuse admission in the event of any misrepresentation by you. Submission of an application does not imply an offer of admission.

- The University of Cambridge, the Cambridge Colleges, the Gates Cambridge Trust and the Cambridge Commonwealth, European and International Trust (and their collaborators) will use your personal information for the purpose of processing your applications for admission and funding and deciding whether to offer you a place for the course you have applied for. For further information on the use of your personal information during the application process, please see 'How we use your personal information (for applicants)'.
- I certify that all the information given in this application is complete and accurate. I also understand that if I have given false or misleading information, the University of Cambridge will not admit me as a Graduate or Postgraduate student and may take legal action against me.