

## 2014 YCCSA SUMMER SCHOLARSHIP PROJECT SUBMISSION

This form is for prospective project supervisors to submit their projects to be included in the YCCSA Summer Scholarships Programme for 2014.

It is the purpose of the Summer School that any projects submitted are interdisciplinary in nature.

<b>Date</b>	7/2/14
<b>Main Supervisor's Name</b>	<i>William Smith</i>
<b>Main Supervisor's Department</b>	<i>Computer Science</i>
<b>Co-supervisors' name(s) and Departments</b>	<i>Rob Jenkins Psychology</i>
<b>Project Title</b>	<i>Enhancing corneal reflection images to improve human face recognition performance</i>
<b>Project Description</b>	<p><i>This project brings together two strands of work investigating natural and artificial complex systems. The first is the human face processing system (Jenkins). In many applied face recognition settings (e.g. corneal imaging), the quality of available images is poor. High profile work by the applicants has shown that images of bystanders' faces extracted from corneal reflection images can be recognised under some viewing conditions (Jenkins &amp; Kerr, 2013). The challenge now is to optimise the available images for recognition accuracy.</i></p> <p><i>The second strand addresses this challenge directly. Smith (computer science) has recently pioneered a new data-driven method for enhancing the quality of low resolution face images (facial super-resolution). In this technique, a patch database is used to reconstruct 3D facial texture by choosing database patches that are locally consistent and agree with the observed low resolution images. In the proposed project, the technique developed by Smith will be adapted so that it can be applied to existing corneal reflection images obtained by Jenkins. We also plan to extend this technique to deal with the curvature of the reflective surface and to exploit the stereo pair of images available from the two eyes. Identification performance will then be compared for the original and enhanced images, using standard experimental methods (paired matching tasks).</i></p>
<b>Required skills</b>	<p><i>Excellent programming skills – Matlab particularly useful. Knowledge of 3D geometry (e.g. transformations and projections), statistical modelling techniques (e.g. principal components analysis), computer vision, graphics and image processing desirable. Interest in human vision. Ability to run complex experiments, manage data and perform statistical analysis of results.</i></p>

<b>Project dates</b>	<i>Monday, 14 July 2014 to Friday, 12 September 2014.</i>
<b>Other information</b>	<i>Two forensic contacts – the Specialist Crime Division of Police Scotland, and the Child Exploitation Online Protection centre (CEOP) – have expressed interest in the results of the proposed research.</i>  <i>Jenkins joined the University of York in 2013. In previous research projects, he has collaborated with colleagues in Computer Science, Physics, Mathematics, and other disciplines.</i>
<b>References</b>	<i>Jenkins R, Kerr C (2013) Identifiable Images of Bystanders Extracted from Corneal Reflections. PLoS ONE 8(12): e83325.</i>  <i>Facial super-resolution work not yet published – contact William Smith for a copy of a paper under review.</i>

When complete, please email the form to [sarah.christmas@york.ac.uk](mailto:sarah.christmas@york.ac.uk)