# 2019 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 2019.

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

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| **Date** | *19/12/2018* |
| **Supervisors' Names and Departments / Affiliation and Contact Email** | *Richard Evans (Physics)* <br> *Angelika Sebald (Chemistry)* <br> *Susan Stepney (Computer Science)* <br> *Matt Dale (YCCSA, CS)* <br> *Jack Dewhirst (YCCSA, CS)* |
| **Project Title** | *Spintronics-based reservoir computing with magnetic devices* |
| **Project Description** | *Reservoir computing is a popular computational framework to train and configure physical systems to compute [1]. It exploits intrinsic dynamical properties, natural or "programmed", to perform control, prediction, and pattern recognition tasks. Recently, a new framework [2] was proposed to characterise the general reservoir computing "quality" of novel substrates, helping explore and optimise the design of new unconventional computing devices.* <br><br> *The aim of this summer project is to investigate the possibility of using a hysteretic magnetic device as a reservoir computer. The project will involve implementing in the VAMPIRE [3] code some simple inputs and outputs to a simulated magnetic film. The inputs will stimulate a dynamical response in the magnetic configuration of the film which ideally produce unique behaviours to exploit. The project will explore the dynamic properties of the film based on physical properties such as magnetic anisotropy and exchange to see how general computing properties are affected. If successful, this could present a revolutionary new way of performing reservoir computing with a practically realizable spintronic device.* |
| **Required Skills** | *Some familiarity with unix-like systems and programming would be beneficial (project will require some C++ coding but direct help is available)* |
| **Supervision and Collaboration Arrangements** | *Weekly team supervision meetings to discuss progress and next steps, and daily support on reservoir computing aspects. The whole team will be actively involved in the project.* |
| **Project Dates** | *The summer school runs for 9 weeks, starting on Monday, 08 July 2019 and finishing on Friday, 06 September 2019.* |
| **Other Information** | *n/a* |
| **References** | *[1] Tanaka, et al. Recent Advances in Physical Reservoir Computing. arXiv. 1808.04962* <br> *[2] Dale, et al. A Substrate Independent Framework to Characterise Reservoir Computers. arXiv. 1810.07135* <br> *[3] https://vampire.york.ac.uk/* |

When complete, please email the form to sarah.christmas@york.ac.uk