

# Christopher Gwilliams

Cardiff University  
School of Computer Science and Informatics  
Queens Buildings  
Cardiff, CF24 3AA

Phone: 07725117838  
Email: scm7cg@cs.cf.ac.uk  
Homepage: [www.encima.co.uk](http://www.encima.co.uk)  
Github: [www.github.com/encima](http://www.github.com/encima)

## Research Interests

My current research interests focus around the use of new technologies to develop 'intelligent' systems that are capable of using knowledge, stored in a predefined format, to enrich the data that passes through them.

## Education

**2010-Present:** *PhD in Computer Science, Cardiff University*

**Using Local and Global Knowledge in Wireless Sensor Networks (Funded by the EPSRC)**

Supervisors: Prof. Alun Preece and Mr. Alex Hardisty

## Research Synopsis

My work is focussed on the use of local and global knowledge in wireless sensor networks (WSNs). We define local knowledge as knowledge that has been gained, by an expert, through experience and/or experimentation; global knowledge is knowledge that is readily available to all. An example of this is the sleeping pattern of an animal: local knowledge is that the sleeping patterns of the animal vary depending on resource availability whereas the global knowledge could be that the animal is nocturnal. Through the use of this local knowledge, we would know to look for that animal at different times, depending on the observed availability of prey throughout the year.

We believe that this knowledge can be encoded into WSNs in order to make informed routing decisions on the data collected. More importantly, through using sensing devices with increased knowledge-processing capabilities, the profit is increased; where profit is the value of the sensed data received by the end user.

In order to demonstrate this, I have used a variety of technologies, such as:

1. Drools - A Java-based rule management system with a forward chaining inference based rule engine. This is used at each sensor in the WSN in order to process sensed data based on the knowledge stored within its knowledge base. As new data is received, the knowledge base is dynamically updated based on the contents of the data.
2. Global Sensor Networks (GSN) - A Java-based sensor middleware that allows the description of sensors through XML files and providing a web-based front end to view the sensed data. We use GSN to add each sensing device and to control the sending and receiving of sensed data within the network.

3. Protege - A Java-based desktop application for developing OWL ontologies. I have used this to create a linking (and extension) of existing ontologies for scientific observations.
4. OpenCV - A C++ computer vision framework for the manipulation of images and video. I have used this in order to remove busy backgrounds from images and extract the largest object in the foreground.
5. Node.JS - A Javascript platform used to build network applications. Node.JS provides an interface to the data held by GSN, as well as an interface to control the Drools rule engine and add new data into the network. We have also implemented APIs in Node that direct manipulation of the rule engine.

**2007-2010: BSc(Hons) in Computer Science, Cardiff University**

**Individual Project: An Automated Helpdesk Application for the Resolution of Hardware and Software Faults in an I.T. Support Company**

## Publications

- |      |   |
|------|---|
| 2012 | <p>C Gwilliams, A Preece, A Hardisty, Benoit Goossens, and Laurentius N Ambu. Local and global knowledge to improve the quality of sensed data. <i>International Journal of Digital Information and Wireless Communications (IJDWC)</i>, 2(2):164–180, 2012</p> <p>Christopher Gwilliams, Alun Preece, Alex Hardisty, AD Preece, Benoit Goossens, and Laurentius N Ambu. K-has: An architecture for using local and global knowledge in wireless sensor networks. In <i>The International Conference on Informatics and Applications (ICIA2012)</i>, pages 331–341. The Society of Digital Information and Wireless Communication, 2012</p> |
|------|---|

## Posters

- |      |  |
|------|--|
| 2012 | <p>Christopher Gwilliams, Alun D Preece, and Alex R Hardisty. Poster: using local and global knowledge in wireless sensor networks. In <i>Proceedings of the 10th international conference on Mobile systems, applications, and services</i>, pages 515–516. ACM, 2012</p> |
|------|--|

## Administrative Experience

**PhD Student Representative:** During the course of my PhD, I have held the position as the postgraduate representative for Computer Science for three years. This has involved taking feedback from students, attending student/staff panels and providing action plans for any issues that may arise in the postgraduate offices.

**University Graduate College (UGC) Representative:** Also throughout the PhD, I have been one of the Physical Sciences representatives for the UGC, sitting on the board for 'Training and Development'. During this period I have assisted with the implementation of professional teaching recognition for PhD students within Cardiff University and the streamlining of courses offered by the University to maximise cost effectiveness.

## Teaching Experience

2010-2013: **Teaching Assistant.** Teaching a range of courses for both undergraduates and Masters students, including, but not limited to: Web development and APIs, Relational and Object-Relational Databases, Mobile App Development and Software Development Practises. Recognised as an Associate Fellow of the HEA.

2010-2013: **Group Supervisor.** Supervising second year group projects that allow students to follow a 'real world' project through from the requirements gathering stage to implementation. This involves: marking reports, ongoing supervision, knowledge of software development processes and the latest technology (should they choose to use new tools).

## Professional Experience

2011: **iOS and Android Development.** Working with Dr. Ian Grimstead to create an application that encourages engagement in areas (i.e. Hospitals) where members of the public can text their views and have them displayed on a large monitor. Involved an Android app to receive and forward the texts with an iPad app to receive SMS and design screens to be output by the device.

**Other Android Development:** Since 2010, I have developed and published 4 Android apps to the Google Play Store. The majority have received over 1,000 downloads and ratings of higher than 4 (out of 5), despite not receiving regular updates due to work commitments.

**Web Development:** Co-organising a postgraduate seminar series each week has given me the opportunity to learn new technologies in a short time and present it to colleagues. During this time, I have presented introductions to Django, Flask, Node.JS and others. I have also developed sites with these tools at hackathons (an example can be seen at [eartub.es](http://eartub.es) and undertaken freelance web development.

## Professional Membership

Higher Education Academy (HEA) : Associate Fellow (2012-Present)

Science, Technology, Engineering and Maths (STEMNET): Ambassador (2010-Present)

Last updated: August 22, 2013