



## **Institute of Technology**

### **Ciência sem Fronteiras / Science Without Borders**

#### **Postgraduate Project Template**

<b>Institution:</b>	Institute of Technology Sligo
<b>Title of Postgraduate Opportunity:</b> (include level of study)	Algebraic error correction in communications networks
<b>PI Name &amp; Contact Details:</b>	Dr Ian McLoughlin <a href="mailto:mcloughlin.ian@itsligo.ie">mcloughlin.ian@itsligo.ie</a>
<b>Department/School:</b>	Department of Life Sciences
<b>Research Centre /Group:</b>	IT Sligo
<b>Research Centre/Group website:</b>	<a href="http://www.itsligo.ie">www.itsligo.ie</a>
<b>Brief Summary of PI research / research group /centre activity</b> <p>The PI is Dr. Ian McLoughlin, Assistant Lecturer in Mathematics and Bioinformatics at IT Sligo. Ian completed his Ph.D. in algebraic error correction at the National University of Ireland, Galway in 2009. Previous to his current position he has worked as both a Statistician and a Pricing Analyst for Aon, at IBM Research in Switzerland, and as a Postdoctoral Researcher at the Clique Research Cluster at University College Dublin, and also at the Digital Enterprise Research Institute (DERI) at the National University of Ireland, Galway.</p>	
<b>Brief Description of Masters or PhD Project</b> <p>Error correcting codes are used to ensure the reliable transmission and storage of information. They are used in a variety of modern devices such as personal computers, mobile phones and digital music players. While the basic concepts of error correcting codes are easy to understand, general formulas for generating good error correcting codes have proven difficult to find. Modern techniques in coding theory often resort to finding good codes using statistical methods. These methods do not necessarily offer insight into why a generated code is possible and/or optimal. We propose to use algebraic methods to directly generate good codes in a deterministic fashion. Recent results from both the PI and his co-authors are promising in this regard. This project would be suitable for a candidate with both mathematical and computer skills. A certain competence in both of these areas would be required, though extensive support would be offered to a candidate with potential.</p>	
<b>Key Attributes of Project for Brazilian Postgraduate Students</b> <p>There is commercial potential in this project, as good codes and good coding techniques are patentable. The proposed work is in a niche area encompassing mathematics, computer science and</p>	

electronic engineering. There is the possibility here to make good progress before other researchers look to exploit the area. The work we have already done has led to significant publications. Furthermore, the candidate would have the opportunity to pick interesting problems not previously investigated elsewhere. There is large scope for publication, and the candidate will be able to choose problems that suit their particular skill set. There are also networking opportunities with researchers working in algebra and information theory at IT Sligo, University College Dublin and the National University of Ireland, Galway.

**Name and contact details for project queries, if different from PI named above:**

Same as PI above.

**Please indicate graduate disciplines which are eligible for application:**

Mathematics; information technology; computer science; electronic engineering.

**Alignment with Science Without Borders Priority Areas:**

Engineering and other technological areas	
Pure and Natural Sciences (e.g. mathematics, physics, chemistry)	
Health and Biomedical Sciences	
Information and Communication Technologies (ICTs)	✓
Aerospace	
Pharmaceuticals	
Sustainable Agricultural Production	
Green Chemistry	
Oil, Gas and Coal	
Renewable Energy	
Minerals	
Biotechnology	
Nanotechnology and New Materials	
Climate Change	
Biodiversity and Bioprospection	
Marine Sciences	
Productive Inclusion and Social Technologies	
Housing and Sanitation	