SIAM Chapter Day, Cardiff University, UK

School of Mathematics, Senghennydd Road, Cardiff, CF24 4AG, Wales

January 15, 2015

PROGRAMME

10:30 - 10:40 Introduction and Welcome

10:40 - 11:30 Prof. Des Higham (University of Strathclyde, Scotland)
Twitter Dynamics

11:40 - 12:30 Prof. Peter Wells (Cardiff University, Wales)
Towards Better Medical Ultrasound

12:40 - 14:00 Posters Presentation and Lunch in Room M1/02

14:10 - 15:00 Prof. Kevin Glazebrook (University of Lancaster, England)
A Graph Patrol Problem with Random Attack Times

15:00 - 16:00 Posters Presentation (continued) and Concluding Discussions over Tea, Coffee, and Welsh Cakes in Room M1/02

All lectures will take place in Room M0/40, School of Mathematics, and will be co-chaired by **Ross McKenzie** (Mathematics, President of Cardiff SIAM Student Chapter) and **Danas Sutula** (Engineering, Vice-President of Cardiff SIAM Student Chapter).

ABSTRACTS OF LECTURES

Twitter Dynamics

Des Higham

Department of Mathematics and Statistics, University of Strathclyde, Scotland

Digital records of human interactions produce large-scale and rapidly changing data sets. Information such as who phoned whom and who tweeted whom provides a fascinating insight into our behaviour that can be of great value to social scientists, commercial organisations and governments. I will discuss some recent mathematical models and resulting algorithms that deal with the evolution of these interactions and help us quantify the central players. I will show some results on Twitter data.

Towards Better Medical Ultrasound

Peter Wells

School of Engineering, Cardiff University, Wales

After X-rays, ultrasound is the most commonly-used medical imaging technology. Following a brief explanation of current clinical ultrasonic imaging techniques and their limitations, some of the principal areas of contemporary research will be described, with an emphasis on the problems which might benefit from mathematical approaches.

A Graph Patrol Problem with Random Attack Times

Kevin Glazebrook

Management School, University of Lancaster, England

A patroller traverses a graph to detect and then thwart potential attacks at nodes. In deciding how to patrol, the patroller needs to take account of many things: the structure of the graph, the possibly different attack time distributions at distinct nodes, the different costs which may be incurred depending on where an attack takes place. Simple, natural ways of patrolling (like repeatedly walking up and down a line graph) may perform poorly. Both random and strategic attackers are considered in the work. We use Lagrangian relaxation to develop index-based heuristics which are easy to compute and which typically achieve within 1% of (cost) optimality.