NuSec Technical Meeting 18 Sept 2017

Wellcome Collection, London

Algorithms for Autonomous Decision Making in Nuclear Security

The Nuclear Security Sciences Network (NuSec) will be holding their annual technical meeting on 18th September 2017 at the Wellcome Collection, London. The title of this year's meeting is "Algorithms for Autonomous Decision Making in Nuclear Security" and the scope of the workshop includes algorithms for automated decision making, the interpretation and analysis of complex multiple data streams, and the practical implementation of decision making systems in the context of Border Protection and other scenarios.

The workshop will consist of technical presentations in the morning and smaller interactive round-table discussions in the afternoon. The afternoon session will focus on two key areas for improving the use of algorithms in nuclear security: what algorithms emerging from today's research could provide benefit to nuclear security applications and how can we provide the data required for the application and testing of these algorithms.

The workshop will also include poster presentations from our summer 2017 Research Pilot Projects and details of our ongoing NuSec and External Funding Opportunities. There be plenty of time for networking opportunities with fellow Academic, Industrial and Government colleagues.

Outline Agenda

Morning: Registration and Refreshments from 9:30

NuSec Network news and Pilot Projects update

Matt Stapleton (AWE) "Algorithms in Nuclear Security"

Simon Maskell (University of Liverpool) "Future Algorithmic Processing"

Industrial case studies of algorithms decision making

Student posters 'elevator pitch'

Lunch & Poster Display

Afternoon Workshops:

(1) Data workshop
Algorithms live off data, both for development and testing. The aim of the data workshop will be to distil the requirements for data to allow the development of modern algorithms, and to share best practice on how such data could be collected and shared for nuclear security applications.

(2) Algorithmic workshop
There are often a relatively small number of algorithmic features that could provide a common taxonomy for many of the algorithms that are actually used to solve real algorithmic problems. The aim of the algorithmic workshop is to help enable attendees to identify people who have algorithmic challenges that share a common feature (albeit in the context of potentially different application domains). Defining these challenges will help steer the development of algorithmic solutions such that those solutions are, by design, aligned with the needs of the nuclear security community.

Close at 16:00

To register for this free workshop please go to Eventbrite

Speaker Abstracts

Algorithms in Nuclear Security – Matt Stapleton (AWE)

I will talk about the use of algorithms and automated decision-making in nuclear security, giving an overview of the applications and challenges. Examples will include border security and (TBD). A major theme will be the modelling of complex real-world scenarios in order to design and test algorithms to robustly make automated decisions with high level of confidence. Modern algorithms arising from Bayesian techniques or Machine Learning will help move this area forward, but they will require better models and larger, higher quality datasets than those typically available. I will provide a (personal) view on the challenges and progress that needs to be made in order to turn this into a reality.

Future Algorithmic Processing – Simon Maskell (University of Liverpool)

Processor clock speeds haven't changed significantly in recent years. However, the increasing availability of multi-core processors means that Moore's law is still being delivered. This shift is mirrored by the increasing affordability and accessibility of many-core processors (typified by GPUs). Frameworks (e.g., CUDA for GPUs and Hadoop/Spark for clusters of commodity hardware) exist that ease the process of writing software for these emerging computational resources. However, there is still a significant investment of time and money required to progress a specific algorithm's implementation. This perhaps explains why Deep Learning has experienced its many recent successes: I perceive that a reusable implementation that can exploit the power of GPUs has been critical to researchers' ability to apply Deep Learning so pervasively and so successfully. I believe that the implication is twofold. First, popularity should not be confused with optimality, particularly if the context of interest has a fundamentally different "shape" to those that are popular. Second, it seems likely that future progress in developing algorithmic tools will not take the form of large numbers of incremental advances but will involve small number of large leaps, in directions that should be informed by the needs of key communities. Those communities include those who need to maximise performance in applications (e.g., national security) where data is sparse, ambiguity pronounced and performance cannot afford to be compromised.