Report from CCPi for the Period 01/04/19 to 30/09/19

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1. Background

The CCPi network was established in 2012 to support the emerging UK computed tomography community with a toolbox of algorithms aimed at increase the quality and level of information. There are four major open source software parts supported: pre-processing techniques for image calibration and noise reduction; reconstruction techniques to create a 3D volume data set from projections; segmentation/quantification techniques that can extract relevant objective values from these 3D volumes; and a software framework enabling the exploitation across a wide range of imaging devices.

The number of imaging devices has grown with many academic groups around the UK taking up tomographic imaging and purchasing new lab based x-ray CT scanners as well as exploiting new national facilities – first Neutron Tomography results were processed by CCPi in Feb 2019. The size of our community has subsequently risen from ~250 in 2013 to over 400 in 2019; 60+% growth. Our primary focus is through developing, maintaining, and promoting the CCPi toolbox, the "Core Imaging Library", http://www.ccpi.ac.uk/CIL

2. Highlights for the Current Reporting Period

The CCPi team has joined code base and development with the RTMCT (Flagship grant) developer group and combining this structure with the CCPPETMR code base in terms of naming schema. This choice was made to integrate with relevant third party software and allow users to migrate between platforms. CCPi code is to be integrated within ISIS/IMAT beamline structure, through the Savu framework used within the DLS (Diamond Light Source) and plans for integration with CLF facility EPAC 2020-25 "Project-Tomographic imaging using intense laser-driven radiation sources".

Good software development practices have been updated; including software code project management, version control, issue tracking, and systematic code testing and builds. We make public releases through Anaconda of the Python software CIL; http://cil.readthedocs.io/en/latest/

Just held a joint synergistic **4-day workshop** in Chester for 100+ participants utilising both VM and remote Azure GPU cloud service, with PETMR (September 3-6).

During this summer period supported four main tomo-events; each attracting over 80 delegates along with a special event organised with the Turing and Royce Institutes.

10-13 June 2019; **Advances in X-ray Imaging workshop**; combined with the CCPi XCT Fringe meeting, held at Harwell Campus and including Turing sponsorship

25-26 June 2019; **Dimensional–XCT conference** with NPL metrology courses and BSI/ISO standardisation presentations as well as industrial exhibitors

9-12 September 2019: **IBFEM-4i 2019**: Workshop, https://ibfem.co.uk/ speakers and training for Image based modelling

11-13 September 2019 **ToScA (The Tomography for Scientific Advancement) main UK User Group conference**, now becoming international https://www.toscainternational.org/

14-15 May 2019 "**Data-Centric Materials Science and Engineering: Microstructure fingerprinting and Digital Twinning for Industry 4.0**" Raison d'etre - to bring together data scientists with materials scientists and engineers co-organised with Royce and Turing. (4x oversubscribed)

Other activities over the last period;

Application submitted and received further funds for beamline time on ISIS–IMAT neutron tomography (18-22 Feb 2019).

Funded four short-term international fellowships for speakers over the four summer XCT events: Anton du Plessis, Stellenbosch CT facility; Xiaogang Yang DESY Photon Science; Allard Hendriksen from CWI; David Ryckelynck, MINES Paristech

Network training activities included; four Avizo courses (22 May, 4-5 June, 5-6 August, 30 September-1 October) three lunch-and-learn events (14 May, 3 June, 9 July) a Summer Research exhibition (2 July) and held two Hackathon events (8-9 April, 12-13 June 2019).

Collaborated on the resubmission for EPSRC CCPi as well as the EPSRC call for a National X-Ray Imaging Facility; based on the EPSRC Roadmap for XCT needs https://epsrc.ukri.org/files/research/epsrc-x-ray-tomography-roadmap-2018/

3. Workshops and New Opportunities

The following events are being organised for the coming year:

- Networking continues; monthly Lunch-and-Learn sessions, complementing the visitors and software-show-tell events and planning for the next four major XCT summer events are ongoing.

- Industrial Metrology sessions continue (next meeting 25 November 2019) culminating with Royce Institute hosting the dimensional-XCT 2020 event. Linked to support for the BSI/ISO standardisation process (ISO/TC 213/WG 10)

- CCPi is on the governance board for Warwick, WMG "EPSRC Strategic Equipment - High Speed CT" EP/S010076/1 (initial meeting on 5 September 2019 – presentation planned for January 2020)

- Proposal to support a Royal Society Summer Science Exhibit in July 2020 and Turing Institute Summer School in June 2020

- Supporting ImagingBioPro network https://mecheng.ucl.ac.uk/imagingbiopro/

4. Issues and Problems

Exceptional support for CCPi has been from Edoardo Pasca and Gemma Fardell; who have covered extra administration effort, during restructure, as well as made the Azure GPU cloud service extremely reliable.

Obvious issue is uncertainty to funding of the CCPi network and other EPSRC grants from 2020 onwards – and we are hoping for a suitable outcome and collaboration with old and new CCPs

http://www.ccpi.ac.uk/