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Providing Software Support to Enable Research: From Feral Parakeets to the Times Digital Archive

Stephanie Thompson et al., University of Birmingham

IDCC20, February 18th 2020

Advanced Research Computing or ‘BEAR’

- Birmingham Environment for Academic Research

1. Architecture, Infrastructure and Systems – 5.8 FTE
2. Research Engagement Group – 3.6 FTE
   - Advocacy on BEAR and data management, training
3. Research Software Group – 9 FTE
   - Team of Research Software Engineers
   - 7 funded by Advanced Research Computing, IT Services
   - 2 discipline-specific

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Research Software Group

What do they do?

- Provide advice on designing and writing software
- Promote & advise on using version control
  - Document history over time
  - Reproducible code
- Help researchers get the most from our advanced computing facilities

GitLab

BETTER SOFTWARE BETTER RESEARCH
www.software.ac.uk

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The Reinhart-Rogoff error – or how not to Excel at economics

April 22, 2013 9.40pm BST

Data and computer code should be made publicly available at an early stage – or else ... esarastudillo

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Last week we learned a famous 2010 academic paper, relied on by political big-hitters to bolster arguments for austerity cuts, contained significant errors; and that those errors came down to misuse of an Excel spreadsheet.

Sadly, these are not the first mistakes of this size and nature when handling data. So what on Earth went wrong, and can we fix it?

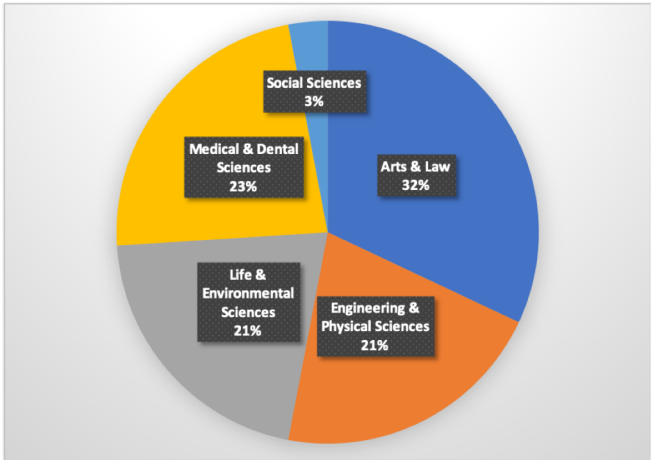
See Mike Croucher's talk:
http://mikecroucher.github.io/MLPM_talk

Research Software Group

How? Up to 20 half-day sessions

- **Coding** eg. developing a research website
- **Coaching** to upskill the researcher eg. learning new programming language
- **Advice** to researchers already developing software eg. managing software release

THE CARPENTRIES



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Case Study: Transcribe Estoria

Researcher: Aengus Ward, Professor in Medieval Iberian Studies

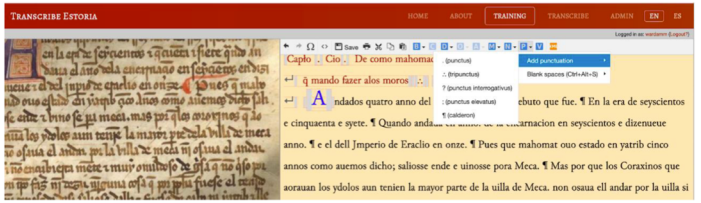
Coding engagement aim:

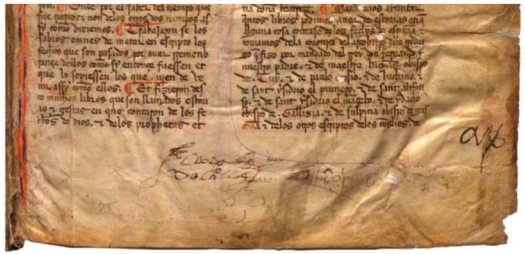
- To create a website to enable crowd-sourcing of transcribers
- Provide access to training materials for transcribers & allow them to practise their skills before transcribing a manuscript
- Available in both Spanish and English

Output

- Website created: https://transcribeestoria.bham.ac.uk/en/
- 300 transcribers have signed up for pilot study
- When complete, an electronic edition of the Chronicle will be publicly accessible
- REF Impact Case Study for the University

In the drop down menu, choose whichever mark you see:





Biblioteca Nacional de España, Ms. 12837, fol. 2r

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Case Study: Feral Parakeets

Researcher: Richard Bufton, Biosciences

Coaching engagement aim:

- Design a database and website to allow data entries globally from birdwatchers & other interested members of the public
- Coaching to upskill the researcher in basic programming and Python

Output

- Website in four languages: https://parakeetsightings.bham.ac.uk
- Collecting sightings into database along with photos for ID checking
- Great publicity for UoB – Richard's project featured on BBC's Springwatch

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Case Study: Times Digital Archive

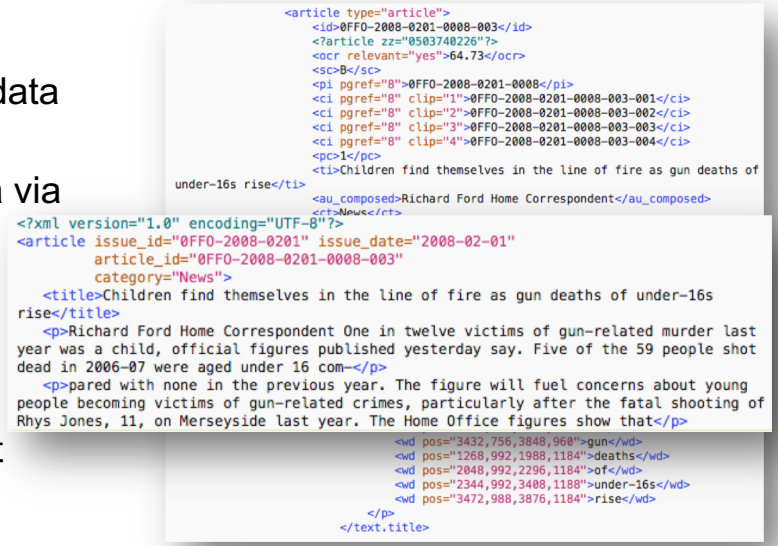
Researcher: Viola Wiegand, Centre for Corpus Research

Advice engagement aim:

- Times Digital Archive (1785-2013) contains lots of historical data in scanned form of varying quality
- Advise researcher on how to optimise processing of text data via our supercomputer

Output

- Faster data processing – 40 hours vs 40 days
- Thesis assessing how surveillance is represented throughout history
- Resulting version of the dataset can be used by other researchers



Wiegand, V. (2019). *A Corpus Linguistic Approach to Meaning-Making Patterns in Surveillance Discourse* [PhD thesis]. University of Birmingham.

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Conclusions

- Research Software Group has rapidly grown over last 2 years in response to demand
- Enabling researchers to:
  - Perform their research faster and better
- Allowing members of the public to both take part in research & access it more easily
- Enabling creation of cross-checked digital data

Upcoming project

- We have purchased the largest IBM Artificial Intelligence Cluster in the UK
  - User support being developed for pilot projects
  - Interest from Economics through to Medicine

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HIGH-PERFORMANCE COMPUTING

University of Birmingham to deploy AI cluster

Researchers at the University of Birmingham will soon be able to carry out research on the largest IBM POWER9 Artificial Intelligence (AI) cluster in the UK, as the university has now announced the deployment alongside HPC integrator OCF. OCF and the university will integrate a total of 11 IBM POWER9-based IBM Power Systems servers into its existing high-performance computing (HPC) infrastructure, the Birmingham Environment for Academic Research (BEAR).

Birmingham initially deployed two IBM Power Systems AC922 servers, powered by POWER9 CPUs with the industry's only CPU-to-GPU Nvidia NVLink interconnect, in September. However, the advanced research computing (ARC) team soon realised it needed more computational power tailored to increasing AI workloads generated by the university's researchers, delivering computational vision analysis and to solve life science challenges, such as cancer diagnosis.

'It's very important to us, as a research-led institution, that we are at the forefront of data research, which means we are always looking at ways to make AI quicker and more accessible for our researchers,' said Simon Thompson, research computing infrastructure architect at the University of Birmingham.

'With the sheer amount of data, the common questions from researchers are how can we analyse it fast enough and how can we make the process even quicker? With our early deployment of the two IBM POWER9 servers, we have seen what is possible. By scaling up, we can keep pace with escalating demand, and offer computational capacity and capability to attract leading researchers.'

The university will now add an additional nine IBM Power Systems AC922 warm water-cooled nodes, each equipped with four Nvidia Tesla V100 16GB Tensor Core GPUs, 1TB of system memory, dual 18 core POWER9 CPUs and Mellanox 100Gb EDR InfiniBand. The system uses IBM PowerAI Enterprise software, unlocking potential for accelerated computing, capitalising on the largest IBM POWER9 cluster in the UK. IBM will also support the new systems by providing comprehensive training and support to Birmingham's researchers in partnership with ARC.

This significant enhancement to BEAR means a more powerful and versatile computing environment for researchers. For example, fellows from The Alan Turing Institute looking at early diagnosis of – and new therapies for – heart disease and cancer, will use AI to run faster diagnostics.

In contrast, researchers in the physical sciences are similarly using machine learning and data science approaches to quantify the 4D (3D plus time) microstructures of advanced materials collected at national large synchrotron facilities, such as the Diamond Light Source. This research expects to use the large model support provided by IBM PowerAI software to analyse TBs of data generated daily; currently an almost impossible task.

'We are thrilled the university has decided to invest in building the UK's largest POWER9 AI cluster', said Simon Robertson, director, IBM Servers, UK & Ireland. Julian Fielden, managing director of OCF, added: 'The University is leading the way with this impressive project and will continue to attract world-class researchers with this type of innovation.'

https://www.scientific-computing.com/news/university-birmingham-deploy-largest-ibm-power9-ai-cluster-uk

Any questions?

https://www.birmingham.ac.uk/bear-software

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