



The research commercialisation office of the University of Oxford, previously called **Isis Innovation**, has been renamed **Oxford University Innovation**

All documents and other materials will be updated accordingly.
In the meantime the remaining content of this Isis Innovation document is still valid.

URLs beginning www.isis-innovation.com/... are automatically redirected to our new domain, www.innovation.ox.ac.uk/...

Phone numbers and email addresses for individual members of staff are unchanged

Email : enquiries@innovation.ox.ac.uk



Alzheimer's disease

big problem, Big Data, big solution



The problem

- More than 800,000 people with dementia
- Costs more than £20 billion per annum
- \$2 billion trials failure



The *Big Data ?* solution

- Diversify target development
- Trials in prodromal or preclinical disease
- Rapid trials with early read-outs



Big data characteristics



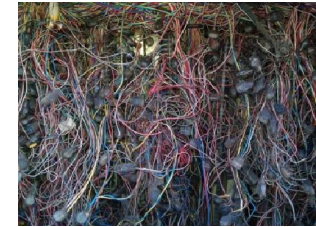
volume



variety



velocity



complexity



Collaboration for translational research in dementia

**Alzheimer's
Research UK Oxford
Drug
Development
Institute**

**Wellcome Trust
Strategic awards:**

**Target Enabling
Packages**

Neuroinflammation

**Dementias Platform
UK**

Dementia Discovery
cohorts
(n=2m)

Dementia UK
BioBank cohort
(n=10k)

Deep and Frequent
Phenotyping cohort



IMI-EPAD

**European
Prevention of
Alzheimer's
disease**

**Readiness
register, cohort
and
Early Phase
Trials**

Pre-competitive
data driven
drug development

Pre-competitive
cohort repurposing for
experimental medicine

Pre-competitive
reutilisation of research
and real-world data

Pre-competitive
data driven
PoC/PhII



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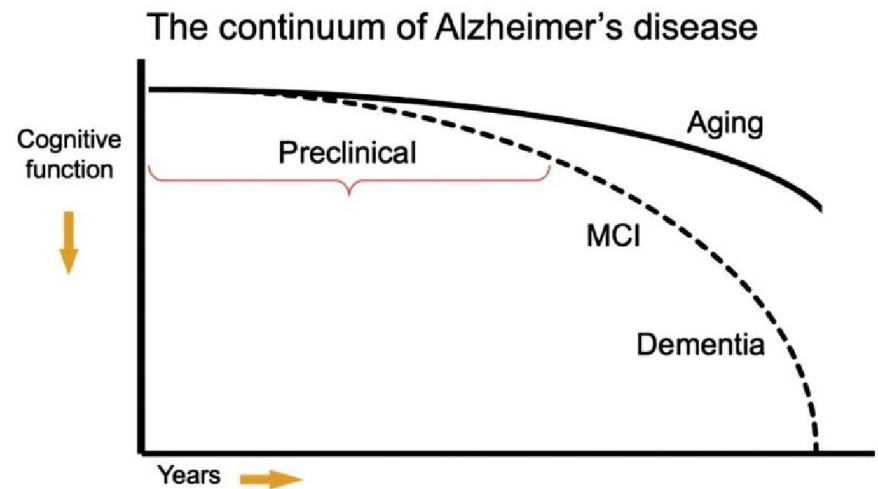
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UK Biobank for Dementia Research

- 500,000 participants; baseline assessments 2005-8
- Web-based questionnaires for additional exposures and outcomes (cognition, mental health, occupation..)
- Multimodal imaging in 100,000 - brain, cardiac and body fat MRI; bone & joint DEXA; 3D carotid ultrasound
- Repeat Neuroimaging, cognition and sampling in 20,000
- Genotyping of all participants (820,000 SNPs)
- Connectivity to EMRs for mental health



Dementias
Platform^{UK}
Medical Research Council



Deep and Frequent Phenotyping

Deep phenotyping

- PET *A β and tau tracers*
- CSF *repeated measures*
- MRI *serial imaging with noise reduction strateg*
- Electrophysiology *EEG and MEG*
- Peripheral markers *noise reduction, change measurement*
- Cognitive markers *computerised batteries, web testing integration*
- Novel markers *retinal imaging, quantitative gait measures*

Frequent phenotyping

- Test the limits of acceptability *monthly, bi-monthly*



Dementias
Platform^{UK}
Medical Research Council



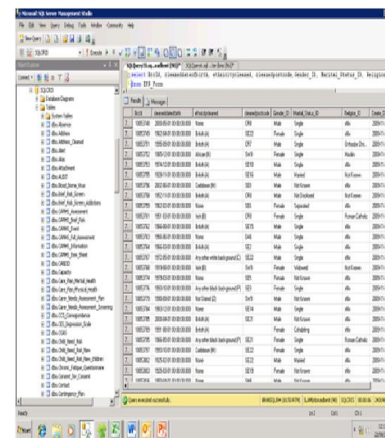
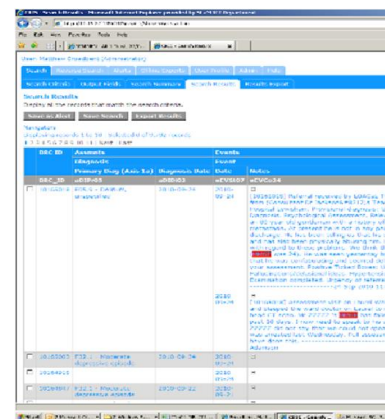
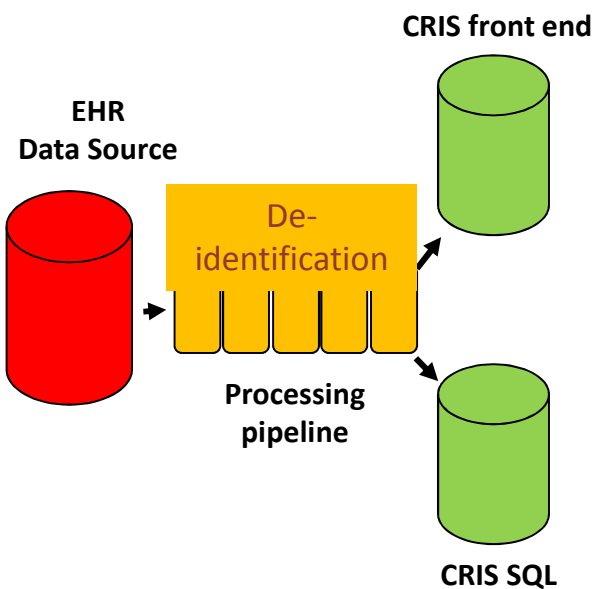
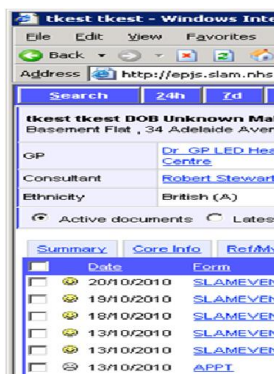
Use of EMRs for research



- SLaM CRIS
 - South London and Maudsley NHS BRC implementation
- D-CRIS
 - Cambridge & Peterborough, Oxford Health, West London, Camden and Islington
 - 1 million plus patients
- UK-CRIS
 - 10 site extension
 - Connectivity to UK BioBank
- Mike Denis and Simon Lovestone



CRIS – core functionality





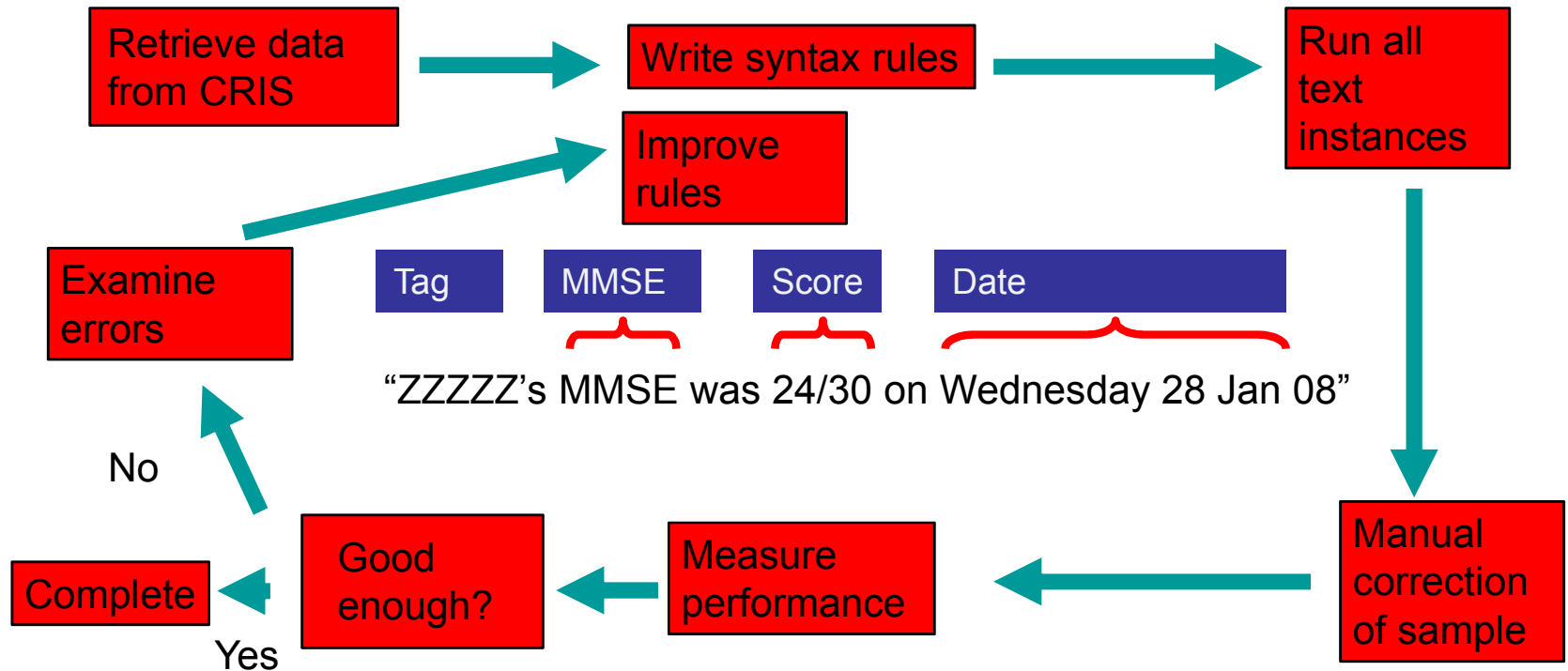
GATE – Text Parsing

FAST enables **information retrieval**, i.e. search and retrieval by matching against user defined strings;

GATE enables **information extraction**, i.e. extracts 'meaning' (structure) from free text context



GATE use case: extract MMSE score and date from free text

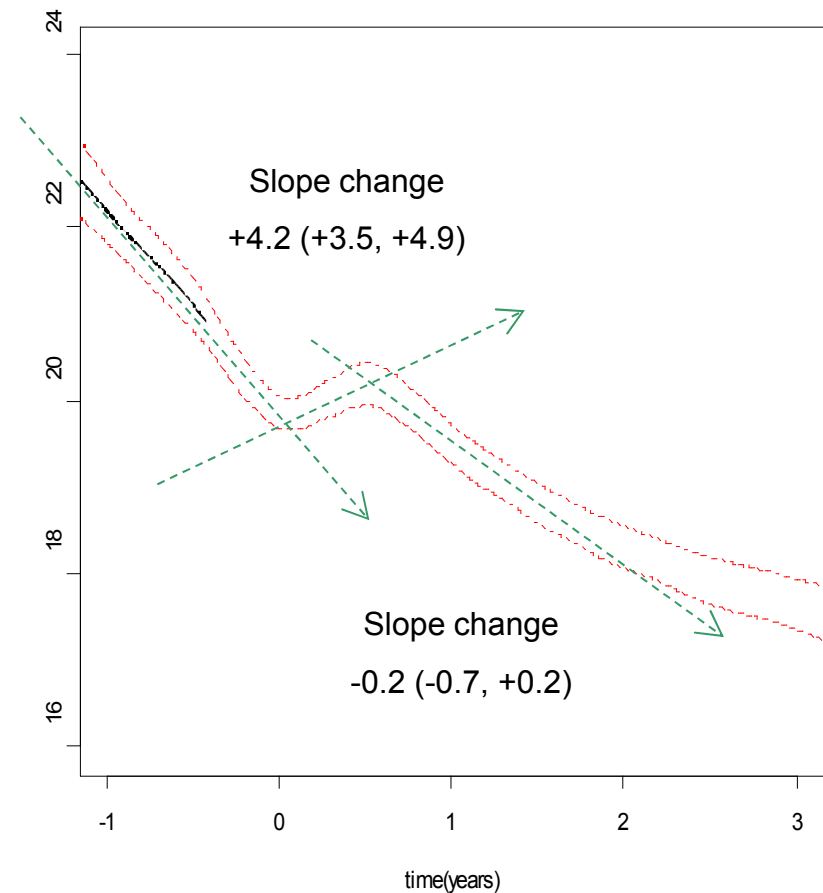




EHR-data re-use for research

(Cholinesterase inhibitors and Alzheimer's disease)

- Phase IV of AChEl
 - > 2500 patient years of therapy
 - > 8 fold dataset compared to Cochrane
- Costs and effectiveness
 - precompetitive collaboration with pharma
 - Text mining derivation of service utilisation and costs
- Predictors of response
 - Biomarkers and clinical



Data from Robert Stewart



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European Medical Information Framework

Academic partners



Patient Organisation



SME partners

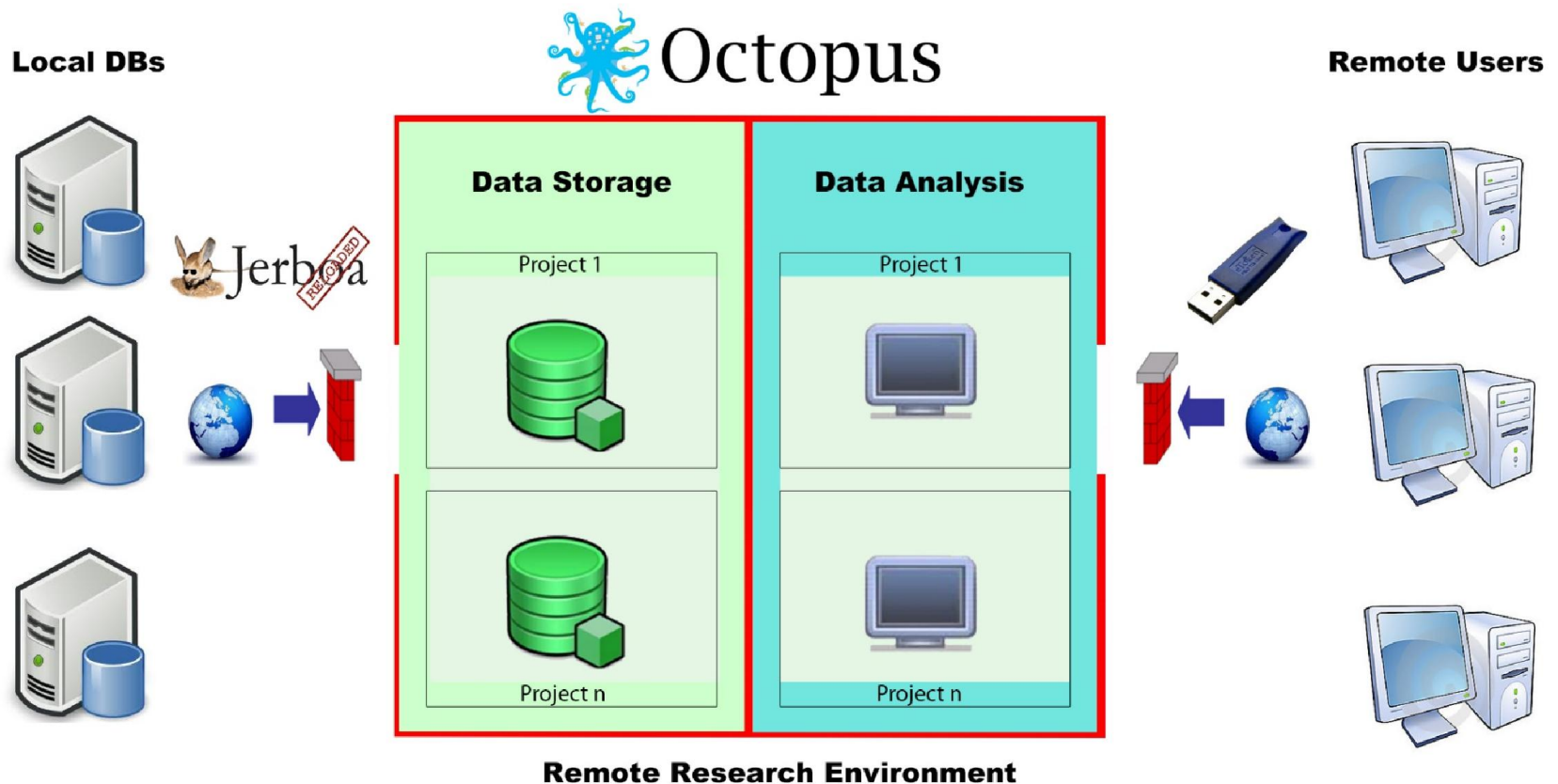


Efpia partners





Private Remote Research Environments





Available EMR data sources – EMIF-Platform

Database name	total (cumulative) # of subjects	# of active patients in January 2012
Aarhus (DK)	2.3 million	1.8 million
Regional DB Tuscany (IT)	4.8 million	3.8 millions
GePaRD (DE)	17 million	12.655.616 (Jan 2007)
THIN (UK)	> 11 million	3.8 million (Sept 2012)
IPCI (NL)	2.9 million	1.6 million
Health Search (IT)	> 2 million	930,000
Pedianet (IT) (<i>0 to 14 years</i>)	400,000	150,000
Pharmo (NL)	> 7 million	5 million
Birth Cohort (UK)	1,184	960
Cardiovasc. Interv. Registry (UK)	460,000	3,000
Salford Diabetes registry (UK) <i>TBC</i>	12,000	12,000
IMASIS (ES)		
EGCUT (ES)	52,000	NA
TOTAL	~ 48 million	~ 17 million



Repurposing from real world data

- Do diseases of inflammation alter risk of AD ?
- Do anti-inflammatory drugs alter risk of AD ?
- Are genetic variants related to inflammatory pathways modulators of risk ?



Big Data and the dementia challenge ?



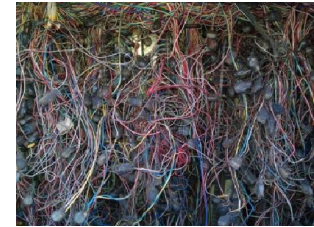
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variety



velocity



complexity

Big data solution

- Add volume : 50m records
- Add variety : pan-omic, structural and functional imaging etc
- Add complexity : deep and broad, coded and narrative



Big Data and the dementia challenge ?



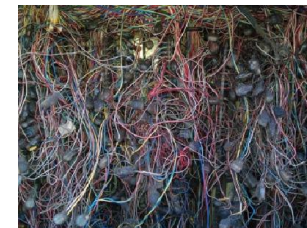
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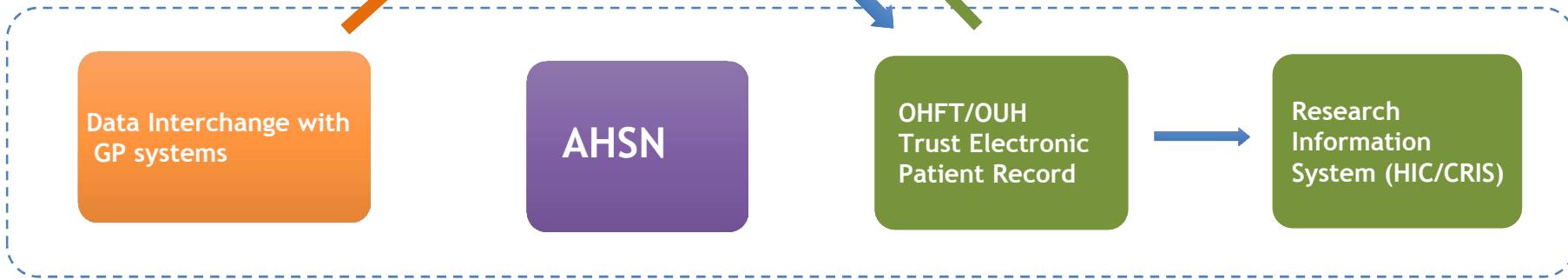




- OHFT patient data
- GP patient data
- User generated data
- Wider Provider community



Secure Network



Mike Denis; CIO Oxford Academic Health Sciences Network



With thanks to....

- > 50 executive members
- > 150 principal investigators
- > 500 scientists
- > 1500 collaborators
- > 50,000 volunteers
- > 50,000,000 individuals contributing data
- > 200,000,000 euros from funders





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Chas Bountra

John Gallacher

Bart
Vannieuwenhuysse

Craig Ritchie
Serge Van Geyten

and **very** many others.....