Additional applications for SKA-derived big data technologies - an Overview

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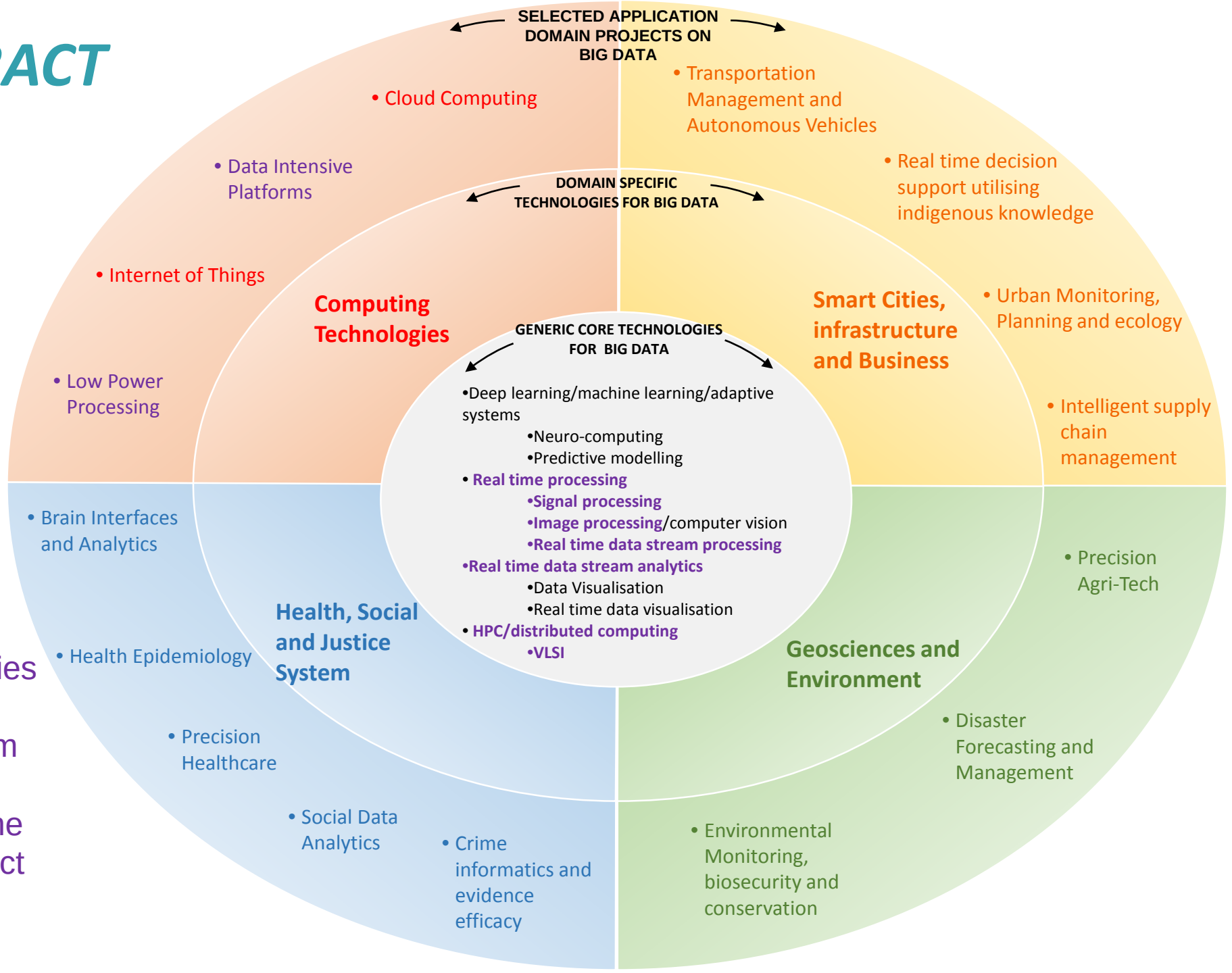
INTERACT

- A collaborative R&D initiative aimed at developing generic real time big data tools and adapting and optimising them to provide high value products and services for NZ companies and society
- The *INTERACT* Partners so far include 5 NZ Universities, 2 CRIs and 2 companies. It is intended that more Universities, CRIs and companies will be recruited to the Partnership
- International Partners will also be sought where necessary skills or resources are not available in NZ
- The SKA Project, accessed via the NZ Alliance, will be a major source of key core technologies (see diagram)

INTERACT



NB: Core technologies in purple derive from the NZA work on the SKA project

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Metrology of data quality and provenance…. what is the opportunity?

- There are many “Big Data” research initiatives around the World
- Most are concentrating on analytics for information and value extraction rather than on these four crucial aspects….

1. Measuring and annotating in real time how *“good”* those data streams and sets actually are, especially before they are converted (A to D) to enter the “digital world”
2. Using the annotation “*wrapper*” to confer inter-operability across diverse streams and sets of data
3. Defining what would be *appropriate* uses of information derived from them?
4. Adjusting the fidelity of the data generation, *in real time,* to meet changing needs

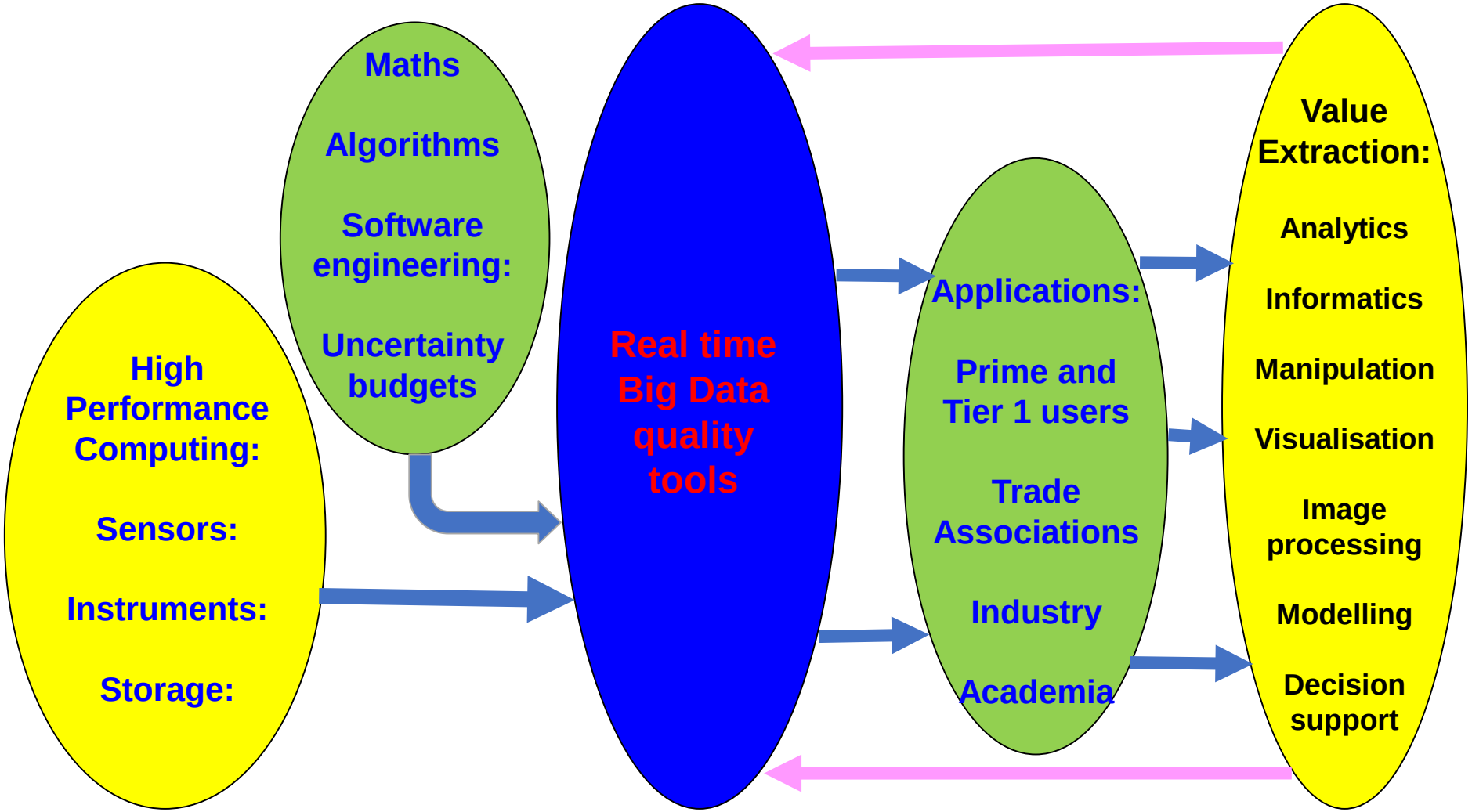
The objective of such R&D

- For NZ to become a world-leading data metrology research, technology & skills development centre in order to:
- Drive fundamental research into
  - Real time metrology of the quality of data
  - Uncertainty prediction and annotation
  - Real time data fusion and inter-dependency optimisation
  - Real time control and optimisation of data acquisition
  - Meta-data enabled inter-operability
- Create and deliver
  - Generic tools to “capture”, predict *and* annotate the quality of those data
  - Calculate and/or predict inter-dependencies of data-sets and data-streams
  - Tools to control and adapt the data generation and capture processes in light of the intended use…..*”fit for purpose”*

Benefits and outputs for NZ

- Major increase in Big Data involvement and research activity
  - Ensuring data generation is fit for purpose
  - Ensuring data flows are interoperable
  - Enabling digital manufacturing and “Industry 4.0”
- Major new area of research
  - Major PBRF impact
  - Collaboration with research intensive partners (e.g. Cambridge, Intel, Google, IBM)
- World Class R&D activity in the region
  - focussed on pulling through outputs to benefit local SMEs and supply chains.
- Promoting inward investment by global multi-nationals
- An application domain (metrology) able to receive its outputs and apply them to generate wealth and improve the quality of life in NZ

Data Fidelity Value Flow



Industry 4.0

- Engineering design
- Intelligent supply chain management
- Economics and business

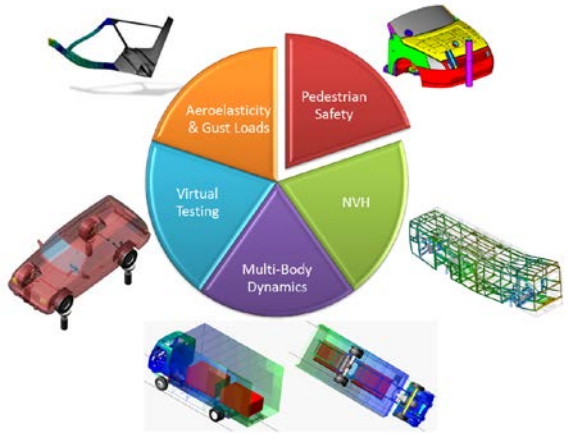
Engineering design

Data
Visualisation

Autonomous &
Intelligent vehicles

Computer
vision

***Digital* Design &**
Manufacture
***Virtual* test and**
prototyping



Virtual Labs

AUT
RESEARCH & INNOVATION

Intelligent supply chain management

- Connected manufacturing and measurement machines
- Connected supply lines
- Data-driven procurement
- Real time supplier status monitoring
- Data-driven logistics
- Connected customer management
- Co-design
- Co-innovation

Social sciences

- Urban planning
- Infrastructure planning and management
- Community engagement

- Empowering indigenous folk with real time, big data enabled:
  - Expert systems
  - Decision trees
  - Decision support

Sport Science

- Real time image processing
  - Automatic calculation of velocities, accelerations, forces and energies
  - Tracking of movement and technique
    - With superimposition of correct technique and/or images of iconic exemplars (e.g. Ronaldo, Federer, Woods, Lillee)
  - Real time coaching
  - Product development, prototyping and testing
  - Multi-camera team tracking

Rehabilitation

- Brain-computer interface
  - Signal processing for
    - Movement stimulation
    - Prosthetic control
- Patient support systems
  - Automatic, autonomic, adaptive and cognitive systems control
- Brain signalling decoding
- Patient stimulation via real time feedback

Economics and business

- Shopper behaviour monitoring and assessment
- Supply chain management
- Visualisation of business informatics
  - For decision making support
- Real time stock control and procurement
- Forecasting and prediction of consumers’ sentiment

Tourism and Hospitality

- Forecasting tourist flows
- Tracking of transient populations
  - Disaster recovery and resource planning
  - Assessing requirements from affected population figures
    - “bums on seats”
- Efficacy of promotional activities
- Macro and micro economic and environmental effects of visitors