

High Performance Computing, AI, the Metaverse and quantum computing to transform space data management

Dr Simon Jackman
Senior Innovation Fellow
University of Oxford



Drivers of change

- HPC for AI moving to exascale (e.g. UK gov £900m)
- National / European sovereignty requirements for HPC, AI and data
- AI moving to MLOps (operationalisation) and accelerating generative AI (e.g. Chat GPT) – ESA Digital Twin Earth and ESOC AI roadmap in place
- Metaverse becoming the context for simulation and visualisation
- Quantum computing gradually moving towards commercial applications

How should we respond as universities working with ESA?

High Performance Computing

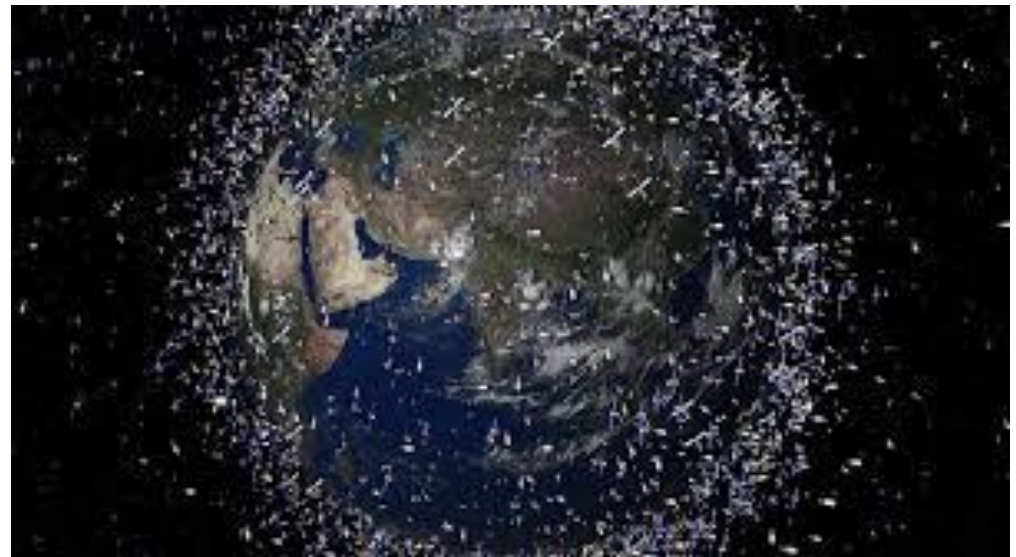
- Tech companies offering HPC, cloud and AI tools to universities
- Multiple systems / several providers (e.g. Microsoft, AWS, European tech companies)
- University HPC hosting wide range of applications and datasets
- Federated HPC for space with downstream science and services? Complementing centralised ESA?
- ESA_LABs + ESA strategy for downstream applications, beyond institutional partners of ESA in DTE (e.g. Destination-E, ECMWF) and in-bound fellowships into ESA?
- Fellowships in ESA_LABs, between ESA_LABs or across ESA_LABs and ESA?

Operationalising AI capabilities

Super-resolution for satellite imagery



Space traffic management incorporating drag and solar effects



Metaverse capabilities and training

- Metaverse is becoming an environment for simulation and visualisation, including for Digital Twins
- How can we use metaverse for enabling engagement?
- Training remotely and at scale



Quantum Computing for Space

- We have looked at optimising materials for space
- Image data processing from earth observation
- Compression of communications data
- These are still somewhat far from market
- Is this an opportunity we could continue to look at together? Could we engage with European and national programmes together?

In summary

- How can ESA_LABs accelerate our progress with data through working together?
- Are there some ESA tools to get sufficient funding to enable us to work together?
- Can ESA help us through being a partner as well as a funder?