Sustainability and Artificial Intelligence
A merger @ Sussex?

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What is Sustainability & AI?

Sustainability & AI, 2 dimensions:
- Impact for sustainability (positive)
- Impact on sustainability (negative)

Impact for sustainability
Example, application of AI-type methodologies in environmental science
- Smart parameter optimisation in environmental models
- Fuzzy sets to link qualitative & quantitative scenarios
- Fuzzy sets to characterise vulnerability to drought

![Fuzzy Logic Diagram](image)

Using fuzzy set theory to address the uncertainty of susceptibility to drought
Frank Ekeleme, Joseph Akama, Lilbeth Acosta-Michlik, Dörthe Krieger, Dennis Tändter
Impact on sustainability

- Carbon footprint 2-3% (4%) total greenhouse gas emissions
- Large water requirements
- Impacts on workforce
- Knowledge gap between haves and have nots
- Bias, prejudice in assertions and recommendations
- Narrow view of future – Training with historical sets → bias towards past
- Violations of privacy, human rights; autonomous behaviour - loss of human control

Solvable to an extent:

e.g. Carbon footprint
- Use servers where electricity provided by renewable E.
- Efficient machine learning architectures → less time → less energy + C
Impact on sustainability

AI is fuzzy notion

One way to classify:
- Artificial Narrow Intelligence (ANI)
- Artificial General Intelligence (AGI)
- Artificial Superintelligence (ASI)

All types, projects have same impact? Likely, no

Impact depends on comprehensiveness; connectedness with other machines, autonomy from humans, …

To understand impact → assessment must be broad & systematic

Need general framework for sustainability assessment of AI
Tools to investigate sustainability of AI

- Environmental Impact Assessment
- Social (Cultural) Impact Assessment
- Life Cycle Assessment

Start by applying/adapting current tools
Sketching a framework for sustainability-friendly AI

Sustainability assessment of AI project/activity

Environmental/social/economic impacts

Sustainability-friendly AI project/technology

Mitigation measures

ex-ante or ex post facto
Going forward

- We need open design of AI (public oversight) – too many potential negative consequences to leave in hands of private sector or academia
- We should *stress test* major AI projects and technologies against sustainability criteria
- Need sustainability assessment framework for AI → Experiment with existing assessment tools (env impact assessment, others)
- Sussex is ideal place for major research activity on “Making AI Sustainable”.
- Collaborate on bid for major interdisciplinary project to comprehensively assess *Sussex AI projects* as case studies:
  - Use and test existing assessment methodologies, develop new methodologies
  - Mutual learning → Identify impacts + develop assessment methodologies + find out how to make AI projects/models more sustainable