The CMAC Digital Platform

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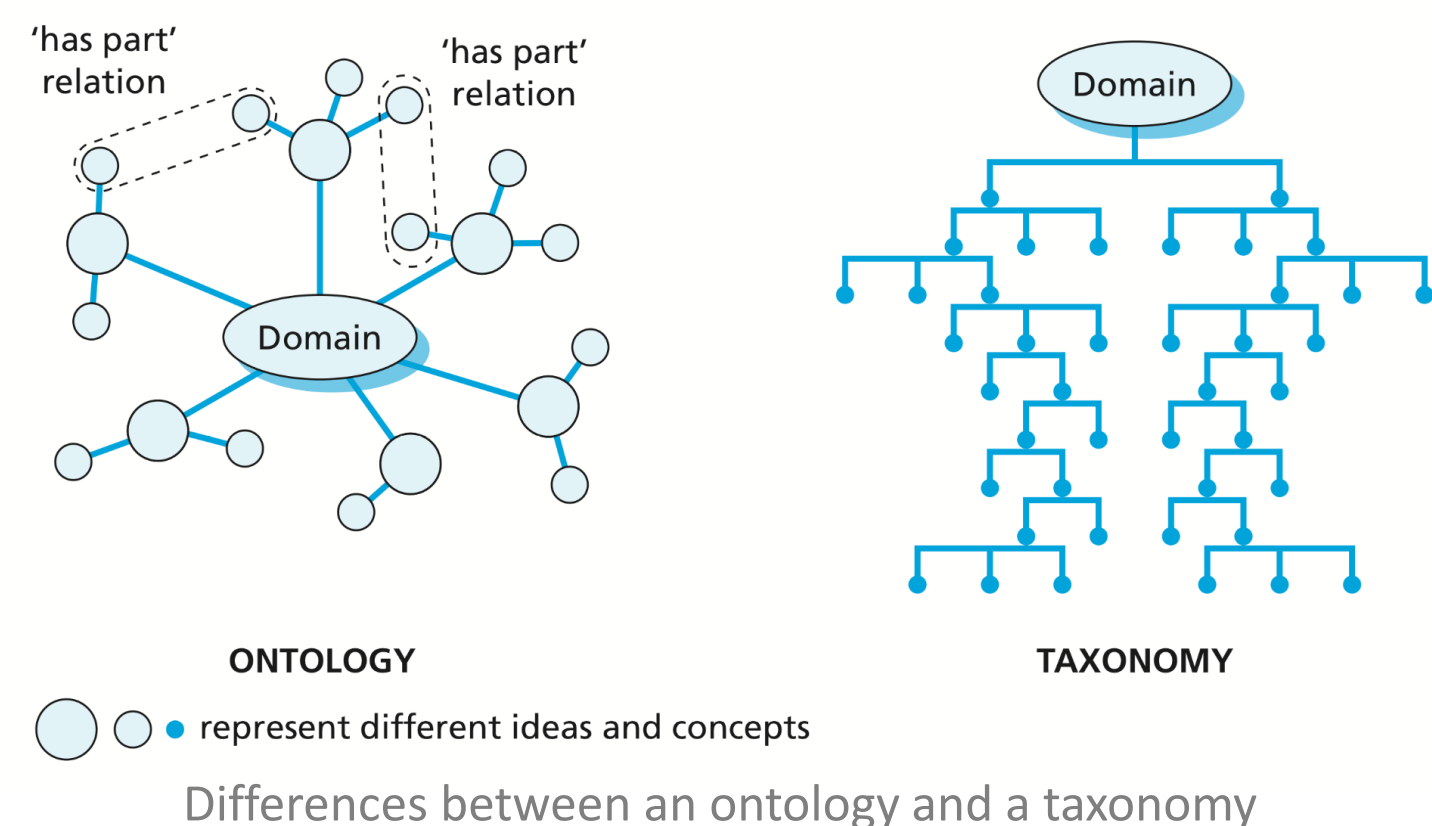antony.vassileiou@strath.ac.uk
The EPSRC Future Manufacturing Research Hub in Continuous Manufacturing and Advanced Crystallisation
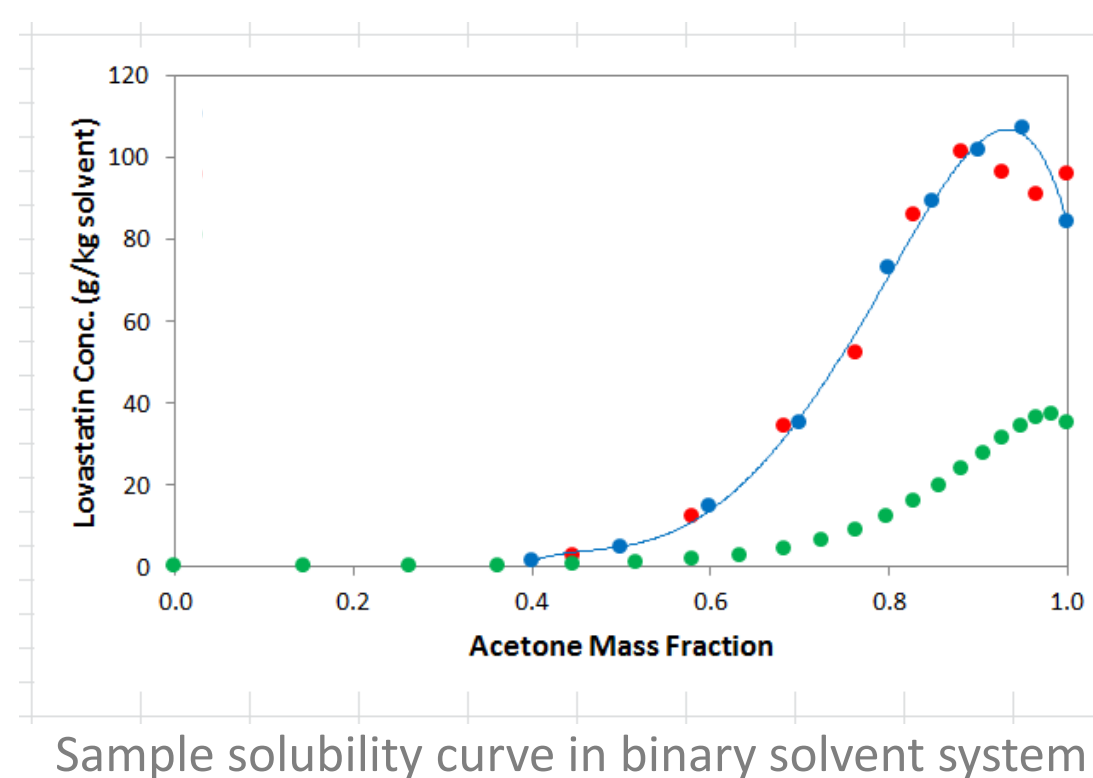University of Strathclyde, Glasgow, G1 1RD, U.K.
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CMAC Data Model. Development of the CMAC data model has begun. This will provide better data linkage, transferability and semantic searching. The flexible structure will allow for growth as the lab developments.

The aim is to create an open standard ontology/language that will be able to merge with others.

'has part' relation   'has part' relation

Domain

Domain

ONTOLOGY   **TAXONOMY**

○ ● ● represent different ideas and concepts

Differences between an ontology and a taxonomy

Calibration Models. Project specific calibration models are being developed and will be integrated within ELN protocols. This will automate and standardise the post process, multivariate analysis step of the research.
Additionally, models could be implemented to real-time systems via the use of OPC (Object linking and embedding Process Control) systems and in turn into process control systems.

Sample solubility curve in binary solvent system

Central diagram

Data: architecture, ELN, CMAC data store, databases, ontologies, standards

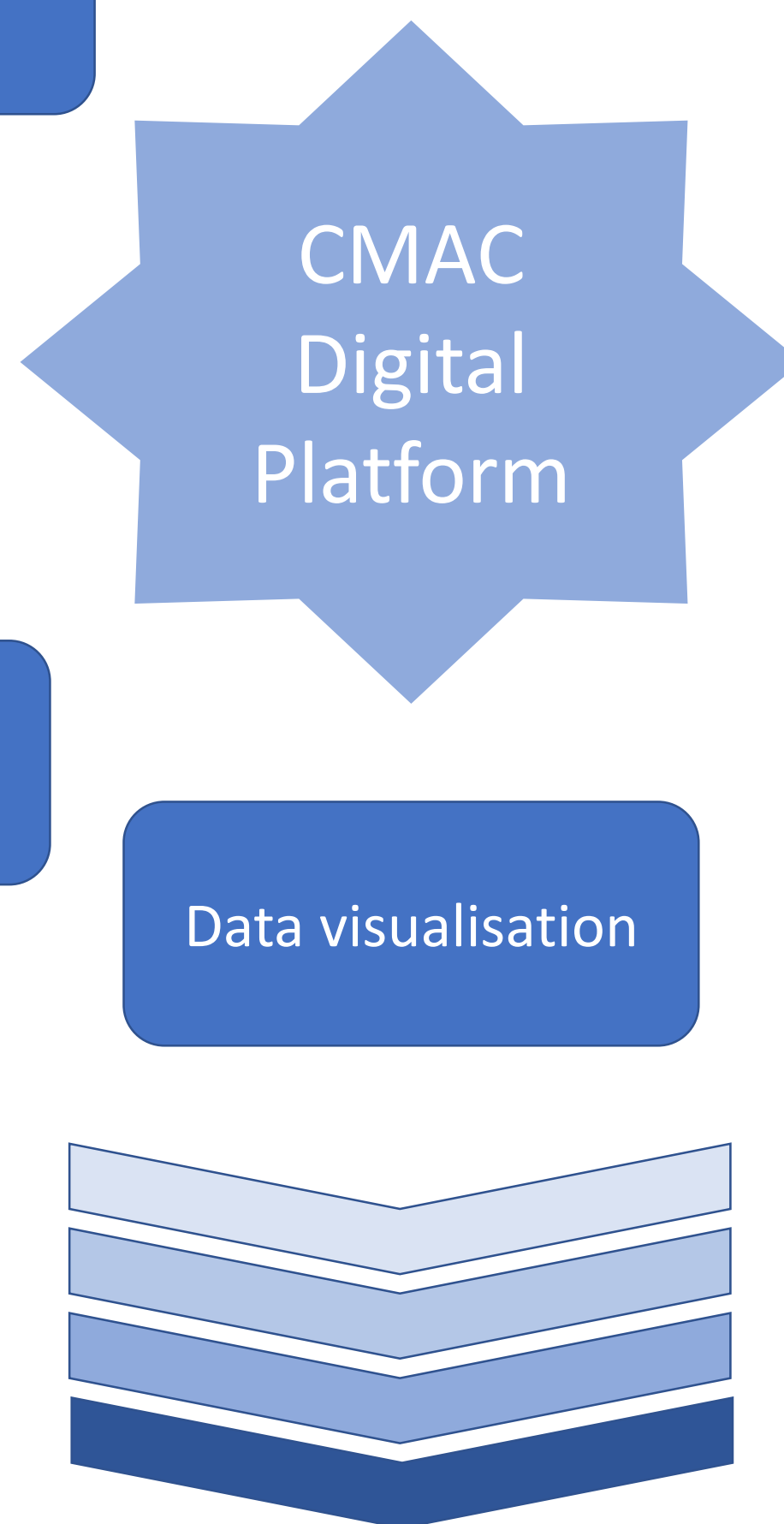Hardware/software infrastructure

Models: PSE flow sheets & standalone

Process control models & control systems

CMAC Digital Platform

Digital workflows & Intelligent Decision Support

Calibration models

Virtualisation

Data visualisation

Model Development and Integration. Utilising and developing models from different vendors to work towards full prediction and simulation. With increasing datasets the ability to apply machine learning should help to further improve models leading to model targeted experimentation
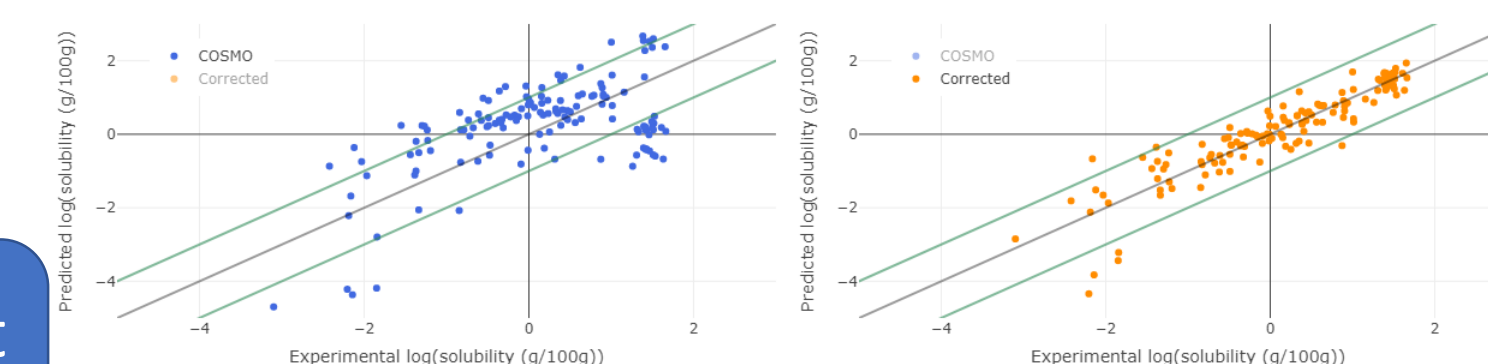
Example of ML correction model for solubility predictions

ARTICULAR: ARtificial inTelligence for Integrated ICT-enabled pharmaceUticaL mAnufactuRing. Integrating Artificial Intelligent learning within bespoke, personalisable Augmented Reality and Virtual Reality interfaces alongside more traditional approaches such as dashboards. These immersive interfaces will help facilitate pharmaceutical manufacturing process design, and visualisation of the complex data being captured and analysed in real-time.

Digital Twin

For CMAC, digital twin refers to a virtual replica of experiments, equipment and measurements.

Current level of theory does not allow full prediction and simulation but can inform or allow targeted experimental design.

- Advancing from flowsheets by merging other models
- Reduce experimental burden, material and time

Working towards a **virtual** representation of processes to **visualise** data.

e.g. crystallise - agglomerate → isolate → compress → test

DIGITAL

PHYSICAL