MM226: Materials Informatics
Homework Assignment: Materials Data Curation

1 Objective

The objective of this assignment is to gain experience in identifying, collecting, and organizing mechanical properties and microstructural information of alloys from scientific literature and handbooks. This process should ensure consistency in data units, labels, grades, and compositions (both weight and atomic fractions).

2 Instructions

1. **Alloy System**: Each group has been randomly assigned a specific alloy system (see Table 1).
2. **Data Collection**: Gather at least 15 to 20 independent data points from research publications and academic databases (Web of Science, Scopus, Google Scholar) as well as handbooks (ASM Handbooks, Materials Properties Databases). If possible, collect more than 20 data points.
    - **Mechanical Properties**: Yield Strength, Ultimate Tensile Strength, Hardness, Elongation, Test Temperature, Strain Rate.
    - **Microstructural Information**: Grain Size, Phases reported, Phase identification.
    - **Composition**: Full chemical composition (both weight and atomic fractions).
    - **Metadata**: Source citation (including DOI numbers for research articles), processing history, and test conditions.
3. **Data Organization**:
    - Compile mechanical properties into a structured CSV file.
    - Store metadata separately in another CSV file.
    - Convert the properties into a JSON file.
    - Append the metadata as a key-value pair within the JSON file.
4. **Report (1 page)**:
    - Overview of the sources used.
    - Comments on missing data, types of data collected, and any gaps identified.

5. **Submission Requirements**:
    - Upload a Python script (Jupyter Notebook or .py file) on Google Classroom.
    - The script must generate the JSON file containing mechanical properties and metadata upon execution.
6. **Submission Deadline**: 3:00 AM, Tuesday, April 8, 2025. Late submissions will not be accepted under any circumstances. No excuses, including network issues or server downtime, will be considered. Assignments will not be accepted via email. Do not approach me with issues related to server overload or connectivity problems. Submit well in advance to avoid last-minute issues.

Table 1: Group Assignments and Topics

Group	Member 1	Member 2	Alloy Series
1	Srikant Ravi Jois	Amrutansh Gupta	Heusler Alloys
2	Inturi Siva Rishitha	Abhinav Gurrapu	Silver Alloys
3	Aditya Kumar Prasad	Burra Vijyusha	High-Entropy Alloys (FCC)
4	Ansh Kyal	Keerthan A	High-Entropy Alloys (BCC)
5	Reyaz Hussain Wazir	Shaksham Kumar Nigam	Co, CoNi-Based Alloys
6	Shah Mahi Sachinkumar	Mohit Garhewal	Copper Alloys (Copper-Tin and others)
7	Nandan K Prasad	Anurag E Prasad	Copper Alloys (Copper-Zinc)
8	Mohan Sai Udarapu	J Shiva	Carbon Steels (Plain Carbon)
9	Kondeti Praveen Kumar	Eata Sai Suraj	Stainless Steels (300 Series - Austenitic)
10	Asmatunnisa Baig	Prakrut Moon	Aluminum Alloys (2XXX Series)
11	Ramavath Sunil Kumar	Praneetha Mannuru	Aluminum Alloys (6XXX Series)
12	Sai Abhilash Dash	Harsh Bhati	Aluminum Alloys (7XXX Series)
13	Utkarsh Mittal	Samridhi	Titanium Alloys (Alpha, Beta, Alpha+Beta)
14	Yash Vardhan Solanki	Pranav Manurkar	Ni-Based Superalloys (Inconel Series)
15	Pohrselvan S.S	Rishabh Patel	Ni-Based Superalloys (UDIMET, Rene, Waspaloy Series)
16	Harshit Kumar	Shubham Prajapati	Ni-Based Superalloys (CMSX Series, TMS Series, PWA Series)
17	Vihaan Singh	Vani Agarwal	TWIP, TRIP Steels
18	Bhumika Aggarwal	Rudresh Pratap Singh	Duplex Steels, Ferritic Steels
19	NAWED ASHRAF	Ayush Kumar Gupta	HSLA Steels
20	Deendayal Suthar	Ommkar Sahoo	Lead Alloys