Towards a Format for Describing Networks

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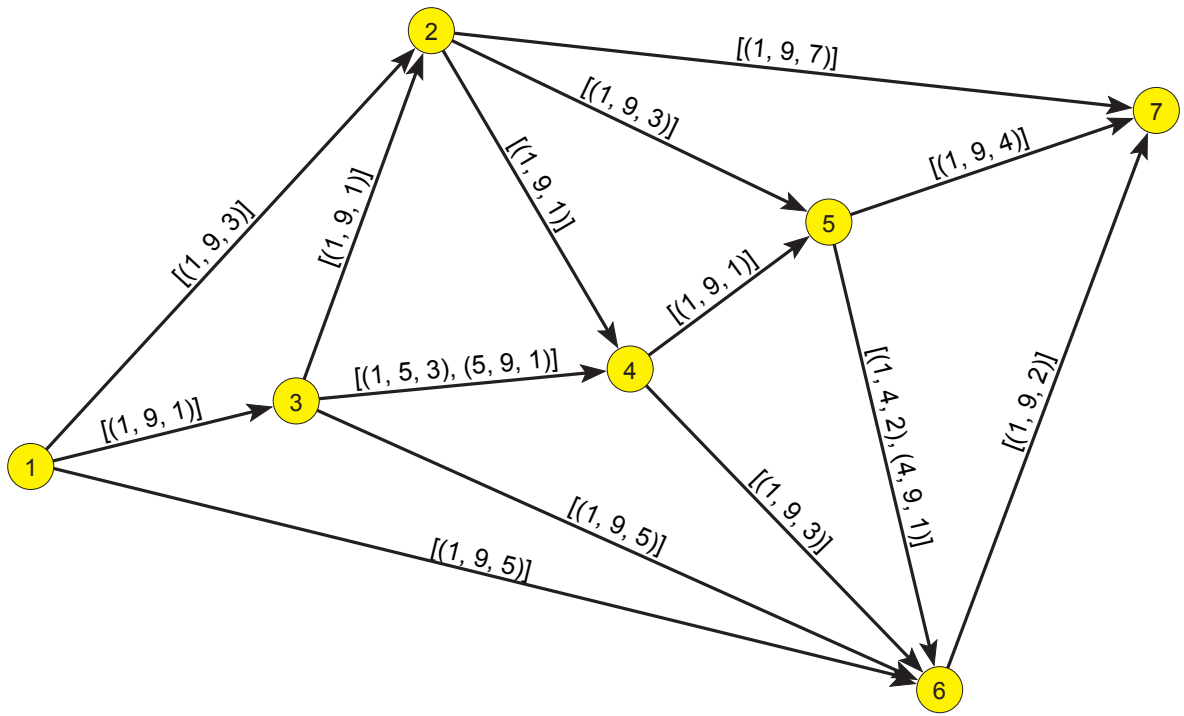
Outline



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Current version of slides (October 6, 2025 at 04 : 29): slides PDF
https://github.com/bavla/netsJSON

Networks

Formally, a *network* $\mathcal{N} = (\mathcal{V}, \mathcal{L}, \mathcal{P}, \mathcal{W})$ consists of:

- a *graph* $\mathcal{G} = (\mathcal{V}, \mathcal{L})$, where $\mathcal{V}$ is the set of nodes and $\mathcal{L}$ is the set of links.
- $\mathcal{P}$ is a set of *node value functions* / properties: $p : \mathcal{V} \rightarrow A$
- $\mathcal{W}$ is a set of *link value functions* / weights: $w : \mathcal{L} \rightarrow B$

Sometimes, implicit additional information/data about values is provided in the specifications of properties: (a) algebraic structures, and (b) properties of values.

There are numerous tools, programs, and packages available for network analysis, each utilizing different formats. Network datasets are available in multiple repositories.

For detailed lists of network analysis resources with links to web pages, see GitHub/bavla/NetsJSON/Info.

The simplest way to describe a network $\mathcal{N}$ is by providing $(\mathcal{V}, \mathcal{P})$ and $(\mathcal{L}, \mathcal{W})$ in a form of two tables.

Formats

Open data plays a crucial role in ensuring the computational reproducibility and verifiability of published results. When preparing such data, it is essential to adhere to the FAIR principles – Findability, Accessibility, Interoperability and Reusability. In 2024 (INSNA) Recommendations for sharing network data and materials were published. It would be highly beneficial to adopt a common "archiving/exchange" network description format.

To include metadata in the network description and to provide support for structured property values (such as lists of words, distributions, temporal quantities, etc.), we are developing a JSON-based format called netsJSON.

In our paper, we present several possible improvements to the netsJSON format so that it can serve as a common format.

Yet another format only makes sense as a project of a larger community of users in the field of data/network analysis.

netsJSON


```
{
"netsJSON": "basic",
"info": {
   "org":1, "nNodes":n, "nArcs":mA, "nEdges":mE,
   "simple":TF, "directed":TF, "multirel":TF, "mode":m,
   "network":fName, "title":title,
   "time": { "Tmin":tm, "Tmax":tM, "Tlabs": {labs} },
   "meta": [events], ...
   },
"nodes": [
   { "id":nodeId, "lab":label, "x":x, "y":y, ... },
   ***
   ],
"links": [
   { "type":arc/edge, "n1":nodeID1, "n2":nodeID2, "rel":r, ... },
   ***
   ],
"data": {
   "data1":description1,
   ***
   }
}
```