

Figures in Engineering Papers

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Outline

Introduction

Types of figures

Guidelines for creating effective figures

Integrating Figures into the Paper

Captions

Case studies

Introduction

Purpose of figures in academic papers

- Clarify complex information

Introduction

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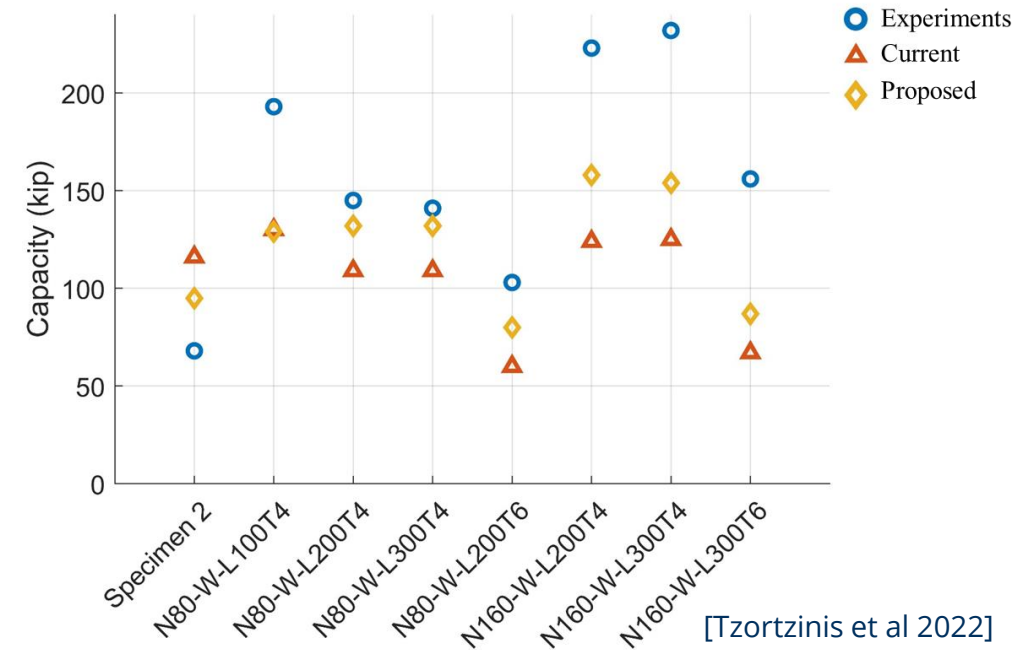
Specimen	Experimental Capacity (Kip)	Current evaluation framework (Kip)	Proposed evaluation framework (Kip)
Specimen 2	73	115	92
N80-W-L-L100T4	195	141	142
N80-W-L200T4	143	110	138
N80-W-L-300T4	145	110	137
...

Introduction

Purpose of figures in academic papers

- Clarify complex information

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- Extra value: Engagement, Memory retention

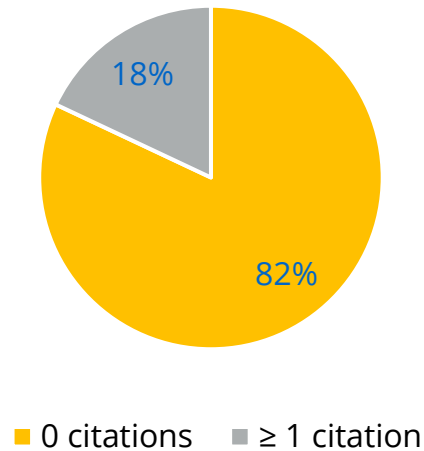
Introduction

Purpose of figures in academic papers

- Increase impact and readability

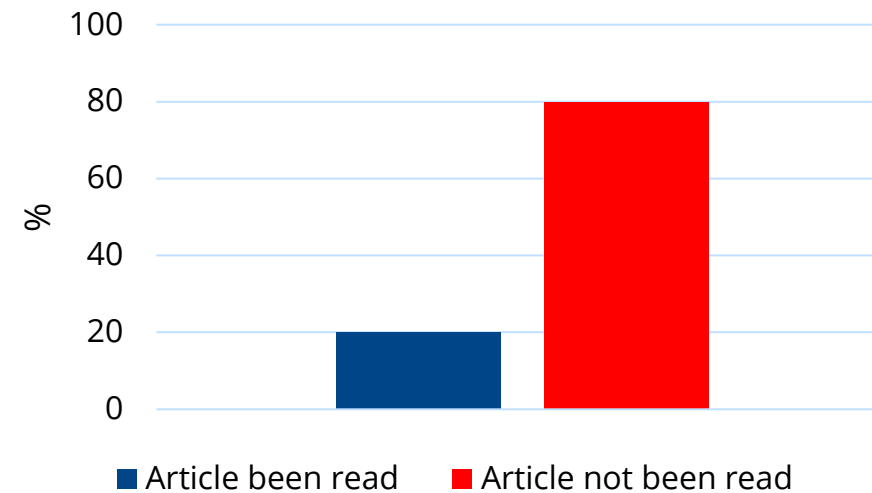
An average paper will be read completely by no more than 10 people

Articles in Humanities



[Data from straitstimes.com]

Cited Articles (in general)



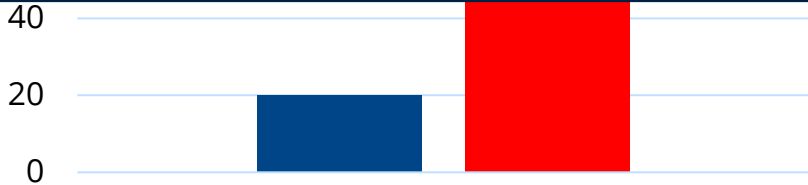
Introduction

Purpose of figures in academic papers

Figures need to tell the whole story!



■ 0 citations ■ ≥ 1 citation



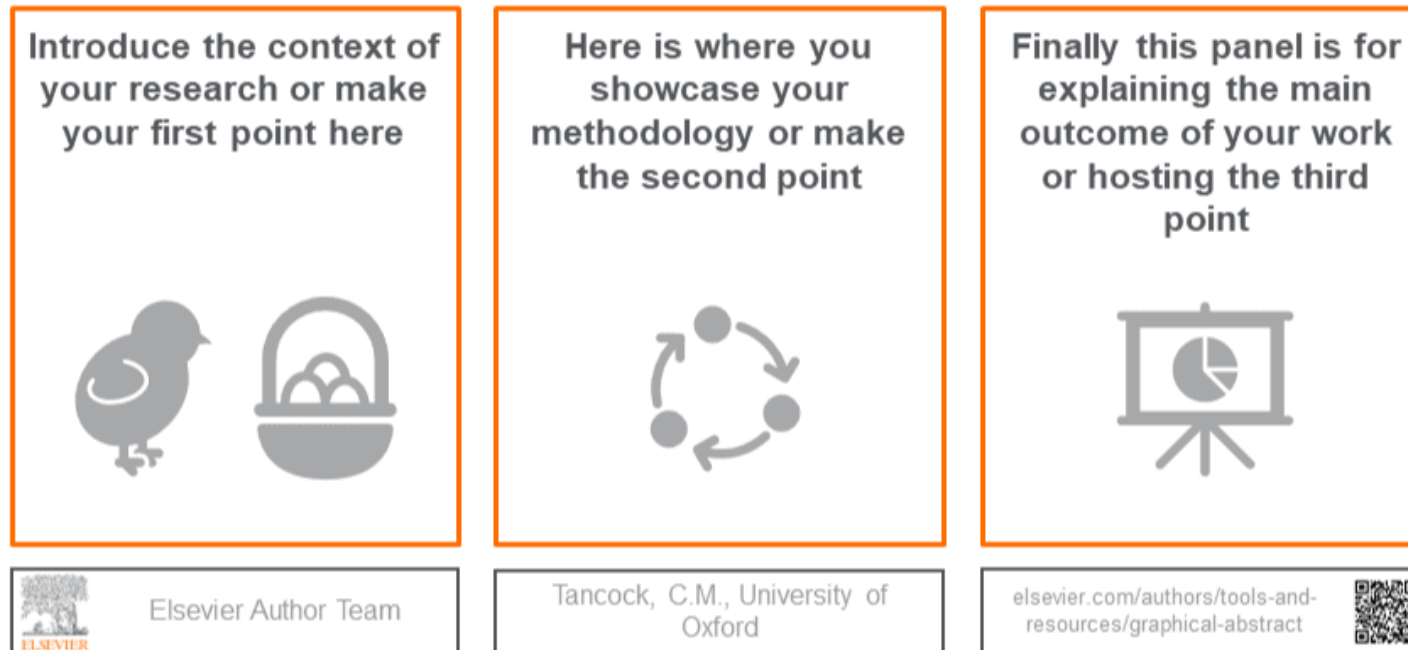
■ Article been read ■ Article not been read

[Data from straitstimes.com]

Types of Figures

Graphical Abstract

Elsevier: Graphical abstract a single, concise, pictorial and visual summary of the main findings of the article. It could either be the concluding figure from the article or better still a figure that is specially designed for the purpose, which captures the content of the article for readers at a single glance.

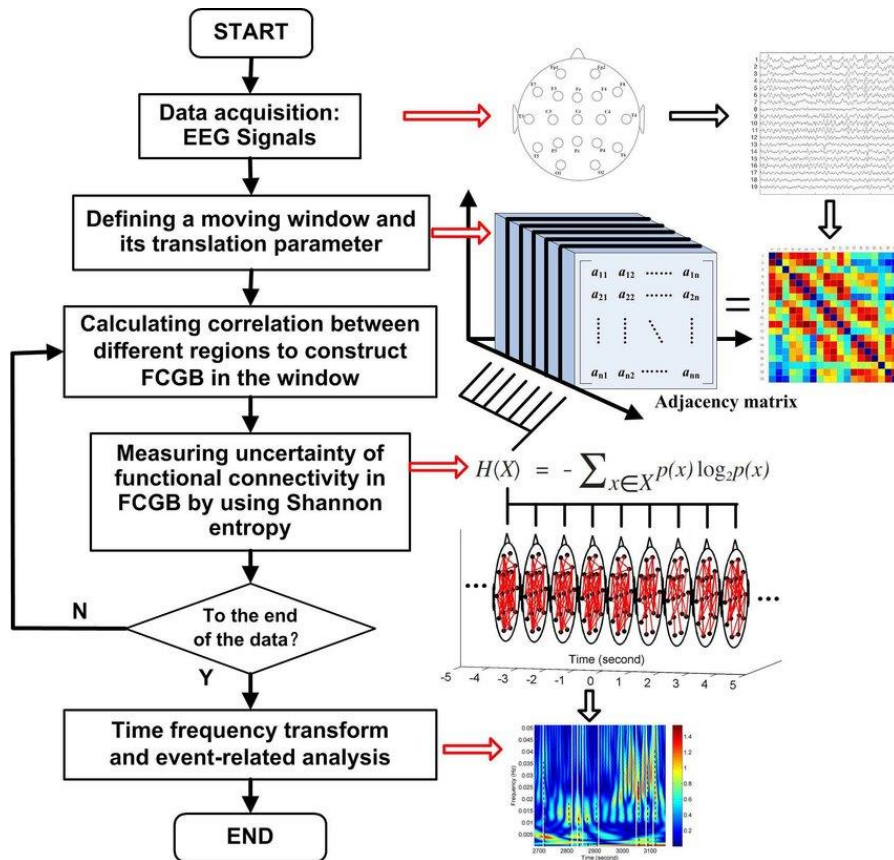


[Elsevier]

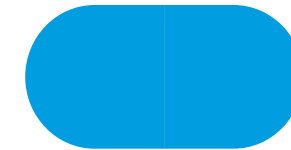
Types of Figures

Methodology

Flowcharts



Common Flowchart Symbols



Start / End



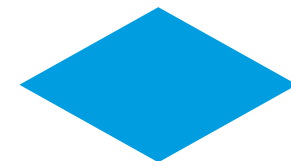
Arrows



Input/ Output



Process



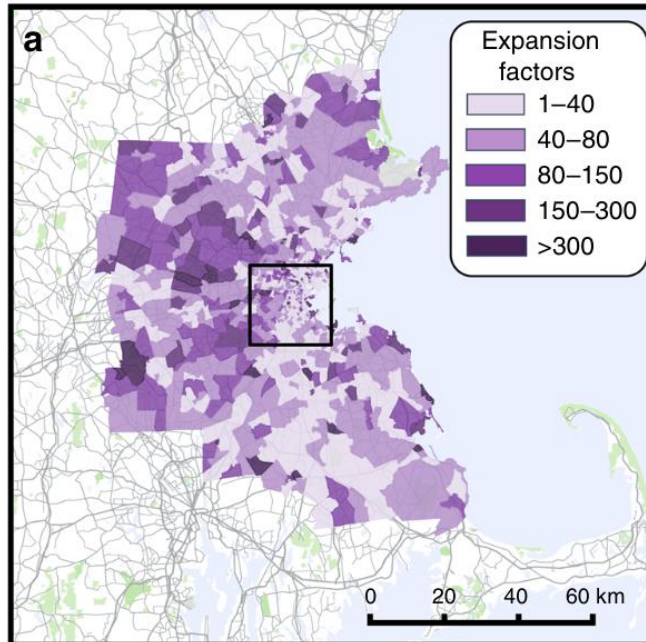
Decision

[Zhang et al. 2024 (10.3390/e20050311)]

Types of Figures

Methodology

Maps (geographic data visualization)



[Barbour et al 2019 (10.1038/s41467-019-11685-w)]

Photographs



[Haughn et al. 2024 (10.1038/s44172-024-00201-8)]

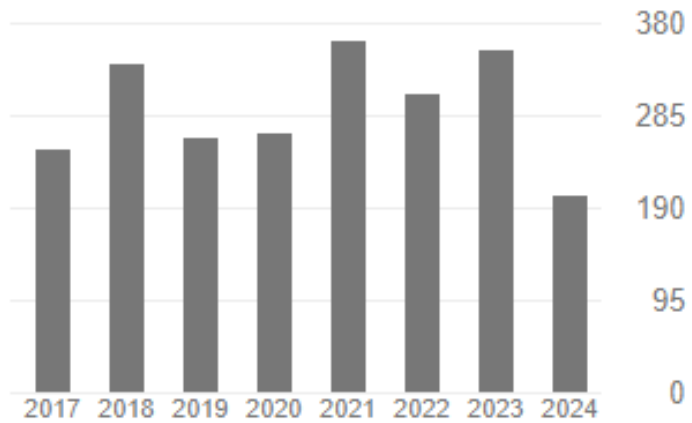
Schematics

Not from an open access article

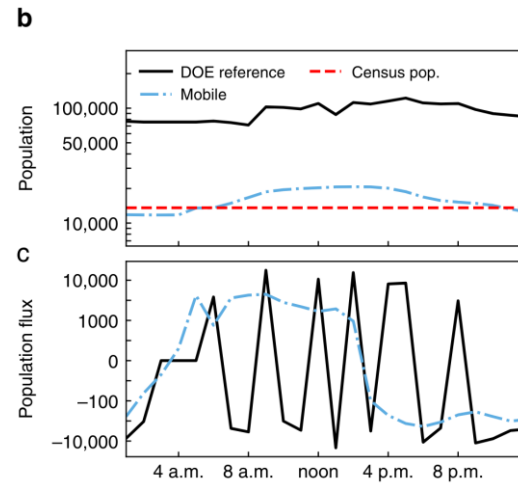
Types of Figures

Results

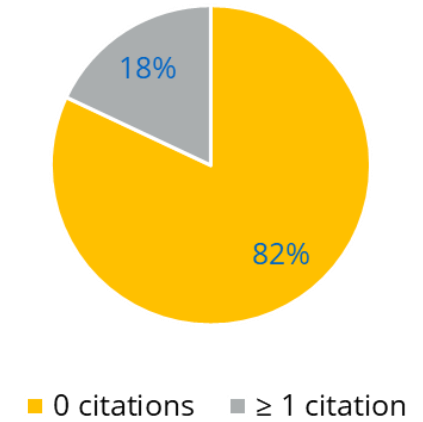
Bar charts



Line graphs



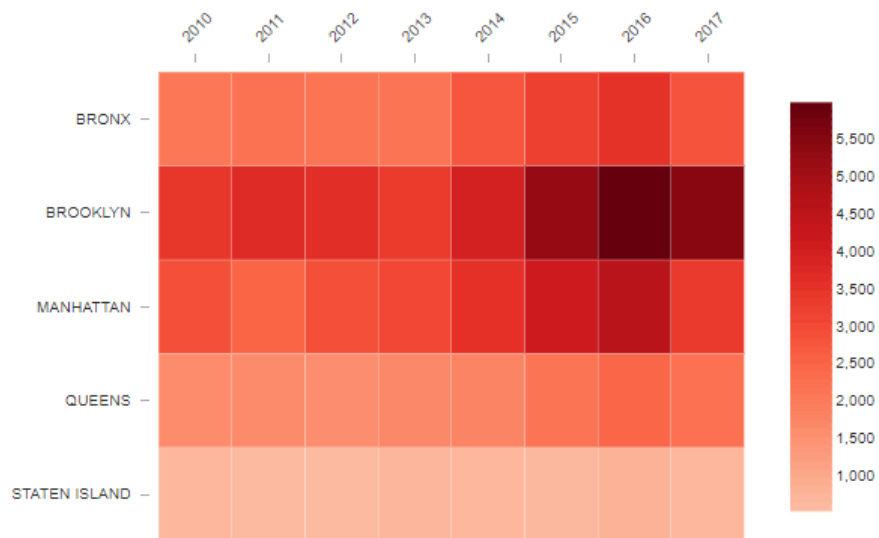
Pie charts



Types of Figures

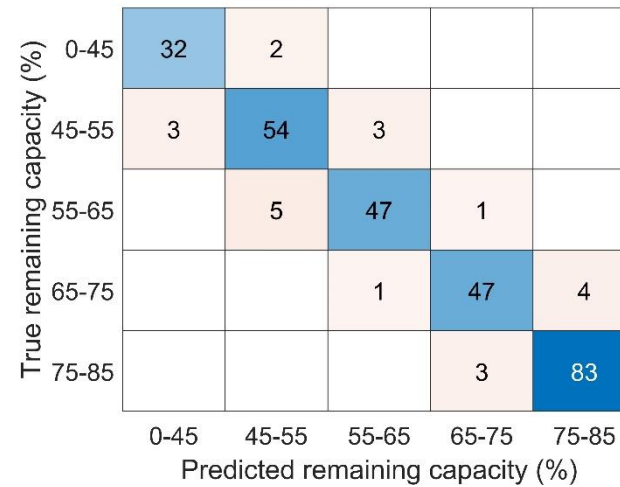
Results

Heatmap

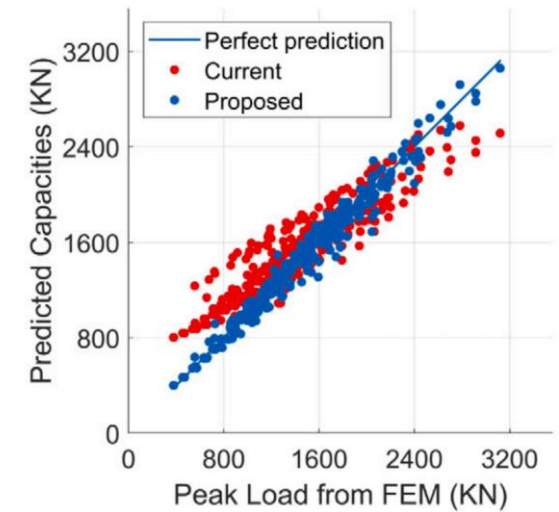


[Diaplayr]

Confusion matrix



Scatter plot



Tools for Figures Generation

Plotting: Matlab, R, Python

CAD Tools: AutoCAD, Solidworks, etc

Schematics: Inkscape, adobe illustration

Integrating figures into papers

How many figures shall we include in typical engineering paper?

Where a figure is placed within text?

Consistency

Concise and self-explanatory captions

Legends underneath graphs

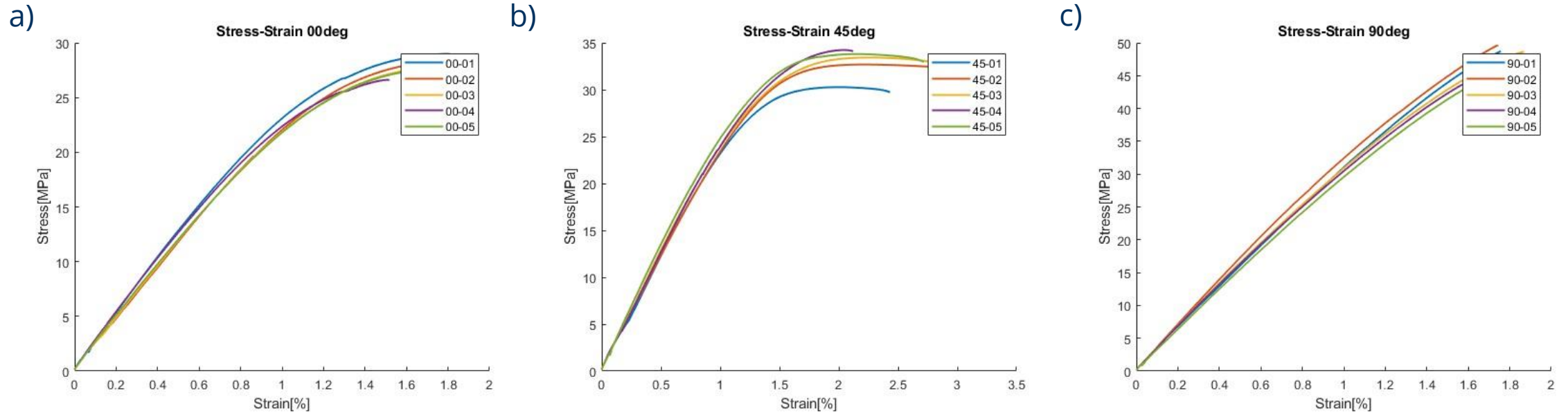
Legends above tables

Never repeat data

Always labelled axes

Case studies

Problem: Material properties of 3D printed filament

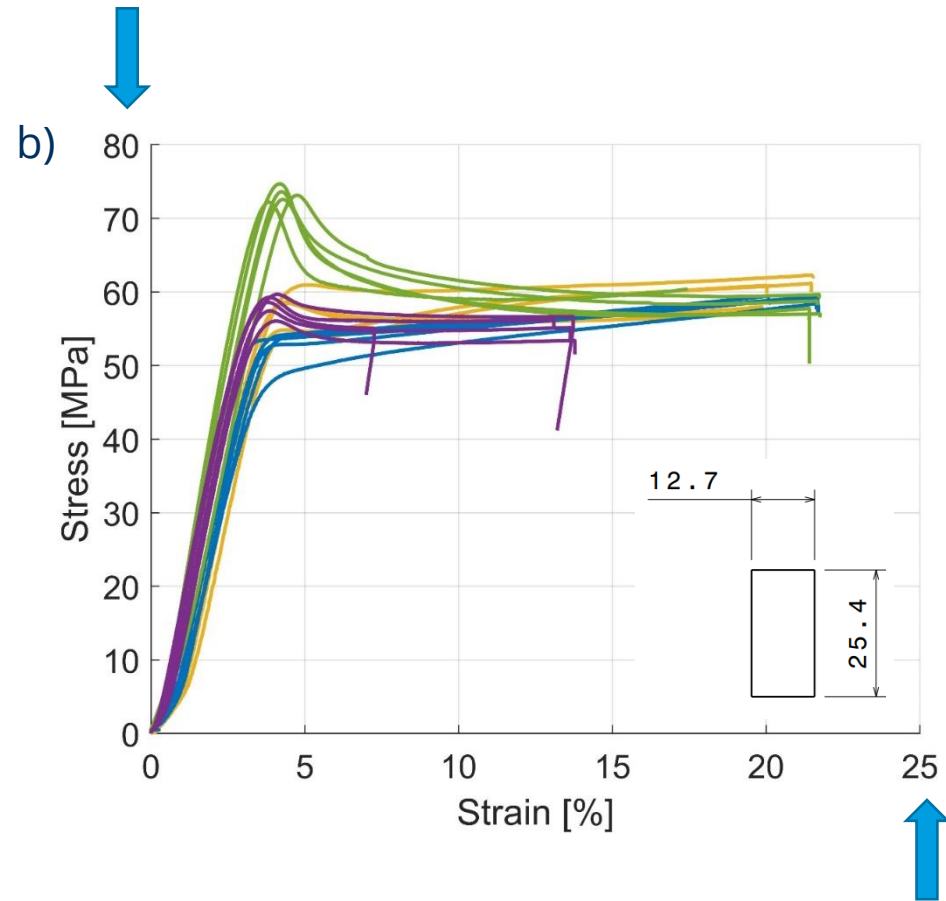
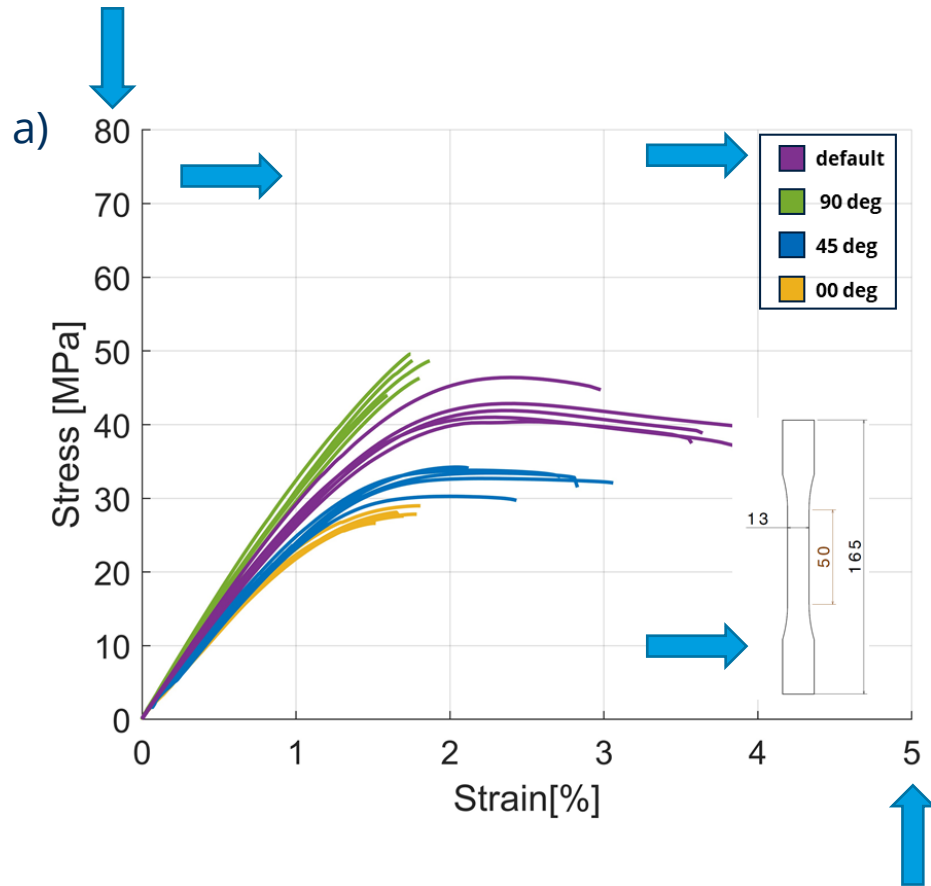


Default MATLAB settings.

Which printing direction results in highest strength? Strain? Stiffness?

What do you think about font, labels, legend, colours, axis, resolution?

Case studies



Any other suggestions?