Project Submission
Helpful Hints on Scientific Writing

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M.EIC Y2 / S1 2025-2026

M.IA Y1 / S1 2025-2026

Components and Deliverables

- **Project Reports**

Reports include problem statement and formalization along with an IEEE formatted final report containing literature review and detailed analysis.

- **Presentation Requirements**

The presentation requires a 10-minute talk, followed by a 10-minute Q&A, supported by PowerPoint slides and, optionally, a demo video.

- **Source Code Deliverable**

The source code may be stored in a documented Git repository, accompanied by a README (mandatory) and a build and run script, to ensure reproducibility.

Presentation Requirements

Presentation Requirements

- **Presentation Structure**

Organize presentations with an introduction, methodology, results, and conclusion sections for clarity and flow.

- **Visual Content Use**

Include clear visuals, such as diagrams, charts, and screenshots, to enhance audience understanding and engagement. If applicable, include a demo video of up to 1 minute to showcase your solution in action.

- **Timing and Delivery**

Practice timing to fit a 10-minute presentation (including a 1-minute demo), speak clearly, and engage the audience effectively.

- **Avoid Slide Overcrowding**

Use bullet points and concise text to prevent overcrowding, while elaborating verbally during the talk.

- **Language**

English or Portuguese.

Presentation

- **When?**

M.IA: 8 January 2026

M.EIC: 9 January 2026

- **Where?**

Room B008

Source Code and Documentation

Source Code and Documentation

- **Organized Git Repository**

Host source code in a well-organized Git repository for maintainability and clarity.

- **Comprehensive README**

README should provide project overview, installation steps, and clear build and run instructions.

- **List Dependencies and Requirements**

Include all dependencies and system requirements to ensure reproducibility of the project.

Paper Format

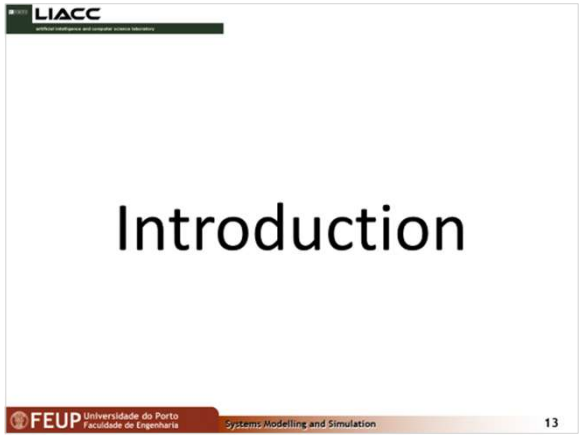
Structure and Formatting Requirements - IEEE Paper Format

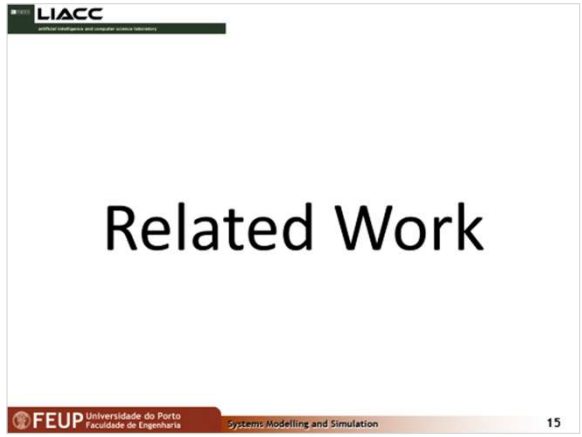
- **IEEE paper format is a widely accepted standard for academic and professional publications.**
- **Double-column layout.**
- **Times New Roman font size 10, and specific section organization**
- **The typical length for conference submissions is 6 to 8 pages, including figures and references.**
- **Students should use the official IEEE template available online to ensure compliance.**

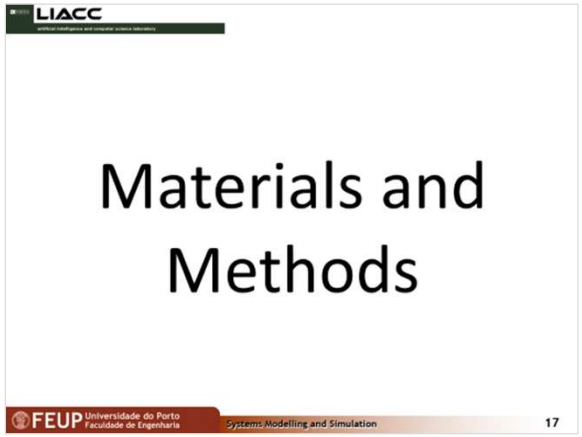
Structure and Formatting Requirements - IEEE Paper Format

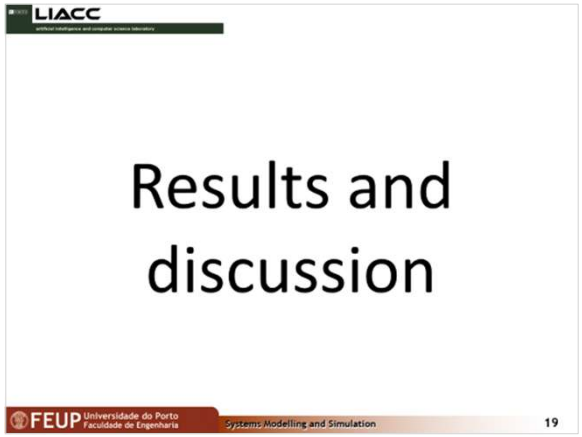
- **Abstract**
- **Keywords**
- **Introduction**
- **Related Work**
- **Methods**
- **Results**
- **Discussion**
- **Conclusion**
- **References**

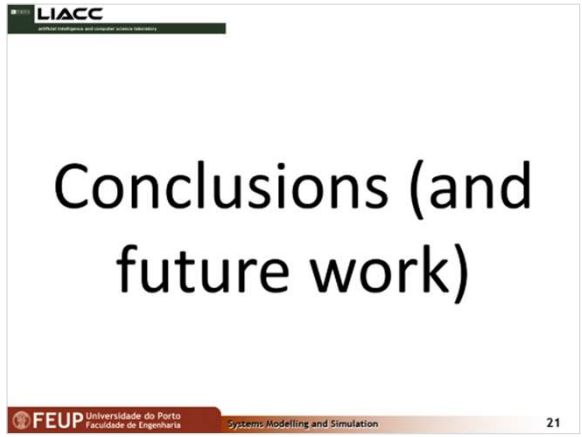
Suggested structure











Abstract

Abstract

- **Context**
- **Problem statement**
- **Goals**
- **Methodology / solution**
- **Main results**
- **Main findings**

- **Keywords (*)**

Introduction

Introduction

- **Context**
- **Problem statement. Clearly define the research question or technical challenge with a precise problem description and formal representations**
- **Motivation (to solve the problem) / significance**
- **Aim and goals**
  - Aim: the main expected outcome of this research project (the big picture!)
  - Goals: specific objectives to be accomplished
- **Research questions**
- **Hypotheses**
- **Document/paper structure**

Related Work

Related Work

- **Review of existing literature.**
- **Relevant concepts and studies.**
- **Summarize background and related work to highlight gaps addressed by the project.**
- **Discussion and critical analysis.**

Materials and Methods

Materials and Methods

- **Problem formalization: what to solve?**
- **Materials:**
  - Data
  - Tools
  - Techniques
- **Methods: how to solve it?**
- **Solution design**

Results and discussion

Results and discussion

- **Methods to collect results**
- **Result presentations (graphs, charts, diagrams, tables, associations)**
- **Critical discussion of bad results**
- **Critical discussion of good results**
- **Focus on counter-intuitive results**
- **Focus on additional results (other than the rest of the literature)**

Conclusions (and future work)

Conclusions (and future work)

- **Remark the conclusions drawn from the related work and gap analysis.**
- **Remark problem and goals.**
- **Remark the main results and findings.**
- **Summarize the main contributions.**
  - Scientific
  - Application
  - Technological
- **Future work**
  - Further developments (how to improve the current work)
  - Future opportunities / R&D paths (spin-off projects/problems of the current work)

References

References

- **IEEE citation style.**
- **Make sure all references are complete and accurate! Don’t rely solely on the BibTeX you get from the web or reference management applications (e.g., Zotero and Mendeley).**
- **Avoid grey literature (e.g. webpages, blogs, whitepapers, opinion articles) and give preference to references that are indexed (e.g. Scopus, WoS, and DBLP). Grey literature may be mentioned as URLs in footnotes.**
- **Maintain consistence in the presentation of the references regarding the name and surname of authors. If names are provided, ensure that all references include this information.**
- **e.g. D. Silva, Tiago Azevedo, and António Costa (2023), … (avoid this!).**
- **e.g. D. Silva, T. Azevedo, and A. Costa (2023), … (prefer this style, see IEEE reference manual).**
- **In BibTex, the field “address” is related to the publisher address, not the conference or event! The address of the events can be included in the (sub)title of the proceedings.**

Helpful Hints on Scientific Writing

Aesthetics

- **A well-designed manuscript helps convey complex information more effectively, making the research more impactful and accessible**
- **Enhances readability and clarity**
  - Well-structured layout
  - Consistent formatting
- **Improves understanding of complex information**
  - Effective use of figures, tables, and graphs
  - Color and contrast
- **Engages the reader**
  - Attractive and pleasing presentation
  - Professional appearance

Aesthetics

- **Facilitates quick information retrieval**
  - Clear visual hierarchy
  - Summarizing key data
- **Supports effective communication of results**
  - Data visualization
  - Logical and intuitive flow
- **Reflects the quality of the research**
  - Attention to detail
  - First impressions matter
- **Accessibility**
  - Inclusive design
  - Use of descriptive captions

Some useful rules to consider

- **The 3-part rule**
  - Introduction
  - Development
  - Conclusion

- **Chapter: 3+ sections**
- **Sections: 3+ paragraphs**
- **Paragraphs: 3+ sentences**

Some useful rules to consider

The section-separation rule

- If the content of a section fits in more subsections, the division should yield at least 2 subsections. Single subsections reflect bad content organization

Bad division

Good division

Some useful rules to consider

Single-paragraph rule

- Avoid using single paragraphs in the body of a section. A well-designed section will have at least 3 paragraphs (recall the 3-part rule)

- **Exception - When to use single paragraphs?**
  - Abstract (if the size is limited, e.g. as in conference papers)
  - Conclusion (the same as above)
  - As an introduction to chapters or sections

Some useful rules to consider

Single-sentence-paragraph rule

- Avoid using single-sentence paragraphs. A well-designed paragraph will have at least 3 sentences (recall the 3-part rule)

- **Exception - When to use single-sentence paragraphs? To introduce:**
  - Figures
  - Tables
  - Lists
  - Algorithms
  - Equations
  - Other non-textual elements

Avoid too much empty space

- **Single-word-ending paragraphs**
- **Whenever possible, try and fill the paragraph width in the last line of the paragraph**

INTRODUCTION

Since the 1950s, the world has gone through a process of rapid urbanization. In 1950 the urbanization rate in Europe was only 51.7% (*1, 2*), which has risen to 74.5% by 2018 (*2*), and is estimated to reach 83.7% in 2050 (*1, 2*). This increasing trend is common to the entire world, with urban population accounting for 29.6% of the world population in 1950, 53.9% in 2015, and 68.4% by 2050 (*1*), and is particularly expressive in Asia and Africa, which are expected to contribute with 90% of the 2.5 billion increase in urban population until 2050 (*2*). Car ownership is also steadily increasing in the European Union (EU), at a yearly rate of 1.2%, totaling 246.3 million passenger cars (*3*) for a population of 446.7 million in 2022 (*4*). These two trends contribute to a high and ever-increasing traffic congestion burden that urban residents incur. The European Commission estimates that total passenger congestion costs amount to 0.98% of the Gross Domestic Product of the EU 28 member states (EU28), or nearly 140 B€/year. And congestion costs are only expected to continue increasing in the EU, by about 50% by 2050 to nearly 200 B€/year (*5*). It is, therefore, paramount to find ever-smarter solutions so that people can live harmoniously in dense communities, as it is only expected that cities will grow in size and population, accentuating congestion problems.

The way people move on a traffic network is guided by greedy principles, where each user selects the most convenient route for themselves. This is the result of applying the concept of Nash equilibrium (*6*) to the traffic assignment problem to arrive at an economic equilibrium. There are some advantages associated with this strategy, namely not requiring communication with fellow users (*7, 8*). It is also intrinsically fair, allowing users to have distinct ways of evaluating possible paths, and entitling every user to make self-interested decisions (*8, 9*). The equilibrium situation in which everyone is greedy is called User Equilibrium (UE), for no user may improve their individual outcomes by unilaterally changing paths (*10*).

This situation differs from the System Optimum (SO) (*10*), where a global system utility function is optimized. This global utility function can be defined so as to attain relevant societal

Avoid too much empty space

- **Whenever possible, try and fill the paragraph width when adding new figures and tables**
- **Preferably, place figures and tables either at the top or the bottom of the page**
- **Graphic elements in the middle of the page usually leave much empty space**

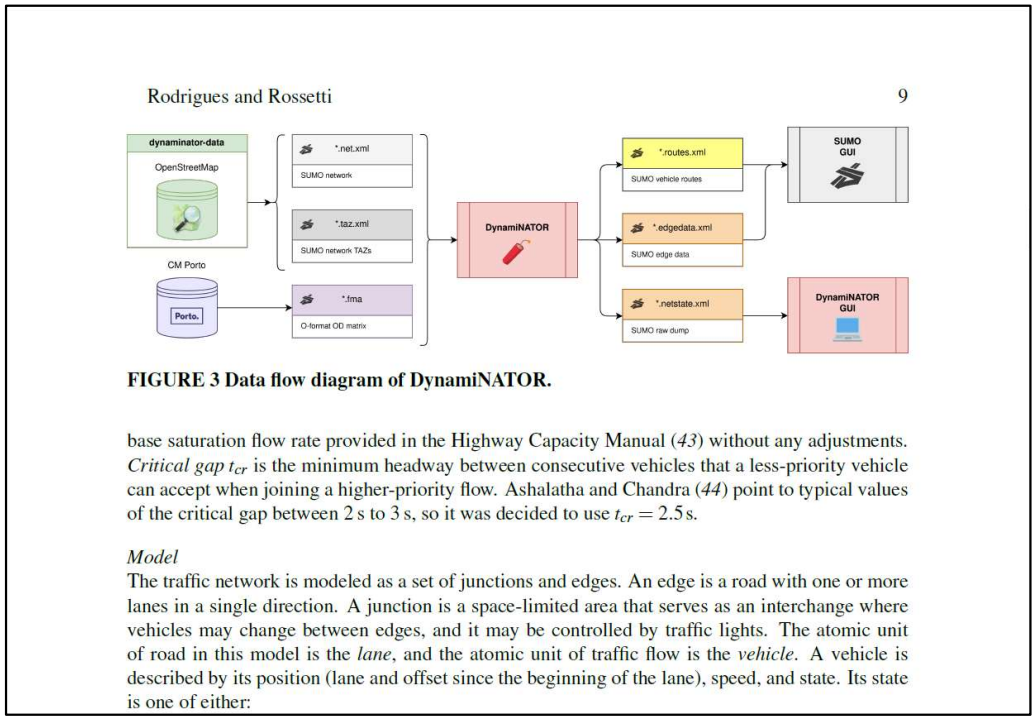


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FIGURE 3 Data flow diagram of DynamiNATOR.

base saturation flow rate provided in the Highway Capacity Manual (*43*) without any adjustments. *Critical gap* t_{cr} is the minimum headway between consecutive vehicles that a less-priority vehicle can accept when joining a higher-priority flow. Ashalatha and Chandra (*44*) point to typical values of the critical gap between 2 s to 3 s, so it was decided to use $t_{cr} = 2.5$ s.

Model

The traffic network is modeled as a set of junctions and edges. An edge is a road with one or more lanes in a single direction. A junction is a space-limited area that serves as an interchange where vehicles may change between edges, and it may be controlled by traffic lights. The atomic unit of road in this model is the *lane*, and the atomic unit of traffic flow is the *vehicle*. A vehicle is described by its position (lane and offset since the beginning of the lane), speed, and state. Its state is one of either:

Figure vs. figure

- **Generally, elements such as figures, tables, and equations, whenever referring to a specific element in the text, are written with the first letter capitalized, followed by the number of the element,**
  e.g. "As depicted in Figure 5, …"

- **When referring to a figure generically, without its number, it is not capitalized,**
  e.g. "The figure below depicts the proposed architecture…"
  e.g. "…, as depicted in figures 5–7."

- **The same is valid for tables and equations. Consistency is key!**

State of the art vs. state-of-the-art

- **Some compound nouns can also be used as adjectives, in which case they're written with hyphens,**

  e.g. "This chapter presents the state of the art in AI."
  e.g., "The state-of-the-art techniques are detailed in the next section."

  e.g. "Data will be collected in real time."
  e.g. "Real-time mechanisms support data exchange in our system."

Numeric citations

- **The numeric citations (e.g. [3] or [11–18] are generally used in conference papers due to space limitations (see IEEE paper formats)**

- **Do not start a sentence with a numeric citation. It doesn't make sense!**
  e.g. "[3] presents an empirical study on ML applied to agriculture."
  e.g. "Silva (2019) presents an empirical study on ML applied to ..." (better!)

- **Hint: when the numeric citation is deleted, the text should still make sense!**
  e.g. "In [3], authors present an empirical study on ML applied to agriculture." (rephrase!)
  e.g. "Authors present an empirical study on ML applied to agriculture [3]."

Formal documents

- **A dissertation should be written with proper and adequate language, should be correct and objective, and should avoid bias**

- **Avoid contractions, such as**
  - **Don't -> do not**
  - **Doesn't -> does not**
  - **That's -> that is**
  - **It's -> it is**
  - **Won't -> will not**
  - And others

- **Prefer these constructions instead:**
  - Like -> such as – e.g. "characteristics such as"
  - So, … -> Therefore – e.g. "Therefore, it is plausible to…"
  - On the other hand, … -> make sure you start with "On the one hand, … . On the other hand, … ."

Work vs. works

Be careful with countable and uncountable nouns

- Works (countable) – self-contained things, as **works** of art or structures in engineering (e.g. "The works by Van Gogh" or bridges, tunnels, etc.)
- Work (uncountable) – the body of knowledge in science is one only, and every scientists contribute a piece to enrich it
  - e.g. "The pieces of work reported by both Mendes (2024) and Machado (2019) suggest that …"
  - Prefer to use "Conclusions and future work" instead
- Countable alternatives to "work":
  - "Carvalho and colleagues carried out a series of **studies** to demonstrate their hypothesis [5]."
  - "Different **efforts** are reported in the literature on this subject [2, 7, 9-11]."
  - "Some empirical **experiments** were performed, which corroborate that idea [18, 21]."
  - "Evaluation **methods** are also proposed by other authors (Carvalho, 2017; Mendes et al, 2025)."
- In academic writing, "**research**" and "**data**" are two uncountable nouns that are notoriously difficult to use correctly. Never add "s" to pluralize "research" or "data". (Note that the word "researches" is only correct when used as the third-person singular of the verb "to research.")

Ethical issues

- **Plagiarism and self-plagiarism**
  - Plagiarism often involves using someone else's words or ideas without proper citation, but you can also plagiarize yourself. Self-plagiarism means reusing work that you have already published or submitted for a class
- **Figure, data, and other elements**
  - The use of someone else's figures and art creation implies proper permissions to be used "as is"
  - Citation is not enough!
    - "Taken from Author (year)" of "borrowed from Author (year) -> requires authorization
    - "Adapted from Author (year)" -> it is your own interpretation and requires no authorization
    - Alternatively, you can include a "Source:…" field in the Figure caption

Proofreading

- **Ask for help from your friends, colleagues, and family**
- **Read, read, read, read quality papers to learn and get inspired**
- **Remember, your supervisors (and conference/journal reviewers) are very busy people. The text they receive for comments should be of good quality and well-presented already**