A LaTeX Template for Writing Papers

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Abstract

This document provides some useful tips as well as serve a template for writing a paper in LaTeX. To understand how LaTeX works, you should compare the source code and the output PDF.

Keywords: keyword1; keyword2; keyword3

1 Text

In LaTeX, just enter an empty line for a new paragraph.

Like this. blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah blah.

Don't use double backslashed for a new paragraph. Backslashed will be used in tables and equations only. Some random text here, there, and everywhere. Some random text here, there, and everywhere. Some random text here, there, and everywhere. Some random text here, there, and everywhere. Some random text here, there, and everywhere.
If you use double backslashes for a new paragraph, it will look very bad. Some random text here, there, and everywhere. Some random text here, there, and everywhere. Some random text here, there, and everywhere. Some random text here, there, and everywhere. Some random text here, there, and everywhere.

If you want to *emphasize* some *words*, use *emph*, instead of *textit*.

2 Citation

- Textual citation: Kwon et al. (2013)

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- Parenthetical citation: (Kwon et al., 2013)
- Multiple parenthetical citations: (Bertsimas and Sim, 2004; Chaerani et al., 2005; Kouvelis and Yu, 1996; Gabrel et al., 2012)
- If you need multiple *textual* citations, it is better to write: Bertsimas and Sim (2004), Chaerani et al. (2005), Kouvelis and Yu (1996), and Gabrel et al. (2012), instead of Bertsimas and Sim (2004); Chaerani et al. (2005); Kouvelis and Yu (1996); Gabrel et al. (2012).

See them in action:

> In this paper, we propose a robust optimization framework for the routing methods based on the CVaR risk measure, assuming that data are uncertain within given sets. The proposed robust optimization method is closely related to robust shortest path (RSP) problems, which find a path that minimizes the worst-case travel cost with an uncertain set of travel cost data. When the uncertain set is box-constrained, the RSP problem can be solved in polynomial time (Bertsimas and Sim, 2003), while the problem is NP-hard when the uncertain set is an ellipsoid (Bertsimas and Sim, 2004; Chaerani et al., 2005) and a set of scenarios (Kouvelis and Yu, 1996). We refer readers to Ben-Tal et al. (2009) and Gabrel et al. (2012) and references therein for general robust optimization methods.

3 Math

Inline equations can be like $\sum_{j:(i,j)\in\mathcal{A}} x_{ij}$.

A single line equation:

$$\sum_{j:(i,j)\in\mathcal{A}} x_{ij} = 1 \quad \forall i \in \mathcal{N} \tag{1}$$

I used $\mathcal{A}$ as a shorthand for $\mathcal{A}$.

Try to give some consistency in your notation. I usually use calligraphic letters to denote sets like set of nodes $\mathcal{N}$, set of arcs $\mathcal{A}$, set of shipments $\mathcal{S}$ as in $n \in \mathcal{N}$ or $\sum_{s\in\mathcal{S}} z_s$, and so on. Lower-case alphabets for variables like x_{ij}, y_i, and z_j. Upper-case roman alphabets like N, A, and S for constants as in $n = 1, ..., N$ or $\sum_{s=1}^{S} x_s$.

I usually use lower-case Greek letters for dual variables: λ_i, ρ_j, etc. Upper-case Greek letters may be some special sets or sets of dual variables: Λ, Θ, etc.

Multiple lines:

$$\sum_{j:(i,j)\in\mathcal{A}} x_{ij} = 1 \quad \forall i \in \mathcal{N} \tag{2}$$

$$\sum_{j:(i,j)\in\mathcal{A}} y_{ij} = 1 \quad \forall i \in \mathcal{N}$$

$$\sum_{j:(i,j)\in\mathcal{A}} z_{ij} = 1 \quad \forall i \in \mathcal{N} \tag{3}$$

$$\sum_{j:(i,j)\in\mathcal{A}} \omega_{ij} = 1 \quad \forall i \in \mathcal{N} \tag{4}$$

$$\sum_{j:(i,j)\in\mathcal{A}} \eta_{ij} = 1 \quad \forall i \in \mathcal{N} \tag{5}$$

A single equation that stretches to multiple lines

$$\begin{aligned}\sum_{j:(i,j)\in\mathcal{A}} x_{ij} + \sum_{j:(i,j)\in\mathcal{A}} x_{ij} + \sum_{j:(i,j)\in\mathcal{A}} x_{ij} \\ + \sum_{j:(i,j)\in\mathcal{A}} x_{ij} + \sum_{j:(i,j)\in\mathcal{A}} x_{ij} + \sum_{j:(i,j)\in\mathcal{A}} x_{ij} \\ + \sum_{j:(i,j)\in\mathcal{A}} x_{ij} + \sum_{j:(i,j)\in\mathcal{A}} x_{ij} + \sum_{j:(i,j)\in\mathcal{A}} x_{ij} \\ + \sum_{j:(i,j)\in\mathcal{A}} x_{ij} + \sum_{j:(i,j)\in\mathcal{A}} x_{ij} = 1\end{aligned} \tag{6}$$

When you want cross-referencing, do this: (1), or (2)–(5).

If you don't want numbering, just add *, like:

$$\sum_{j:(i,j)\in\mathcal{A}} x_{ij} = 1 \quad \forall i \in \mathcal{N}$$

or

$$\sum_{j:(i,j)\in\mathcal{A}} x_{ij} = 1 \quad \forall i \in \mathcal{N}$$

or

$$\sum_{j:(i,j)\in\mathcal{A}} x_{ij} = 1 \quad \forall i \in \mathcal{N}$$

$$\sum_{j:(i,j)\in\mathcal{A}} y_{ij} = 1 \quad \forall i \in \mathcal{N}$$

Please do not use words for variables.

- Don't:

  $$counter_1 = 3 + 10$$

  where $counter_1$ may be confused with $c \times o \times u \times n \times t \times e \times r_1$.

- Instead do:

  $$c_i = 3 + 10$$

  or

  $$\text{counter}_1 = 3 + 10$$

or

$$\mathsf{counter}_1 = 3 + 10$$

depending on the context.

You can use $\boldsymbol{x}$ as a vector of x_{ij}. Some matrices $\boldsymbol{A}$ and $\boldsymbol{B}$. Some vectors are here:

$$\boldsymbol{y} = \begin{bmatrix} 3 \\ 2 \\ 1 \end{bmatrix}, \qquad \boldsymbol{z} = \begin{bmatrix} z_1 \\ z_2 \\ \vdots \\ z_n \end{bmatrix}$$

A matrix is here:

$$\boldsymbol{A} = \begin{bmatrix} a_{11} & \cdots & a_{22} \\ \vdots & \ddots & \vdots \\ a_{1n} & \cdots & a_{nn} \end{bmatrix}$$

If you like curly brackets:

$$\boldsymbol{A} = \begin{pmatrix} a_{11} & \cdots & a_{22} \\ \vdots & \ddots & \vdots \\ a_{1n} & \cdots & a_{nn} \end{pmatrix}$$

4 Theorem

You can write a theorem with a proof.

Theorem 1. *If one is not drunken, the following is true:*

$$1 + 2 = c \tag{7}$$

where c is a constant that represents 3.

Proof. Obvious. □

Definition 1. *Definition.....*

Lemma 1. *Lemma.....*

Proof. We can prove this lemma by using Theorem 1. □

5 Tables

When you prepare tables, please just ignore the positioning of tables in the final PDF file. I put the code for Table 1 above this text and the code for Table 3 below this text. Their actual locations in the output PDF file will be determined by LaTeX. Table 2 is a bad presentation of Table 1.

Table 1: The table caption is above the table. Text to the left, numbers to the right.

Name	Location	Number	Number
Michael	Chicago	10	3.190
Sara	Montreal	110	123.148
Sandra	LA	1210	3.000
Alexander	San Francisco	8	0.000

Table 2: A bad presentation.

Name	Location	Number	Number
Michael	Chicago	10	3.190
Sara	Montreal	110	123.148
Sandra	LA	1210	3.000
Alexander	San Francisco	8	0.000

Tables 1–3 are small tables. If you have a big table like Table 4, then you can use '`sidewaystable`'. However, it is best to redesign the table and not to use sideway tables. Think one more time to decide if you really need such a big table to make your arguments clear.

6 Figures

For figures, it is better to put the caption below the figure. See Figure 1. Whenever possible, you should save your figure as a vector-based PDF file. PDF files that were converted from a JPG file do not look good. Compare Figures 2a and 2b. As you have already seen in Figure 2, you can put figures side by side.

If you are using `MATLAB` to generate figures, read `http://stom.chkwon.net/matlab` for some examples using `save2pdf`.

Table 3: Arc attributes for the 8-node network, with ρ_a: the population density along arc a and $c_a(v_a) = A_a(1 + 0.15(v_a/l_a)^4)$.

Arc a				
Start	End	A_a	l_a	ρ_a
1	2	6	900	701
1	3	4	1400	11193
2	3	6	700	1701

Table 4: A sideway table.

	LINGO				Modified EDO				2-Step EDO			
Case	Solution Type	Risk	Toll Revenue	Run Time	Risk	Toll Revenue	Run Time	Objective Gap (%)	Risk	Toll Revenue	Run Time	Objective Gap (%)
1	Global	2469.86	0	4 sec	2945.94	703.28	8 sec	47.75	2469.86	1.96	14 sec	0.08

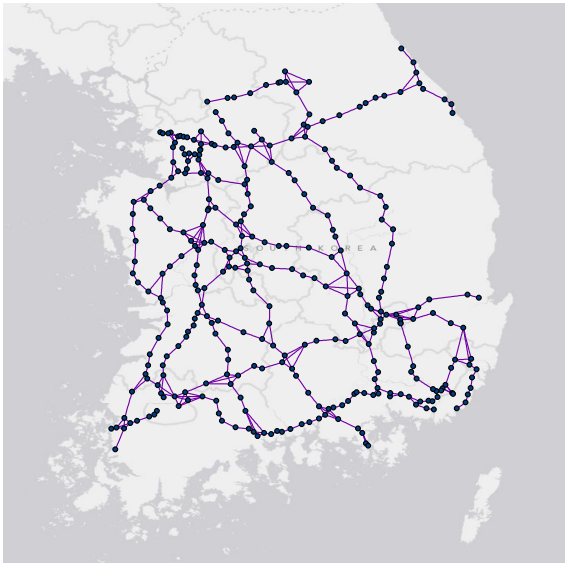
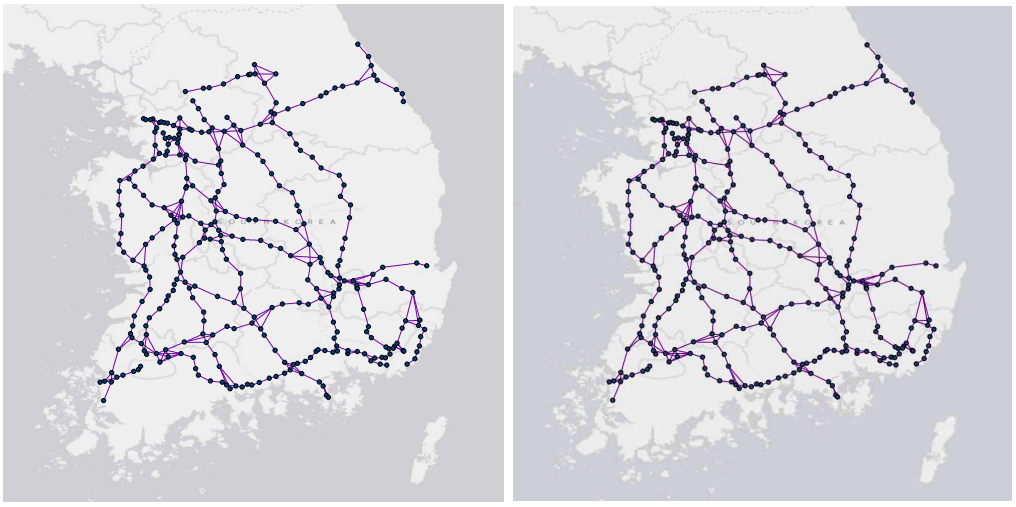


Figure 1: Figure caption is below the figure.



(a) Vector-based PDF (b) PDF converted from JPG

Figure 2: Figures side by side using `subfigure`. Zoom in and out to see the difference.

7 Concluding Remarks

Some guidelines are provided in `http://stom.chkwon.net/latex`. If you have questions regarding LaTeX, go to `http://tex.stackexchange.com` and ask questions to experts. I go there every day. This document has appendices. Appendix C has some interesting materials.

Acknowledgement

Thank you for reading this. This document was not supported by any agency.

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References

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Appendix

This is appendix.

A Proofs

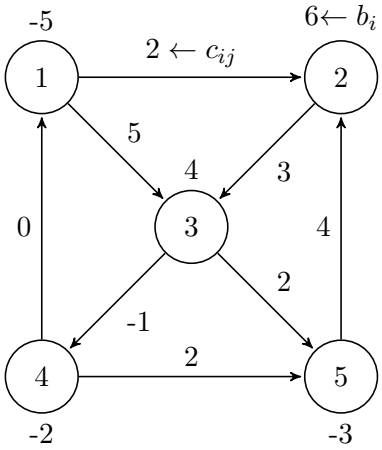
You may want to collect proofs for theorems here. This is Appendix A.

B Data

Or maybe some data. This is Appendix B.

C Drawing

You can also draw some figures within LaTeX. You can put it between text like this:



You can also put them in figures like Figures 3 and 4. You can also draw a network that is slightly more graphical as in Figure 5. You can even draw a digram that is as complicated as Figure 6. Visit `http://www.texample.net/tikz/examples/` for more examples and ideas.

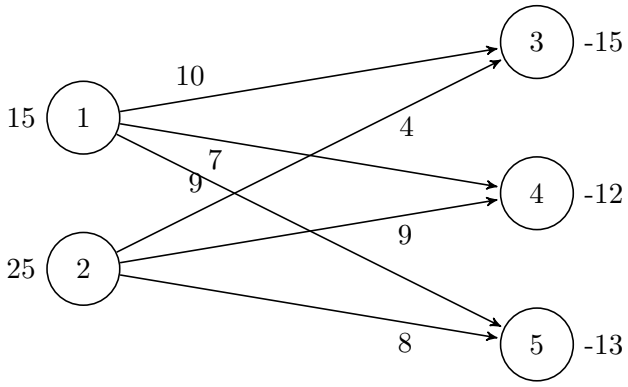


Figure 3: Some network 2

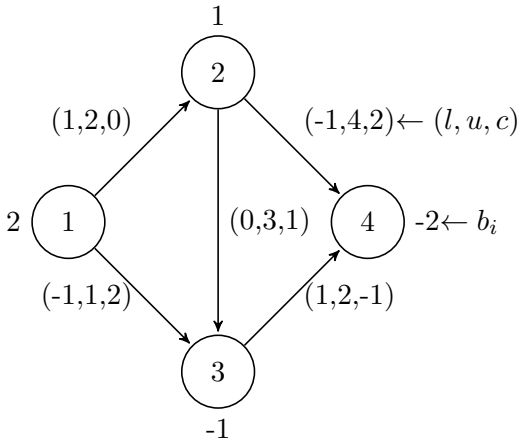


Figure 4: Some network 3

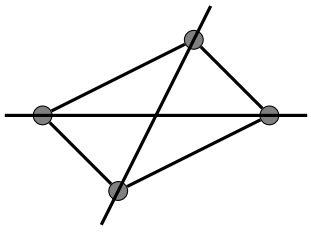


Figure 5: Some network

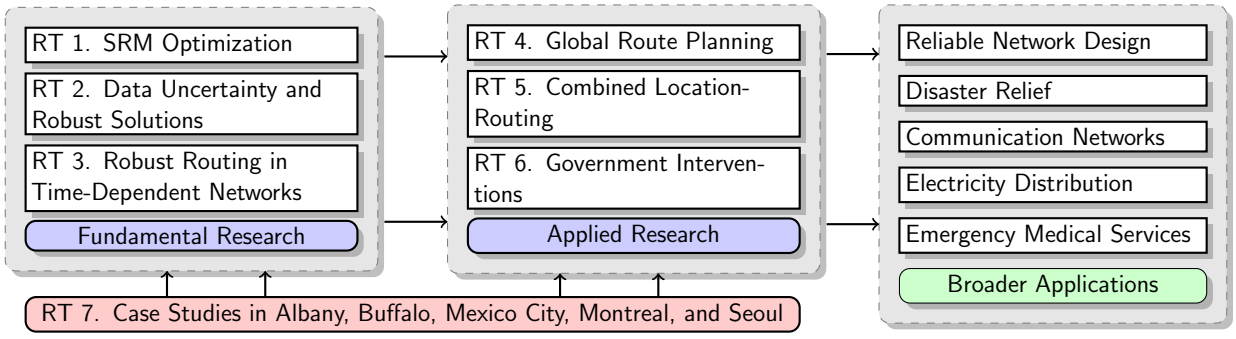


Figure 6: Complicated diagram