Middlesex University Dubai

LATEX BY EXAMPLE

Judhi Prasetyo

Computer Engineering & Informatics

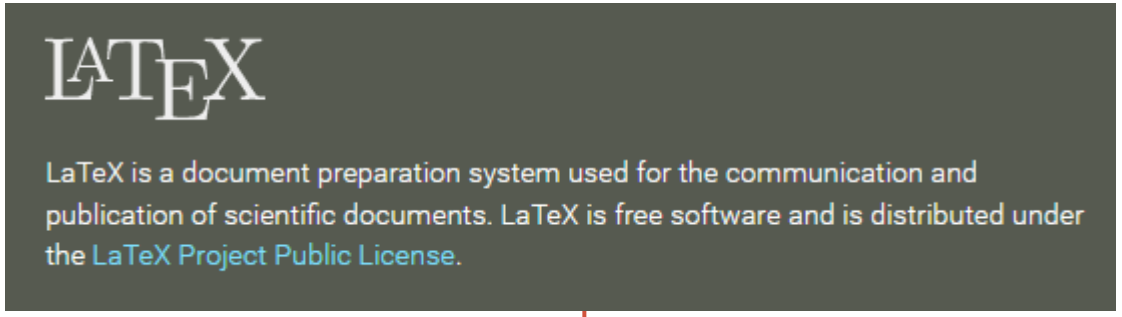
Middlesex University Dubai

Learning outcomes

By the end of this session, you will be able to:

- Create a LaTeX document using Overleaf
- Format a LaTeX document with two columns IEEE format
- Create an automatic reference to a Bibliography
- Add figures to your document
- Add table to your document

LaTeX



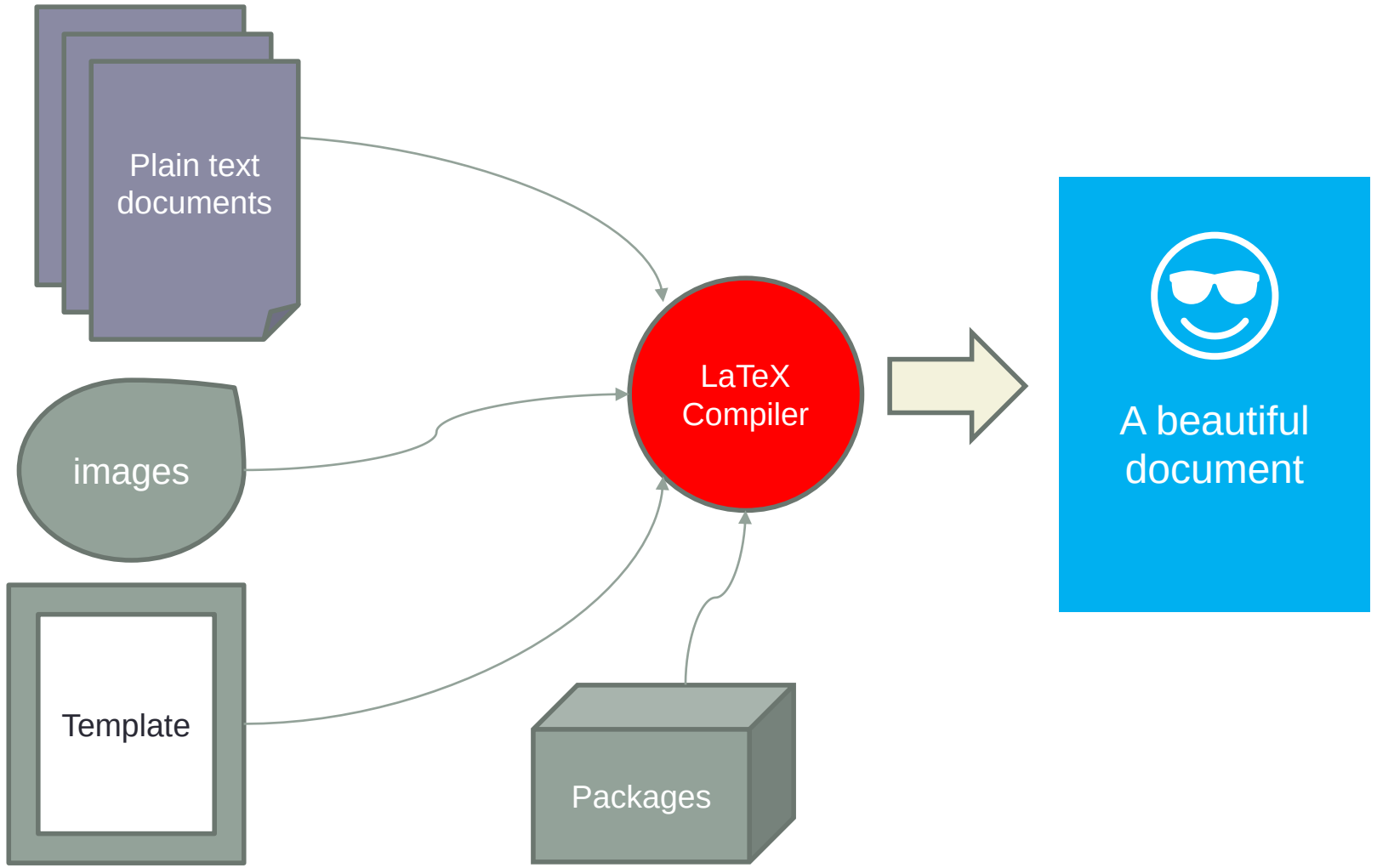
does this

- Separate content and format
- Bibliography support
- Sophisticated structuring abilities
- Reference tracking
- Highly extendible capabilities

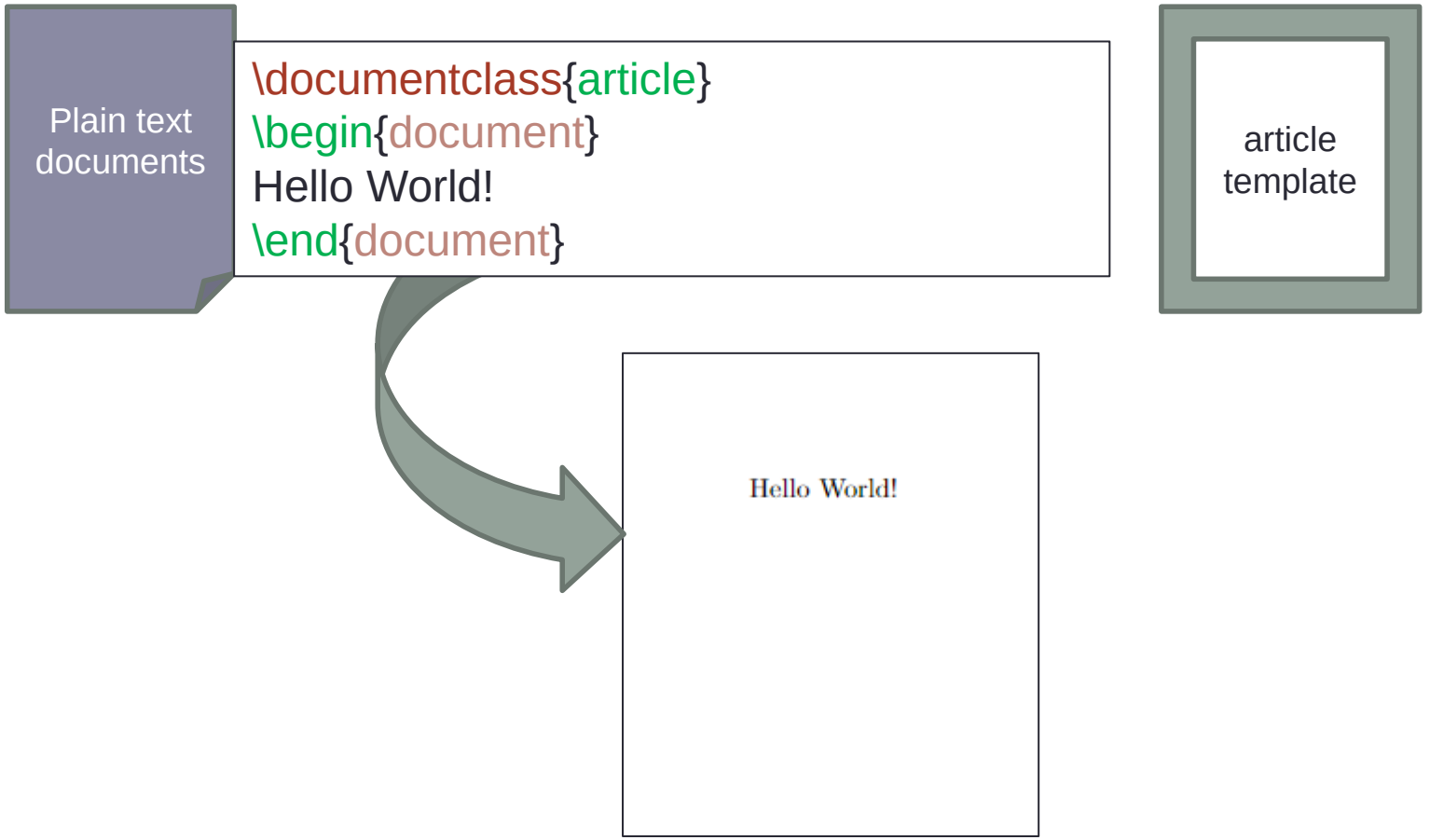
does NOT do this

- Spell checking
- Give us complete control over formatting
- Provide GUI for editing (provided by some tools)

How LaTeX work



A very simple LaTeX document



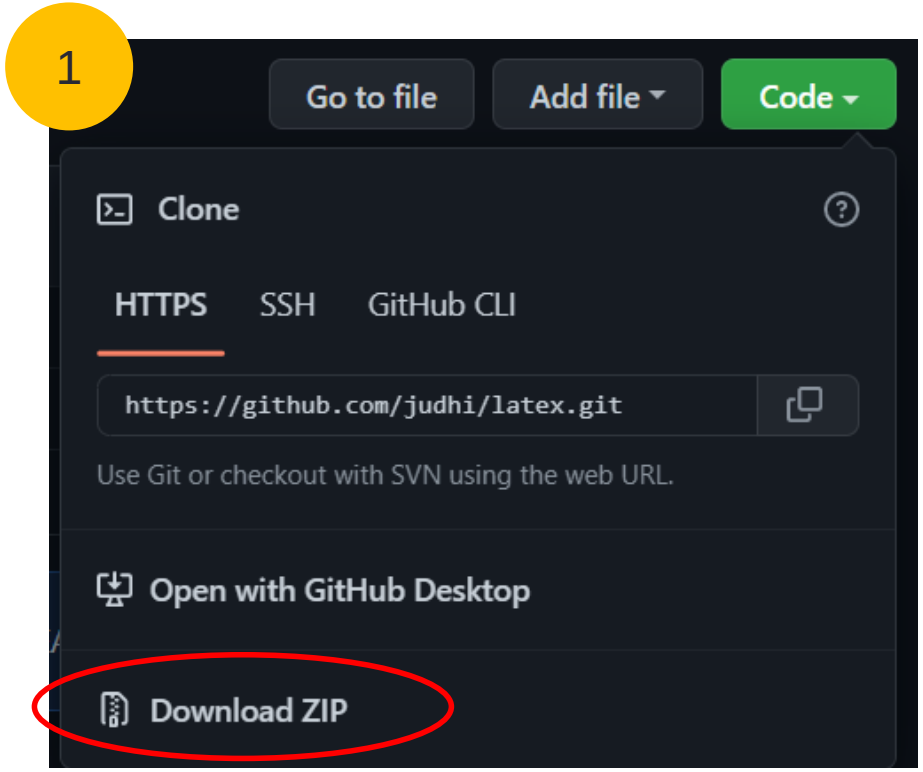
Overleaf

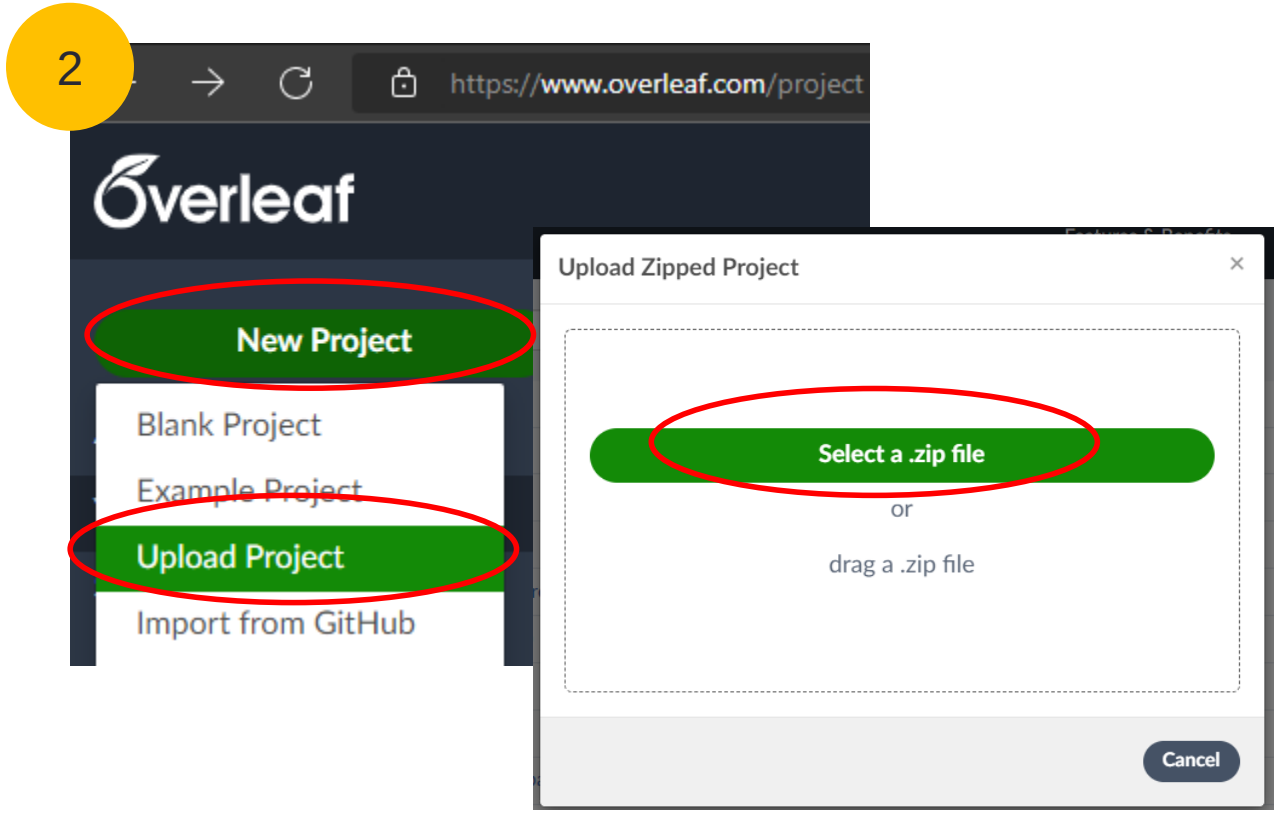
- Overleaf is a website for writing documents in LATEX.
- It ‘compiles’ your LATEX automatically to show you the results.
- You may start with a FREE plan, register here:

https://www.overleaf.com/register

Let's start!

1. Download ZIP / clone the sample document from https://github.com/judhi/latex
2. Upload the ZIP file to your Overleaf : **New Project > Upload Project > Select a .zip file** (or drag & drop)





Using Overleaf

Text editor

Switcher

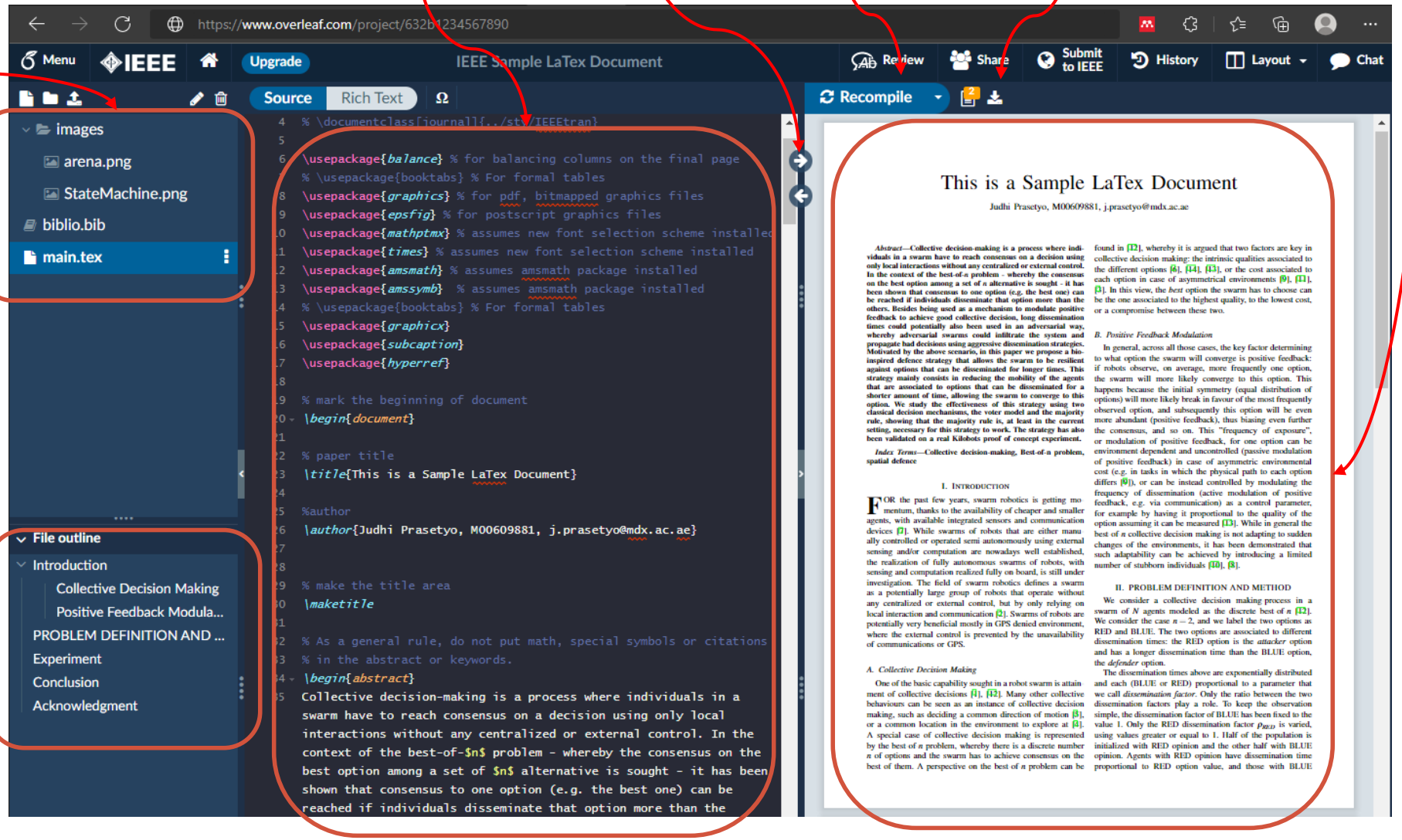
Compile button

Download as PDF button

Compiled output

File manager
- text
  - main
  - biblio
- images

File outline



Document Structure - Headers

```
1  \documentclass[journal]{IEEEtran}
2  %
3  % If IEEEtran.cls has not been installed into the LaTeX system
   files, manually specify the path to it like:
4  % \documentclass[journal]{../sty/IEEEtran}
5
6  \usepackage{balance} % for balancing columns on the final page
7  % \usepackage{booktabs} % For formal tables
8  \usepackage{graphics} % for pdf, bit-mapped graphics files
9  \usepackage{epsfig} % for postscript graphics files
10 \usepackage{mathptmx} % assumes new font selection scheme installed
11 \usepackage{times} % assumes new font selection scheme installed
12 \usepackage{amsmath} % assumes amsmath package installed
13 \usepackage{amssymb}  % assumes amsmath package installed
14 % \usepackage{booktabs} % For formal tables
15 \usepackage{graphicx}
16 \usepackage{subcaption}
17 \usepackage{hyperref}
```

Format the document using IEEEtran two-columns journal template

Anything starts with % sign is considered as comment. To intentionally write a percent sign, add a backslash in front of it: \%

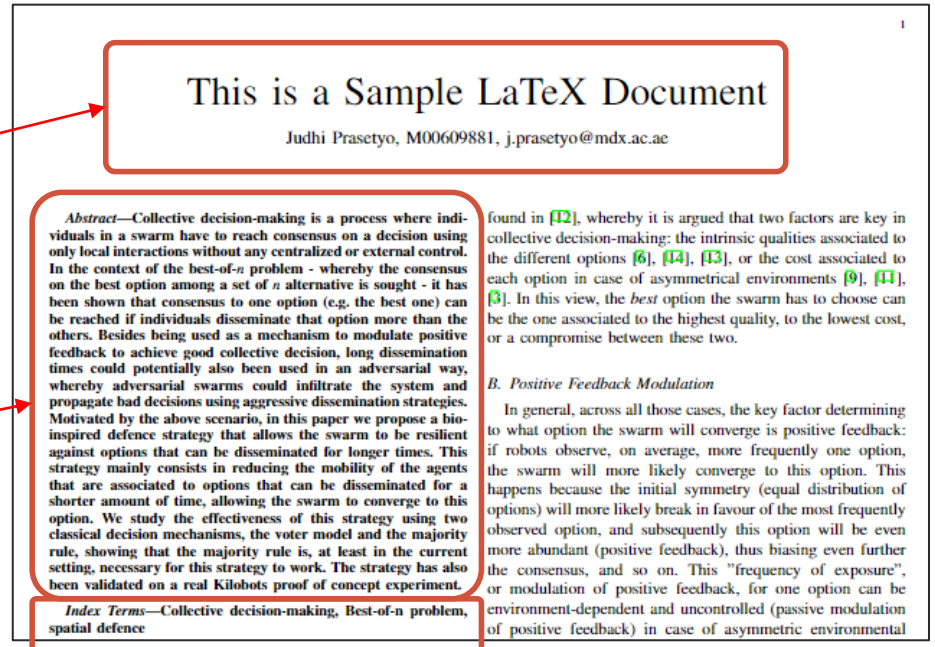
Not all of these packages must be used. Depends on the requirement.

Document Structure - Content

```
% mark the beginning of document
\begin{document}

% paper title
\title{This is a Sample LaTeX Document}

%author
\author{Judhi Prasetyo, M00609881, j.prasetyo@mdx.ac.ae}


% make the title area
\maketitle

% As a general rule, do not put math, special symbols or citations
% in the abstract or keywords.
\begin{abstract}
Collective decision-making is a process where individuals in a
swarm have to reach consensus on a decision using only local
interactions without any centralized or external control. In the
```

Should correspond with
\end{*abstract*}

Should correspond with
\end{*document*}



This is a Sample LaTeX Document

Judhi Prasetyo, M00609881, j.prasetyo@mdx.ac.ae

***Abstract*—Collective decision-making is a process where individuals in a swarm have to reach consensus on a decision using only local interactions without any centralized or external control. In the context of the best-of-*n* problem - whereby the consensus on the best option among a set of *n* alternative is sought - it has been shown that consensus to one option (e.g. the best one) can be reached if individuals disseminate that option more than the others. Besides being used as a mechanism to modulate positive feedback to achieve good collective decision, long dissemination times could potentially also been used in an adversarial way, whereby adversarial swarms could infiltrate the system and propagate bad decisions using aggressive dissemination strategies. Motivated by the above scenario, in this paper we propose a bio-inspired defence strategy that allows the swarm to be resilient against options that can be disseminated for longer times. This strategy mainly consists in reducing the mobility of the agents that are associated to options that can be disseminated for a shorter amount of time, allowing the swarm to converge to this option. We study the effectiveness of this strategy using two classical decision mechanisms, the voter model and the majority rule, showing that the majority rule is, at least in the current setting, necessary for this strategy to work. The strategy has also been validated on a real Kilobots proof of concept experiment.**

***Index Terms*—Collective decision-making, Best-of-n problem, spatial defence**

found in [12], whereby it is argued that two factors are key in collective decision-making: the intrinsic qualities associated to the different options [6], [14], [13], or the cost associated to each option in case of asymmetrical environments [9], [11], [3]. In this view, the *best* option the swarm has to choose can be the one associated to the highest quality, to the lowest cost, or a compromise between these two.

B. Positive Feedback Modulation

In general, across all those cases, the key factor determining to what option the swarm will converge is positive feedback: if robots observe, on average, more frequently one option, the swarm will more likely converge to this option. This happens because the initial symmetry (equal distribution of options) will more likely break in favour of the most frequently observed option, and subsequently this option will be even more abundant (positive feedback), thus biasing even further the consensus, and so on. This "frequency of exposure", or modulation of positive feedback, for one option can be environment-dependent and uncontrolled (passive modulation of positive feedback) in case of asymmetric environmental

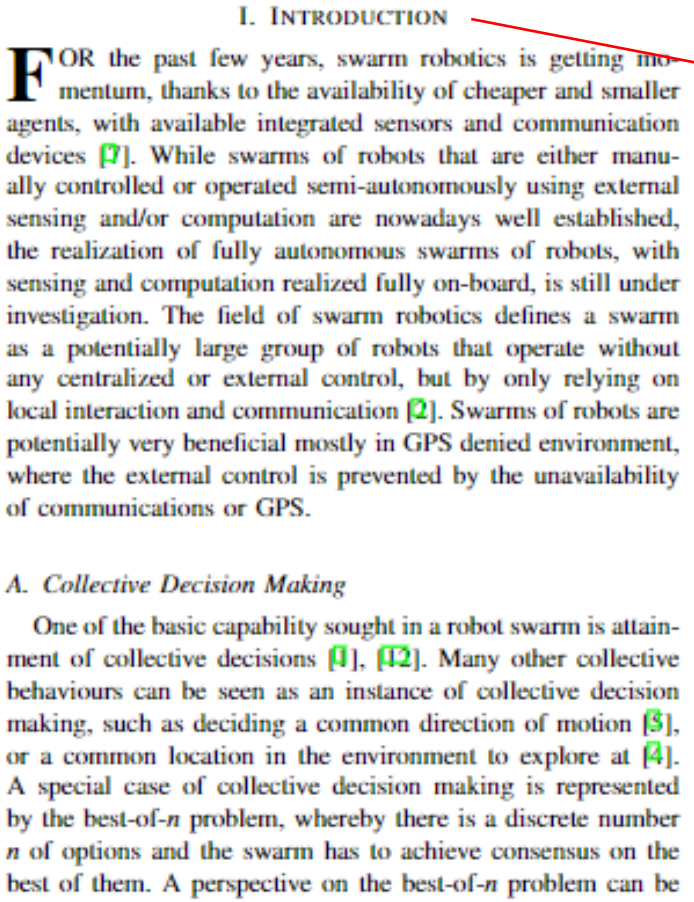
```
\begin{IEEEkeywords}
Collective decision-making, Best-of-n problem, spatial defence
\end{IEEEkeywords}
```

Section and Subsection

```
48  \IEEEPARstart{F}{or} the past few years, s
    the availability of cheaper and smaller ag
```

The very first letter is a 2 line initial drop letter followed by the rest of the first word in caps.

Subsection must start with
\subsection{*name_of_section*}
No ending marker needed.
Subsection number will be added automatically.



I. Introduction

FOR the past few years, swarm robotics is getting momentum, thanks to the availability of cheaper and smaller agents, with available integrated sensors and communication devices [7]. While swarms of robots that are either manually controlled or operated semi-autonomously using external sensing and/or computation are nowadays well established, the realization of fully autonomous swarms of robots, with sensing and computation realized fully on-board, is still under investigation. The field of swarm robotics defines a swarm as a potentially large group of robots that operate without any centralized or external control, but by only relying on local interaction and communication [2]. Swarms of robots are potentially very beneficial mostly in GPS denied environment, where the external control is prevented by the unavailability of communications or GPS.

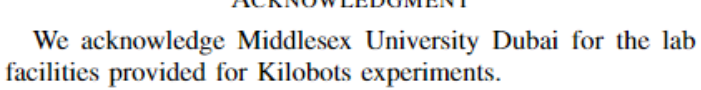
A. Collective Decision Making

One of the basic capability sought in a robot swarm is attainment of collective decisions [1], [12]. Many other collective behaviours can be seen as an instance of collective decision making, such as deciding a common direction of motion [8], or a common location in the environment to explore at [4]. A special case of collective decision making is represented by the best-of-*n* problem, whereby there is a discrete number *n* of options and the swarm has to achieve consensus on the best of them. A perspective on the best-of-*n* problem can be

Section must start with
\section{*name_of_section*}
No ending marker needed.
Section number will be added automatically.

Add asterisk after **section** to suppress the automatic section number
\section*{*name_of_section*}

```
160  \section*{Acknowledgment}
161  We acknowledge Middlesex University Dubai for
     the lab facilities provided for Kilobots
     experiments.
```



Acknowledgment

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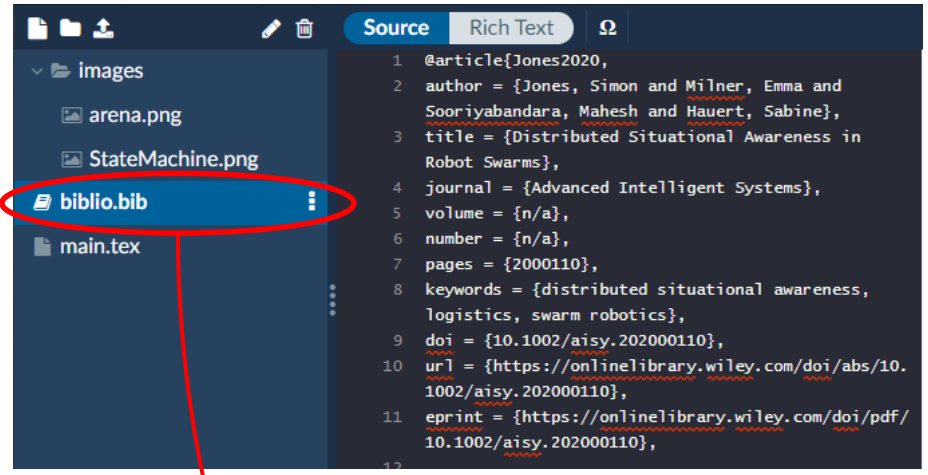
Referencing

```
relying on local interaction and
communication~\cite{brambilla/ferrante/birattari/dorigo:2013}. Swarms of robots are potentially very
```

Use **\cite{***ref_name***}** to mark reference to certain source. The *ref_name* must already listed as BIBTEX in the **biblio.bib** file

```
154  % bibliography
155  \bibliographystyle{plain}
156  \bibliography{biblio}
157
158  \end{document}
```



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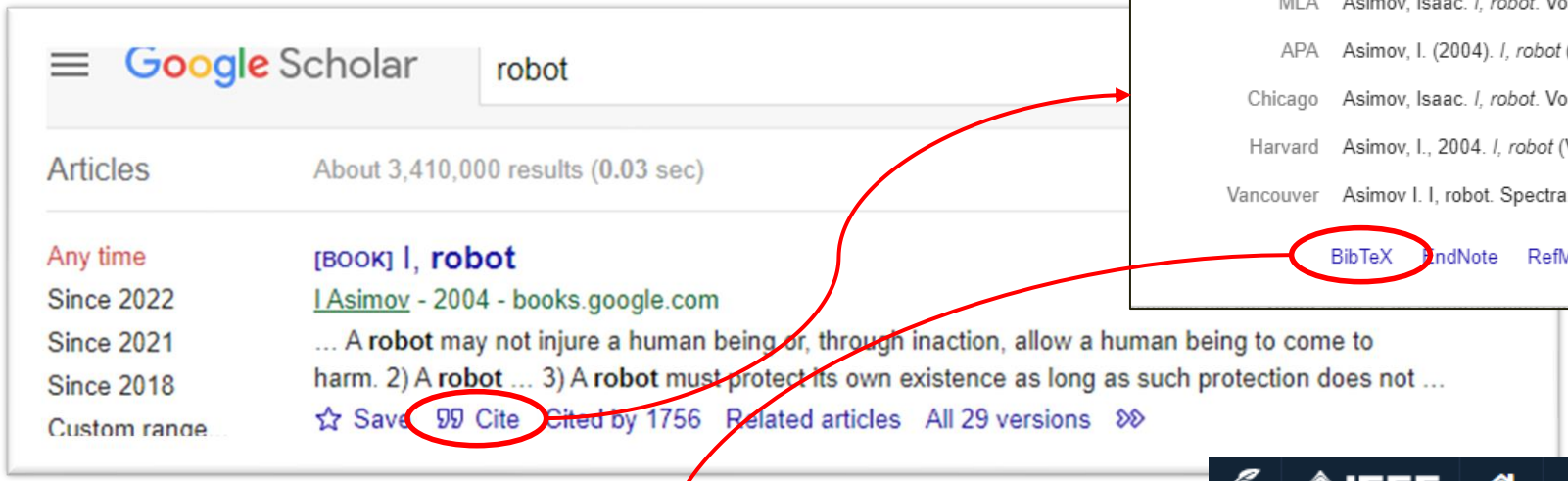
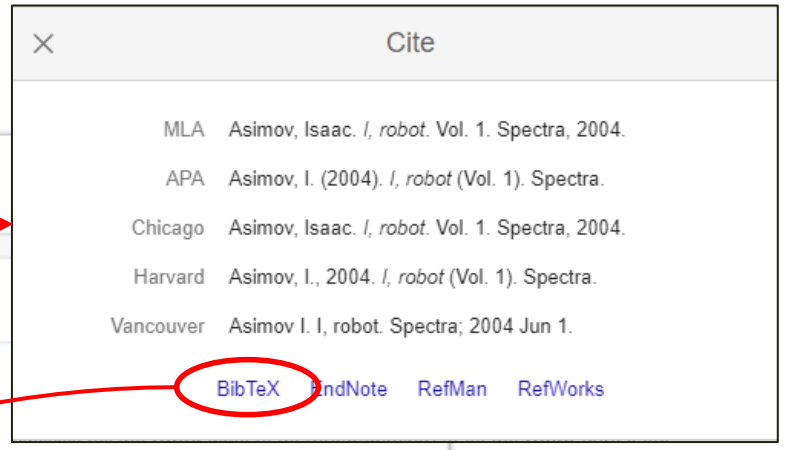
Related references will be generated automatically

References

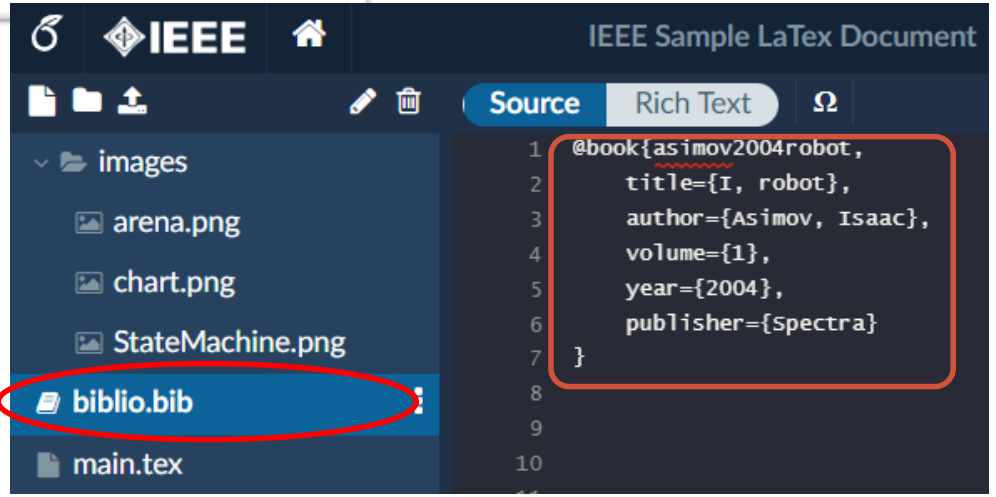
[1] E. Bonabeau, M. Dorigo, and G. Theraulaz. *Swarm Intelligence - From Natural to Artificial Systems*. Oxford University Press, 1999.
[2] Manuele Brambilla, Eliseo Ferrante, Mauro Birattari, and Marco Dorigo. Swarm robotics: a review from the swarm engineering perspective. *Swarm Intelligence*, 7(1):1–41, 2013.
[3] A. Brutschy, A. Scheidler, E. Ferrante, M. Dorigo, and M. Birattari. Can ants inspire robots? Self-organized decision making in robotic swarms. In *Proceedings of the 2012 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS'12)*, pages 4272–4273, Los Alamitos, CA, 2012. IEEE Computer Society Press.
[4] Nikolaus Correll and Alcherio Martinoli. Modeling and designing self-organized aggregation in a swarm of miniature robots. *The International Journal of Robotics Research*, 30(5):615–626, 2011.
[5] E. Ferrante, A. E. Turgut, C. Huepe, A. Stranieri, C. Pinciroli, and M. Dorigo. Self-organized flocking with a mobile robot swarm: a novel motion control method. *Adaptive Behavior*, 20(6):460–477, 2012.

BIBTEX citation example



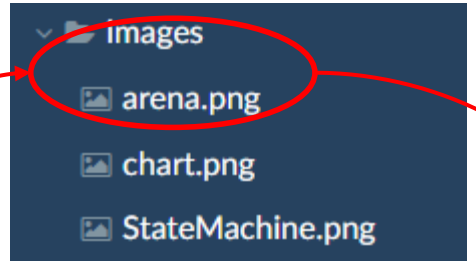



```
@book{asimov2004robot,
          title={I, robot},
          author={Asimov, Isaac},
          volume={1},
          year={2004},
          publisher={Spectra}
}
```

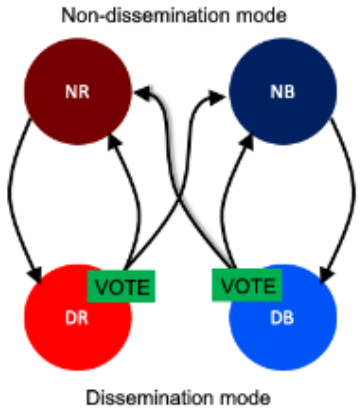


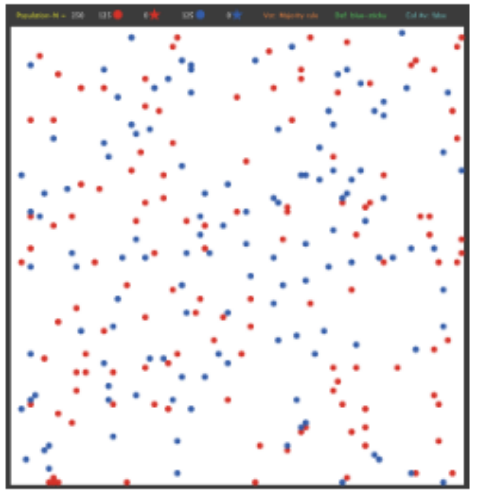
Inserting Figures

figure* will occupy two columns width




```
\begin{figure*}[t]
  \centering
  \subfloat[]{\includegraphics[width=0.3\textwidth]
  {images/StateMachine.png}
  \label{fig:statemachine}}
  \hfill
  \subfloat[]{\includegraphics[width=0.4\textwidth]
  {images/arena.png}
  \label{fig:arena}}
  \hfill
  \caption{Panel $a$: Probabilistic finite state
  machine. $NR$, $NB$ , $DR$ and $DB$ represent
  the non-dissemination and dissemination states,
  for RED and BLUE agents respectively. Panel $b$:
  Screenshot of the simulation arena. %This image
  is taken from NetLogo software
  }
  \label{fig:arena_and_method}
\end{figure*}
```





(a) (b)

Fig. 1: Panel *a*: Probabilistic finite state machine. *NR*, *NB* , *DR* and *DB* represent the non-dissemination and dissemination states, for RED and BLUE agents respectively. Panel *b*: Screenshot of the simulation arena.

Anything between $ signs is considered as mathematical formula. To intentionally write a dollar sign, add a backslash in front of it: **\$**

Referencing to a Label

figure without asterisk will occupy single column width

```
141  This is an example sentence that refer to a
     figure~\ref{fig:chart} that should be automatically shown
     before this paragraph, although it is defined after.
142
143  \begin{figure}
144    \centering
145    \includegraphics[width=0.3\textwidth]{images/chart.png}
146    \hfill
147  \caption{Only one figure in a single column}
148    \label{fig:chart}
149  \end{figure}
```

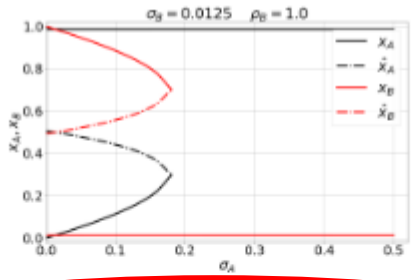


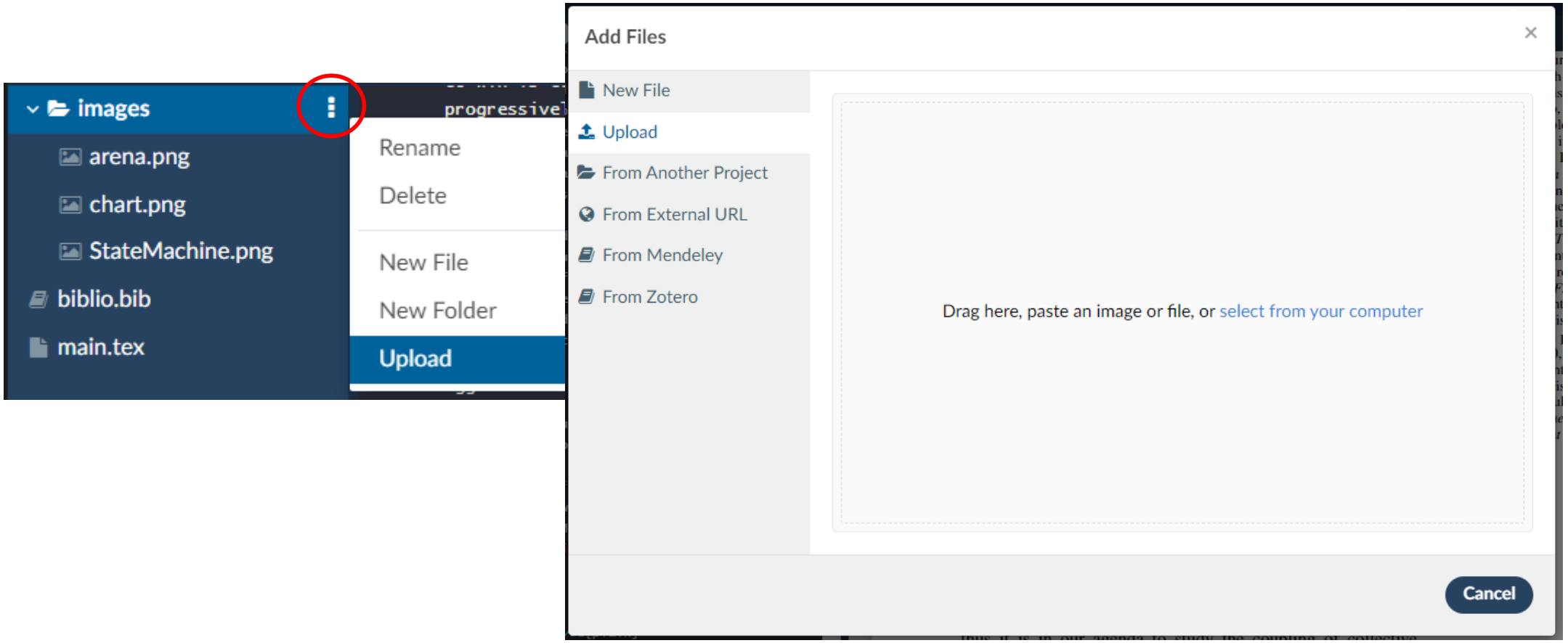
Fig. 2: Only one figure in a single column

adipiscing elit pellentesque habitant. Arcu odio ut sem nulla pharetra diam sit. Eu consequat ac felis donec. Arcu bibendum at varius vel pharetra. Vulputate odio ut enim blandit volutpat maecenas volutpat blandit aliquam. Augue lacus viverra vitae congue eu consequat ac felis donec.

This is an example sentence that refer to a figure 2 that should be automatically shown before this paragraph, although it is defined after.

\ref{*labelname***}** will make a reference to a label with *labelname*. To define a label, use **\label{***labelname***}**

Uploading more figures



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Inserting Table

[t] places the table at the top of a text page

```
74  \begin{table*}[t]
75  \caption{Experiment Parameters}
76  \label{params-table}
77  \centering
78  \begin{tabular}{|c|c|c|}
79  \hline
80  Notation & Values &
81  Description
82  \\
83  \hline
84  $N$
85  &
86  $[100, 250, 500, 750, 1000]$.
87  &
88  Swarm Population, total number of robots.\\
```

Define 3 columns separated by vertical lines

The **&** sign separates the columns

The **** signs mark the end of last column

TABLE I: Experiment Parameters

Notation	Values	Description
N	[100, 250, 500, 750, 1000].	Swarm Population, total number of robots.
ρ_{RED}	[1.0, 1.25, 2.5, 3.75, 5.0, 6.25, 7.5, 8.75, 10]	RED Dissemination Factor.
ρ_{BLUE}	[1.0]	BLUE Dissemination Factor.
-	["Voter Model","Majority Rule"]	Voting methods.
k	[3, 5, 7]	Minimum number of agents that participate in the voting when using Majority Rule.

Inserting Table (cont'd)

[h] place the table at the position in the text where the table environment is. The **!** sign maintains original width-height ratio

The **&** sign separates the columns

The **** signs mark the end of last column

```
160  \begin{table}[h!]
161  \centering
162  \begin{tabular}{|p{0.1\textwidth}|p{0.3\textwidth}|}
163  \hline
164  No & Description \\
165  \hline
166  $1$ & One \\
167  $2$ & Two \\
168  $3$ & Three \\
169  \hline
170  \end{tabular}
171  \caption{Single column width table}
172  \end{table}
```

No	Description
1	One
2	Two
3	Three

TABLE II: Single column width table

REFERENCES

[1] E. Bonabeau, M. Dorigo, and G. Theraulaz. *Swarm Intelligence - From Natural to Artificial Systems*. Oxford University Press, 1999.

[2] Manuele Brambilla, Eliseo Ferrante, Mauro Birattari, and Marco Dorigo. Swarm robotics: a review from the swarm engineering perspective. *Swarm Intelligence*, 7(1):1–41, 2013.

[3] A. Brutschy, A. Scheidler, E. Ferrante, M. Dorigo, and M. Birattari. Can ants inspire robots? Self-organized decision making in robotic

ı nulla
endum

HAVE FUN!

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