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Introduction to Scientific Working

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Outline

1. **LaTeX**
2. **Journals**
3. **TikZ**

Keywords

acknowledgement · awards · beamer · bibliography · CORE ranking · DBLP · conference · editorial board · generative AI · Google Scholar · h–index · impact factor · journal · LaTeX · LIPIcs · LNCS · open access · plagiarism · presentation · program committee · rebuttal · review · submission · TikZ · workshop · ···

Types of Scientific Works

- seminar report
- bachelor thesis
- master thesis
- PhD thesis
- habilitation thesis
- workshop paper
- conference paper
- journal article
- book chapter
- book

Exemplary Bachelor Theses

▸ Number Link	Benjamin Rupprechter	2009
▸ Kurodoko	Johannes Koch	2020
▸ Five Cells	Diana Gründlinger	2023

Common Ingredients

- appendices
- bibliography
- chapters / sections
- figures
- footnotes
- formulas
- hyper links
- lists
- plots
- program code
- screen shots
- table of contents
- tables

- split environment

src

```
\begin{equation} \begin{split}
H_c &= \frac{1}{2n} \sum_{l=0}^n (-1)^l (n-l)^{p-2}
\sum_{l_1 + ... + l_p = l} \prod_{i=1}^p \binom{n_i}{l_i} \\
&\quad \cdot [(n-l)-(n_i-l_i)]^{n_i-l_i} \cdot
\Bigl[ (n-l)^2 - \sum_{j=1}^p (n_i-l_i)^2 \Bigr]
\end{split} \end{equation}
```

$$H_c = \frac{1}{2n} \sum_{l=0}^{n} (-1)^l (n-l)^{p-2} \sum_{l_1+\cdots+l_p=l} \prod_{i=1}^{p} \binom{n_i}{l_i} \cdot [(n-l)-(n_i-l_i)]^{n_i-l_i} \cdot \left[(n-l)^2 - \sum_{j=1}^{p} (n_i-l_i)^2 \right] \tag{1}$$

- alignment

```
\begin{align*}
\alpha^* \beta (\alpha \cup \beta)^*
&\,\subseteq\, \beta^+ \overbrace{\alpha^* (\alpha \cup \beta)^*}^{m-1}
\tag{$\alpha^* \beta^+ \subseteq \beta^+ \alpha^*$} \\
&\,\subseteq\, \beta^+ \beta^* \alpha^*
\tag{induction hypothesis} \\
&\,\subseteq\, \beta^* \alpha^*
\end{align*}
```

src

$$
\begin{aligned}
\alpha^*\beta(\alpha \cup \beta)^* &\subseteq \beta^+ \overbrace{\alpha^*(\alpha \cup \beta)^*}^{m-1} && (\alpha^*\beta^+ \subseteq \beta^+\alpha^*) \\
&\subseteq \beta^+\beta^*\alpha^* && \text{(induction hypothesis)} \\
&\subseteq \beta^*\alpha^*
\end{aligned}
$$

▸ cases

```
For ordinals $\alpha$ and $\beta$ their sum $\alpha + \beta$ is defined as follows:
\begin{align*}
\alpha + \beta \,=\, \begin{cases}
\alpha &\text{if $\beta = 0$} \\
(\alpha + \gamma) + 1 &\text{if $\beta = \gamma + 1$} \\
\sup\,\{\alpha + \xi \mid \xi < \beta\} &\text{if $\beta$ is a limit ordinal}
\end{cases}
\end{align*}
```

src

For ordinals α and β their sum $\alpha + \beta$ is defined as follows:

$$\alpha + \beta = \begin{cases} \alpha & \text{if } \beta = 0 \\ (\alpha + \gamma) + 1 & \text{if } \beta = \gamma + 1 \\ \sup\{\alpha + \xi \mid \xi < \beta\} & \text{if } \beta \text{ is a limit ordinal} \end{cases}$$

Bibliography

```
The books \cite{SK21,SK23} are great for study.

\begin{thebibliography}{1}
\bibitem{SK21}
Stefan Kottwitz, \emph{\LaTeX\ Beginner's Guide}, 2nd edition,
Packt Publishing, 2021.
\bibitem{SK23}
Stefan Kottwitz, \emph{\LaTeX\ Graphics with TikZ}, 1st edition,
Packt Publishing, 2023.
\end{thebibliography}
```

src

- `\begin{thebibliography}[`*widest label*`]`
- `\cite{`*keys*`}`
- `\bibitem[`*label*`]{`*key*`}`

BibTeX

- separate database file containing references: *filename*`.bib`
- `\bibliographystyle{`*style*`}` and `\bibliography{`*filename*`}` in main document
- common styles: `plain` `unsrt` `alpha` `abbrv`
- `\usepackage{natbib}` provides additional styles: `plainnat` `unsrtnat` `abbrvnat`
- BibTeX entry types: `book` `article` `inproceedings` `phdthesis` `techreport` `...`

```
@book{SK23,
  author    = "Stefan Kottwitz",
  title     = "\LaTeX\ Graphics with {TikZ}",
  edition   = "first",
  publisher = "Packt Publishing",
  year      = 2023
}
```

- required fields: `author` or `editor` `title` `publisher` `year`
- optional fields: `volume` or `number` `series` `address` `edition` `month` `note`

```
@inproceedings{KM19,
 author    = "Christina Kohl and Aart Middeldorp",
 title     = "Composing Proof Terms",
 booktitle = "Proc.\ 27th International Conference on Automated Deduction",
 series    = "Lecture Notes in Artificial Intelligence",
 volume    = 11716,
 pages     = "337--353",
 publisher = "Springer",
 year      = 2019,
 doi       = "10.1007/978-3-030-29436-6_20"
}
```

latex src bib file

- required fields: `author` `title` `booktitle` `year`
- optional fields: `editor` `volume` or `number` `series` `pages` `organization` `address` `publisher` `month` `note`

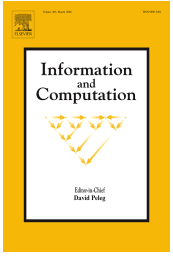
Outline

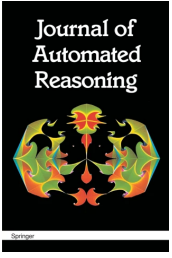
- editorial board
- deadlines
- reviewing process
- publication
- impact factor
- open access

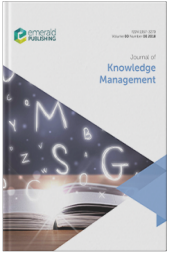
Some Computer Science Journals

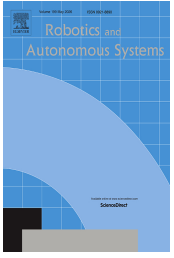
CACM CSUR FGCS JACM I&C IOTJ IPL JAIR JAR JFP JKM

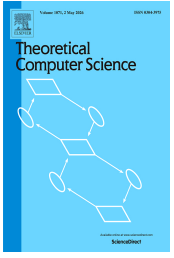
JMLR JSC LMCS NMI RAS TCS TOCL TODS TPLP · · ·









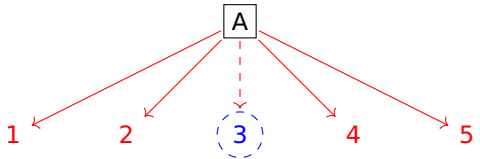


Outline

Trees

```
\node [draw, black, rectangle] {A} [red, ->]
  child { node {1} }
  child { node {2} }
  child [dashed] { node [draw, blue, circle] {3} }
  child { node {4} }
  child { node {5} };
```

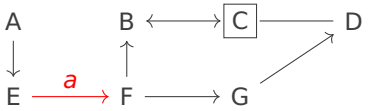
src



Graphs

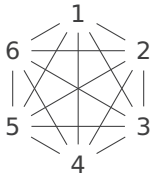
```
\usetikzlibrary{graphs,quotes}
\graph [grow right = 15mm] {
  A -!- B <-> C [draw] -- D,
  E -> [red,"$a$"] F -> {B, G},
  G -> D,
  A -> E };
```

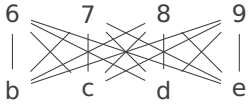
src



```
\usetikzlibrary{graphs.standard}
\tikz \graph { subgraph K_n [n=6, clockwise] };
\tikz \graph [branch right, grow down]
  { subgraph K_nm [V = {6,...,9}, W = {b,...,e}] };
```

src

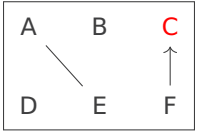




Matrices

```
\usetikzlibrary{matrix}
\matrix (m) [matrix of nodes, draw, column sep = 5mm, row sep = 6mm] {
  A & B & |[red] (c)| C \\
  D & E & |(f)| F \\
};
\draw (m-1-1) edge (m-2-2);
          (f) edge[->] (c);
```

src



```
\usetikzlibrary{matrix}
\matrix [matrix of math nodes, left delimiter=(, right delimiter=\}] {
  a_8 & a_1 & a_6 \\
  a_3 & a_5 & a_7 \\
  a_4 & a_9 & a_2 \\
};
```

src

$$\left(\begin{array}{ccc} a_8 & a_1 & a_6 \\ a_3 & a_5 & a_7 \\ a_4 & a_9 & a_2 \end{array} \right\}$$