$\LaTeX$ sample document

Risi Kondor

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Basic terms

Number fields

$\mathbb{N}$	Natural numbers
$\mathbb{Z}$	Integer numbers
$\mathbb{R}$	Real numbers
$\mathbb{C}$	Complex numbers

Vectors

A row vector $\boldsymbol{x}$ and a column vector $\boldsymbol{y}$:

$$\boldsymbol{x} = (x_1, x_2, \ldots, x_N) \qquad\qquad \boldsymbol{y} = \begin{pmatrix} y_1 \\ y_2 \\ \vdots \\ y_N \end{pmatrix}.$$

The set of N dimensional real vectors is denoted $\mathbb{R}^N$, so $\boldsymbol{x}, \boldsymbol{y} \in \mathbb{R}^N$. The i'th element of $\boldsymbol{x}$ is denoted $[\boldsymbol{x}]_i$ or sometimes (like above) just x_i.

> **MATLAB:** To define a row vector with elements $1, 2, 3$, type `x=[1,2,3]`. To define a column vector with the same elements, type `y=[1;2;3]`.

Matrices

An $N \times M$ matrix:

$$A = \begin{pmatrix} a_{11} & a_{12} & \ldots & a_{1M} \\ a_{21} & a_{22} & \ldots & a_{2M} \\ \vdots & & \ddots & \vdots \\ a_{N1} & a_{N2} & \ldots & a_{NM} \end{pmatrix}.$$

Note that the first index is the row index and the second index is the column index. The set of $N \times M$ real matrices is denoted $\mathbb{R}^{N \times M}$, so $A \in \mathbb{R}^{N \times M}$. The (i, j)-element of A is denoted $[A]_{i,j}$ or sometimes (like above) just a_{ij}.

> **MATLAB:** To define a matrix $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$, type `A=[1,2;3,4]`
.

1 Numbered section

1.1 Numbered subsection

1.1.1 Numbered subsubsection

Section

Subsection

Subsubsection

Unnumbered equation:

$$e^{-\left(x-x'\right)^2/(2\sigma^2)}.$$

Numbered equation:

$$e^{i\pi} = -1 \tag{1}$$

Equation 1 is the most beautiful thing in the universe, as explained in [1]. If you have a citation database, you can also use `bibtex`. It is always good to include some figures, too, especially pretty ones like Figure 1.

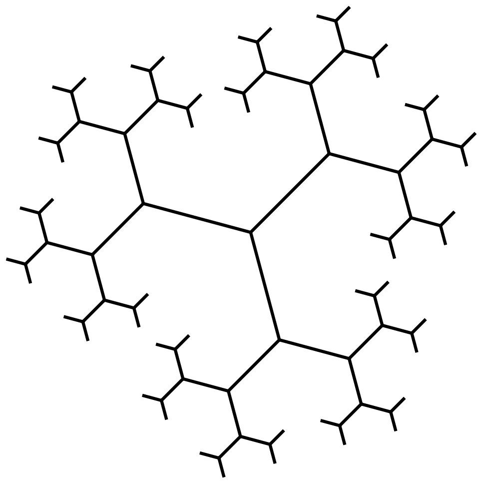

Figure 1: Part of a three-regular tree

If your you want to align equations, use `eqnarray`

$$\begin{aligned} 1 &= \alpha_1 + \alpha_2 \qquad (2)\\ -1 &= \alpha_1 - \alpha 2. \qquad (3)\end{aligned}$$

If the reason you need a multiline display is that your equation is too long, you can also use `multline` to split it:

$$\begin{aligned} K(i,j) = K_{\mathrm{R}}^{(k)}(\,d(i,j)) \;=\; & \frac{1}{2}\,\pi(k-1)\int_0^\pi \frac{e^{-\beta\left(1-\frac{2\sqrt{k-1}}{k}\cos x\right)}}{k^2-4\,(k-1)\,\cos^2 x}\,\cdot \\ & \tanh\left(\frac{1}{1+\frac{1}{1+\arctan\beta}}\right)\sin x\,[\,(k-1)\sin(d+1)\,x-\sin(d-1)\,x\,]\,dx \end{aligned}$$

Don't forget to put a little bit of space , for example `\,` before the dx!

To include text fixed with and with no formatting, use the `verbatim` package. If you need just a few symbols, like in this sentence, use the special form `\verb#<text goes here>#`.

Single line feeds in text mode are ignored, doble line feeds break the paragraph. Multiple spaces next to each other are treated as a single space, while math mode ignores spaces altogether. You need special commands like `\,`\, `\:`, `\;`, `\quad`, `\!`, `\hspace{}`, `\hskip{}` and `\fill` if you need to adjust the spacing.

Beginners often revel in vertical fractions, writing things like $e^{-\frac{x^2}{2\sigma^2}}$. A more serious abuse of the system is to use text mode for mathematics, for example 2x instead of $2x$, or math mode for text as in $R_{empirical}(f)$. The latter should be written `R_{\text{{empirical}}(f)`, producing $R_{\text{empirical}}(f)$.

Delimiters often come in pairs, to get the sizes right, use `\left` and `\right`. In fact, you should always use them for (), [], etc., even when you want the base size, because they help with spacing, too. It may help to define macros such as

```
newcommand{\br}[1]{\left(#1\right)}
```

allowing you to write `\br{ }` instead of `\left( \right)` every time. For conditional probabilities $p\left(x \mid y\right)$, sets, etc. you need `\mid`, too. If the sizes stil don't come out right, you'll have to start playing around with `\bigl`, `\Bigl`, `\biggl` and their right hand counterparts.

Some useful symbols

Operators	$\cdot\ \times\ \pm\ \mp\ \ast\ \circ\ \cup\ \cap\ \setminus$
Relation symbols	$\leq \geq \neq \not< \approx \sim \propto \in \ni \subset \subseteq \supset \supseteq$
Delimiters	$\Bigg(\bigg(\Big(\big(()\big)\Big)\bigg)\Bigg)$ $\Bigg[\bigg[\Big[\big[[]\big]\Big]\bigg]\Bigg]$ $\Bigg\{\bigg\{\Big\{\big\{\{\}\big\}\Big\}\bigg\}\Bigg\}$ $\Bigg\vert\bigg\vert\Big\vert\big\vert\vert\vert\big\vert\Big\vert\bigg\vert\Bigg\vert$ $\Bigg\Vert\bigg\Vert\Big\Vert\big\Vert\Vert\Vert\big\Vert\Big\Vert\bigg\Vert\Bigg\Vert$
Arrows	$\rightarrow \mapsto \leftarrow \Leftarrow \Rightarrow \Longleftarrow \downarrow$
Dots	$1, 2, \ldots, n\ \vdots\ \ddots$
Special	$\infty\ \blacksquare$
Summation	$\sum \quad \sum_{i=1}^{m}$
Products	$\prod \quad \prod_{i=1}^{m}$
Integration	$\int_0^\infty f(x)\,dx$

References

[1] I. M. Haughty, Mathematics with not much meaning but great æsthetic appeal. Proceedings of winter skiing trip. March 29, 2003.