The ‘boldtensors’ Package

May 21, 2026

1 Introduction

The `boldtensors` package provides a convenient shorthand for typesetting latin and greek characters in bold and blackboard layouts within the standard `\mathversion{normal}` environment.

It uses active characters to keep the syntax minimal:

- `$~T$` produces a bold tensor symbol $\boldsymbol{T}$. $\hat{\boldsymbol{T}}$
- `$"R$` produces a blackboard bold symbol $\mathbb{R}$ (e.g., for real numbers).

2 Package Options

The package supports two main options:

- **nabla**: Enables the bold Nabla operator ∇ via the `\nabla` command.
- **differential**: Automatically loads the `bt-isodiff` package, which redefines the character ‘d’ as an upright (roman) operator, compliant with ISO 80000-2 standards.

Note on Differential Operators: While `boldtensors` (via `bt-isodiff`) provides an easy ”global” replacement of the ‘d’ character for quick typing, users looking for a more sophisticated, semantic approach to differential operators are encouraged to take a look at the modern `fixdif` package. `fixdif` offers fine-grained control over spacing and is specifically optimized for various engines including LuaLaTeX.

3 Example: The Line Element

Using the `differential` option, the metric line element can be written naturally. Note that the ‘d’ is upright while coordinates remain italic:

```
\begin{math}
  ds^2 = g_{\alpha\beta} dx^{\alpha} dx^{\beta}
\end{math}
```

Result: $\mathrm{d}s^2 = g_{\alpha\beta}\mathrm{d}x^\alpha\mathrm{d}x^\beta$

4 Example: Tensor field

A tensor field of type (p, q) can be fully expanded into its components and basis vectors/covectors. While the long form with partial fractions is precise, the shorthand notation using $\boldsymbol{\partial}$ and $\mathbf{d}$ is significantly more compact and common in General Relativity:

```
% Standard long form
\begin{math}
  ~T = T_{j_1,\ldots,j_q}^{i_1,\ldots,i_p} %
  \frac{\partial}{\partial ~x^{i_1}}\otimes\cdots\otimes\frac{\partial}{\partial ~x^{i_p}} %
  \otimes d~x^{j_1}\otimes\cdots\otimes d~x^{j_q}
\end{math}

% Compact shorthand
\begin{math}
  ~T = T_{j_1,\dots,j_q}^{i_1,\dots,i_p} %
  ~\partial_{i_1}\otimes\cdots\otimes~\partial_{i_p} %
  \otimes ~dx^{j_1}\otimes\cdots\otimes ~dx^{j_q}
\end{math}
```

$$\boldsymbol{T} = T_{j_1,\dots,j_q}^{i_1,\dots,i_p}\boldsymbol{\partial}_{i_1}\otimes\cdots\otimes\boldsymbol{\partial}_{i_p}\otimes\mathbf{d}x^{j_1}\otimes\cdots\otimes\mathbf{d}x^{j_q}$$

Note that with the `differential` option enabled, `~d` automatically produces a bold, upright differential operator, maintaining ISO compliance even in its bold form.

5 Example: Einstein Field Equations

The major advantage of this package is that subscripts, indices, and accents can be used on bold symbols without layout or spacing issues. Any index is placed correctly according to the font metrics.

In General Relativity, the Einstein field equations relate the geometry of spacetime to the energy-momentum content. Using the ~ notation, we can represent the Einstein tensor $\boldsymbol{G}$ and the energy-momentum tensor $\boldsymbol{T}$ as distinct geometric objects:

```
\begin{math}
  ~G = \frac{8 \pi G}{c^4} ~T
\end{math}
```

Result:

$$\boldsymbol{G} = \frac{8\pi G}{c^4}\boldsymbol{T}$$

Where:

- $\boldsymbol{G}$ is the Einstein Tensor (bold).
- G is Newton's gravitational constant (italic scalar).
- $\boldsymbol{T}$ is the Energy-Momentum Tensor (bold).

This clear visual distinction between tensors and scalars is the primary goal of the `boldtensors` style.