# Writing posters with *beamerposter* package in LaTeX

## Han Lin Shang

Department of Econometrics & Business Statistics,
Monash University, Melbourne, VIC 3145, Australia

Email    HanLin.Shang@monash.edu

Abstract    The *beamerposter* package in LaTeX is an excellent tool for the creation of posters. There are several options available using the *beamerposter* package, when writing a poster in LaTeX. Here, I would like to present some of these options associated with the *beamerposter* package. I shall introduce the basics and some useful companion packages that make a poster look neat and nice.

## 1   The *beamerposter* package

### 1.1   Learning the basics

The *beamerposter* package [3] has been developed by Philippe Dreuw and Thomas Deselaers, which allows to write poster presentations in various font sizes in a straightforward manner. As shown in Table 1, the package on CTAN is composed of the following files:

| | |
|---|---|
| beamerposter.sty | Define the font sizes |
| beamerposter.tex | Manual in English |
| beamerposter.pdf | Compiled manual in English |
| example.tex | Example of a poster created by the package |

Table 1: Content in the *beamerposter* package.

The *beamerposter* package allows you to define a poster of sizes from A0 to A4. In particular, it also allows you to benefit from the nice color box handling and alignment in the *beamer* class to create nice posters.

The *beamerposter* package is an extension of the LaTeX *beamer* [2] and *a0poster* [1] classes. It has the advantages of both classes. On the one hand, the *beamer* class is considered as the standard class for presentation and offers a great variety of *beamer*

themes; on the other hand, *a0poster* class allows a poster in either landscape or portrait orientation and offers great flexibility in font size and font style.

*Beamerposter* is a package used within the class of *beamer*. Therefore, the beginning of a LaTeX file would be something like

```
\documentclass{beamer}
\usepackage[orientation=portrait, size=a0, scale=1.4]{beamerposter}
\begin{document}
Write something here
\end{document}
```

Within the document, you can write the content of your poster, as you would write for any other documents in LaTeX. If you prefer your poster to be in the landscape orientation, then simply replace the option portrait with landscape.

All that remains to be done is to compile your document in the usual way using LaTeX's PDFTeXify, dvips and dvipdf, as described in Table 2.

| PDFTeXify | your_doc.tex |
|-----------|--------------|
| dvips     | your_doc.tex |
| dvipdf    | your_doc.tex |

Table 2: Various ways of compiling a LaTeX file.

## 1.2   Structuring the poster

With the help of *textpos* package [4], you can easily divide a poster into different columns and sections. The package *textpos* facilitates placing boxes at relative or absolute position at the LaTeX page. As pointed out by Norman Gray (the creator of the *textpos* package), the main reason for creating *textpos* package is to help produce a large format conference poster. We can load this package as usual with `\usepackage[absolute,overlay]{textpos}` in the preamble.

The *textpos* package works in two modes, namely relative and absolute. In the relative mode, the block positioning coordinates in the `textblock` environment are taken to be relative to an 'anchor point', which is the current position. It follows by other blocks that may locate above or below. However, if the entire environment is to be laid out individually, then the absolute mode should be used, where the anchor point is the fixed top left corner of the page. When using the absolute position mode, the `textblocks` are placed under any other text on the page (imagine purple color background). The option `overlay` allows the positioned blocks of text overlay any other page content.

As a main function of the *textpos* package, the syntax of the `textblock` environment is described as follows

```
\begin{textblock}{<hsize>}{<hpos>,<vpos>}
Write something here
\end{textblock}
```

The `<hsize>` and `<hpos>` are arguments given in units of a module `\TPHorizModule`, and `<vpos>` is given in units of a module `\TPVertModule`. These parameters can be set by `\setlength{\TPHorizModule}{<dimen>}` and for `\TPVertModule` as well. Customarily, `<dimen>` is set to be 1cm. `<hsize>` is a whole or fraction number that controls the size of `textblock`, `<hpos>` and `<vpos>` are two whole or fraction numbers that jointly determine the horizontal and vertical positions.

Within the `textblock`, you may divide the page into several columns and create different sections with

```
\begin{block}{Title of section}
Write something here
\end{block}
```

Although this could be done using package *multicol* or `minipage` environment, I prefer to use the `block` environment instead, as this is more versatile. The `block` environment allows to include a `block` inside your poster. Unlike the `minipage` environment, the `block` environment does not require to specify a given length and width of `block`, since these information are specified through the `textblock` environment. So, to write two blocks in the same column, the following code

```
\begin{block}{Title of block 1}
  First block
\end{block}
\begin{block}{Title of block 2}
  Second block
\end{block}
```

produces Figure 1.



Figure 1: An illustration of writing two blocks with full page width.

Of course, you can also define the `block` environment within the `textblock` environment. For instance, one would like to produce two column posters; and within each column, there are a number of blocks. The following code

```
\begin{textblock}{30}(0.1,1.6)
  \begin{block}{Title of block 1}
    First block
  \end{block}
  \begin{block}{Title of block 2}
    Second block
  \end{block}
\end{textblock}


\begin{textblock}{30}(30.1,1.6)
  \begin{block}{Title of block 3}
    Third block
  \end{block}
  \begin{block}{Title of block 4}
    Fourth block
  \end{block}
\end{textblock}
```

produces Figure 2.

| Title of block 1 | Title of block 3 |
| --- | --- |
| First block | Third block |
| Title of block 2 | Title of block 4 |
| Second block | Fourth block |

Figure 2: An illustration of writing two blocks with two columns.

For instance, you can include a `textblock` environment with another `textblock` environment, so that the possibilities are enormous. For example, the following code

```
\begin{textblock}{60}(0.1,1.65)
\begin{block}{Title of block 1}
Let $\mathbf{y}$ and $\mathbf{x}$ be the response and predictor
vectors, whose observations are denoted as $y_i$ and
$\mathbf{x}_i$. The nonparametric regression model is $\dots$
\end{block}
\end{textblock}


\begin{textblock}{30}(0.1,9.25)
```

```
\begin{block}{Title of block 1}
Let $\mathbf{y}$ and $\mathbf{x}$ be the response and predictor
vectors, whose observations are denoted as $y_i$ and
$\mathbf{x}_i$. The nonparametric regression model is $\dots$
\end{block}
\end{textblock}

\begin{textblock}{16}(0.1,20.2)
\begin{block}{Title of block 1}
Let $\mathbf{y}$ and $\mathbf{x}$ be the response and predictor
vectors, whose observations are denoted as $y_i$ and
$\mathbf{x}_i$. The nonparametric regression model is $\dots$
\end{block}
\end{textblock}
```
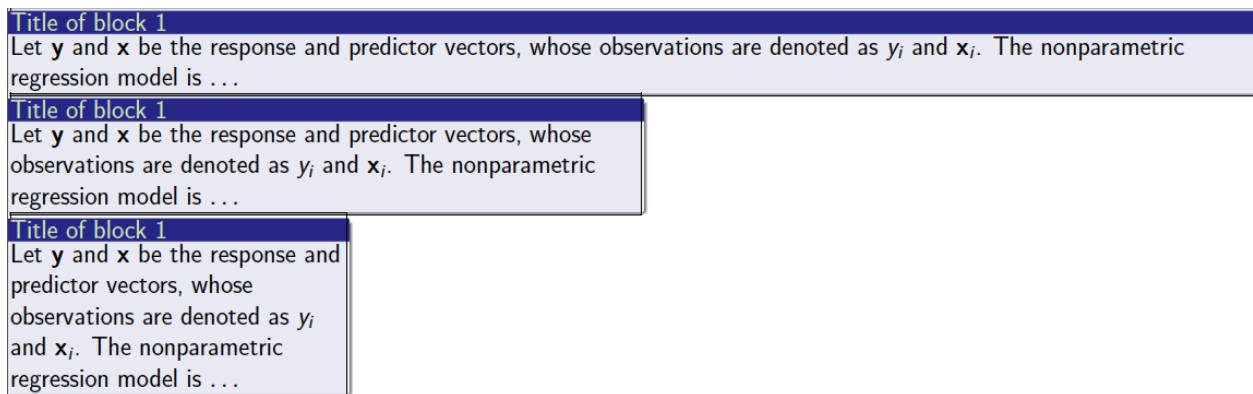
produces Figure 3.



Figure 3: An illustration of one `textblock` environment within another `textblock` environment using the *beamer* theme of Frankfurt.

With the tools of `textblock` and `block`, we are now in position to create a poster using the *beamerposter* package. Figure 4 provides a simple illustration. The source code for producing Figure 4 can be obtained upon requested from the author.

# Bayesian bandwidth estimation for nonparametric regression model with an unknown error density

Author A, Author B, Author C*

## Nonparametric regression setting

Let $\mathbf{y}$ and $\mathbf{x}$ be the response and predictor vectors, whose observations are denoted as $y_i$ and $\mathbf{x}_i$. The nonparametric regression model is

$$y_i = m(\mathbf{x}_i) + \epsilon_i, \quad i = 1, 2, \ldots, n$$

where $\epsilon_i$ is assumed to be i.i.d. with an unknown density denoted by $f(\epsilon)$. It is assumed that $cor(\epsilon_i, \mathbf{x}_i) = 0$.

## Nadaraya-Watson kernel estimator

The unknown $m(\mathbf{x}_i)$ is estimated by the Nadaraya-Watson (NW) kernel estimator

$$\hat{m}(\mathbf{x}_i; \mathbf{h}) = \sum_{i=1}^{n} w_i(x) y_i, \quad w_i(x) = \frac{\frac{1}{\mathbf{h}} K(\frac{\mathbf{x} - \mathbf{x}_i}{\mathbf{h}})}{\sum_{i=1}^{n} \frac{1}{\mathbf{h}} K(\frac{\mathbf{x} - \mathbf{x}_i}{\mathbf{h}})}.$$

where $K(\cdot)$ is a kernel function, and the bandwidth vector $\mathbf{h}$ is treated as a parameter. The NW estimator $\hat{m}(\mathbf{x}_i; \mathbf{h})$ includes an undesirable term, $K(0)/\mathbf{h}$. Therefore, we use the leave-one-out NW kernel estimator,

$$\hat{m}_i(\mathbf{x}_i; \mathbf{h}) = \frac{(n-1)^{-1} \sum_{j=1; j \neq i}^{n} \frac{1}{\mathbf{h}} K(\frac{\mathbf{x}_i - \mathbf{x}_j}{\mathbf{h}}) y_j}{(n-1)^{-1} \sum_{j=1; j \neq i}^{n} \frac{1}{\mathbf{h}} K(\frac{\mathbf{x}_i - \mathbf{x}_j}{\mathbf{h}})},$$

## Estimation of an unknown error density

We propose to approximate $f(\epsilon_i)$ by a kernel density given by

$$\hat{f}(\epsilon_i; b) = \frac{1}{n-1} \sum_{j=1; j \neq i}^{n} \frac{1}{b} K(\frac{\hat{\epsilon}_i - \hat{\epsilon}_j}{b}),$$

where $b$ is the bandwidth. Efromovich (2005) justified that residuals are proxies of errors.

## Likelihood

The likelihood of $\mathbf{y}$ given $(\mathbf{h}, b)'$ is approximated by

$$L(\mathbf{y}|\mathbf{h}, b) = \prod_{i=1}^{n} \left\{ \frac{1}{n-1} \sum_{j=1; j \neq i}^{n} \frac{1}{b} K(\frac{\hat{\epsilon}_i - \hat{\epsilon}_j}{b}) \right\}$$

## Prior

Let $\pi(\mathbf{h})$ and $\pi(b)$ denote the priors of $\mathbf{h}$ and $b$, which are assumed to follow a Cauchy distribution

$$\pi(h_i) = \frac{1}{\pi(1 + h_i^2)}, \quad \pi(b) = \frac{1}{\pi(1 + b^2)}.$$

## Posterior

The posterior of $(\mathbf{h}', b)'$ is approximated as (up to a normalising constant)

$$\pi(\mathbf{h}, b|\mathbf{y}) \propto \pi(\mathbf{h}) \pi(b) L(\mathbf{y}|\mathbf{h}, b).$$

## Sampling algorithm

A MCMC algorithm, such as random-walk Metropolis, is used to sample $\mathbf{h}$ and $b$. The ergodic averages of the sample values of $\{(\mathbf{h}^{(i)}, b^i), i = 1, \ldots, 10,000\}$ are used as the estimates of $\mathbf{h}$ and $b$.

## Simulation

Consider the relationship between $\mathbf{y}$ and $\mathbf{x} = (\mathbf{x}_1, \mathbf{x}_2, \mathbf{x}_3)'$ given by

$$y_i = \sin(2\pi x_{1,i}) + 4(1 - x_{2,i})(1 + x_{2,i}) + \frac{2x_{3,i}}{1 + 0.8 x_{3,i}^2} + \epsilon_i,$$

for $i = 1, 2, \ldots, 1000$. A sample was generated by drawing $x_{1i}, x_{2i}, x_{3i}$ independently from $U(0, 1)$, and $\epsilon_i$ from the mixture of two Gaussian densities defined as $0.7N(0, 0.7^2) + 0.3N(0, 1.5^2)$.

The following table presents the parameters estimated by the Bayesian algorithms with the assumptions of unknown, Student $t$ and Gaussian error densities.

| Error density | Parameter | Estimate | 95% Bayesian credible intervals | SIF |
|---|---|---|---|---|
| Unknown | $b$ | 0.2387 | (0.1691, 0.3187) | 5.64 |
| | $h_1$ | 0.0874 | (0.0693, 0.1070) | 21.41 |
| | $h_2$ | 0.0594 | (0.0339, 0.0879) | 30.54 |
| | $h_3$ | 0.2008 | (0.1611, 0.2481) | 13.24 |
| | LML | -1444.19 | | |
| Student $t$ | $\nu$ | 10.0169 | (7.1201, 14.0821) | 6.66 |
| | $h_1$ | 0.0827 | (0.0622, 0.1048) | 8.86 |
| | $h_2$ | 0.0701 | (0.0401, 0.0989) | 12.69 |
| | $h_3$ | 0.1908 | (0.1448, 0.2459) | 9.81 |
| | LML | -1457.07 | | |
| Gaussian | $\sigma$ | 1.0523 | (1.0109, 1.0983) | 1.16 |
| | $h_1$ | 0.0773 | (0.0544, 0.0924) | 14.49 |
| | $h_2$ | 0.0797 | (0.0572, 0.1121) | 17.36 |
| | $h_3$ | 0.1879 | (0.1438, 0.2333) | 16.21 |
| | LML | -1485.72 | | |

Note: LML refers to log marginal likelihood, and SIF refers to simulation inefficient factor.

## Conclusion

Based on Bayes factors, the Bayesian algorithm with an unknown error density performs better than the wrongly specified error distributions, although it performs slightly worse than the correctly specified error distributions in other simulations.

## Reference

Efromovich, S. (2005), 'Estimation of the density of regression errors', *The Annals of Statistics*, **33**(5), 2194–2227.

*Contact Author C@edu for the draft

Figure 4: An illustration of a poster produced by the *beamerposter* package using the *beamer* theme of Frankfurt.

## 1.3   Adding color

Previous section should allow you to obtain a structure of your poster, but you may like to add some color to the poster. This can be achieved in *beamerposter* package, because you can define any color using the rgb scale, just put `\definecolor{colorname}{rgb}{r,g,b}` in the preamble. The r,g,b are numbers within 0 and 1, they express the amount of red, green and blue you add to create each color. For example, `\definecolor{lightpurple}` `{rgb}{0.8,0.3,0.7}`. You can now obtain any word in color by typing any word. Colors can also be defined by other scales, such as gray scale.

You may also want to consider packages *color* and *xcolor* which provide access to several kinds of colors, tints, shades, tones of arbitrary colors.

## 1.4   Obtaining smaller or larger size posters

The option `scale=number` for making posters from A0 to A4 is easily accessible in the *beamerposter* package. Thus, you can always rescale the poster to smaller or larger page size. For completeness, Table 3 lists different page sizes from A0 to A4. For different page sizes, you may have to re-position the `textblock` coordinates accordingly.

|     | w(in) | h(in) | w(mm) | h(mm) | w(ft) | h(ft) |
|-----|-------|-------|-------|-------|-------|-------|
| A0  | 33.07 | 46.77 | 840   | 1188  | 2.76  | 3.90  |
| A1  | 23.39 | 33.07 | 594   | 840   | 1.95  | 2.76  |
| A2  | 16.54 | 23.39 | 420   | 594   | 1.38  | 1.95  |
| A3  | 11.69 | 16.53 | 297   | 420   | 0.97  | 1.38  |
| A4  | 8.26  | 11.69 | 210   | 297   | 0.69  | 0.97  |

Table 3: Width and height of different page sizes.

# 2   *Beamer* themes

*Beamer* class supports the concept of a theme, with which you can alter the appearance of your poster, such as the color of `block`. It is this feature that truly separates the *beamerposter* package from the *a0poster* class. Possible *beamer* themes are listed in alphabetical order: AnnArbor, Antibes, Bergen, Berkeley, Berlin, Boadilla, CambridgeUS, Copenhagen, Darmstadt, default, Dresden, Frankfurt, Goettingen, Hannover, Ilmenau, JuanLesPins, Luebeck, Madrid, Malmoe, Marburg, Montpellier, PaloAlto, Pittsburgh, Rochester, Singapore, Szeged, Warsaw.

While the code for producing Figure 3 uses the *beamer* theme of Frankfurt, an example of blocks created by `\usetheme{Singapore}` is exhibited in Figure 5.
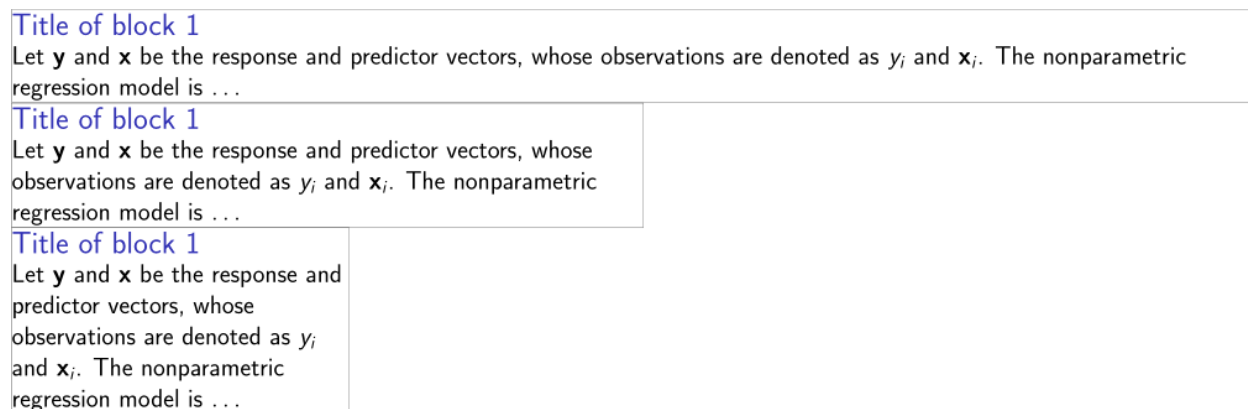
Title of block 1
Let **y** and **x** be the response and predictor vectors, whose observations are denoted as $y_i$ and $\mathbf{x}_i$. The nonparametric regression model is . . .

Title of block 1
Let **y** and **x** be the response and predictor vectors, whose observations are denoted as $y_i$ and $\mathbf{x}_i$. The nonparametric regression model is . . .

Title of block 1
Let **y** and **x** be the response and predictor vectors, whose observations are denoted as $y_i$ and $\mathbf{x}_i$. The nonparametric regression model is . . .

Figure 5: An illustration of one `textblock` environment within another `textblock` environment using the *beamer* theme of Singapore.

# 3  Conclusion

We have now seen some of the options offered by the *beamerposter* package for writing a poster presentation in LaTeX. It is an extension of the *beamer* class and *a0poster* class. An introduction of *a0poster* class can be found in [5]. However, it is highly recommended to use the *beamerposter* package with the *textpos* package as a way of locating different blocks of texts. The orientation of a poster can be portrait or landscape, font size can easily be scaled up or down, and best of all, the *beamer* themes can easily be adopted into a poster created by the *beamerposter* package.

# References

[1] The *a0poster* class and manual.
http://www.ctan.org/tex-archive/macros/latex/contrib/a0poster/

[2] The *beamer* class.
http://www.ctan.org/tex-archive/macros/latex/contrib/beamer/

[3] The *beamerposter* package.
http://www.ctan.org/tex-archive/macros/latex/contrib/beamerposter

[4] The *textpos* package.
http://www.ctan.org/tex-archive/macros/latex/contrib/textpos/

[5] T. Morales de Luna (2008) Writing posters in LaTeX, The PracTex Journal, No. 3.
http://www.tug.org/pracjourn/2008-3/morales/