Hierarchical-block conditioning approximations for high-dimensional multivariate normal probabilities

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December 7, 2019

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Table of contents

Introduction

Introduction

- The computation of the multivariate normal (MVN) probabilities

$$\Phi_n(\mathbf{a}, \mathbf{b}; 0, \Sigma) = \int_a^b \frac{1}{\sqrt{(2\pi)^n |\Sigma|}} \exp\left(-\frac{1}{2}\mathbf{x}^T \Sigma^{-1}\mathbf{x}\right) d\mathbf{x}, \quad (1)$$

where $\mathbf{a}$ and $\mathbf{b}$ are integration limits, the mean vector μ is assumed to be 0, Σ is a positive-definite covariance matrix, is required for a variety of applications.

- In high-dimensional settings (large n), it is hard to calculate (1) directly.

- We review new approaches proposed by Cao et al. (2019) to approximate high-dimensional multivariate normal probability (1) using the hierarchical matrix $\mathcal{H}$ (Hackbusch, 2015) for the covariance matrix Σ.

The methods are based on

1. the bivariate conditioning method (Trinh and Genz, 2015) and
2. the hierarchical Quasi-Monte Carlo method (Genton et al., 2018).

Elements

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The theme provides sensible defaults to
\emph{emphasize} text, \alert{accent} parts
or show \textbf{bold} results.
```

becomes

The theme provides sensible defaults to *emphasize* text, accent parts or show **bold** results.

Font feature test

- Regular
- *Italic*
- SMALLCAPS
- **Bold**
- ***Bold Italic***
- **Bold SmallCaps**
- `Monospace`
- *`Monospace Italic`*
- **`Monospace Bold`**
- ***`Monospace Bold Italic`***

Lists

Items

- Milk
- Eggs
- Potatos

Enumerations

1. First,
2. Second and
3. Last.

Descriptions

PowerPoint Meeh.

Beamer Yeeeha.

- This is important

- This is important
- Now this

- This is important
- Now this
- And now this

Animation

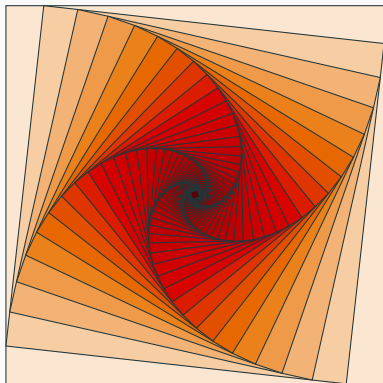- This is really important
- Now this
- And now this

Figure 1: Rotated square from texample.net.

Tables

Table 1: Largest cities in the world (source: Wikipedia)

City	Population
Mexico City	20,116,842
Shanghai	19,210,000
Peking	15,796,450
Istanbul	14,160,467

Blocks

Three different block environments are pre-defined and may be styled with an optional background color.

Default
Block content.

Alert
Block content.

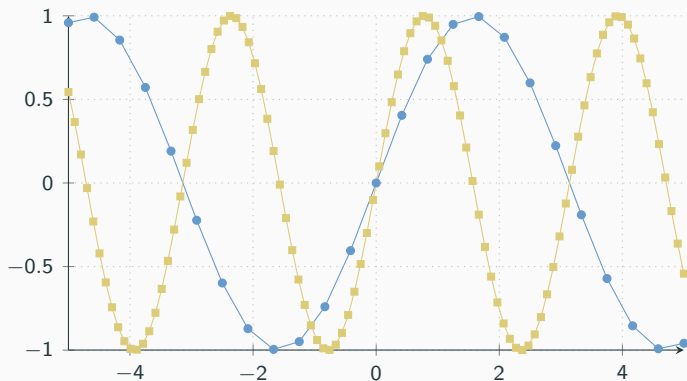**Example**
Block content.

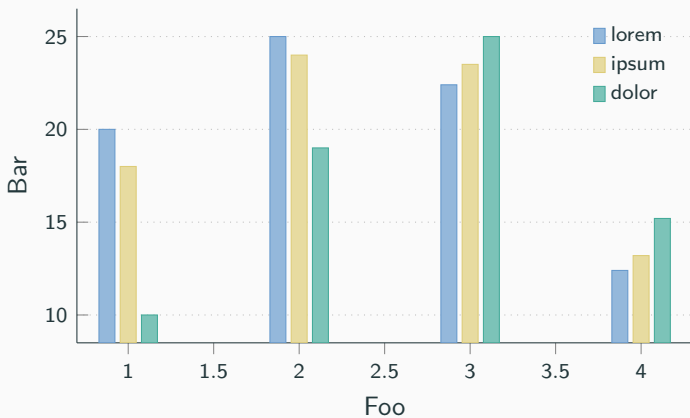**Default**

Block content.

Alert

Block content.

Example

Block content.

Math

$$e = \lim_{n \to \infty} \left(1 + \frac{1}{n}\right)^n$$

Veni, Vidi, Vici

Frame footer

metropolis defines a custom beamer template to add a text to the footer. It can be set via

`\setbeamertemplate{frame footer}{My custom footer}`

Some references to showcase [allowframebreaks] **?????**

Conclusion

Summary

Get the source of this theme and the demo presentation from

github.com/matze/mtheme

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Questions?

Backup slides

Sometimes, it is useful to add slides at the end of your presentation to refer to during audience questions.

The best way to do this is to include the appendixnumberbeamer package in your preamble and call \appendix before your backup slides.

metropolis will automatically turn off slide numbering and progress bars for slides in the appendix.

References

Cao, J., Genton, M. G., Keyes, D. E., and Turkiyyah, G. M. (2019).
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