# Introduction to Beamer slides and the tikz package

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*special thanks to Jen Feder Bobb!*

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# A list of cool things

- Here is the first thing
- and now the second

BIOSTAT look I have a subitem!
BIOSTAT and it says more things

- and now I have a subsubitem!

# Theorems and definitions

**Theorem**

*Pittsburgh Steelers > Baltimore Ravens*

**Proof:**

1. A good year for the Ravens ends in a (losing) trip to the AFC championship

□

**Definition (biostat)**

Working hard and being awesome

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# Theorems and definitions

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# A figure

Figure: This is a picture of biostat camping!

# Camping reference

This slide's only purpose is to reference the camping picture in figure ??

# Table: collocated monitors

- 313 monitors throughout continental United States; 289 unique locations

| City | # Monitors | # Collocated |
|---:|---:|---:|
| New York | 8 | 2 |
| Houston | 7 | 2 |
| Phoenix | 7 | 3 |
| Seattle | 7 | 2/2 |
| Chicago | 5 | 2 |
| Philadelphia | 5 | 3 |

Table: Number of Collocated Monitors

# Spatial-temporal model

Gaussian Process, specific to region ($r(s)$) and constituent:

$$x_{r(s)}(s,t) = \mu_{r(s)} + w_{r(s)}(s,t) + \epsilon_{r(s)}(s,t)$$

$x_{r(s)}(s,t)$ Gaussian process for a constituent at time $t$ and space $s$

$\mu_{r(s)}$ Region-specific mean for a constituent

$\epsilon_{r(s)}(s,t)$ Mean zero, white noise process with variance $\tau^2_{r(s)}$

- Exposure measurement error
- Microscale variation (Paciorek and Schervish, 2006)

$w_{r(s)}(s,t)$ Gaussian process, mean zero with covariance

$$Cov\Big(w_{r(s)}(s,t), w_{r(s')}(s',t')\Big) = \left(\begin{cases} \sigma^2_{r(s)}\rho\big(\|s-s'\|; \phi_{r(s)}, \kappa_{r(s)}\big) & t = t' \\ 0 & t \neq t' \end{cases}\right\}$$

*where $\rho$ is the Matèrn covariance function with Bessel function of the third kind*

$$L\left(\boldsymbol{\Theta}_{r(s)}; \mathbf{m}_{r(s)}\right) \propto$$
$$\prod_{t=1}^{T} |\mathbf{M}_{r(s)}|^{-1/2} \exp\left(-\frac{1}{2}[\mathbf{m}_{r(s)}(t) - \mu_{r(s)}\mathbf{1}]'\mathbf{M}_{r(s)}^{-1}[\mathbf{m}_{r(s)}(t) - \mu_{r(s)}\mathbf{1}]\right)$$

$\boldsymbol{\Theta}_{r(s)}$ $(\sigma_{r(s)}, \phi_{r(s)}, \kappa_{r(s)}, \mu_{r(s)}, \tau_{r(s)})$

$\mathbf{m}_{r(s)}(t)$ observed, log-transformed monitor levels for region $r(s)$ for day $t$

$\mu_{r(s)}$ region-specific mean

where $\mathbf{M}_{r(s)}$ is the appropriate covariance matrix with $(i, k)$ element equal to

$$\sigma^2_{r(s)}\rho(\|s_i - s_k\|; \phi_{r(s)}, \kappa_{r(s)}) + \tau^2_{r(s)} \cdot \mathrm{I}_{\{s_i = s_k\}}$$

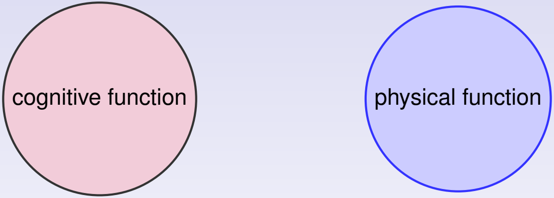
# Citations

Now I will cite some important papers. The following are really important [**?**, **?**, **?**]

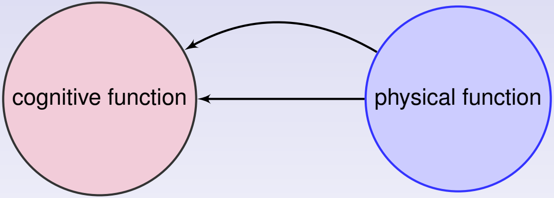
# Tikz help

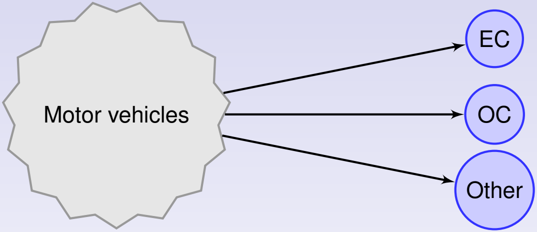
- Lots of internet help pages
- Find similar graphic and check out code
- Wikipedia: http://en.wikipedia.org/wiki/PGF/TikZ
- texample: http://www.texample.net/tikz/examples/tag/beamer/

# Tikz package



# Tikz package

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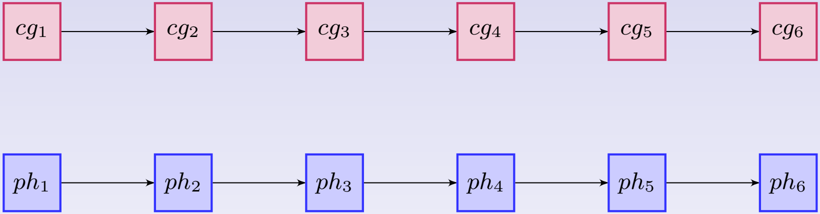

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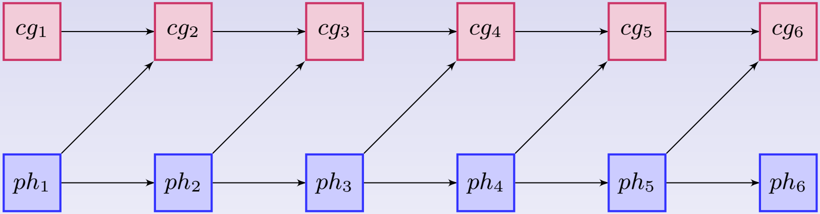

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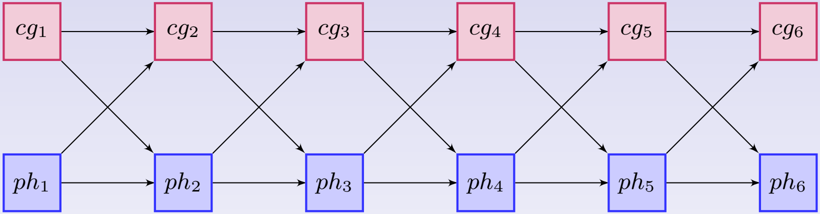

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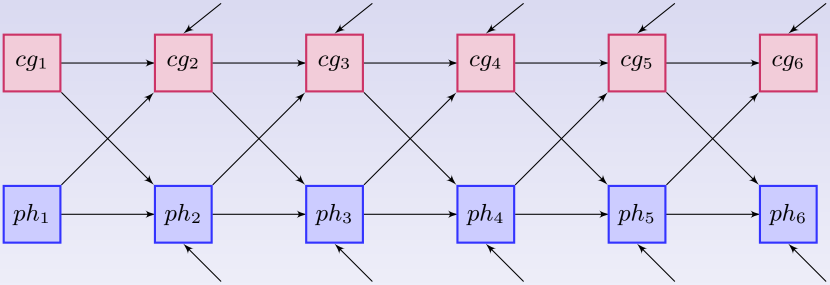

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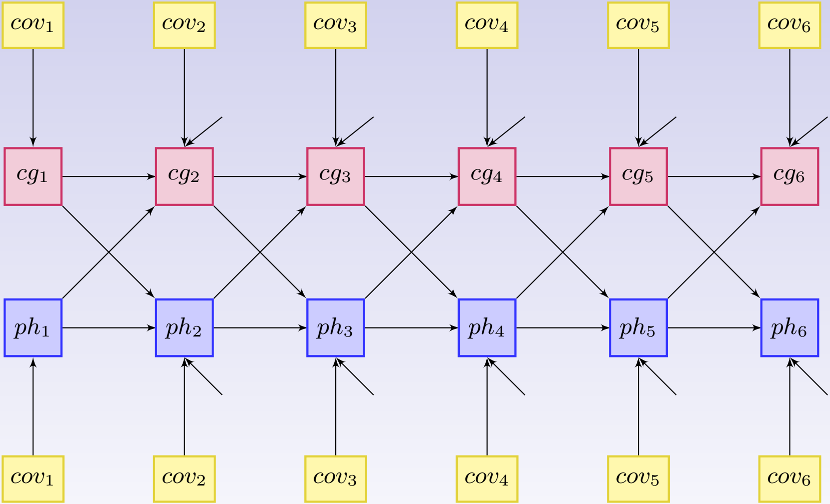

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# Thanks!

The End ♡