Introduction to ggplot2

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Getting started

```
install.packages("ggplot2")
require(ggplot2)

# Data Note: ggplot2 requires data.frames
```

Logic of ggplot2

- Based on the Grammar of Graphics
- Layerable graphics with an underlying structure to the syntax

Arguments of ggplot(..., layer())

Data

- gets pulled into the ggplot() function
- variables in the data are mapped to various *aesthetics*

Arguments of ggplot(..., layer())

Aesthetics

- how your data are represented visually
  - aes(x = , y = ,)
  - aes(color = , shape = , fill = , size = , alpha =)

Arguments of ggplot(..., layer())

Geometry

- Essentially determines the type of graph
  - bar, histogram, line, point, etc

Arguments of ggplot(..., layer())

Statistic

- the statistical transformation.
- Default is 'identity', but lots of others possible:
  - bin, density, boxplot, contour

Arguments of ggplot(..., layer())

Facet

- Do you want to plot subsets of your data?
  - facet_wrap(~var, nrows/ncols =)
  - facet_grid(~var)

Arguments of ggplot(..., layer())

Scales:

- Need one for each aesthetic mapping
- x scale, y scale
- scale transformation of shapes and colors (think color mapping)

Arguments of ggplot(..., layer())

Coordinate System

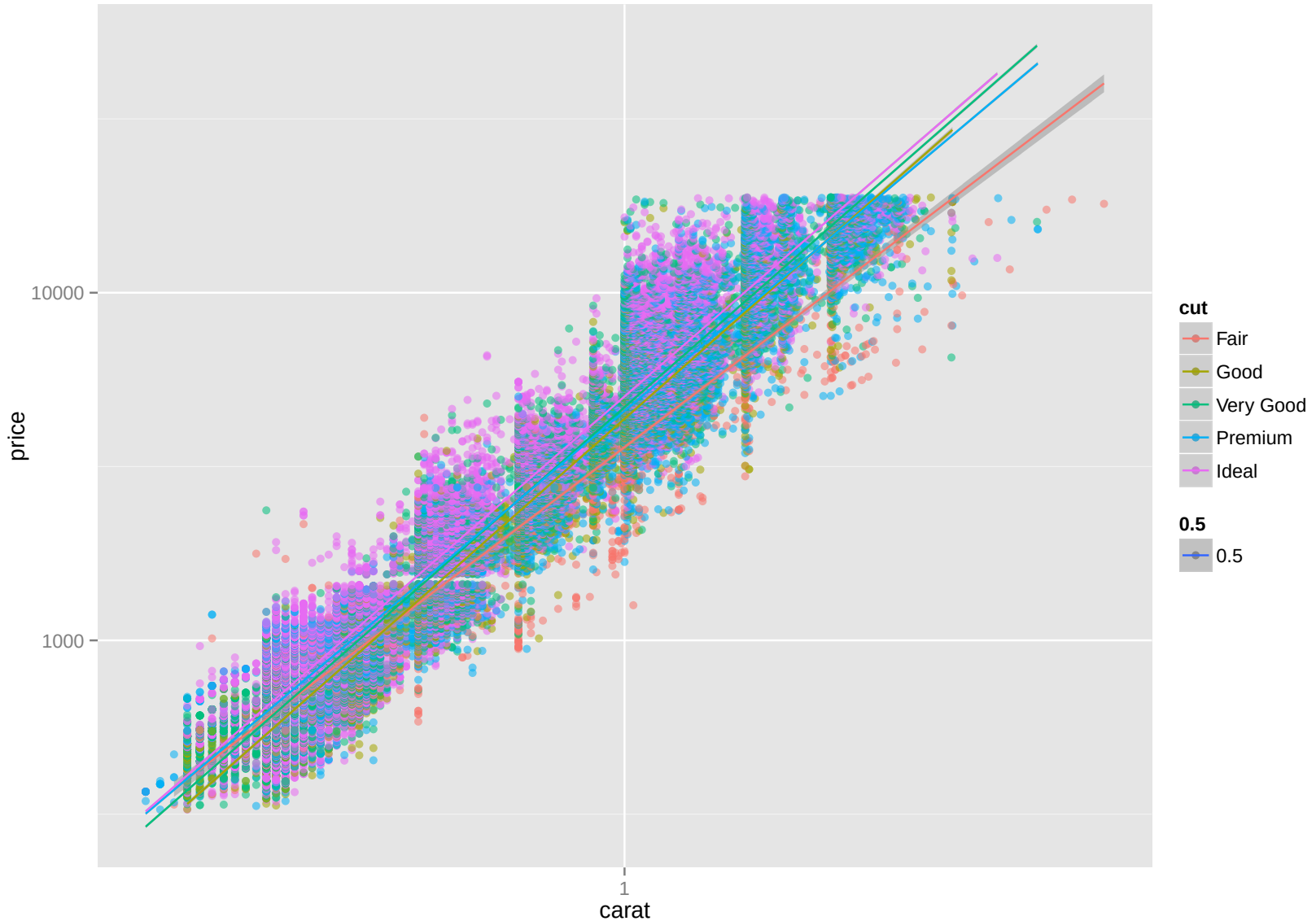
- default is Cartesian

Full ggplot() specification:

```
ggplot() +
  layer(
    data = diamonds, mapping = aes(x= carat, y = price, col
    geom = "point" , stat = "identity" , position = "identi
    ) +
  layer(
   data = diamonds, mapping = aes(x = carat, y = price) ,
   geom = "smooth" , stat = "smooth" , method = lm, positio
   ) +
  scale_y_log10() +
  scale_x_log10() +
  coord_cartesian()
```

Translation: using the diamonds data set, map *'carat'* to horizontal (x) position and *'price'* to vertical (y) position. Display the raw data with points that are colored according to the variable *'cut'*. Finally, add a smoothing line with all of the same data mapping onto a log-transformed axis scale.

The code on that last slide gives us



. . . a

mess

This slide is blank on purpose.

The magic of defaults

Allow us to simplify the full ggplot() specification to:

```
ggplot(diamonds, aes(carat, price)) + geom_point() +
  stat_smooth(method = lm) +
  scale_y_log10() +
  scale_x_log10()
```

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- Makes strong assumptions in order to reduce the amount of typing
- Mimics syntax of plot()
- In my experience, using qplot() at the beginning delays full understanding of ggplot() syntax
- Recommend starting with ggplot(), then relying on qplot() once you're comfortable with full ggplot()

Horoscopic advice:

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- Take the time to learn the structure of ggplot and its syntax
  - diving in with your own data will speed this up
- start with the most basic graph you need, and build to the most complicated, learning about layers and aesthetic mappings as you need them

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  - each tag pings its unique ID on a random delay between 30 - 60 seconds
  - receiver records detections

Plots I'd like to see:

- Temperature in all three tanks
- Total number of detections per tag
- Detections over time (expecting to fall off)
  - Detections over time, by tag ID
- Tag life

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ggplot2 FAQ (good name for a band?)

- How do I add error bars?

```
p + geom_errorbar(aes(x = , ymax = , ymin = )) #required a
```

- How do I save a plot I've made?

```
ggsave("plot.png" , plot = last_plot() , width = , height =
```

- What should I do to make my life easier when using ggplot2?
  - Have tidy data, watch your data classes, and bookmark the ggplot2 FAQ on Stack Overflow.

Of course.

This repo on GitHub - all materials, including slides Also has links to more teaching resources on all these things