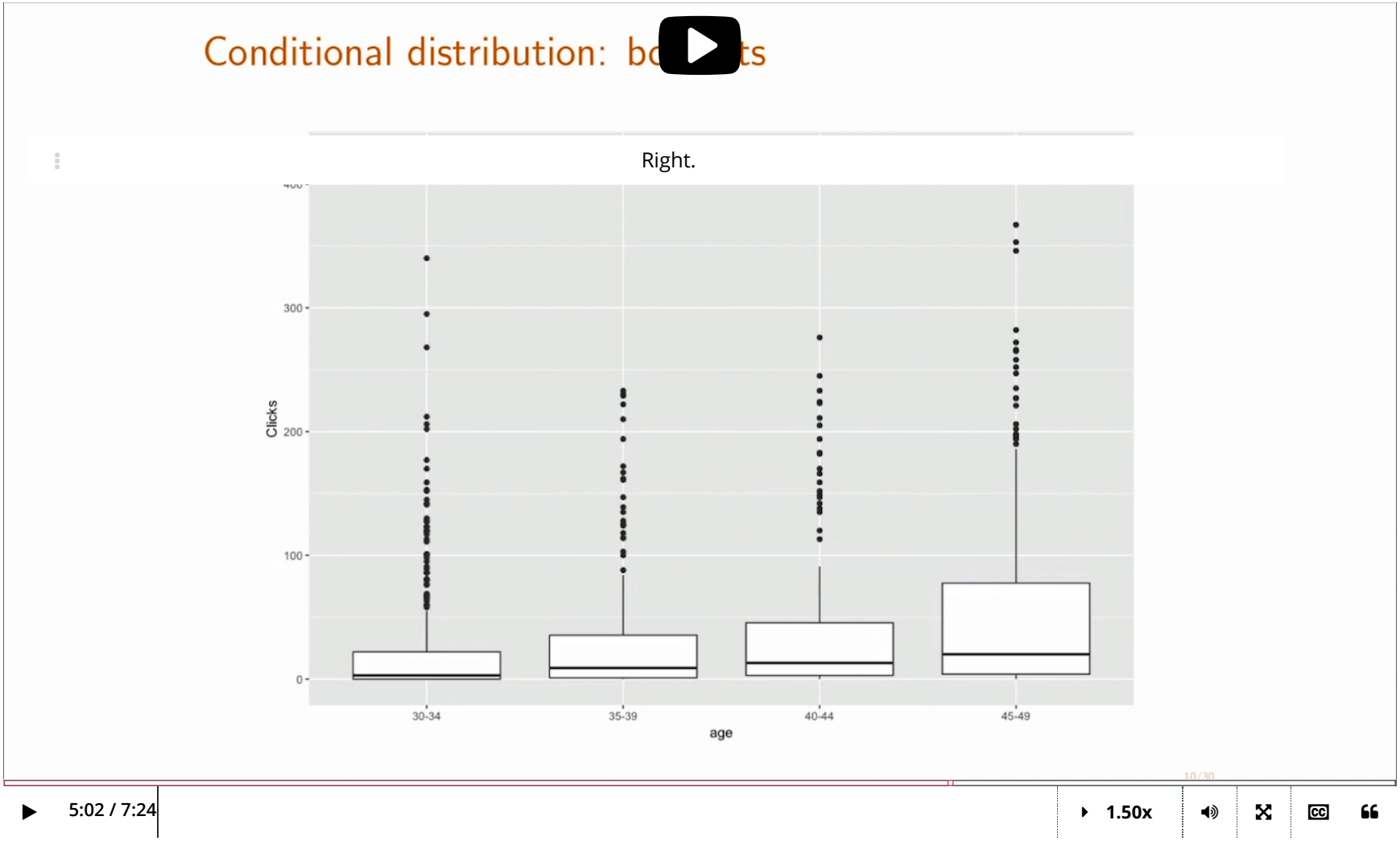
# 6. Plots of Conditional Distributions and Conditional Quantiles and Box-and-Whisker Plots

## Plots of Conditional Distributions and Conditional Quantiles and Boxplots

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## The Shapes of Joint and Conditional Distributions

1/1 point (graded)
Let $f(x,y)$ be the joint pdf of the pair of **continuous** random variables $(X,Y)$. Select from the following all statements that are correct.

- [x] $f(y \mid x) = \frac{f(x,y)}{f(x)}$, provided $f(x) \neq 0$
- [x] $f(y \mid x)$, for each $x$, is a scaled version of the slice of the 3-D plot of $f(x, y)$ across the $x$ intercept.
- [ ] $f(y|x)$ is the probability that $Y = y$ given $X = x$.

✔

**Solution:**

The first two choices are correct. The first choice is the definition of the conditional pdf. The second choice is correct because it follows from the definition that for a given $x$, $f(y|x)$ is equal to the slice of $f(x, y)$ at the $x$ intercept scaled by $\frac{1}{f(x)}$.

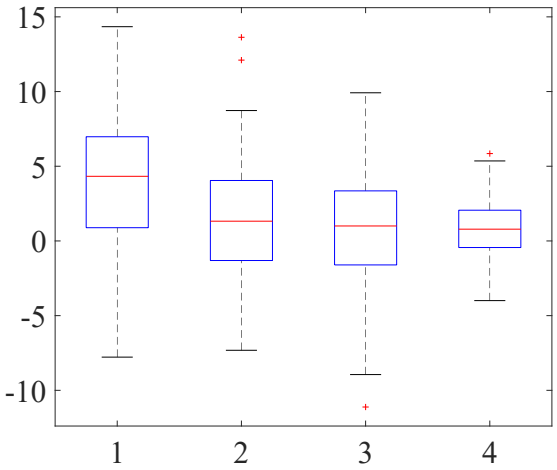
The third choice is not correct because, among many things, $f(y|x)$ can take values greater than $1$ and still be a valid pdf and a probability can never be greater than 1. Further, for a continuous random variable with a continuous pdf the probability that the random variable takes on any particular value is equal to $0$.

Submit You have used 1 of 2 attempts

Answers are displayed within the problem

## Box-and-Whisker Plot

1/1 point (graded)
The following is a box-and-whisker plot drawn using $100$ $y$ axis points for each $x$ value $1, 2, 3, 4$:




Which of the following statements accurately reflect the box-and-whisker plot shown above?

- [ ] The $y$ values have a similar standard deviation for all values of $x = 1, 2, 3, 4$.
- [x] The middle 50 percentile of $y$ values is more concentrated for $x = 4$ when compared to the other three $x$ values.
- [x] The conditional distribution of $y$ given $x$ does not appear to be heavily skewed one way or another for all values of $x$.
- [x] If we assume as ground truth that for every $x$ the conditional distribution of $y$ given $x$ is symmetric, then it is reasonable to conclude that the mean of the conditional distributions is non-increasing with $x$.

✔

**Solution:**

The second, third, and fourth statements reflect what we see in the box-and-whisker plot.

Submit You have used 2 of 2 attempts

Answers are displayed within the problem

## Concept Check: Estimation for Each x

1/1 point (graded)
Is the following statement true or false?

"For a given $x$, upon observing samples $Y_1, \ldots, Y_n$ we have seen an estimation technique in this class to estimate the mean, median, and quantiles of $Y$ for this $x$ even in the absence of a statistical model for $Y$ given this $x$."

- (●) True
- ( ) False

✔

**Solution:**

The answer is **True**. M-estimation can be used to estimate the mean, median, and quantiles of $Y$ for a given $x$ even without having to assume a statistical model for the same.

Submit You have used 1 of 1 attempt

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## [STAFF] By "this class" do you mean in this lecture on Linear Regression or the entire Statistics class we've had up until now?

question posted about 8 hours ago by **DriftingWoods**

I would answer differently based on this.

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1 response

**Erocha** (Community TA)
about 8 hours ago

The entire course.

Thanks - got the answer right but I think for a much simpler reason than given.

posted 12 minutes ago by **DriftingWoods**

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