6. Total Variation Distance for Continuous Distributions

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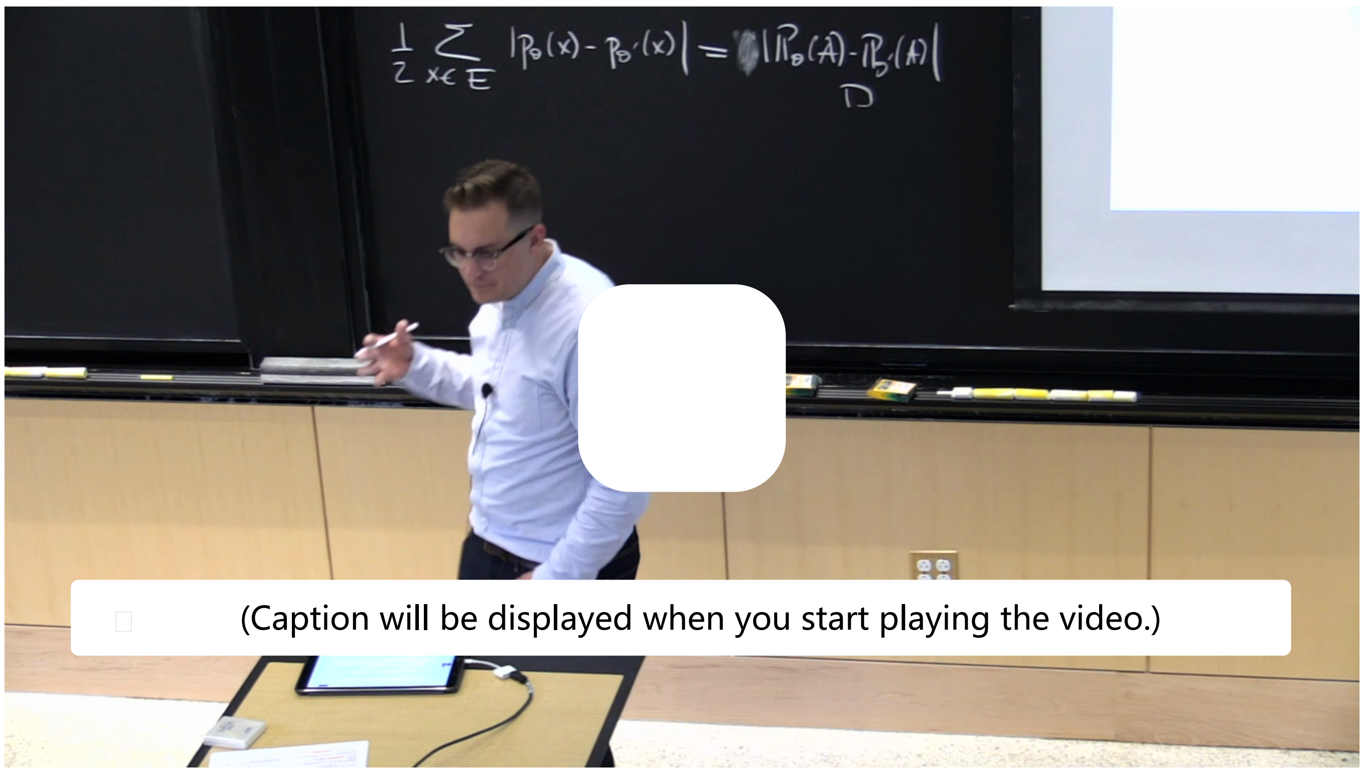

If it's continuous, well, I don't have a PMF.

I have a PDF, all right?

So the PDF, I remind you, is just,

when I want to compute the probability of belonging

to some subset of EA, just have to integrate the PDF over A.

I know that it's non-negative and that it

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Let $\mathbf{P}$ and $\mathbf{Q}$ be probability distributions on a **continuous** sample space E with probability density functions f and g. Then, the total variation distance between $\mathbf{P}$ and $\mathbf{Q}$

$$\mathrm{TV}(\mathbf{P},\mathbf{Q}) = \max_{A\subset E} |\mathbf{P}(A) - \mathbf{Q}(A)|,$$

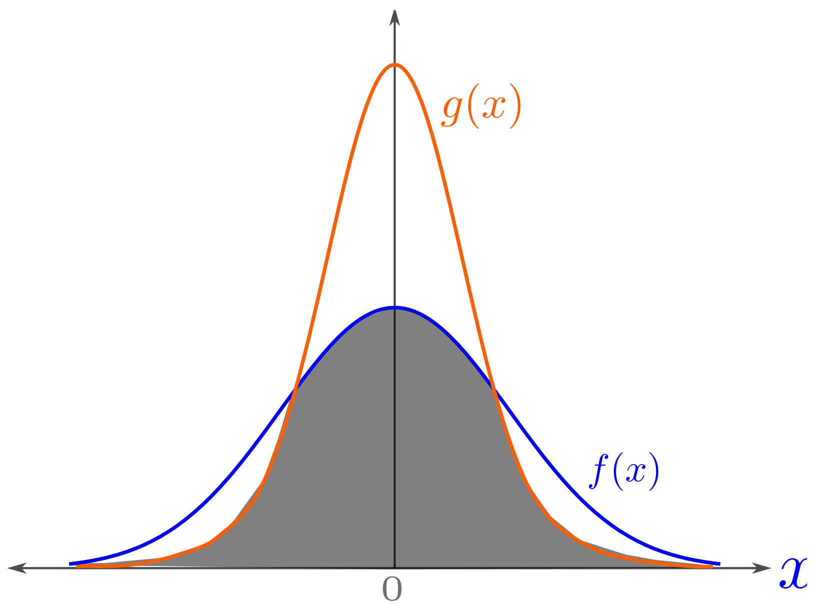
can be computed as

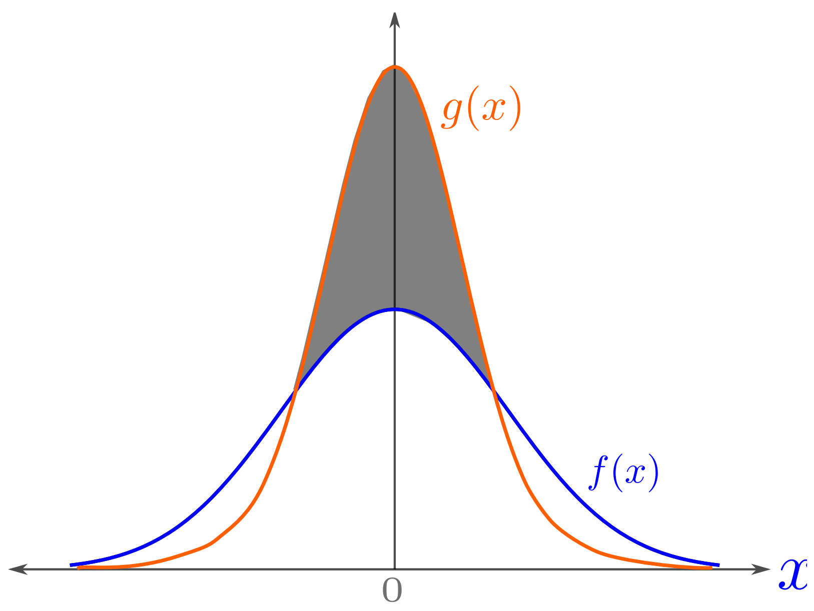
$$\mathrm{TV}(\mathbf{P},\mathbf{Q}) = \frac{1}{2}\int_{x\in E} |f(x) - g(x)|.$$

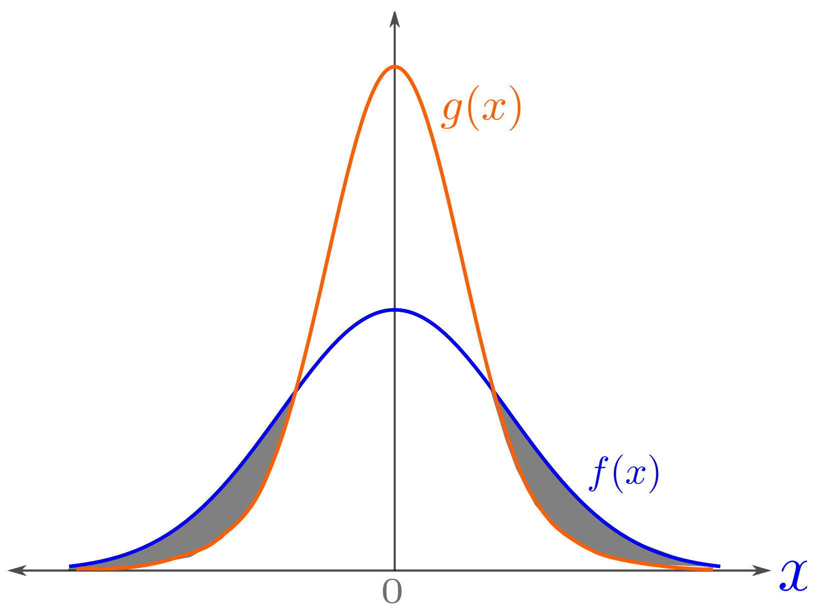
Graphical Interpretation of Total Variation

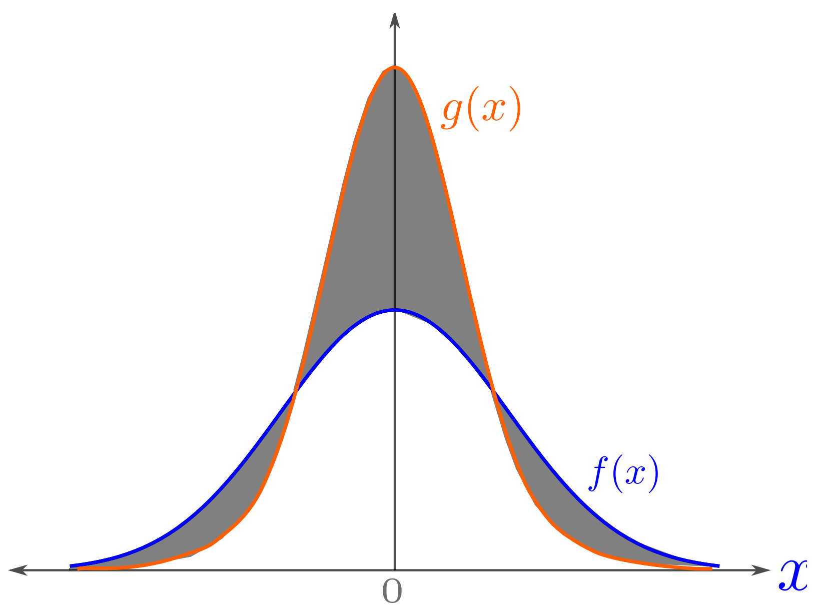
1/1 point (graded)

Let $X \sim \mathbf{P}$ and $Y \sim \mathbf{Q}$ be Gaussian random variables with mean 0. Let f denote the probability density function of X and g denote the density of Y. Which answer is a correct graphical interpretation of $2\mathrm{TV}(\mathbf{P},\mathbf{Q})$, 2 times the total variation distance between $\mathbf{P}$ and $\mathbf{Q}$?







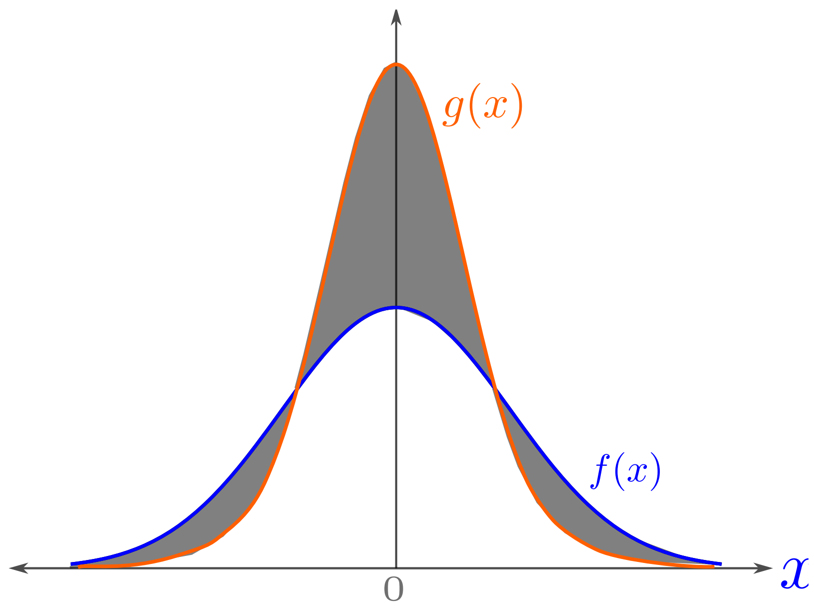


Solution:

Recall the formula for total variation when both distributions are continuous:

$$\mathbf{TV}\left(\mathbf{P},\mathbf{Q}\right)=\frac{1}{2}\int_{\mathbb{R}}\left|f\left(x\right)-g\left(x\right)\right|dx$$

The integral on the right hand side is precisely the (unsigned) area **between** the densities f and g:



提交 你已经尝试了1次（总共可以尝试2次）

Answers are displayed within the problem

讨论

显示讨论

主题： Unit 3 Methods of Estimation:Lecture 8: Distance measures between distributions / 6. Total Variation Distance for Continuous Distributions