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Recitation Section: A5

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Question 1: Why do we need multi-variate r.v.'s and give real life correlated multivariate r.v.

Solution 1: We use multi-variate r.v. because in real-life, there are multiple factors (variables) which affects a particular event. Therefore, to be able to analyse how much these variables are correlated and to obtain likelihoods for the cases where we need multiple factors.

Examples:

1) There are multiple variables such as $\frac{\text{CO}_2}{7}$, $\frac{\text{CH}_4}{7}$, $\frac{\text{N}_2\text{O}}{7}$ which affects greenhouse effect

There is positive correlation between amount of CO_2 and greenhouse effect.

2) Being Covid-19 (+) is also affected by multiple factors such as paying attention to social distance, wearing masks; using hand sanitizer.

social distancing vs being covid +. (negative correlation)

Question 2: Let r.v. X be a continuous r.v. and it's pdf is given as

$$f(x) = 3x^2, \quad 0 < x < 1$$

Find the prob. that the r.v. X exceeds the value of $\frac{1}{2}$.

Solution 2: $P(X > \frac{1}{2}) = ?$

$$P(X > \frac{1}{2}) = \int_{\frac{1}{2}}^{\infty} f(x) dx = \int_{\frac{1}{2}}^1 3x^2 dx = x^3 \Big|_{\frac{1}{2}}^1 = 1^3 - \left(\frac{1}{2}\right)^3 = \frac{7}{8} //$$

↓
upper bound
is 1 because
of the
p.d.f definition.