

Crib 17 : Linear Regression

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The crib sheet contains cheat-sheet worthy information but is not a substitute for lectures or for reading the notes. It also contains pointers and common mistakes.

- The formula for linear regression is the following.

$$L[Y|X] = E[Y] + \frac{\text{cov}(X, Y)}{\text{var}(X)}(X - E[X])$$

- For zero-mean random variables Y, Z , where the signal is αY , the noise is Z , and our received signal is $X = \alpha Y + Z$, our **signal-to-noise** (SNR) ratio is the following.

$$\frac{\alpha^2 E[Y^2]}{\sigma^2}$$

And, linear regression will yield the following, in terms of SNR :

$$L[Y|X] = \frac{\alpha^{-1} X}{1 + SNR^{-1}}$$

- The **projection property** states that

$$E[(Y - L[Y|X])X] = 0$$

In fact, we know that $E[Y - L[Y|X]] = 0$.