$$\boxed{\underset{(\text{odds})}{\text{chance}} = \frac{P}{1-P}} \quad \frac{\text{evento}}{\text{NÃO evento}}$$

$$P_{AMANDA} = 0{,}80 \Rightarrow \text{chance} = \frac{0{,}80}{0{,}20} = \frac{4}{1} = 4$$

$$P_{LUIZ} = 0{,}25 \rightarrow \text{chance} = \frac{0{,}25}{0{,}75} = \frac{1}{3}$$

$$\text{OLS: } \hat{Y}_i = \alpha + \beta_1 X_{1_i} + \beta_2 X_{2_i} + \dots + \beta_K X_{K_i}$$

Logística Binária (Hosmer & Lemeshow: Communications in Statistics (1980))

$$\ln\left(\frac{P_i}{1-P_i}\right) = \underbrace{\alpha + \beta_1 X_{1_i} + \beta_2 X_{2_i} + \dots + \beta_K X_{K_i}}_{Z:\ \text{logito}}$$

$$\ln\left(\frac{p}{1-p}\right) = Z$$

$$\frac{p}{1-p} = e^Z$$

$$p = e^Z - p e^Z$$

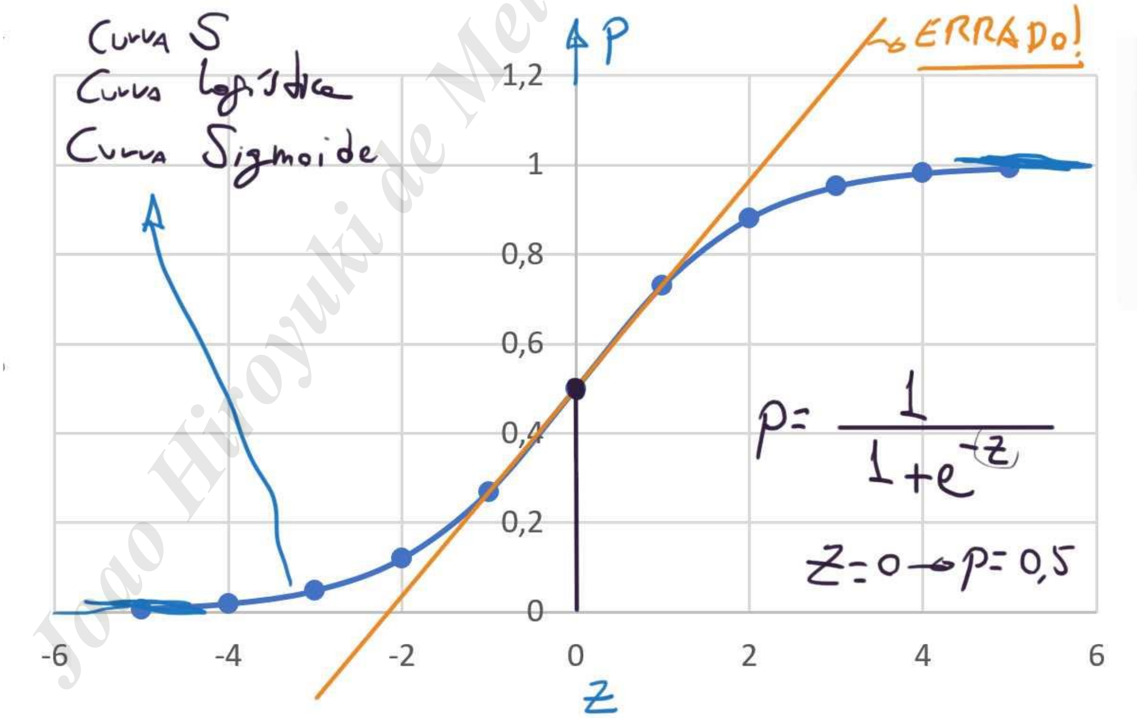
$$p(1+e^Z) = e^Z$$

$$\hat{p} = \frac{e^Z}{1+e^Z} \quad \| \quad \hat{p} = \frac{1}{1+e^{-Z}}$$

$$-\infty \leqslant Z \leqslant +\infty$$

$$\hat{P}_i = \frac{1}{1+e^{-\overbrace{(\alpha + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_K X_K)}^{Z}}}$$

$$\underbrace{\frac{1}{1+e^{-(z)}}}_{P_{evento}} + \underbrace{\frac{1}{1+e^{(z)}}}_{P_{NÃO\ evento}} = 1$$



SIM (evento) $Y = 1$ (evento)

NÃO (~evento) $Y = 0$ (~evento)

dist

sem

evento: cat. alter.

NÃO evento: cat. ref.

Atrasado
quali

$$\hat{P}_{atrasado_i} = \frac{1}{1 + e^{-(\alpha + \beta_1 \cdot dist_i + \beta_2 \cdot sem_i)}}$$

$$\text{atrasado} \sim \textit{Bernoulli}\left(\text{prob}_{\text{atrasado}=1} = \hat{P}\right)$$

$$\log\left[\frac{\hat{P}}{1-\hat{P}}\right] = -26.17 + 0.19(\text{dist}) + 2.36(\text{sem})$$

$$\hat{P}_{i\,(At=1)} = \frac{1}{1 + e^{-(-26{,}17 + 0{,}19\,dist_i + 2{,}36\,sem_i)}}$$

Bernoulli

$$p(Y_i) = p_i^{Y_i} \cdot (1 - p_i)^{1 - Y_i}$$

$$p(Y=1) = p^1 \cdot (1-p)^{1-1} = p$$

$$p(Y=0) = p^0 \cdot (1-p)^{1-0} = 1-p$$

$\chi^2 \sim F$ $\uparrow LL$ $\downarrow$ AIC BIC

$$\chi^2 = -2 \cdot (LL_0 - LL_{model})$$

AIC (Akaike Info Criterion):

$$AIC = -2\,LL_m + 2(\underbrace{k}_{\beta's}+1)$$

menor, melhor

BIC (Bayesian Info Criterion):

$$BIC = -2\,LL_m + (k+1) \cdot \ln(n)$$

pseudo R^2 McFadden (Nobel Economia 2000)
(escolhas discretas)

$$pR^2_{MF} = \frac{\overbrace{-2\,(LL_0 - LL_{modelo})}^{\chi^2}}{-2LL_0}$$

$$pR^2_{C-U} = \frac{1 - \left(\frac{e^{LL_0}}{e^{LL}}\right)^{2/n}}{1 - \left(e^{LL_0}\right)^{2/N}}$$
(Nagelkerke)

<u>cutoff:</u>

Se phat $\geq$ cutoff $\Rightarrow$ <u>EVENTO</u>

Se phat $<$ cutoff $\Rightarrow$ <u>NÃO evento</u>

Matriz de Confusão

classificado	real: TRUE	real: FALSE
TRUE	46	16
FALSE	13	25
	59	41

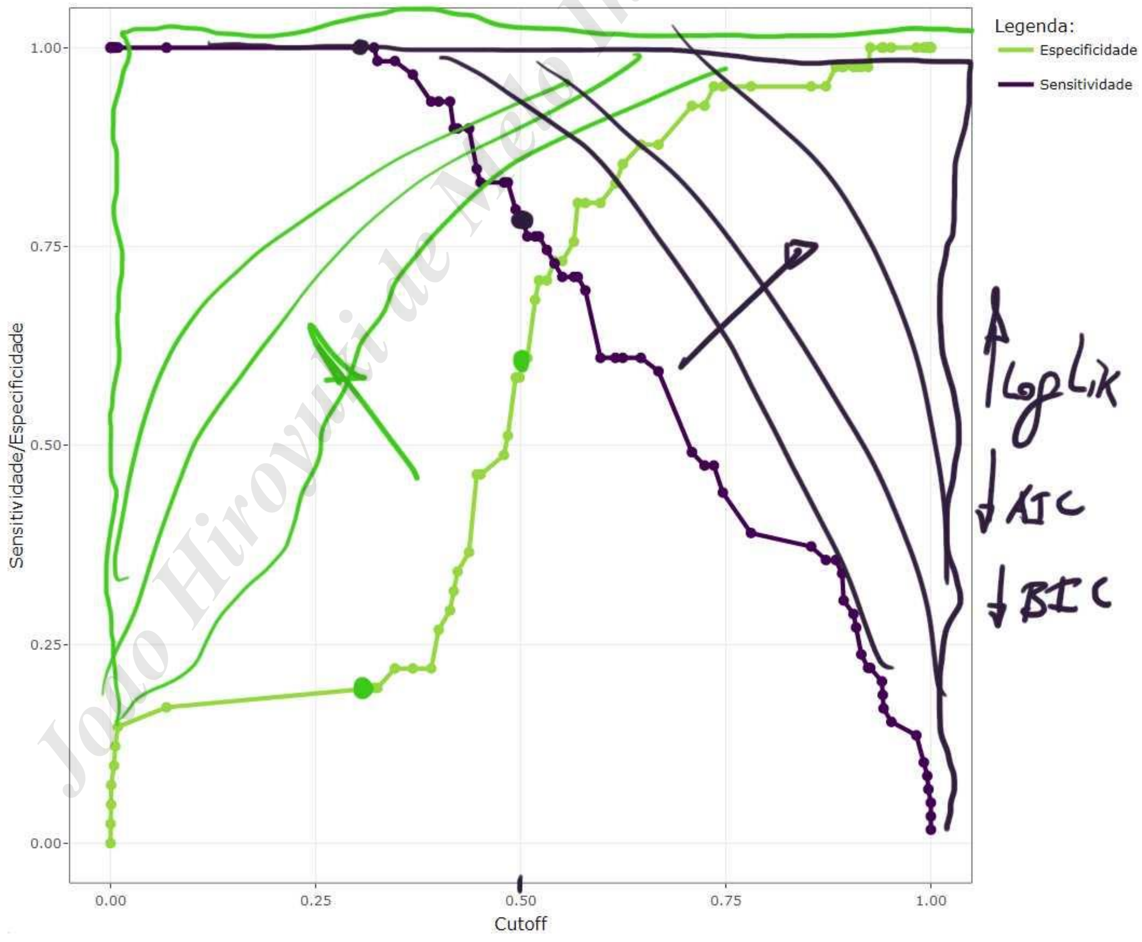
```
Sensitivity : 0.7797
Specificity : 0.6098
Accuracy : 0.71
```

$$\text{Acurácia (EGM)} = \frac{46+25}{100} = 0{,}71$$

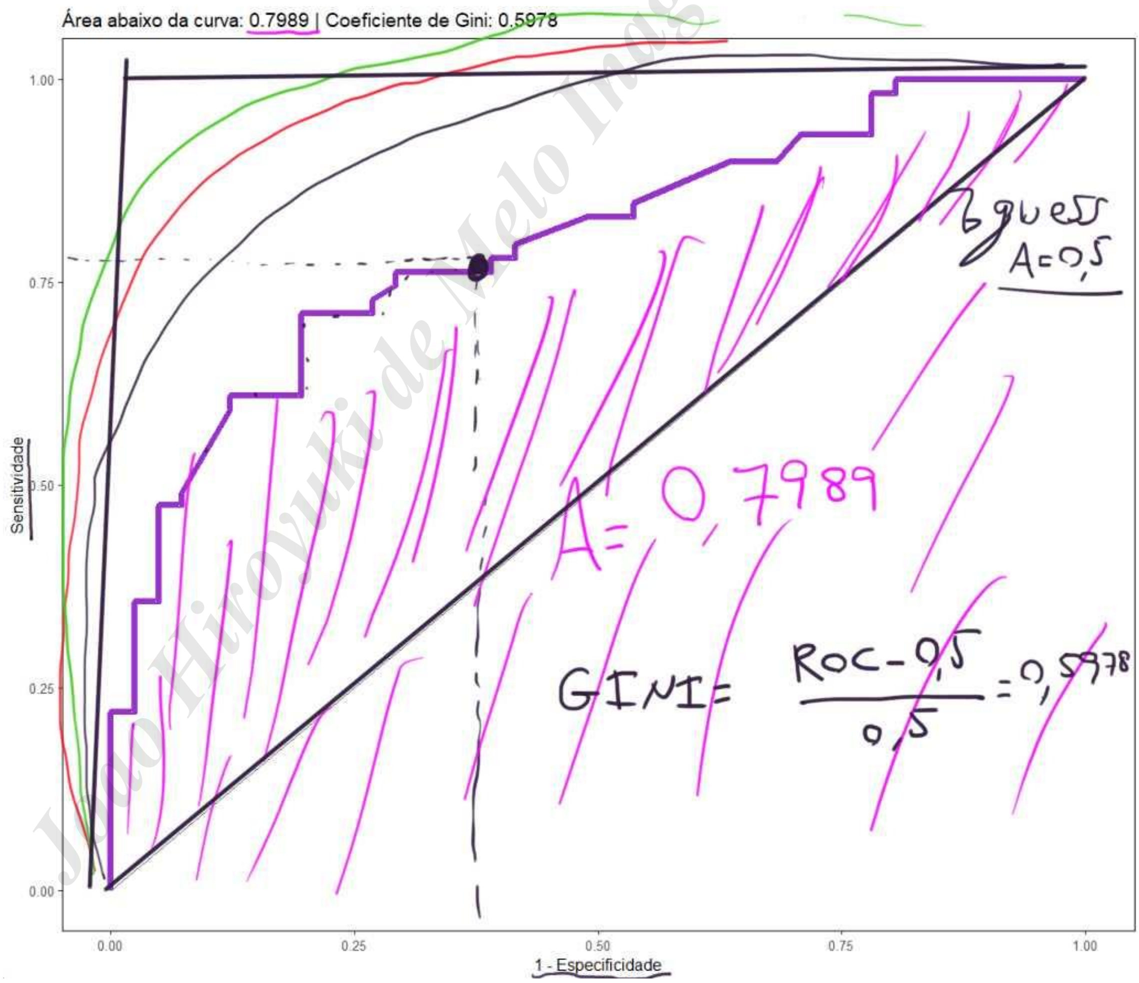
$$\text{Sensitividade (Recall)} = \frac{46}{59} = 0{,}77$$

$$\text{Especificidade} = \frac{25}{41} = 0{,}6098$$

p/ determinado cutoff



ROC: Receiver Operating
Characterist



$$P = \frac{1}{1 + e^{-(z)}} \longrightarrow$$

Log Lik ↑
AIC ↓
BIC ↓
ROC ↑
GINI ↑

} independem do cutoff

cutoff

matriz de confusão

Acurácia (EGM)
Sensitividade
Especificidade

} p/ aquele cutoff