Performance measures

Confusion matrix

		True condition	
	Total population	Condition positive	Condition negative
Predicted condition	Predicted condition positive	True positive, Power	False positive, Type I error
	Predicted condition negative	False negative, Type II error	True negative

Source: https://en.wikipedia.org/wiki/Receiver_operating_characteristic

Measures of accuracy

- Terminology
  - $TP \rightarrow$ true positives, $TN \rightarrow$ true negatives,
  - $FP \rightarrow$ false positives, $FN \rightarrow$ false negatives

    $$N = TP + TN + FP + FN$$
  - TP – Correct identification of positive labels
  - TN – Correct identification of negative labels
  - FP – Incorrect identification of positive labels
  - FN – Incorrect identification of negative labels

Measures of accuracy

- Accuracy: Overall effectiveness of a classifier
  - $\mathrm{A} = \frac{TP+TN}{N}$
  - Maximum value that accuracy can take is 1
  - This happens when the classifier exactly classifies two groups (i.e., $FP = 0$ and $FN = 0$)
- Remember
  - Total number of true positive labels = TP+FN
- Similarly
  - Total number of true negative labels = TN+FP

Measures of accuracy

- Sensitivity: Effectiveness of a classifier to identify positive labels
  - $S_e = \frac{TP}{TP + FN}$
- Specificity: Effectiveness of a classifier to identify negative labels
  - $S_p = \frac{TN}{FP + TN}$
- Both S_e and S_p lie between $0 \ and \ 1, 1$ is an ideal value for each of them
- Balanced accuracy
  - $BA = (sensitivity + specificity)/2$

Measures of accuracy

- Prevalence: How often does the yes condition actually occur in our sample

$$P = \frac{TP + FN}{N}$$

- Positive predictive value: Proportion of correct results in labels identified as positive
  - $PPV \; = \frac{(sensitivity * prevalence)}{((sensitivity{*}prevalence) + ((1{-}specificity){*}(1{-}prevalence)))}$
- Negative prediction value: Proportion of correct results in labels identified as negative
  - $NPV \; = \frac{specificity * (1{-}prevalence)}{(((1{-}sensitivity){*}prevalence) + ((specificity){*}(1{-}prevalence)))}$

Measures of accuracy

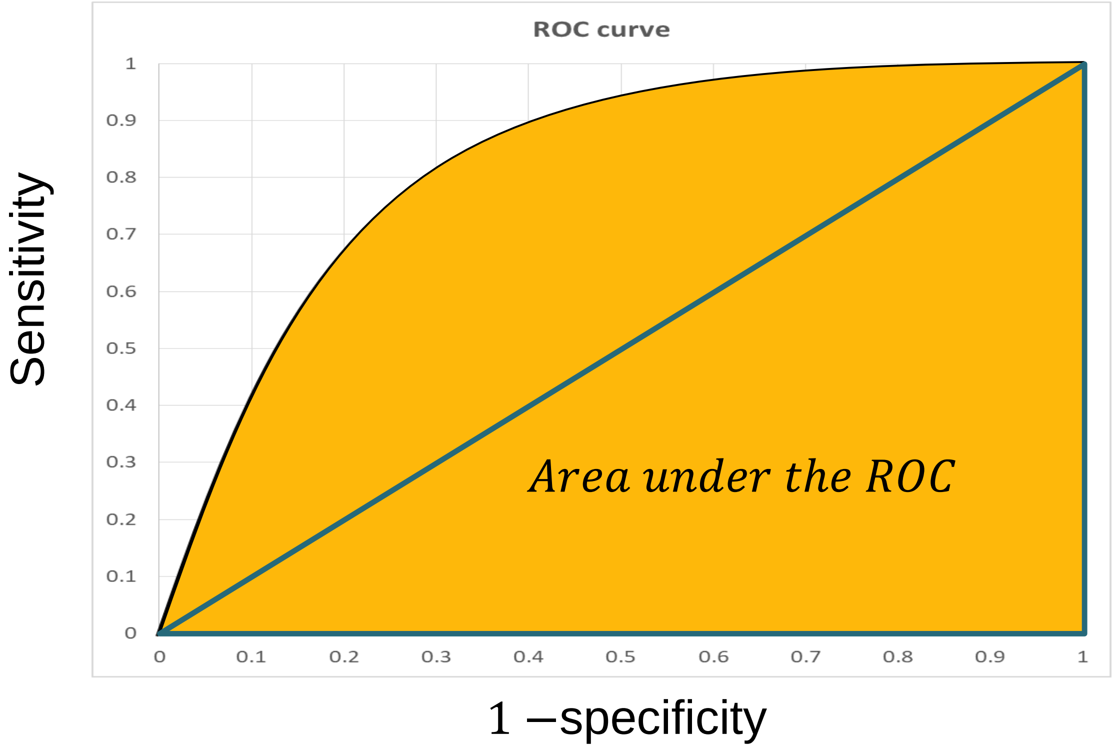
- Detection rate:
  - $DR = \frac{TP}{N}$
- Detection prevalence: prevalence of predicted events
  - $DP = \frac{TP+FP}{N}$
- The Kappa statistic (or value) is a metric that compares an **observed accuracy** with an **expected accuracy** (random chance)
- Kappa = $\frac{observed\ accuracy - expected\ accuracy}{1 - expected\ accuracy}$

Measures of accuracy

- Observed accuracy
  - $OA = \frac{a+d}{N}$
- Expected accuracy
  - $EA = \frac{(a+c)(a+b)+(b+d)(c+d)}{N}$
- Kappa $= \frac{\frac{(a+d)}{N} - \left(\frac{(a+c)(a+b)+(b+d)(c+d)}{N}\right)}{\left(1 - \left(\frac{(a+c)(a+b)+(b+d)(c+d)}{N}\right)\right)}$
  - Where $a, b, c\ and\ d$ are $TP, FP, FN\ and\ TN$ respectively

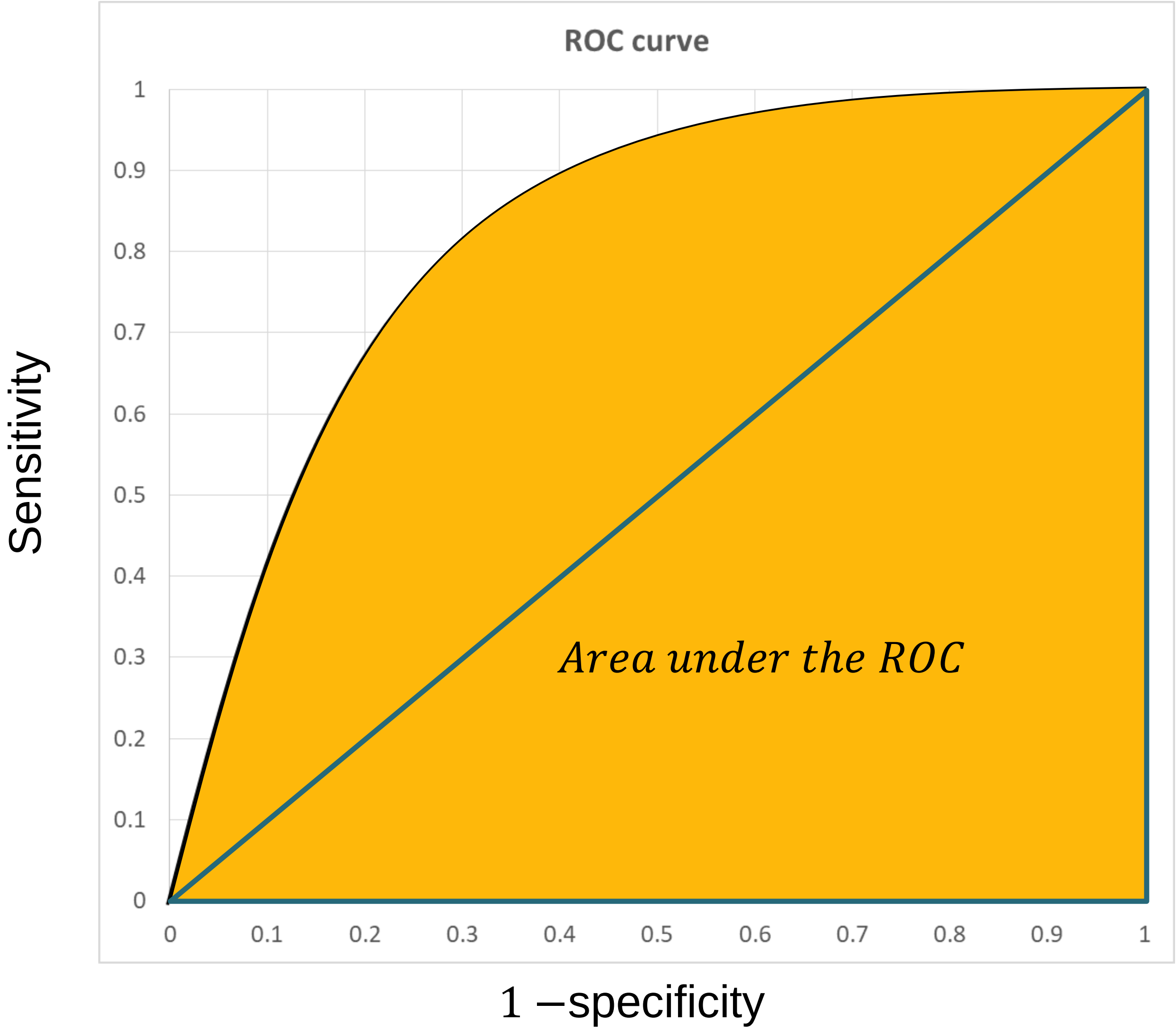
ROC

- ROC – An acronym for Receiver Operating Characteristics
- Originally developed and used in signal detection theory
- ROC graph:
  - Sensitivity as a function of specificity
  - sensitivity (Y-axis) and $1 - \text{specificity}$ (X-axis)



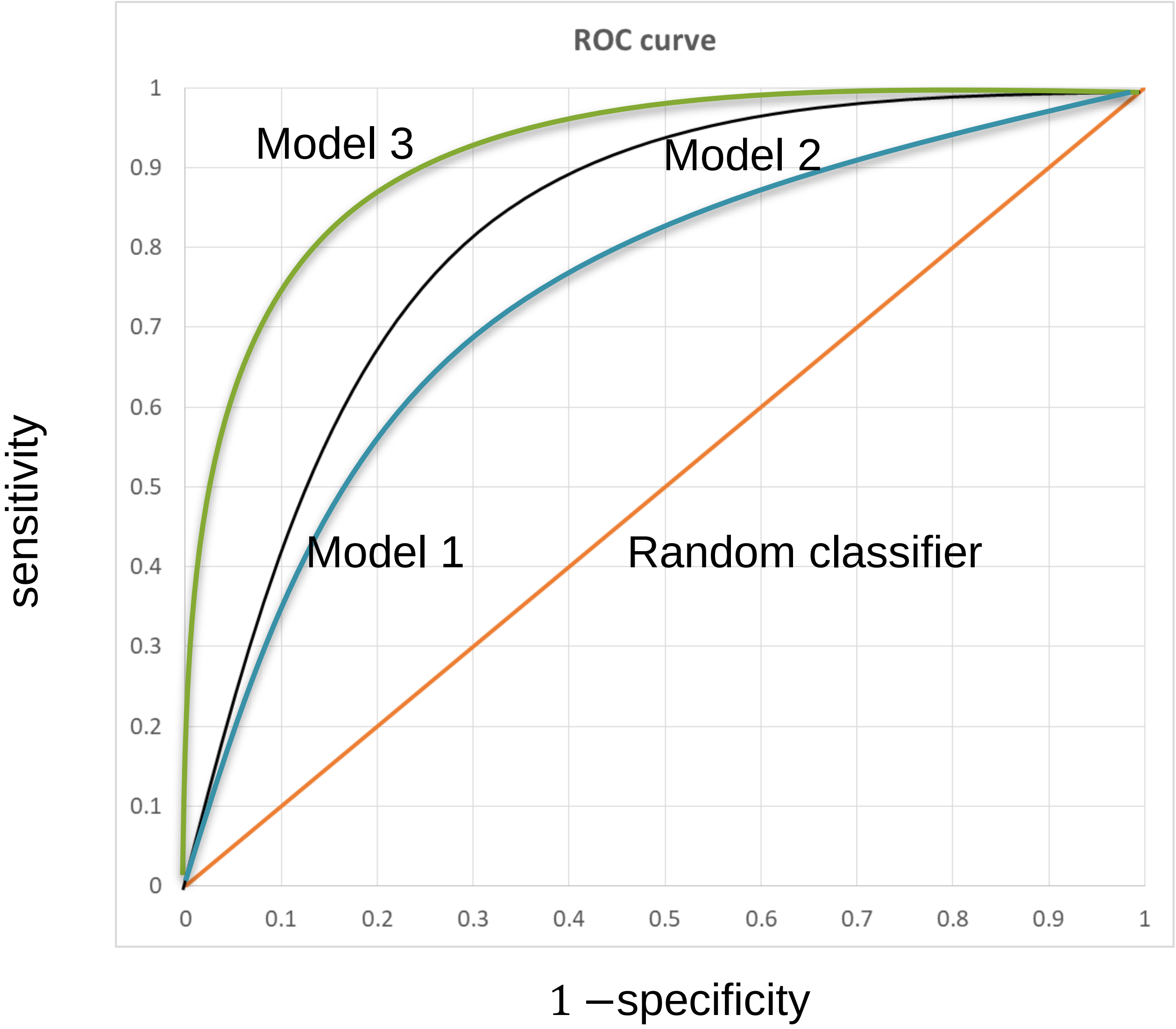
ROC

- ROC can be used to
  - See the classifier performance at different threshold levels (from 0 to 1)
  - AUC- Area under the ROC
    - An area of 1 represents a perfect test; an area of 0.5 represents a worthless model.
    - $.90 - 1$ = excellent
    - $.80 - .90$ = good
    - $.70 - .80$ = fair
    - $.60 - .70$ = poor
  - AUC < 0.5, check whether your labels are marked in opposite



ROC

- ROC can be used to
  - Compare different classifiers at one threshold or overall threshold levels
  - Performance
  - Model 3 > Model 2 > Model 1




operation == "MIRROR_X":
mirror_mod.use_x = True
mirror_mod.use_y = False
mirror_mod.use_z = False
_operation == "MIRROR_Y":
mirror_mod.use_x = False
mirror_mod.use_y = True
mirror_mod.use_z = False
_operation == "MIRROR_Z":
mirror_mod.use_x = False
mirror_mod.use_y = False
mirror_mod.use_z = True
selection at the end -add
_ob.select= 1
ier_ob.select=1
ntext.scene.objects.active
("Selected" + str(modifier
irror_ob.select = 0
bpy.context.selected_ob
ata.objects[one.name].se
int("please select exactly

THANK YOU