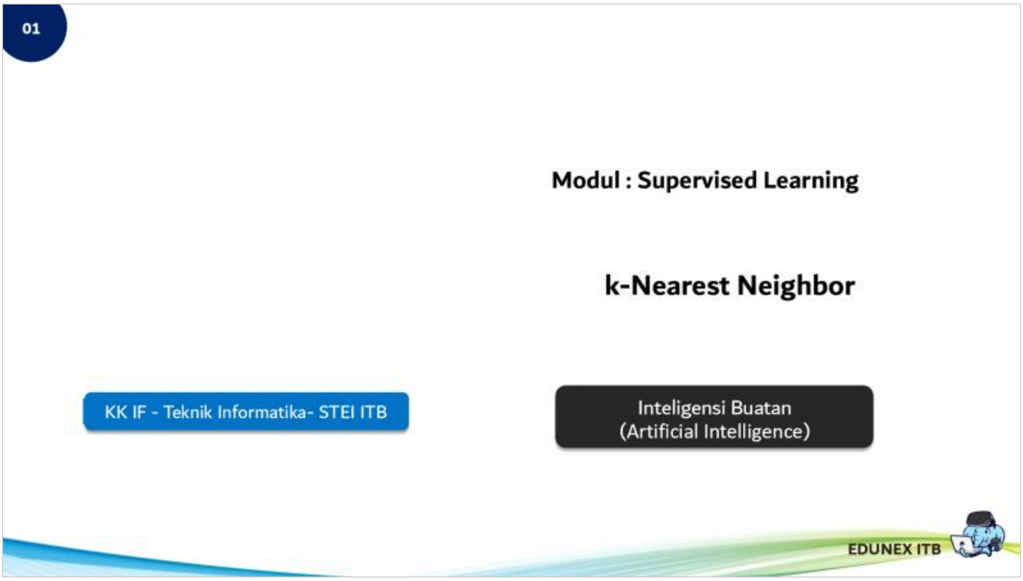
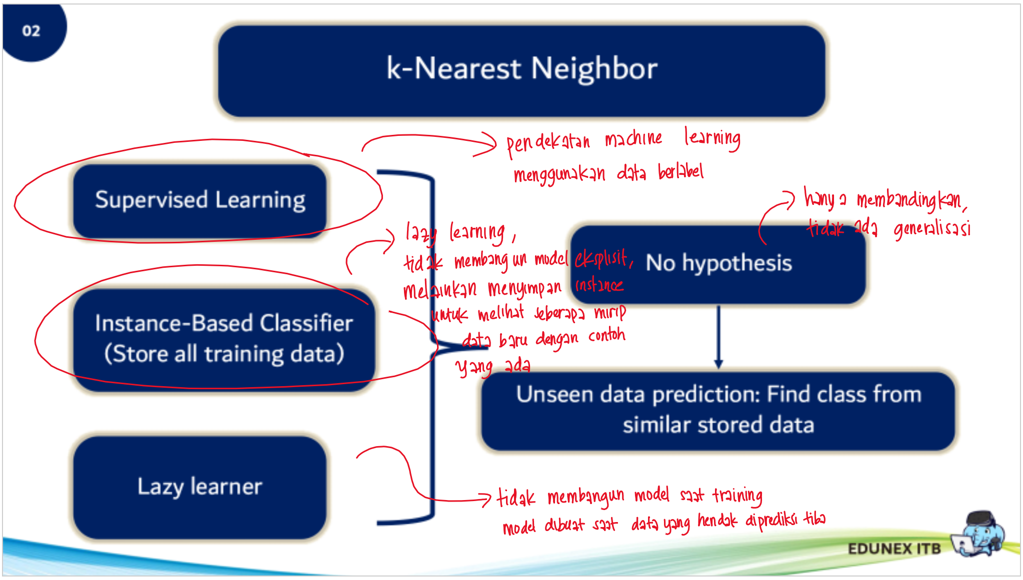
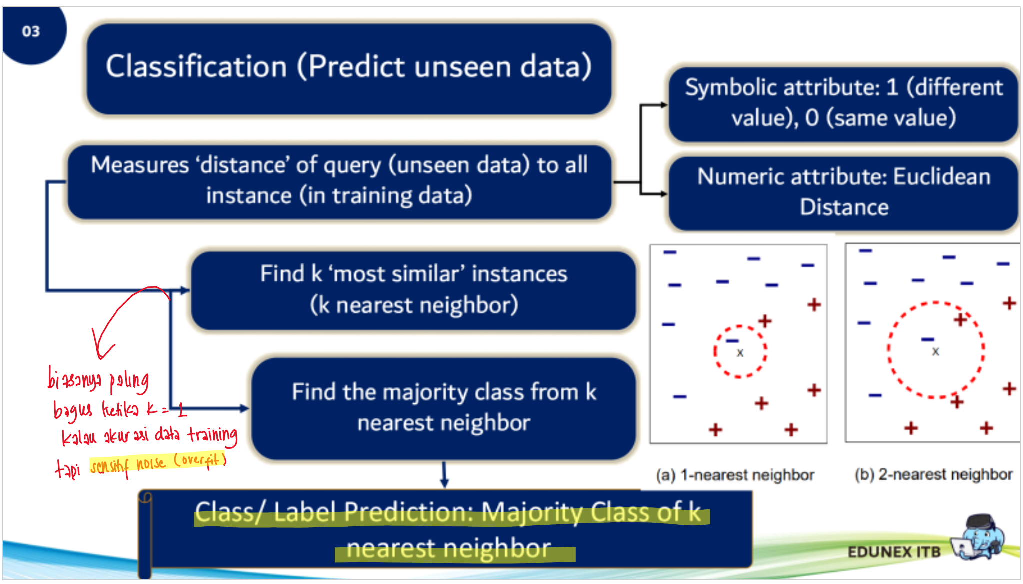
KNN

PDF
KNN







distance = ukuran kemiripan
↳ bisa pakai euclidean / manhattan distance untuk atribut numerik, kalau untuk kategorikal bisa sama = 0, beda = 1

04

Example: Play Tennis Dataset

outlook	temp.	humidity	windy	play
sunny	hot	high	false	no
sunny	hot	high	true	no
overcast	hot	high	false	yes
rainy	mild	high	false	yes
rainy	cool	normal	false	yes
rainy	cool	normal	true	no
overcast	cool	normal	true	yes

outlook	temp.	humidity	windy	play
sunny	mild	high	false	no
sunny	cool	normal	false	yes
rainy	mild	normal	false	yes
sunny	mild	normal	true	yes
overcast	mild	high	true	yes
overcast	hot	normal	false	yes
rainy	mild	high	true	no

EDUNEX ITB

sama = 0, beda = 1

05

Classify New Instance: <Sunny, Cool, High, True>

outlook	temp.	humidity	windy	play	Distance
sunny	hot	high	false	no	2
sunny	hot	high	true	no	1
overcast	hot	high	false	yes	3
rainy	mild	high	false	yes	3
rainy	cool	normal	false	yes	3
rainy	cool	normal	true	no	2
overcast	cool	normal	true	yes	2
sunny	mild	high	false	no	2
sunny	cool	normal	false	yes	2
rainy	mild	normal	false	yes	4
sunny	mild	normal	true	yes	2
overcast	mild	high	true	yes	2
overcast	hot	normal	false	yes	4
rainy	mild	high	true	no	2

k = 1 → D-2 → Play: No

k = 2 → D-1, D-2, → Play: No

k = 3 → D-1, D-2, D-6 → Play: No

EDUNEX ITB

06

Notes on k-Nearest Neigbbor

Advantages

- Approximation can be less complex for complex target function

kadang fungsi target terlalu kompleks dan sulit ditulis dalam rumus

→ karena KNN tidak membuat rumus, meskipun target function rumit, pendekatan jauh lebih sederhana

Disadvantages

- Cost of classifying new instance high
- Consider all features → target function depends only on a few features

→ untuk setiap data baru, KNN harus hitung jaraknya dengan semua data latih → cost tinggi

→ KNN mempertimbangkan semua fitur, padahal bisa saja hanya beberapa fitur yang relevan → fitur tidak penting bisa mengganggu perhitungan jarak

EDUNEX ITB

id	hobi	umur	pendidikan	kelas
1	Game	remaja	sma	1
2	Game	dewasa	s1	2
3	Game	dewasa	diploma	3
4	Baca	dewasa	s1	3
5	Olahraga	dewasa-muda	s1	2
6	Olahraga	dewasa-muda	diploma	3
7	Game	dewasa-muda	sma	1
8	Olahraga	dewasa-muda	sma	1
9	Baca	dewasa-muda	sma	1
10	Game	dewasa-muda	s1	3
11	Baca	Remaja	diploma	1
12	Game	remaja	diploma	2
13	game	dewasa	sma	3

Id	Jarak thd data baru
1	1+1+1=3
2	**1+0+0=1**
3	**1+0+1=2**
4	**1+0+0=1**
5	**0+1+0=1**
6	**0+1+1=2**
7	1+1+1=3
8	0+1+1=2
9	1+1+1=3
10	1+1+0=2
11	1+1+1=3
12	1+1+1=3
13	1+0+1=2

1. Hitung Jarak setiap instance data latih utk data uji berikut:
   hobi = olahraga; umur = dewasa; pendidikan = s1
2. Untuk k=5, maka kelas dari data uji di atas adalah: ... 3

EDUNEX ITB

kategorikal
↓ one-hot encoding
numerikal

} supaya fitur punya tipe yang sama

Distance Measurement on Numeric Attributes

$$D = \left(\sum_{i=1}^{n} |p_i - q_i|^p \right)^{1/p}$$

Minkowski distance

jika,
p = 1 → Manhattan distance
p = 2 → Euclidean distance
p = n → Chebysev distance

$$D_m = \sum_{i=1}^{n} |p_i - q_i|$$

Manhattan distance

pergerakan GRID (vertikal / horizontal)

$$D_e = \left(\sum_{i=1}^{n} (p_i - q_i)^2 \right)^{1/2}$$

Euclidean distance

pergerakan garis lurus

EDUNEX ITB

Brightness	Saturation	Class
40	20	Red
50	50	Blue
60	90	Blue
10	25	Red
70	70	Blue
60	10	Red
25	80	Blue

Brightness	Saturation	Class
20	35	?

$d1 = \sqrt{(20 - 40)^2 + (35 - 20)^2}$
$= \sqrt{400 + 225}$
$= \sqrt{625}$
$= 25$

$d2 = \sqrt{(20 - 50)^2 + (35 - 50)^2}$
$= \sqrt{900 + 225}$
$= \sqrt{1125}$
$= 33.54$

$$D_e = \left(\sum_{i=1}^{n} (p_i - q_i)^2 \right)^{1/2}$$

Euclidean distance

$$\sqrt{(X_2 - X_1)^2 + (Y_2 - Y_1)^2}$$

- X_2 = New entry's brightness (20).
- X_1 = Existing entry's brightness.
- Y_2 = New entry's saturation (35).
- Y_1 = Existing entry's saturation.

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Brightness	Saturation	Class
40	20	Red
50	50	Blue
60	90	Blue
10	25	Red
70	70	Blue
60	10	Red
25	80	Blue

Brightness	Saturation	Class
20	35	?

Brightness	Saturation	Class	Distance
40	20	Red	25
50	50	Blue	33.54
60	90	Blue	68.01
10	25	Red	10
70	70	Blue	61.03
60	10	Red	47.17
25	80	Blue	45

Kalau 3 tetangga terdekat
RED

bisa set default value
Kalau ada majority class sama

EDUNEX ITB

07

THANK YOU

EDUNEX ITB

KNN2

01

Modul : Supervised Learning

Prediction Measurement

Nur ULFA Maulidevi

KK IF - Teknik Informatika- STEI ITB

Inteligensi Buatan
(Artificial Intelligence)

EDUNEX ITB

02

Prediction Measurement

Supervised Learning → "Correct Class"

Prediction based on Model/ Hypothesis from Learning

benar

aslinya benar dibilang salah

		Prediction	
		True	False
Reality	True	**Tp** **True-positive**	Fn False-negative
	False	Fp False-positive	**Tn** **True-negative**

prediksi positif aslinya negatif

prediksi negatif aslinya negatif

03

Example

Instance	Correct Class	Prediction	
1	+	+	TP
2	-	-	TN
3	-	+	FP
4	+	-	FN
5	-	+	FP
6	+	-	FN
7	+	+	TP
8	-	-	TN
9	-	-	TN
10	+	+	TP

04

Accuracy

		Prediction	
		True	False
Reality	True	**Tp** **True-positive**	Fn False-negative
	False	Fp False-positive	**Tn** **True-negative**

bagus digunakan ketika distribusi kelas seimbang

Fraction of all correct predictions over all predicted instances

prediksi benar

$$Accuracy = \frac{Tp + Tn}{Tp + Fp + Tn + Fn}$$

semua benar

05

Precision

		Prediction	
		True	False
Reality	True	**Tp** **True-positive**	Fn False-negative
	False	Fp False-positive	**Tn** **True-negative**

"dari semua ⊕, berapa yang benar² ⊕?"

→ untuk kalau FP berbahaya

Fraction of positive predictions that are correct

$$Precision = \frac{Tp}{Tp + Fp}$$

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06

Recall

		Prediction	
		True	False
Reality	True	**Tp** **True-positive**	Fn False-negative
	False	Fp False-positive	**Tn** **True-negative**

"dari semua yang aslinya ⊕ berapa yang berhasil diprediksi?"

→ kalau FN berbahaya

Fraction of positive instances that are correctly predicted (retrieved/caught)

$$Recall = \frac{Tp}{Tp + Fn}$$

} prediksi instance yang aslinya true

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05

Exercise: Find accuracy, precision and recall

Instance	Correct Class	Prediction
1	+	+
2	-	-
3	-	+
4	+	-
5	-	+
6	+	-
7	+	+
8	-	-
9	-	-
10	+	+
11	+	-
12	-	-
13	-	+
14	+	-

① accuracy

$\frac{7}{14} = 50\%$

② precision

$\frac{3}{6} = 50\%$

③ recall

$\frac{3}{7} = 42,86\%$

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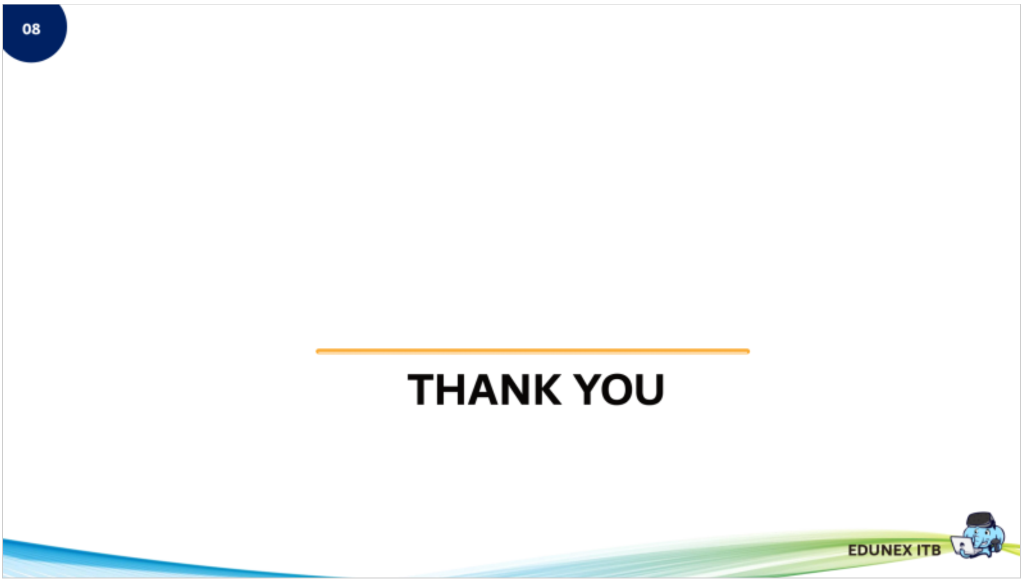
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THANK YOU
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