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(R = /)

(Blasco *et al.*, 2009)

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(Lee *et al.*, 2008a)

(Lee *et al.*, 2008b)

(Pearson, & Elster, 1992)

(Ghazanfari *et al.*, 1996)

(Jarimops &

Jaisin, 2008)

(Ahmadi

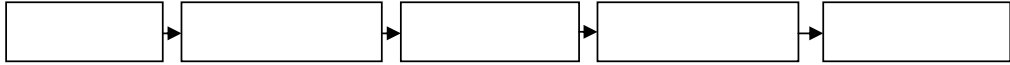
Moghadam *et al.*, 2008)

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1. Medjool
 2. Feature extraction
 3. Classification

nalavi@mail.uk.ac.ir :

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.(Ghazanfari *et al.*, 1996)

.(Lu *et al.*, 2000)

.(Taghizadeh *et al.*, 2007)



.(Jarimops, & Jaisin, 2008)

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.(Lee *et al.*, 2008a)

(Jarimops, &

.Jaisin, 2008)

.(Lee *et al.*, 2008a)

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(BP)

.(Menhaj, 1999)

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.(Haji Saidi, 2007)

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- 4. Multilayer feed forward neural network (MLNN)
 - 5. Canon DIGITAL IXUS 750
 - 6. Codex Standard 143-1985
 - 7. Mouldy
 - 8. Blemish
 - 9. splotchy
 - 10. Damaged

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- 1. Machine learning
 - 2. Back propagation error
 - 3. Multi structure neural network (MSNN)

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1. Shrinkage



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HSV

) (f) (v)

2. Saturate

YCbCr
mb mg mr)

Y RGB B G R

I(x,y)

Gy Gx (x,y)

y x

(Gonzalez, & Woods, 2004)

(my

$$\frac{\partial I}{\partial x} = \frac{I(x+1) - I(x-1)}{2} \quad (1)$$

$$\nabla I = \begin{bmatrix} G_x \\ G_y \end{bmatrix} = \begin{bmatrix} \frac{\partial I}{\partial x} \\ \frac{\partial I}{\partial y} \end{bmatrix} \quad (2)$$

$$|\nabla I| \approx |G_x| + |G_y| \quad (3)$$

$$BW = \begin{cases} 1 & \text{if } |\nabla I| > \gamma \text{ Grad} \\ 0 & \text{if } |\nabla I| \leq \gamma \text{ Grad} \end{cases} \quad (4)$$

AND

(Iwd)

()

$\gamma \text{ Grad}$

$(M_{|\nabla I|})$

B G

BW

(dgb mgb) B G

(BW)

(Dgb Mgb)

B G

$$I_w = \begin{cases} 1 & \text{if } \begin{cases} 110 < m_r < 245 \\ 80 < m_g < 235 \\ 70 < m_b < 220 \\ 95 < m_y < 20 \end{cases} \\ 0 & \text{else} \end{cases} \quad (5)$$

$$I_{wd} = I_w \text{ AND } BW \quad (6)$$

(L)

(D)

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(IMould)

$$E = \frac{L}{D} \quad (7)$$

(PMouldy)

(FFNN³)

(CFNN²)

$$I_{gb} = \begin{cases} 1 & \text{if } \begin{cases} d_{gb} < 0.55 \times D_{gb} \\ m_{gb} > 0.5 \times M_{gb} \end{cases} \\ 0 & \text{else} \end{cases} \quad ()$$

$$I_{Mould} = I_{wd} - I_{gb} \quad ()$$

HSV S H RGB

YCbCr Cb

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$$I_{blemish} = \begin{cases} 1 & \text{if } c_b < 115 \\ 0 & \text{else} \end{cases} \quad ()$$

$$I_{Crushing} = E < 1.3 \quad ()$$

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n (×n) (×n)

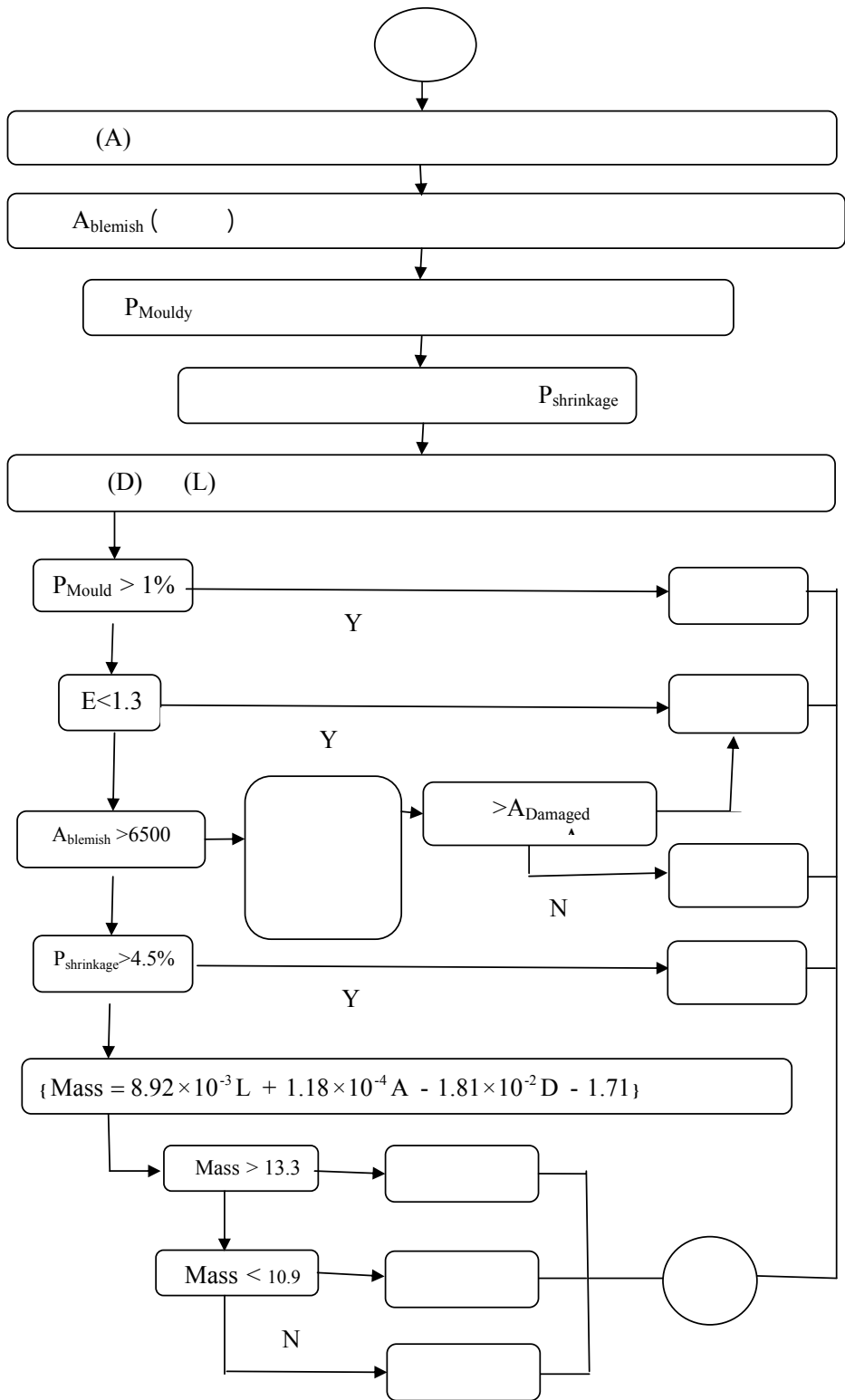
RGB

n (n×)

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2. Cascade forward neural network
 3. Feed forward neural network
 4. Hyperbolic tangent sigmoid
 5. Linear transfer function
 6. Levenberg-Marquardt

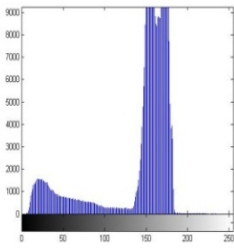
1. Crushing



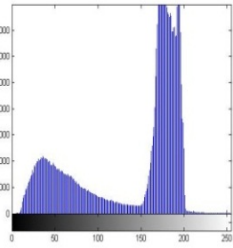
D L A

(Mass)

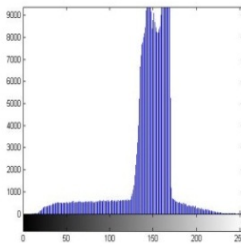
$$\text{Mass} = 8.92 \times 10^{-3} L + 1.18 \times 10^{-4} A - 1.81 \times 10^{-2} D - 1.71$$



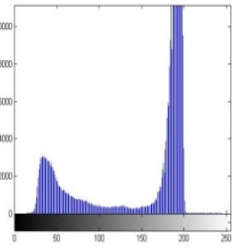
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B G

HSV

S

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(V)

Cb

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(I)

() BW

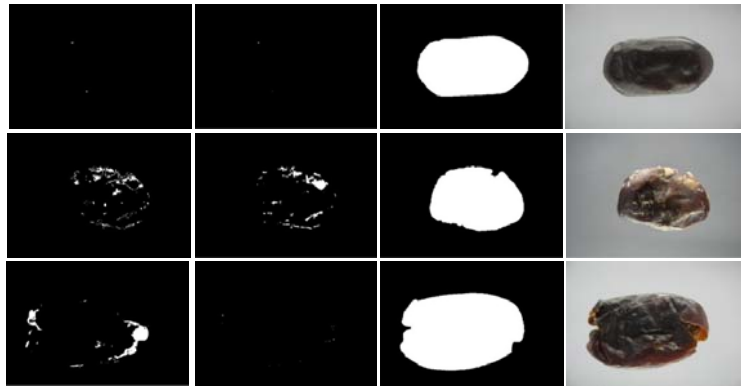
($\gamma_{Grad} = 4$)

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$\gamma_{Grad} = 4$

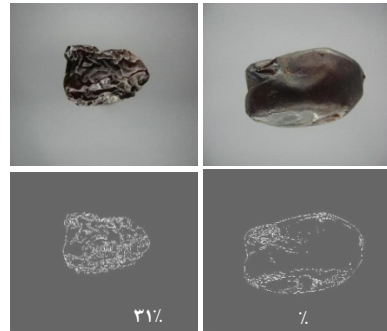
($\gamma_{Grad} = 0.5 \times M_{|V|}$)

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CFNN

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(RGB

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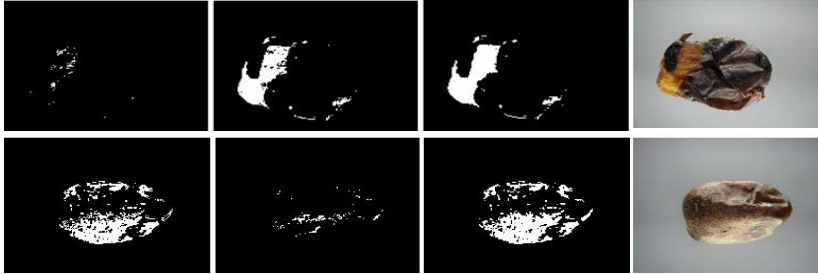
(Sobel)

B R

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(Lee et al., 2008a)

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(Lee et al., 2008b)

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