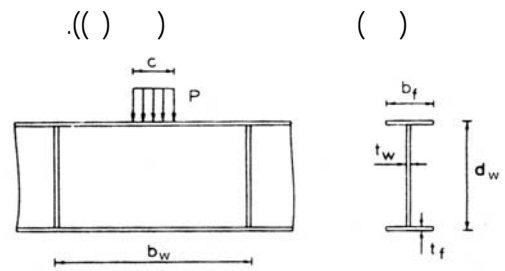


()

1*

(/ / / / /)

[]



()

[]

[] []

[]

:[]

$$P_{uy} = (16M_f \sigma_w t_w)^{0.5} + \sigma_w t_w c_e \quad ()$$

$$P_{ub} = \frac{1}{1.45} [1.1 t_w^2 (E \sigma_w)^{0.5} (\frac{t}{t_w})^{0.25} (1 + \frac{c_e t_w}{d_w t_f})] \quad ()$$

()

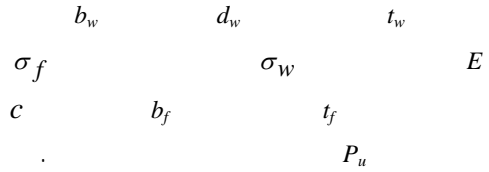
ANN

$$c_e = c + 2t_f \quad ()$$

$$M_f = 0.25 \sigma_f b_f t_f^2 \quad ()$$

(())

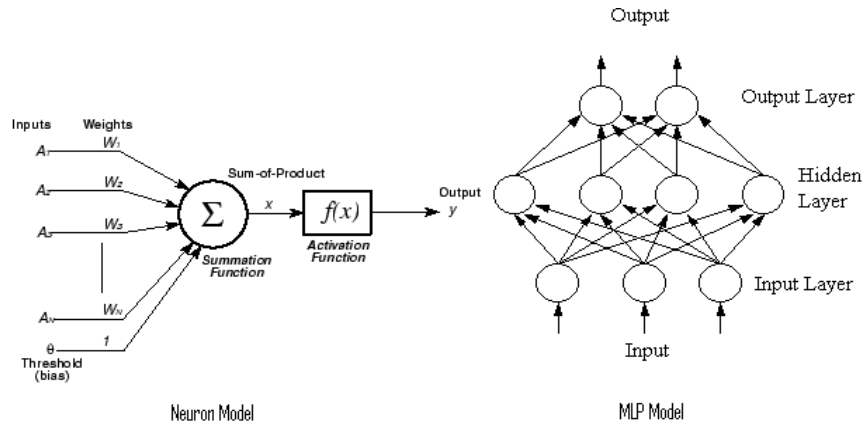
(MLP)



(BP)

[]

[]



MLP

$$P = f(X) \quad (1)$$

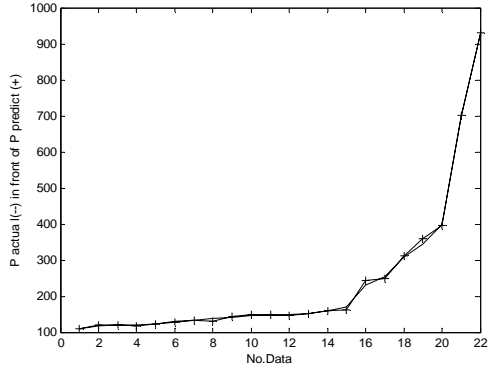
$$X^T = [b_w \quad d_w \quad c \quad t_w \quad t_f \quad b_f \quad \sigma_w \quad \sigma_f] \quad (2)$$

$$(n+1)p + m(p+1) = mq \quad (3)$$

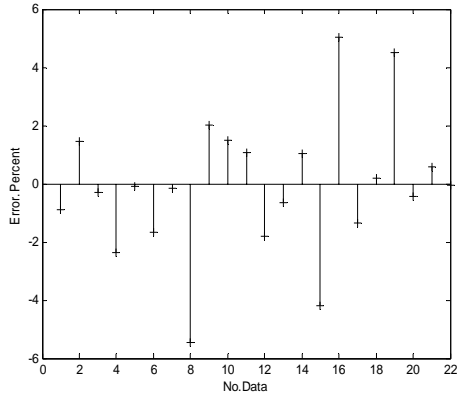
) () () ()

| | | | | |
|--|--|-------------|--|--|
| | | | | |
| | | Log sigmoid | | |

MLP



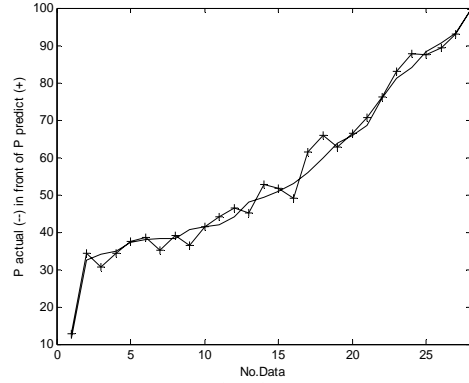
()



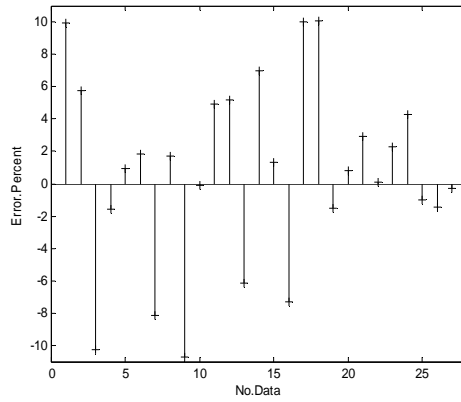
()

():

().



()



()

():

().

| MLP | |
|------|--|
| | |
| % . | |
| % | |
| % . | |
| % . | |
| (%) | |
| (%) | |

(-) (-)

() ()

() ()

| | | | | | |
|--|--|-------------|--|--|--|
| | | | | | |
| | | Log sigmoid | | | |
| | | Log sigmoid | | | |

| | |
|----------|--|
| MLP | |
| ۱۱ | |
| ۱.۱۵% | |
| ۸.۷۵% | |
| ۲.۰۳% | |
| ۴.۸۷% | |
| ۷۰ (۷۶%) | |
| ۲۲ (۲۴%) | |

MLP

()

()

(Roberts-error)

(ANN-error)

| No. | b_w (mm) | d_w (mm) | t_w (mm) | σ_w (N/mm ²) | c (mm) | b_f (mm) | t_f (mm) | σ_f (N/mm ²) | P_{ex} (KN) | ANN-error % | Roberts-error % |
|-----|---------------|---------------|---------------|------------------------------------|-------------|---------------|---------------|------------------------------------|------------------|----------------|--------------------|
| 1 | 600 | 500 | 0.99 | 192 | 50 | 149 | 3.05 | 221 | 8.45 | 1.38 | -9.48 |
| 2 | 600 | 250 | 0.99 | 193 | 50 | 149 | 6.75 | 279 | 11.5 | 9.97 | 1.92 |
| 3 | 900 | 600 | 2 | 205 | 40 | 100 | 6 | 280 | 31 | 8.92 | -23.79 |
| . | . | . | . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . | . | . |
| 9 | 2500 | 800 | 2 | 308 | 40 | 300 | 15 | 285 | 64 | -2.28 | 8.99 |
| 10 | 500 | 500 | 2 | 243 | 50 | 50 | 24.6 | 225 | 76 | 0.11 | 22.85 |
| 11 | 600 | 750 | 3.05 | 221 | 50 | 149 | 6.75 | 279 | 81.12 | 2.28 | -6.68 |
| . | . | . | . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . | . | . |
| 18 | 450 | 450 | 3.97 | 257 | 60 | 49 | 10 | 267 | 136 | 6.02 | -22.74 |
| 19 | 660 | 635 | 3.25 | 250 | 75 | 152 | 12.7 | 250 | 141 | 2.15 | 14.55 |
| 20 | 1760 | 1000 | 3.8 | 352 | 40 | 100 | 11.9 | 292 | 144 | 4.59 | -26.24 |
| . | . | . | . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . | . | . |
| 196 | 500 | 500 | 6 | 253 | 100 | 150 | 10 | 237 | 399 | -0.44 | 9.04 |
| 197 | 1840 | 558 | 8 | 305 | 75 | 300 | 8 | 305 | 525 | -0.05 | -20.29 |
| 198 | 1840 | 558 | 8 | 286 | 75 | 150 | 16 | 427 | 625 | 4.50 | -9.46 |
| 199 | 1840 | 558 | 8 | 305 | 56 | 150 | 16 | 427 | 652 | -0.07 | -6.65 |
| 200 | 500 | 500 | 9.95 | 222 | 50 | 150 | 10 | 240 | 698 | 0.57 | -15.87 |

[]

MATLAB

چون در این روش از نتایج تعداد زیادی آزمایش به جای استفاده از نتایج تحلیل‌های قبلی (با خطاهای متفاوت) استفاده شده است، لذا خطا به نحوی تعدیل گردیده و کمتر از خطای حداکثر موجود در سایر تحلیل‌ها می‌باشد.

- 1- Fonseca, E. T., Vellasco, C. G., Andrade, A. L. and Vellasco, B. R. (2003). "A Patch Load Parametric Analysis Using Neural Networks." *Journal of Constructional Steel Research*, Vol. 59, PP. 251-267.
- 2- Roberts, T. M. (1983). "Patch Loading in Plate Girders." *Plated Structures-Stability and Strength*, R. Narayanan, Elsevier Applied Science, London, PP. 77-102.
- 3- Roberts, T. M. and Newark, A. C. B. (1997). "Strength of Webs Subjected to Compressive Edge Loading." *Journal of Structural Engineering*, Vol. 123, PP. 176-183.
- 4- Granath, P. (2000). "Serviceability Limit State of I-Shaped Steel Girders Subjected to Patch Loading." *Journal of Constructional Steel Research*, Vol. 54, PP. 387-408.
- 5- Roberts, T. M. and Rockey, K. C. (1979). "A Mechanism Solution for Predicting the Collapse Loads of Spender Plate Girders when Subjected to in-plane Patch Loading." *Proceedings, Institution of Civil Engineers*, Part2, Vol. 67, PP. 155-175.
- 6- Menhaj, M. B. (2006). *Computational Intelligence (Vol. 1), Fundamentals of Neural Networks*, Amirkabir University Pub., Tehran, Iran (in Persian).
- 7- Kaveh, A. and Iranmanesh, A. (2000). *Artificial Neural Networks for Structural Optimization*, Building and Housing Research Center, Tehran, Iran (in Persian).