

## Supplementary Material

### Machine learning based optimization method for vacuum carburizing process and its application

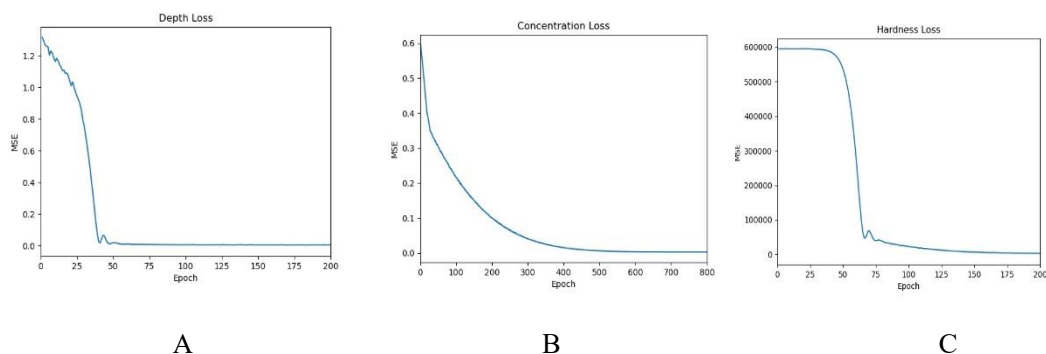
Honghao Jia<sup>1</sup>, Dongying Ju<sup>2,3</sup>, Jianting Cao<sup>1,\*</sup>

<sup>1</sup>Department of Information System, Saitama Institute of Technology, Fukaya 369-0203, Japan.

<sup>2</sup>Saitama Institute of Technology, Fukaya 369-0203, Japan.

<sup>3</sup>Key Laboratory of Near Net Forming of Materials in Hebei Province, University of Science and Technology, Shijiazhuang 050018, Hebei, China.

**\*Correspondence to:** Prof. Dongying Ju, Saitama Institute of Technology, 1690 Fusaiji, Fukaya 369-0203, Japan. E-mail: dyju.sitec@gmail.com; Prof. Jianting Cao, Department of Information System, Saitama Institute of Technology, 1690 Fusaiji, Fukaya 369-0203, Japan. E-mail: cao@sit.ac.jp



**Supplementary Figure 1.** Error rate of training results. A: Carburizing layer depth error rate; B: Surface carbon concentration error rate; C: Surface hardness error rate.

Intelligent optimization system for vacuum carburizing process

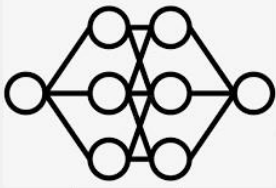
Optimal prediction of vacuum Carburizing

Enter the target value

Carburized layer depth:

Surface carbon concentration:

Hardness:



Forecast

Prediction result

Carburization temperature	Diffusion temperature	Forced carburizing time	Diffusion time	Forced carburizing concentration	Diffuse carbon concentration	Carburizing layer depth %	Surface carbon concentration %	Hardness
935.0	935.0	49.0	100.0	1.22	0.76	0.94902	0.73557	833.0437
940.0	940.0	50.0	100.0	1.22	0.76	0.95795	0.743	833.0293

Depth error rate	Concentration error rate	Hardness error rate
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Select training data

file select

train

Expansion

epoch=5000

Priority weight

Carburized layer depth

Surface carbon concentration

hardness

**Supplementary Figure 2:** Optimized prediction system interface.