

APPLICATION OF MACHINE LEARNING TECHNIQUES FOR THE OPTIMIZATION OF STEELMAKING IN ELECTRIC ARC FURNACE

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Miguel Cuartas Hernández

STEEL SHOP

(FABRICATION OF BILLETS)



GSW manufactures steel wire rod in a wide range of grades

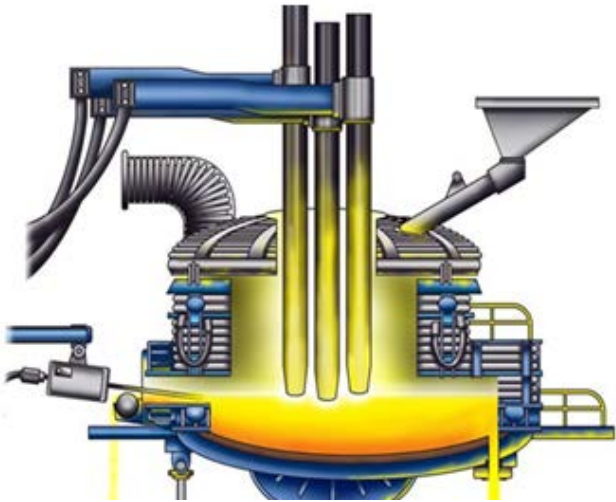
The process is developed in two phases

ROLLING MILL

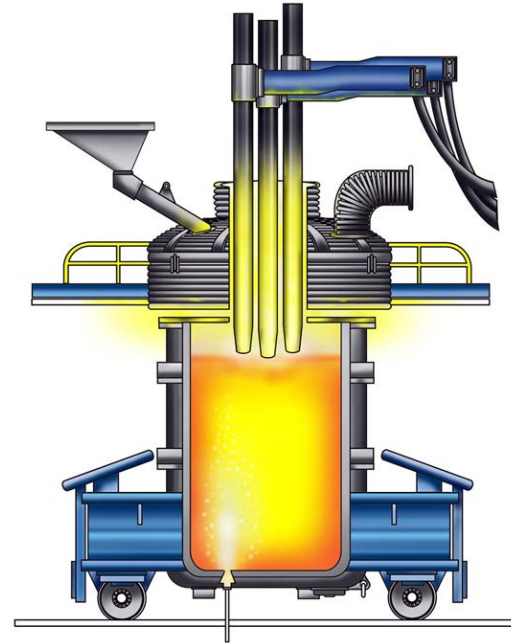
(FABRICATION TO ROD WIRE)



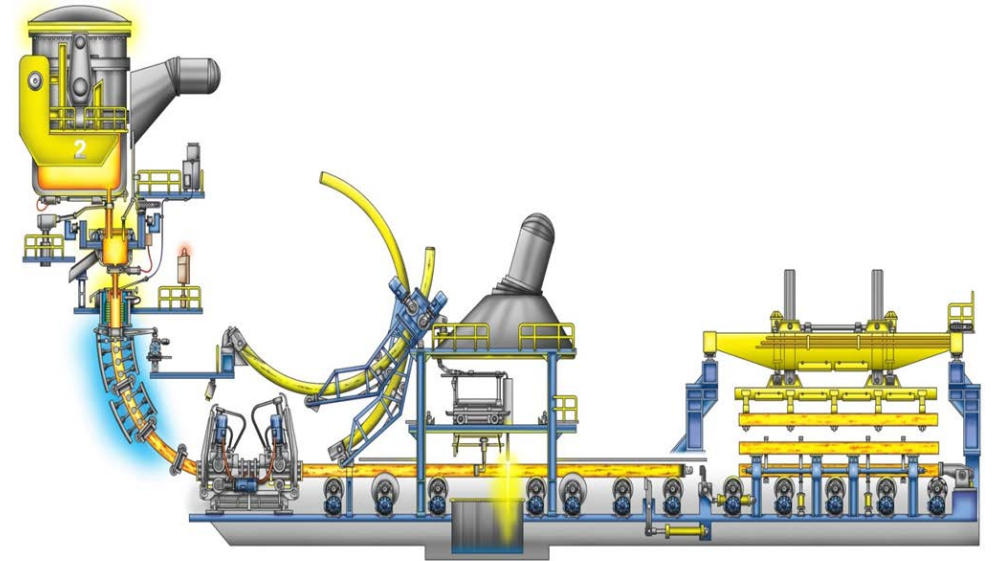
STEEL SHOP (FABRICATION OF BILLETS)



Electric Arc
Furnace

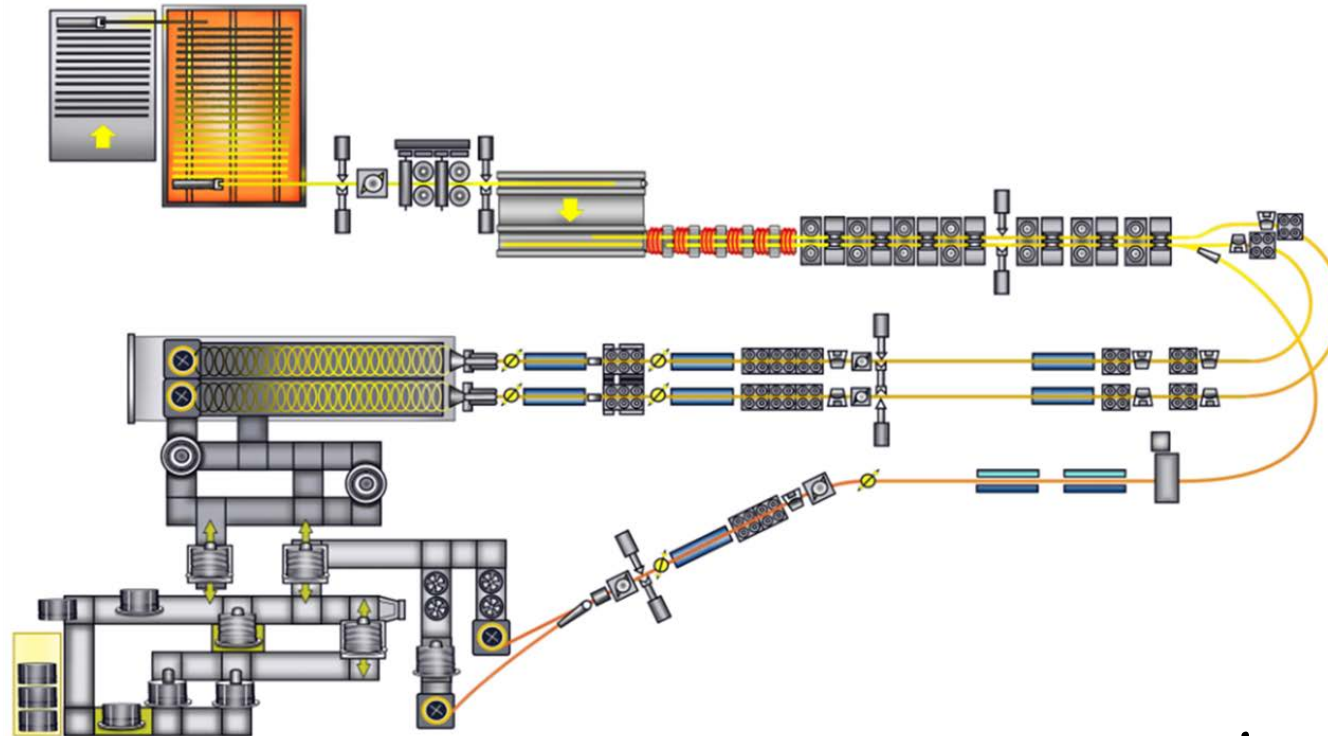


Ladle
Furnace



Continuous
Casting

ROLLING MILL (FABRICATION TO ROD WIRE)



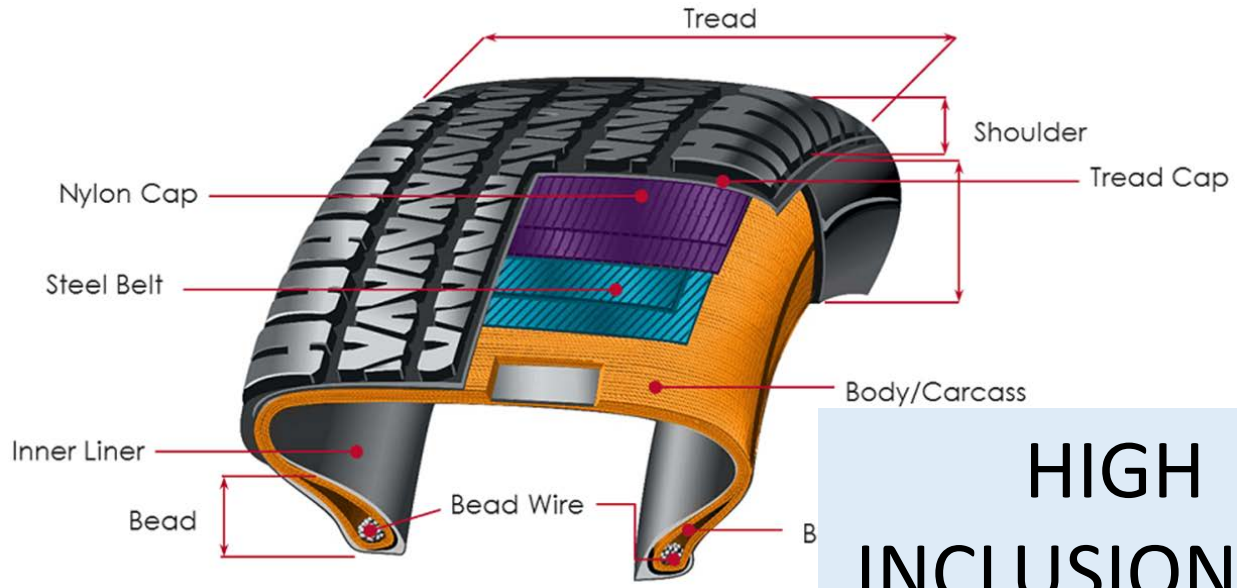
HUNDREDS OF INPUT VARIABLES



MACHINE
LEARNING

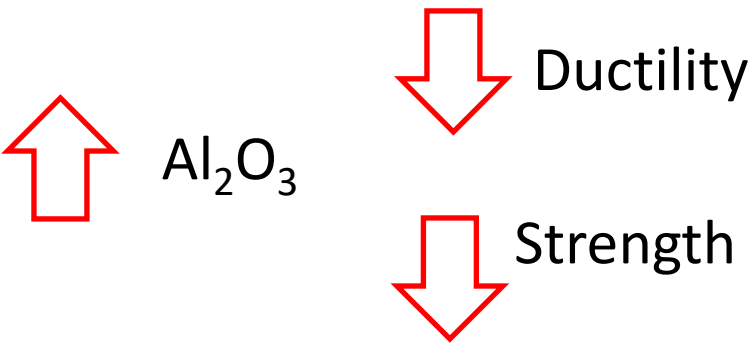
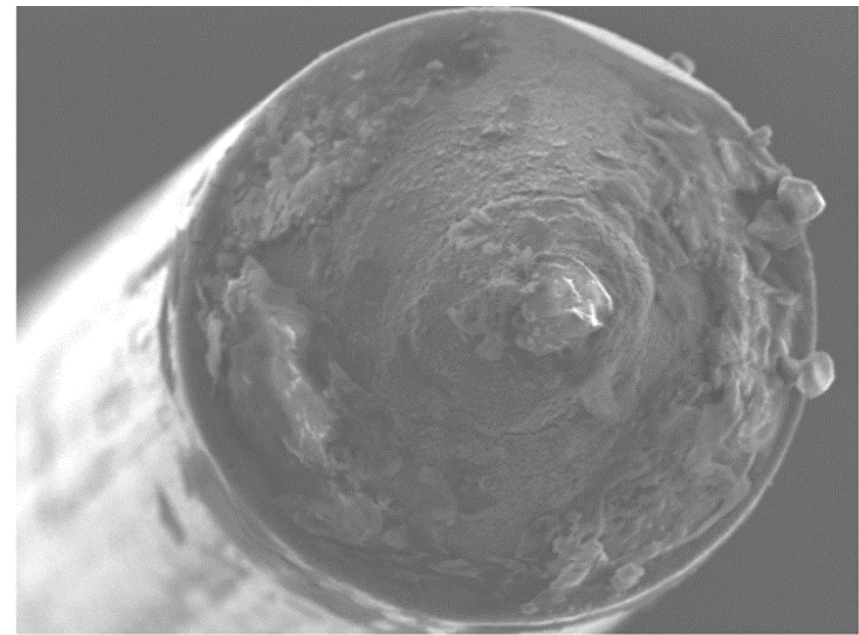
1. PREDICTION OF NON-METALLIC INCLUSIONS
2. OPTIMIZATION OF THE FABRICATION OF COLD DRAWN STEEL WIRE
3. PREDICTION OF THE STRENGTH OF STEEL RODS
4. IMPROVEMENT OF THE FATIGUE PERFORMANCE OF SPRING STEEL

PREDICTION OF NON-METALLIC INCLUSIONS IN STEEL WIRES FOR TIRE REINFORCEMENT



- Small diameter (0.2 mm).
- High responsibility.
- High strength (up to 4000 MPa).

**HIGH
INCLUSIONARY
CLEANLINESS**



Journal of Intelligent Manufacturing

**MACHINE LEARNING ALGORITHMS FOR THE PREDICTION OF NON-METALLIC
INCLUSIONS IN STEEL WIRES FOR TIRE REINFORCEMENT**

--Manuscript Draft--

Manuscript Number:	JIMS-D-18-00540R2
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Article Type:	Original Research
Keywords:	Machine Learning; steel wire; Continuous Casting; non-metallic inclusions; Random Forest; imbalanced dataset.

FIRST QUARTILE JOURNAL

IMPACT FACTOR 3.657 (2018)

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Prediction of non-metallic inclusions in steel wires for tire reinforcement by means of machine learning algorithms

Cuartas M, Ruiz E, Ferreño D et al. See more

AIP Conference Proceedings (2019) 2186

DOI: 10.1063/1.5138082

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Abstract

This study was aimed at developing a reliable Machine Learning algorithm to classify castings of steel for tire reinforcement depending on the number and properties of inclusions, experimentally determined. 855 castings were available for training, validation and testing.

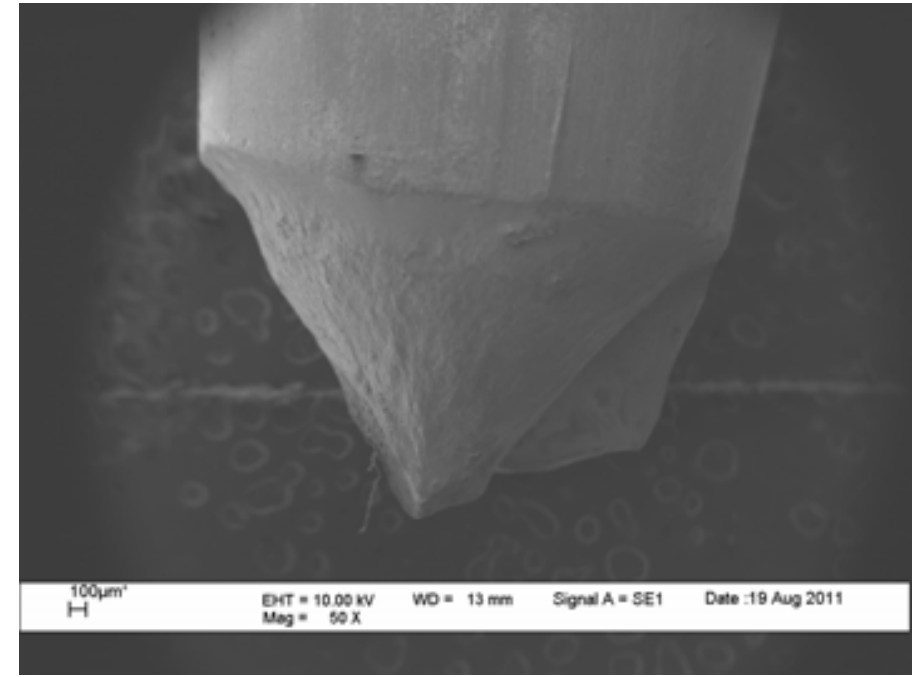
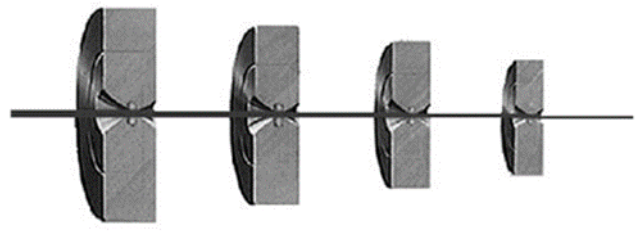
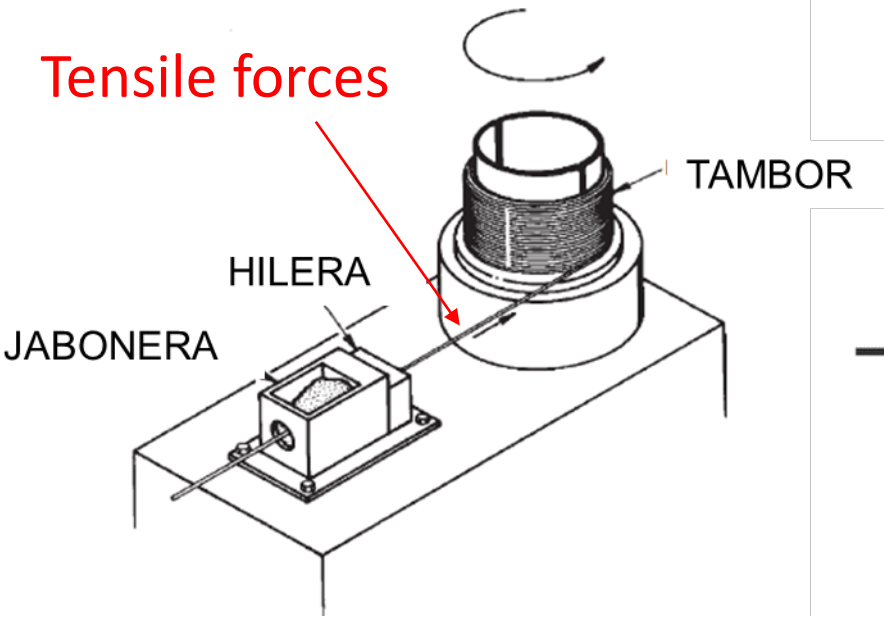
Cite

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OPTIMIZATION OF THE FABRICATION OF COLD DRAWN STEEL WIRE



HIGH DEFORMATION OF STEEL

BREAKAGE
OF THE
WIRE

OPTIMIZATION OF THE FABRICATION OF COLD DRAWN STEEL WIRE



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Optimization of the Fabrication of Cold Drawn Steel Wire Through Classification and Clustering Machine Learning Algorithms

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ABSTRACT The demanding deformations steel is subjected to during drawing may result in the breakage of the wire. The hypothesis of this research is that drawing failure is not a random event but can be predicted using a suitable approach. Machine Learning classification and clustering algorithms have been implemented

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OPTIMIZATION OF THE FABRICATION OF COLD DRAWN STEEL WIRE



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Kyoto, Japan

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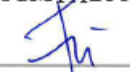
CERTIFICATE OF APPRECIATION


THIS CERTIFICATE IS AWARDED TO


Ms. Estela Ruiz
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**OPTIMIZATION OF THE FABRICATION OF COLD DRAWN STEEL WIRE THROUGH
CLASSIFICATION AND CLUSTERING MACHINE LEARNING ALGORITHMS**

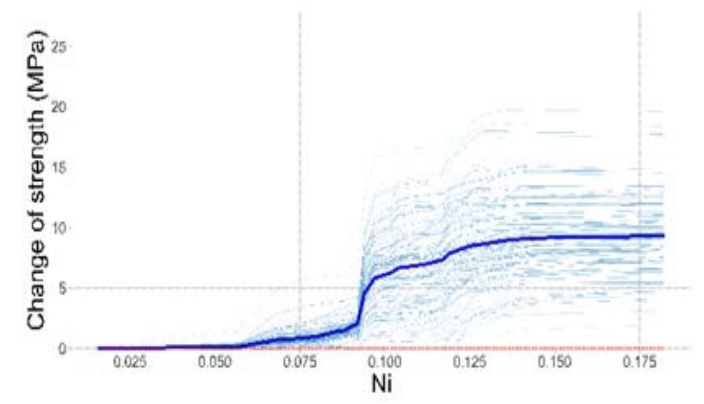
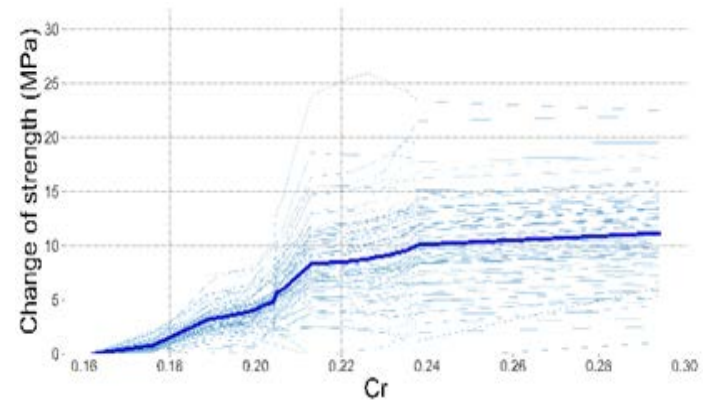
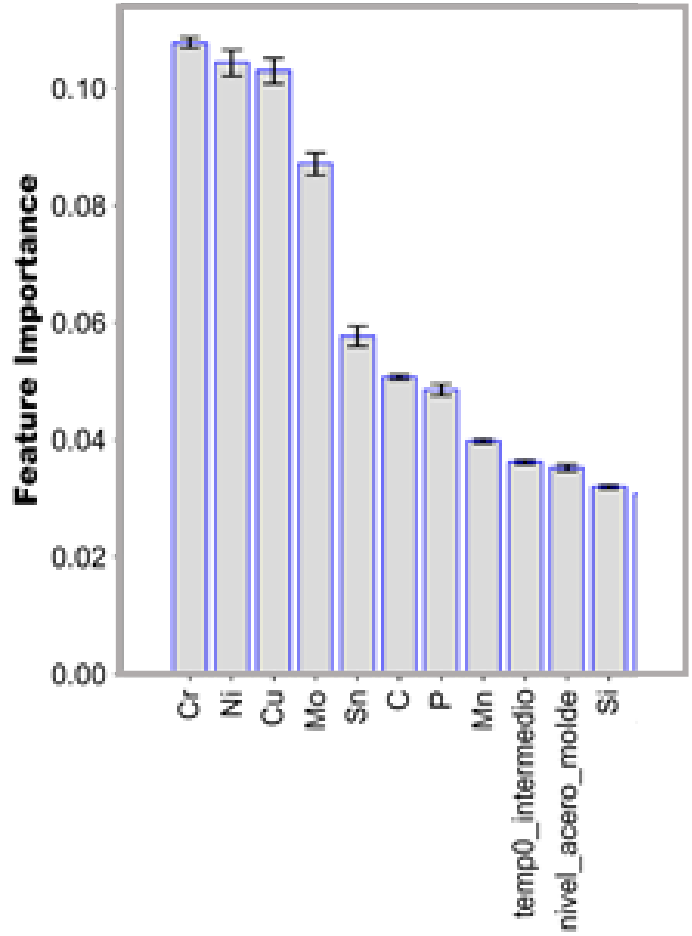
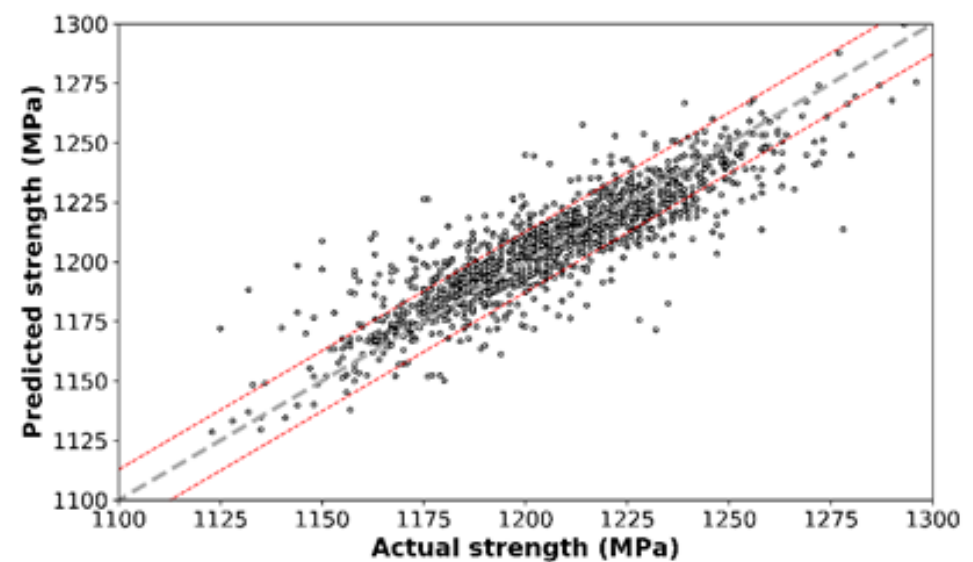
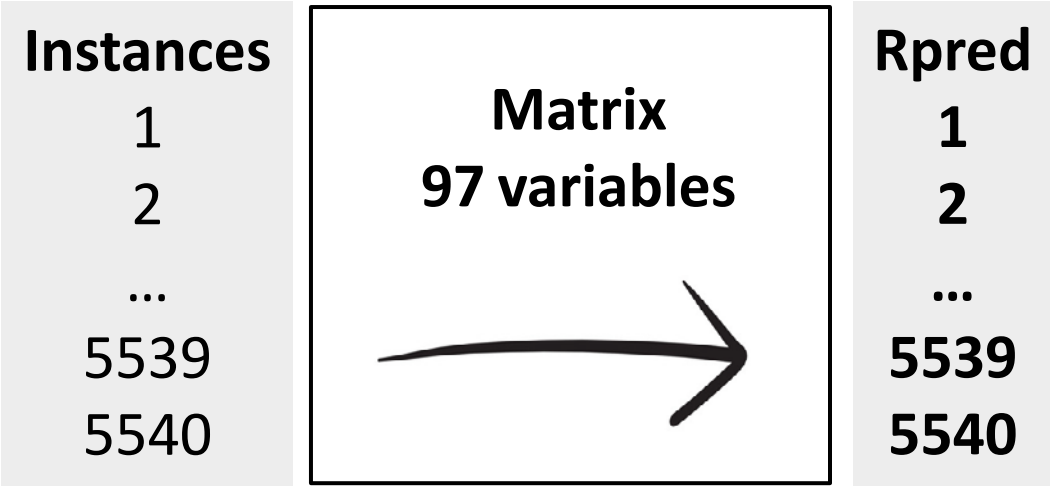
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PREDICTION OF THE STRENGTH OF STEEL RODS



International Journal of Computer Integrated Manufacturing



SECOND QUARTILE JOURNAL
IMPACT FACTOR 2.090 (2018)

Machine Learning Algorithms for the Prediction of the Strength of Steel Rods: an Example of Data-Driven Manufacturing in Steelmaking.

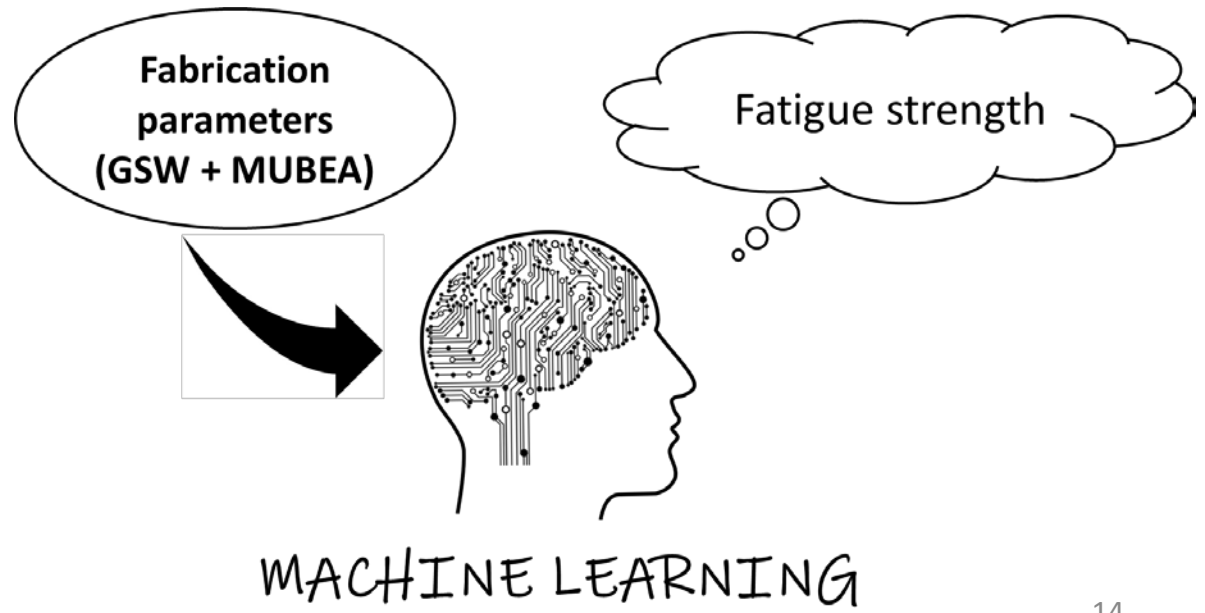
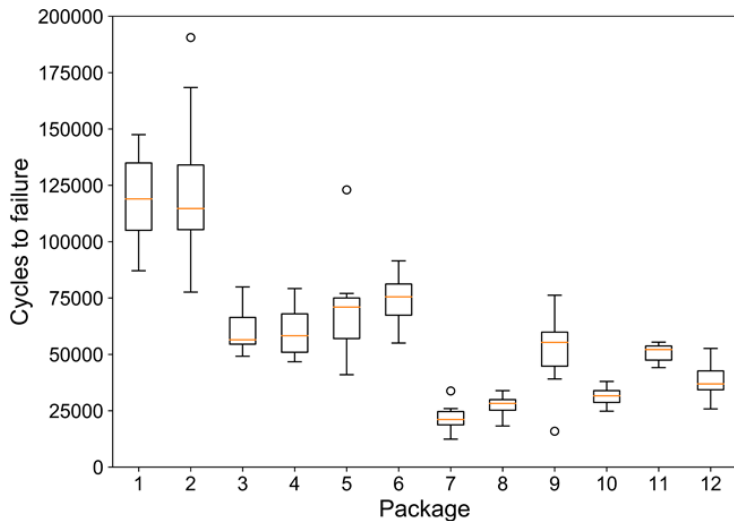
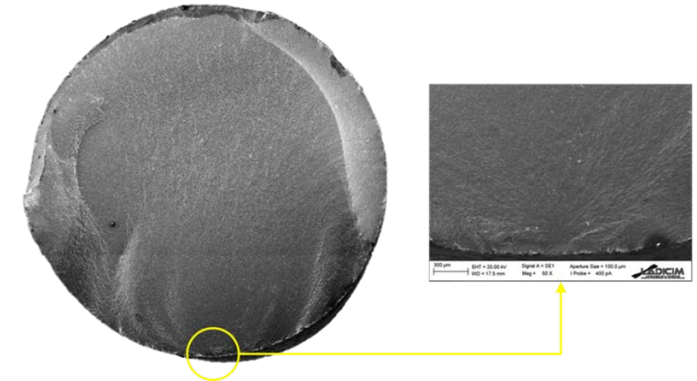
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IMPROVEMENT OF THE FATIGUE PERFORMANCE OF SPRING STEEL

ROTATING BENDING FATIGUE TEST



Experimental conditions:
 $\sigma_a = 400 \text{ MPa.}$
 $v = 1500\text{-}2000 \text{ rpm.}$
 $L = 206 \text{ mm.}$



QUESTIONS, COMMENTS?

THANK YOU VERY MUCH!