List of Symbols

Symbol	Description
n	n-type Semiconductor
p	p-type Semiconductor
h	Plank's Constant
N_a	Acceptor concentration
N_d	Donor concentration
k	Boltzmann's constant
E_g	Bandgap
ΔE_g	Change in bandgap
V_T	Thermal voltage
ε	Strain
ε_{ox}	Permittivity of SiO_2
ε_{Si}	Permittivity of Si
E_C	Conduction band minima energy
E_V	Valence band minima energy
σ	Conductivity
L_D	Debye length
λ	Eigenvalue of a matrix
ΔH_p	Free energy after physisorption
ΔH_p	Free energy after chemisorption
m_0	Rest mass of electron
m_c^*	Conductive effective mass
L_D	Debye length
S	Sensitivity
t_{res}	Response time
t_{rec}	Recovery time
P_i	Partial pressures
K_i	Sensitivity coefficients for different gases
G_o	Conductance of the of the sensor in air.
G	Conductance of the of the sensor

C	Concentration of the gas
λ	Eigenvalue of a matrix
μ	Mean
η	Learning rate
α	Momentum
H	Number of hidden layer
NH	Number of neuron in hidden layer
A_C	Average accuracy in all cross validation folds
k	Number of folds in cross validation
o_i	Actual outputs
t_i	Desired outputs
$\phi(x)$	A nonlinear mapping from the input space to the feature space
w	Vector of weight coefficients
b	Bias constant
ξ_i	Slack variables
ν	nu-parameter which controls the number of support vectors and errors in nu-SVM
C	Cost function in C-SVM
H	Hilbert space
$L_v(.)$	Vapnik ε-insensitive loss function
E_A	the activation energy for the adsorption

List of Abbreviations

Abbreviation	Description
Si	Silicon
MOS	Metal Oxide Semiconductor
FET	Field Effect Transistor
MOSFET	Metal Oxide Semiconductor Field Effect Transistor
VOC	Volatile organic compound
GC	Gas chromatography
MS	Mass spectrometry
ECD	Electron capture detectors
FID	Flame ionization detectors
FPD	Flame photometry detectors
IRS	Infrared spectrometers
IMS	Ion mobility spectrometers
NMRS	Nuclear resonance spectrometers
PID	Photo-ionization detectors
QFMS	Quadruple fingerprint mass Spectrometers
QMB	Quartz crystal microbalance
TGS	Taguchi gas sensor
PARC	Pattern recognition
MISFET	Metal Insulator-Semiconductor
CP	Conducting Polymer
PCA	Principal components analysis
LDA	Linear discriminant analysis
FSS	Feature subset selection
PDF	Probability density function
ANN	Artificial neural networks
EN	Electronic nose
ART	Adaptive resonance theory
PNN	Probabilistic neural network
SOM	Self organizing map
LVQ	Learning vector quantization

FFT	Fast fourier transformation
MLR	Multiple linear regression
PCR	Principal component regression
TCA	Transformed cluster analysis
SVM	Support vector machine
RBF	Redial basis function
kNN	k-nearest neighbour
DWT	Discrete wavelet transform
ANFIS	Neuro-fuzzy inference system
RBFNN	Radial basis function neural network
MIMO	Multi-input/multi-output
QPST	Quadratic polynomial step regression
SVR	Support vector regression
NIR-MAS	Near infrared molecular absorption Spectrometry
SPCA	Standardized principal component Analysis
URM	Unitary response mode
CWT	Continuous wavelet transform
MSPCA	Multiscale principal component analysis
ASM	Average Slope Multiplication
M-SVR	Multi-output Support Vector Regression
MLP	Multilayer perceptron
GDMBP	Gradient descent with momentum back Propagation
KRR	Kernel ridge regression
IRWLS	Iterative reweighted least squares