Acronym	
AOA	Archimedes optimization algorithm
BROA	battle royale optimization algorithm
CHNR	cyclic harmonic to noise ratio utilized as the fitness function DBTS.
CPU	Central Processing Unit. The CPU Intel(R) Core i7-10750H is used.
DBT	dynamic bandit tree (the proposed bandit tree optimization algorithm)
DBT1	the bandit tree algorithm based on the single-tree space partition and the standard Thompson sampling
DBT2	the bandit tree algorithm based on the multi-tree space partition and the standard Thompson sampling.
DBT3	the bandit tree algorithm based on multi-tree space partition and the reshaped Thompson sampling. The final version of DBT used in the fault diagnosis method.
DBTS	dynamic bandit tree search (the proposed fault diagnosis method)
db	decibel
EWT	empirical wavelet transform
FIFB	fault informative frequency band
FIFBs	fault informative frequency bands
Fig.	figure
GA	genetic algorithm
GOA	grasshopper optimization algorithm
GBO	Gradient-Based Optimizer
MAB	multi-armed bandit
MCT	Monte Carlo tree search
OVMD	optimized variational mode decomposition
OEWT	optimized empirical wavelet transform
PCB621B40	sensor type of the accelerometer used for collecting the bearing data
PCB604B31	sensor type of the accelerometer used for collecting the gearbox data
SES	squared envelope spectrum
SESs	squared envelope spectrums
SNR	signal to noise ratio
UCB	upper confidence bound
VMD	variational mode decomposition
WOA	whale optimization algorithm

Notation	
$A = \{a_i\}_{i=1,\ldots,K}$	K-armed bandits
a_s^t	the selected arm
a_{i^*}	the optimal bandit
$B^t = \left(b_1^t, b_2^t, \ldots, b_n^t\right)$	Boundaries at time t for an n-dimensional problem.

$B_{\min}$	the minimum bandwidth required for calculating the fault index
b_n , b_{n+1}	The *n*-th and *n+1*-th boundaries of Meyer wavelet filters
$\left(b_1, b_2\right)$	a bandit pair. They are also the boundaries of the filters in Fig. 1. One boundary corresponds to one tree.
$\left(b_1^t, b_2^t\right)$	a sample of the bandit pair at time t .
b_i^t	the current boundary generated by the i -th tree
b_i^O	the most recent optimal boundary generated by the i -th tree
b_i^U	the upper bound of the boundary of the i -th tree
b_i^L	the lower bound of the boundary of the i -th tree
C*ij*	the j -th cell at level i
C$ij_{\text{Tree } k}$	the j -th cell at level i from tree k
$C\left(l, h\right)$	cyclic harmonic to noise ratio of the signal having frequency band $[l, h]$. l and h are the lower and upper cutoff frequencies of the filter
$D\left(\bullet\right)$	the reshaping function
d	the number of dimensions
$FI\left(b_1, b_2\right)$, or $FI\left(\bullet\right)$	the reward function of the Bernoulli bandit model. It is calculated based on the signal of the frequency band $[b_1, b_2]$.
$FI_{obj}\left(\bullet\right)$	the final objective function
$FI_{\max}(\bullet)$	a maximization function
$f\left(r \mid p\right) = p^r\left(1-p\right)^{1-r}$	the probability density function of the Bernoulli bandit model. r is the Bernoulli reward and p is the probability of the successful Bernoulli trial
$f_r\left(o^t\right)$	the reward function
f_s	the sampling frequency
$G\left(\bullet\right)$	the gamma function
H_i	the amplitude of the i-th fault harmonic used in the evaluation metric, i.e., M_{vSNR} and M_{mAmp} . The amplitude is normalized.
h_i	the frequency value of the i-th fault harmonic used in the evaluation metric, i.e., M_{vSNR} and M_{mAmp} .
$Har(i)$	the amplitude of the *i*-th estimated harmonic used in cyclic harmonic to noise ratio. The amplitude is not necessarily normalized.
$i \in [K] = \{1, 2, ..., K\}$	the bandit index
k_i	the kurtosis calculated using the amplitudes from the frequency range

	$[h_i - h_1/2, h_i + h_1/2]$.
$Lmax(n)$	the surrounding local maximum of $Har(i)$
l	the tree depth
M	the number of fault frequency harmonics
M_{hKurt}	the harmonic kurtosis
M_{mAmp}	the mean amplitude of fault harmonics in the normalized squared envelope spectrum
M_{vSNR}	vanilla signal to noise ratio
N_{arm}	the number of armed-bandits at the deepest tree level.
N_{sig}	the length of the digital signal
n	the number of queries
o^t	the observation
$O(\bullet)$	the big O notation for analyzing complexity
$p^0(\bullet)$	the initial prior
$p^t(\bullet)$	the prior at time *t*. It is the probability of the successful Bernoulli trial at time *t*.
$q_\theta(\bullet \mid a_i^t)$	the conditional probability measure
$R = \{r_i^t\}_{i\in[K]}^{t=1,2,...,T}$	the received rewards
r_B^t	a Bernoulli reward at time *t*
$S=\{a_i^t\}_{i\in[K]}^{t=1,2,...,T}$	the selected arms
SES	the squared envelope spectrum
$t = 1, 2, ..., T$	the time step
μ_i	the mean reward
$V = \{\nu_i\}_{i=1,...,K}$	unknown reward distributions
α and β	the two parameters of the Beta distribution denoted as $Beta(\alpha, \beta)$
α_i^t and β_i^t	the above parameters at time *t* and being from tree *i*
π	the bandit strategy
θ	the parameter vector
$\hat{\theta}$	the sample of θ
Θ	the parameter space
$\phi(\bullet): R^n \to [0,1]$	the balancing function of the Bernoulli bandit model. Set as $\phi(B^t)=1/2$.

Ω	the observation space
$\Upsilon_n(\omega)$	the scaling function
$\Psi_n(\omega)$	the wavelet function
$\omega \in \Lambda_i, i = 1, 2, 3, 4$	the frequency
$\Lambda_i, i = 1, 2, 3, 4$	feasible sets
σ_n, σ_{n+1}	the half widths of the transition areas
$\xi(\bullet)$	a special function with domain in $[0,1]$.
Δ	the frequency resolution