

High level  
features  
from CNN

### Cuckoo search algorithm

Initial population

Apply cuckoo  
search algorithm

Best population

### Whale optimization algorithm

Initial population

Apply whale  
optimization  
algorithm

Best population

### Hybridization of cuckoo search and whale optimization algorithm

Apply AWCN  
algorithm

Intermediate  
population

Optimal  
feature set

Apply SOPF  
algorithm

