该代码为基于模糊神经网络的水质评价代码

该案例作者申明:

1:本人长期驻扎在此板块里,对该案例提问,做到有问必答。本套书籍官方网站为:video.ourmatlab.com

2:点此从当当预定本书:«Matlab神经网络30个案例分析»。

3:此案例有配套的教学视频,视频下载方式video.ourmatlab.com/vbuy.html。

4:此案例为原创案例,转载请注明出处(«Matlab神经网络30个案例分析»)。

5:若此案例碰巧与您的研究有关联,我们欢迎您提意见,要求等,我们考虑后可以加在案例里。

Contents

清空环境变量

```
clc
clear
```

参数初始化

```
xite=0.001;
alfa=0.05;

%网络节点
I=6;    %输入节点数
M=12;   %隐含节点数
O=1;    %输出节点数

%系数初始化
p0=0.3*ones(M,1);p0_1=p0;p0_2=p0_1;
p1=0.3*ones(M,1);p1_1=p1;p1_2=p1_1;
p2=0.3*ones(M,1);p2_1=p2;p2_2=p2_1;
p3=0.3*ones(M,1);p3_1=p3;p3_2=p3_1;
p4=0.3*ones(M,1);p4_1=p4;p4_2=p4_1;
p5=0.3*ones(M,1);p5_1=p5;p5_2=p5_1;
p6=0.3*ones(M,1);p6_1=p6;p6_2=p6_1;

%参数初始化
c=1+rands(M,I);c_1=c;c_2=c_1;
b=1+rands(M,I);b_1=b;b_2=b_1;

maxgen=100; %进化次数

%网络测试数据,并对数据归一化
load data1 input_train output_train input_test output_test

%选连样本输入输出数据归一化
[inputn,inputps]=mapminmax(input_train);
[outputn,outputps]=mapminmax(output_train);
[n,m]=size(input_train);
```

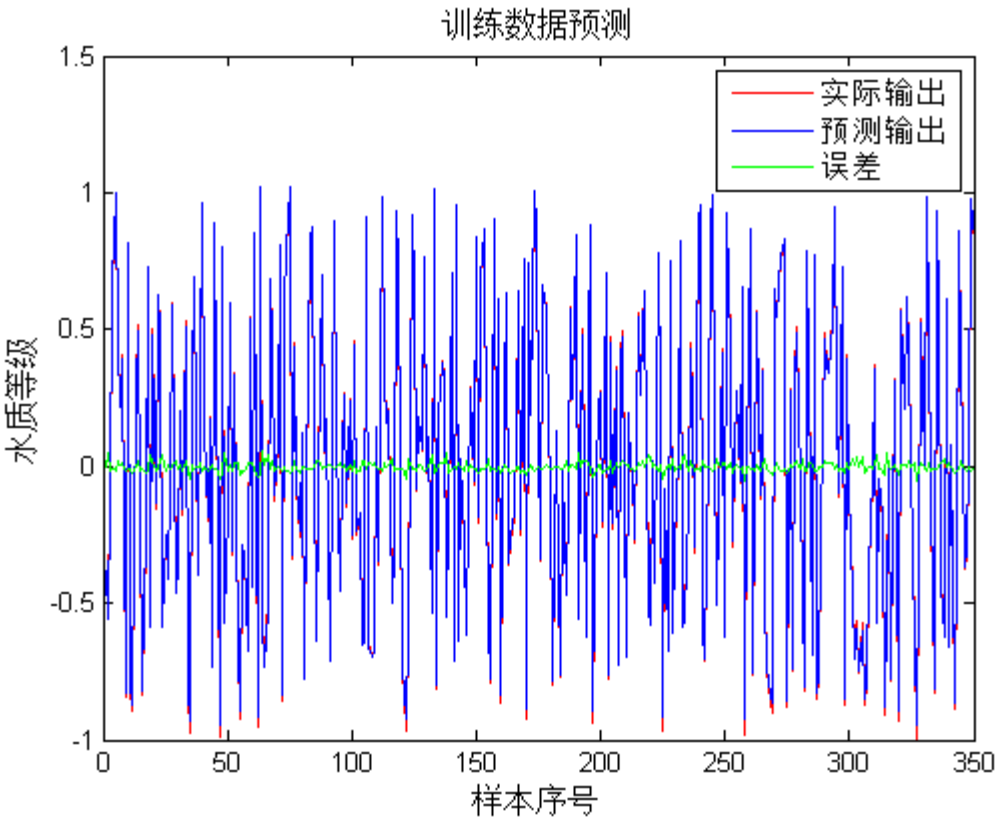
网络训练

```
%循环开始,进化网络
for  iii=1:maxgen
    iii;
    for k=1:m
        x=inputn(:,k);
```

```
        %输出层结算
        for i=1:I
            for j=1:M
                u(i,j)=exp(-(x(i)-c(j,i))^2/b(j,i));
            end
        end

        %模糊规则计算
        for i=1:M
            w(i)=u(1,i)*u(2,i)*u(3,i)*u(4,i)*u(5,i)*u(6,i);
        end
        addw=sum(w);

        for i=1:M

yi(i)=p0_1(i)+p1_1(i)*x(1)+p2_1(i)*x(2)+p3_1(i)*x(3)+p4_1(i)*x(4)+p5_1(i)*x(5)+p6_1(i)*x(6);
        end

        addyw=yi*w';
        %网络预测计算
        yn(k)=addyw/addw;
        e(k)=outputn(k)-yn(k);

        %计算p的变化值
        d_p=zeros(M,1);
        d_p=xite*e(k)*w./addw;
        d_p=d_p';

        %计算b变化值
        d_b=0*b_1;
        for i=1:M
            for j=1:I
                d_b(i,j)=xite*e(k)*(yi(i)*addw-addyw)*(x(j)-c(i,j))^2*w(i)/(b(i,j)^2*addw^2);
            end
        end

        %更新c变化值
        for i=1:M
            for j=1:I
                d_c(i,j)=xite*e(k)*(yi(i)*addw-addyw)*2*(x(j)-c(i,j))*w(i)/(b(i,j)*addw^2);
            end
        end

        p0=p0_1+ d_p+alfa*(p0_1-p0_2);
        p1=p1_1+ d_p*x(1)+alfa*(p1_1-p1_2);
        p2=p2_1+ d_p*x(2)+alfa*(p2_1-p2_2);
        p3=p3_1+ d_p*x(3)+alfa*(p3_1-p3_2);
        p4=p4_1+ d_p*x(4)+alfa*(p4_1-p4_2);
        p5=p5_1+ d_p*x(5)+alfa*(p5_1-p5_2);
        p6=p6_1+ d_p*x(6)+alfa*(p6_1-p6_2);

        b=b_1+d_b+alfa*(b_1-b_2);
        c=c_1+d_c+alfa*(c_1-c_2);

        p0_2=p0_1;p0_1=p0;
        p1_2=p1_1;p1_1=p1;
        p2_2=p2_1;p2_1=p2;
        p3_2=p3_1;p3_1=p3;
        p4_2=p4_1;p4_1=p4;
        p5_2=p5_1;p5_1=p5;
        p6_2=p6_1;p6_1=p6;

        c_2=c_1;c_1=c;
        b_2=b_1;b_1=b;

    end
    E(iii)=sum(abs(e));

end

figure(1);
plot(outputn,'r')
hold on
plot(yn,'b')
hold on
plot(outputn-yn,'g');
legend('实际输出','预测输出','误差','fontsize',12)
title('训练数据预测','fontsize',12)
```

```
xlabel('样本序号','fontsize',12)
ylabel('水质等级','fontsize',12)
```

```
Warning: Ignoring extra legend entries.
```

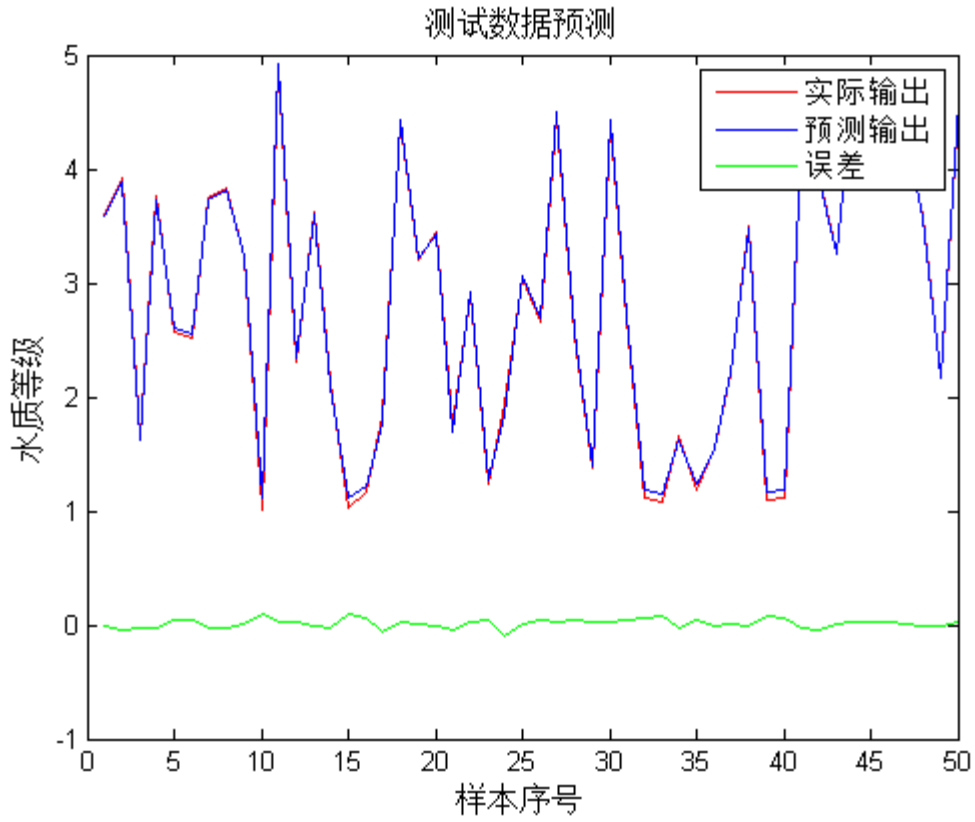


网络预测

```
%数据归一化
inputn_test=mapminmax('apply',input_test,inputps);
[n,m]=size(inputn_test)
for k=1:m
    x=inputn_test(:,k);

     %计算输出中间层
     for i=1:I
         for j=1:M
             u(i,j)=exp(-(x(i)-c(j,i))^2/b(j,i));
         end
     end

     for i=1:M
         w(i)=u(1,i)*u(2,i)*u(3,i)*u(4,i)*u(5,i)*u(6,i);
     end

     addw=0;
     for i=1:M
         addw=addw+w(i);
     end

     for i=1:M

yi(i)=p0_1(i)+p1_1(i)*x(1)+p2_1(i)*x(2)+p3_1(i)*x(3)+p4_1(i)*x(4)+p5_1(i)*x(5)+p6_1(i)*x(6);
     end

     addyw=0;
     for i=1:M
         addyw=addyw+yi(i)*w(i);
     end
```

```
      %计算输出
      yc(k)=addyw/addw;
end

%预测结果反归一化
test_simu=mapminmax('reverse',yc,outputps);
%作图
figure(2)
plot(output_test,'r')
hold on
plot(test_simu,'b')
hold on
plot(test_simu-output_test,'g')
legend('实际输出','预测输出','误差','fontsize',12)
title('测试数据预测','fontsize',12)
xlabel('样本序号','fontsize',12)
ylabel('水质等级','fontsize',12)
```

```
n =
     6
m =
    50
Warning: Ignoring extra legend entries.
```



嘉陵江实际水质预测

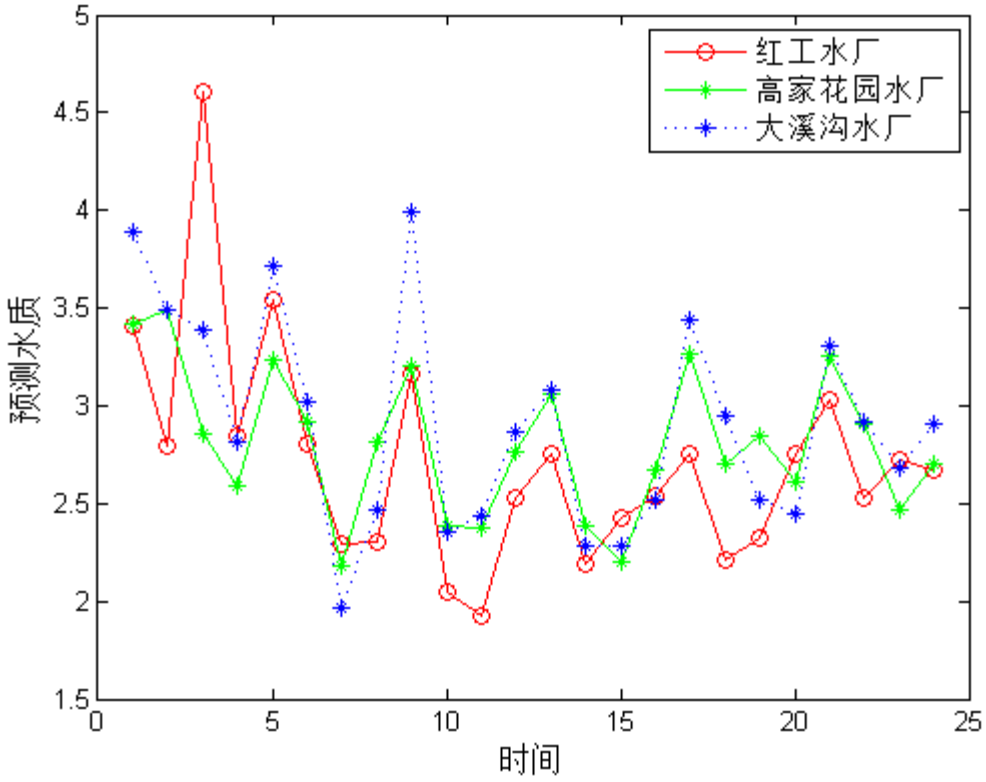
```
load  data2 hgsc gjhy dxg
%-----------------------------------红工水厂-----------------------------------
zssz=hgsc;
%数据归一化
inputn_test =mapminmax('apply',zssz,inputps);
[n,m]=size(zssz);

for k=1:1:m
    x=inputn_test(:,k);

    %计算输出中间层
    for i=1:I
```

```
        for j=1:M
            u(i,j)=exp(-(x(i)-c(j,i))^2/b(j,i));
        end
    end

    for i=1:M
        w(i)=u(1,i)*u(2,i)*u(3,i)*u(4,i)*u(5,i)*u(6,i);
    end

    addw=0;

    for i=1:M
        addw=addw+w(i);
    end

    for i=1:M

yi(i)=p0_1(i)+p1_1(i)*x(1)+p2_1(i)*x(2)+p3_1(i)*x(3)+p4_1(i)*x(4)+p5_1(i)*x(5)+p6_1(i)*x(6);
    end

    addyw=0;
    for i=1:M
        addyw=addyw+yi(i)*w(i);
    end

    %计算输出
    szzb(k)=addyw/addw;
end
szzbz1=mapminmax('reverse',szzb,outputps);

for i=1:m
    if szzbz1(i)<=1.5
        szpj1(i)=1;
    elseif szzbz1(i)>1.5&&szzbz1(i)<=2.5
        szpj1(i)=2;
    elseif szzbz1(i)>2.5&&szzbz1(i)<=3.5
        szpj1(i)=3;
    elseif szzbz1(i)>3.5&&szzbz1(i)<=4.5
        szpj1(i)=4;
    else
        szpj1(i)=5;
    end
end
% %-----------------------------------高家花园-----------------------------------
zssz=gjhy;
inputn_test =mapminmax('apply',zssz,inputps);
[n,m]=size(zssz);

for k=1:1:m
    x=inputn_test(:,k);

    %计算输出中间层
    for i=1:I
        for j=1:M
            u(i,j)=exp(-(x(i)-c(j,i))^2/b(j,i));
        end
    end

    for i=1:M
        w(i)=u(1,i)*u(2,i)*u(3,i)*u(4,i)*u(5,i)*u(6,i);
    end

    addw=0;

    for i=1:M
        addw=addw+w(i);
    end

    for i=1:M

yi(i)=p0_1(i)+p1_1(i)*x(1)+p2_1(i)*x(2)+p3_1(i)*x(3)+p4_1(i)*x(4)+p5_1(i)*x(5)+p6_1(i)*x(6);
    end

    addyw=0;
    for i=1:M
        addyw=addyw+yi(i)*w(i);
    end

    %计算输出
    szzb(k)=addyw/addw;
```

```
end
szzbz2=mapminmax('reverse',szzb,outputps);

for i=1:m
    if szzbz2(i)<=1.5
        szpj2(i)=1;
    elseif szzbz2(i)>1.5&&szzbz2(i)<=2.5
        szpj2(i)=2;
    elseif szzbz2(i)>2.5&&szzbz2(i)<=3.5
        szpj2(i)=3;
    elseif szzbz2(i)>3.5&&szzbz2(i)<=4.5
        szpj2(i)=4;
    else
        szpj2(i)=5;
    end
end
% %-----------------------------------大溪沟水厂-----------------------------------
zssz=dxg;
inputn_test =mapminmax('apply',zssz,inputps);
[n,m]=size(zssz);

for k=1:1:m
    x=inputn_test(:,k);

    %计算输出中间层
    for i=1:I
        for j=1:M
            u(i,j)=exp(-(x(i)-c(j,i))^2/b(j,i));
        end
    end

    for i=1:M
        w(i)=u(1,i)*u(2,i)*u(3,i)*u(4,i)*u(5,i)*u(6,i);
    end

    addw=0;

    for i=1:M
        addw=addw+w(i);
    end

    for i=1:M

yi(i)=p0_1(i)+p1_1(i)*x(1)+p2_1(i)*x(2)+p3_1(i)*x(3)+p4_1(i)*x(4)+p5_1(i)*x(5)+p6_1(i)*x(6);
    end

    addyw=0;
    for i=1:M
        addyw=addyw+yi(i)*w(i);
    end

    %计算输出
    szzb(k)=addyw/addw;
end
szzbz3=mapminmax('reverse',szzb,outputps);

for i=1:m
    if szzbz3(i)<=1.5
        szpj3(i)=1;
    elseif szzbz3(i)>1.5&&szzbz3(i)<=2.5
        szpj3(i)=2;
    elseif szzbz3(i)>2.5&&szzbz3(i)<=3.5
        szpj3(i)=3;
    elseif szzbz3(i)>3.5&&szzbz3(i)<=4.5
        szpj3(i)=4;
    else
        szpj3(i)=5;
    end
end

figure(3)
plot(szzbz1,'o-r')
hold on
plot(szzbz2,'*-g')
hold on
plot(szzbz3,'*:b')
xlabel('时间','fontsize',12)
ylabel('预测水质','fontsize',12)
legend('红工水厂','高家花园水厂','大溪沟水厂','fontsize',12)
```

```
web browser www.matlabsky.com
```

```
Warning: Ignoring extra legend entries.
```



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Published with MATLAB® 7.9