C/C++程序设计案例实战

——手拉手做游戏

华中农业大学信息学院　章 英

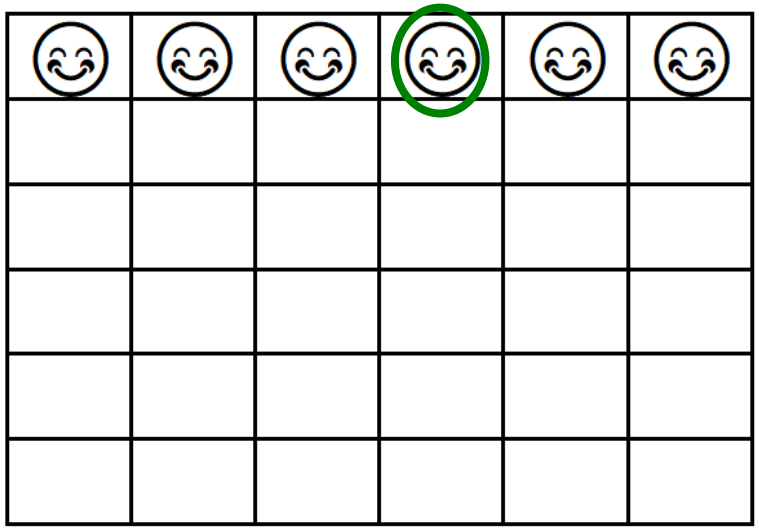
华中农业大学 信息学院

问题引入——手拉手做游戏

问题引入——学生进入教室

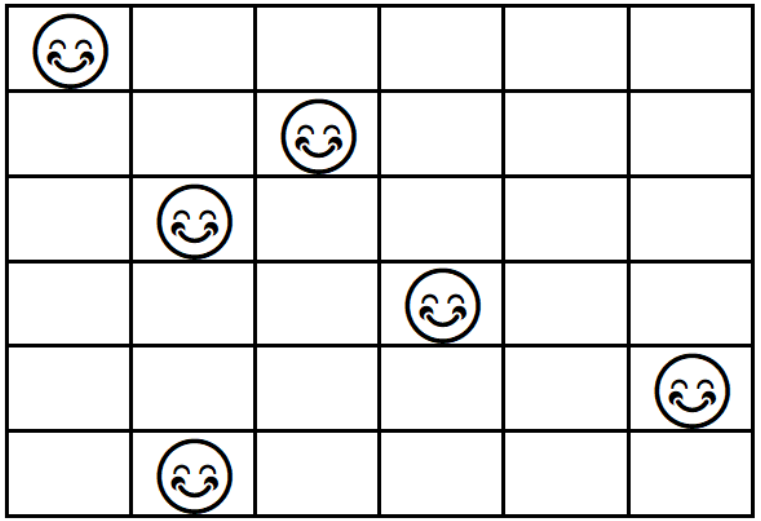
1号同学 4号同学

a[0] a[3]



4号同学

where?



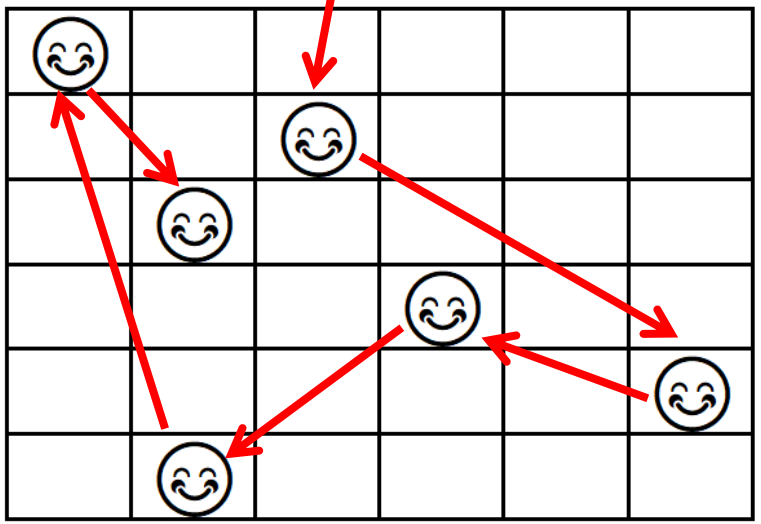
顺序入座

int a[6];

随机入座

???

问题引入——学生进入教室



手拉手做游戏

5

1

6

3

2

4

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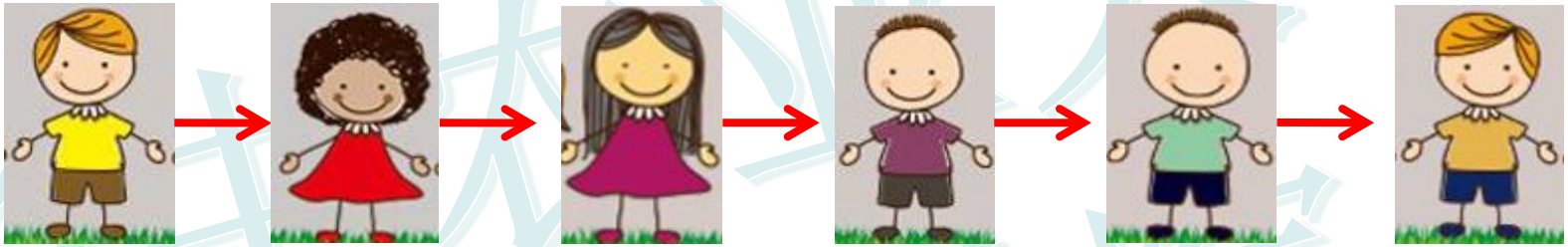
手拉手做游戏

1号地址



1 2 3 4 5 6

1号姓名	2号姓名	3号姓名	4号姓名	5号姓名	6号姓名
2号地址	3号地址	4号地址	5号地址	6号地址	空地址

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结点结构体

1号地址

1　　2

1号姓名
2号地址

2号姓名
3号地址

```
struct StuNode
{
   char name[20];
   StuNode *next;
};
```

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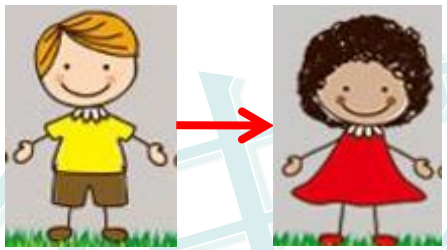
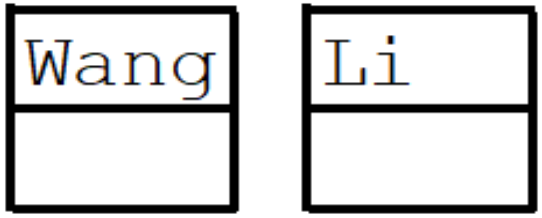
结构体成员赋值

pTeacher



1 2

```
StuNode s1,s2,*pTeacher;
strcpy(s1.name,"Wang");
strcpy(s2.name,"Li");
```



s1 s2

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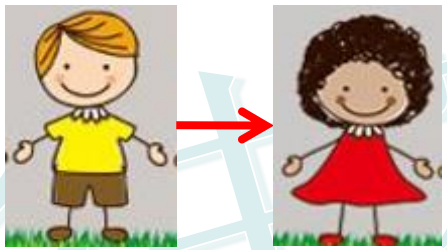
结构体成员赋值

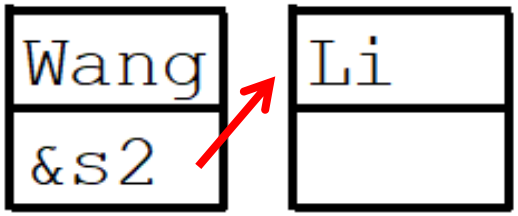
pTeacher



1 2

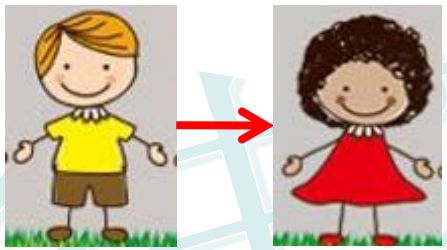
```
StuNode s1,s2,*pTeacher;
strcpy(s1.name,"Wang");
strcpy(s2.name,"Li");

s1.next = &s2;
```



结构体成员赋值

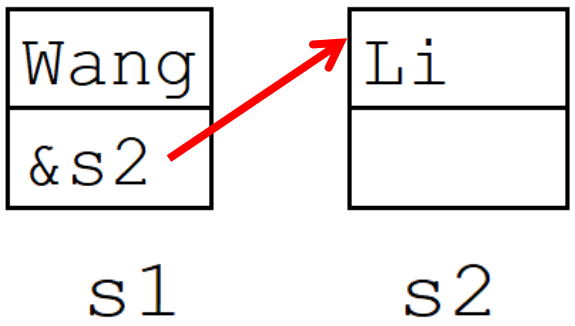
pTeacher | &s1



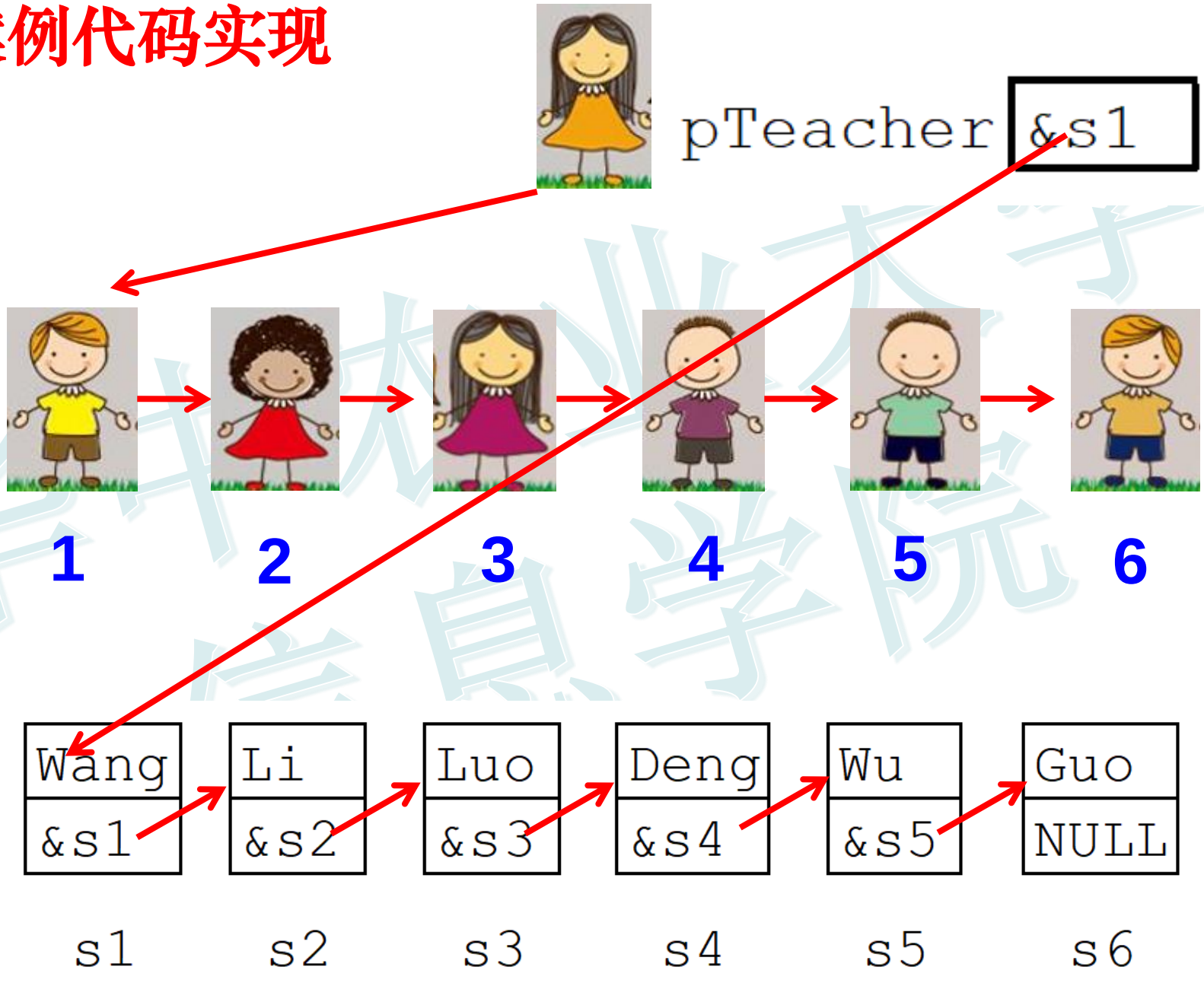
1 2

```
StuNode s1,s2,*pTeacher;
strcpy(s1.name,"Wang");
strcpy(s2.name,"Li");

s1.next = &s2;
pTeacher = &s1;
```



案例代码实现


pTeacher
&s1
1
2
3
4
5
6
Wang
&s1
Li
&s2
Luo
&s3
Deng
&s4
Wu
&s5
Guo
NULL
s1
s2
s3
s4
s5
s6

案例代码实现

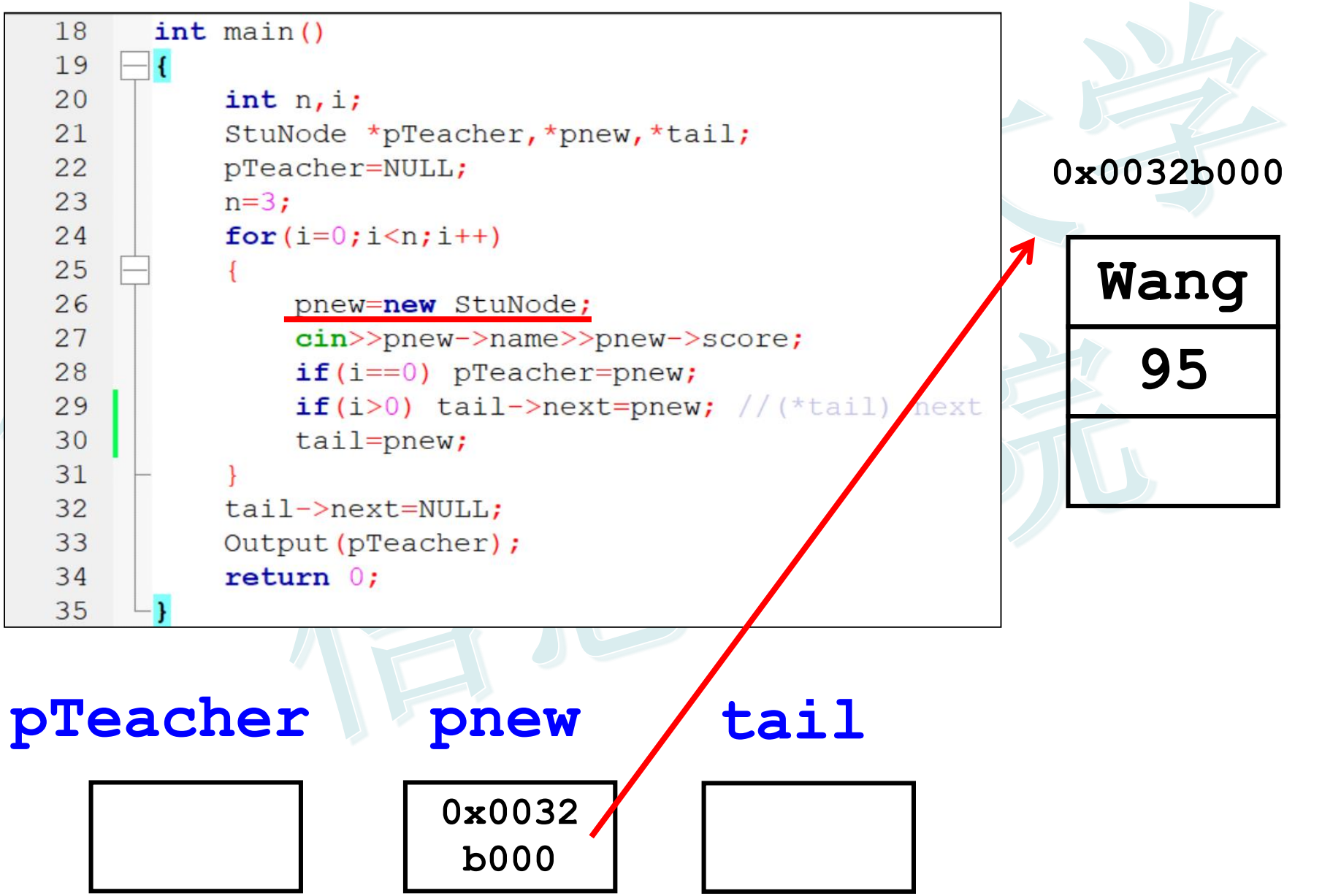
```
18  int main()
19  {
20      int n,i;
21      StuNode *pTeacher,*pnew,*tail;
22      pTeacher=NULL;
23      n=3;
24      for(i=0;i<n;i++)
25      {
26          pnew=new StuNode;
27          cin>>pnew->name>>pnew->score;
28          if(i==0) pTeacher=pnew;
29          if(i>0) tail->next=pnew; //(*tail).next
30          tail=pnew;
31      }
32      tail->next=NULL;
33      Output(pTeacher);
34      return 0;
35  }
```

pTeacher　　pnew　　tail

案例代码实现

pnew = new StuNode;

```
18  int main()
19  {
20      int n,i;
21      StuNode *pTeacher,*pnew,*tail;
22      pTeacher=NULL;
23      n=3;
24      for(i=0;i<n;i++)
25      {
26          pnew=new StuNode;
27          cin>>pnew->name>>pnew->score;
28          if(i==0) pTeacher=pnew;
29          if(i>0) tail->next=pnew; //(*tail).next
30          tail=pnew;
31      }
32      tail->next=NULL;
33      Output(pTeacher);
34      return 0;
35  }
```



案例代码实现

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19  {
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30          tail=pnew;
31      }
32      tail->next=NULL;
33      Output(pTeacher);
34      return 0;
35  }
```

箭头指向运算符

pnew->name　等价于　(*pnew).name

案例代码实现

pTeacher = pnew;

```
18  int main()
19  {
20      int n,i;
21      StuNode *pTeacher,*pnew,*tail;
22      pTeacher=NULL;
23      n=3;
24      for(i=0;i<n;i++)
25      {
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27          cin>>pnew->name>>pnew->score;
28          if(i==0) pTeacher=pnew;
29          if(i>0) tail->next=pnew; //(*tail).next
30          tail=pnew;
31      }
32      tail->next=NULL;
33      Output(pTeacher);
34      return 0;
35  }
```

0x0032b000

Wang
95

pTeacher

0x0032 b000

pnew

0x0032 b000

tail

案例代码实现

tail = pnew;

```
18  int main()
19  {
20      int n,i;
21      StuNode *pTeacher,*pnew,*tail;
22      pTeacher=NULL;
23      n=3;
24      for(i=0;i<n;i++)
25      {
26          pnew=new StuNode;
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29          if(i>0) tail->next=pnew; //(*tail).next
30          tail=pnew;
31      }
32      tail->next=NULL;
33      Output(pTeacher);
34      return 0;
35  }
```

0x0032b000

Wang
95

pTeacher

0x0032 b000

pnew

0x0032 b000

tail

0x0032 b000

案例代码实现

pnew = new StuNode;

```
18  int main()
19  {
20      int n,i;
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30          tail=pnew;
31      }
32      tail->next=NULL;
33      Output(pTeacher);
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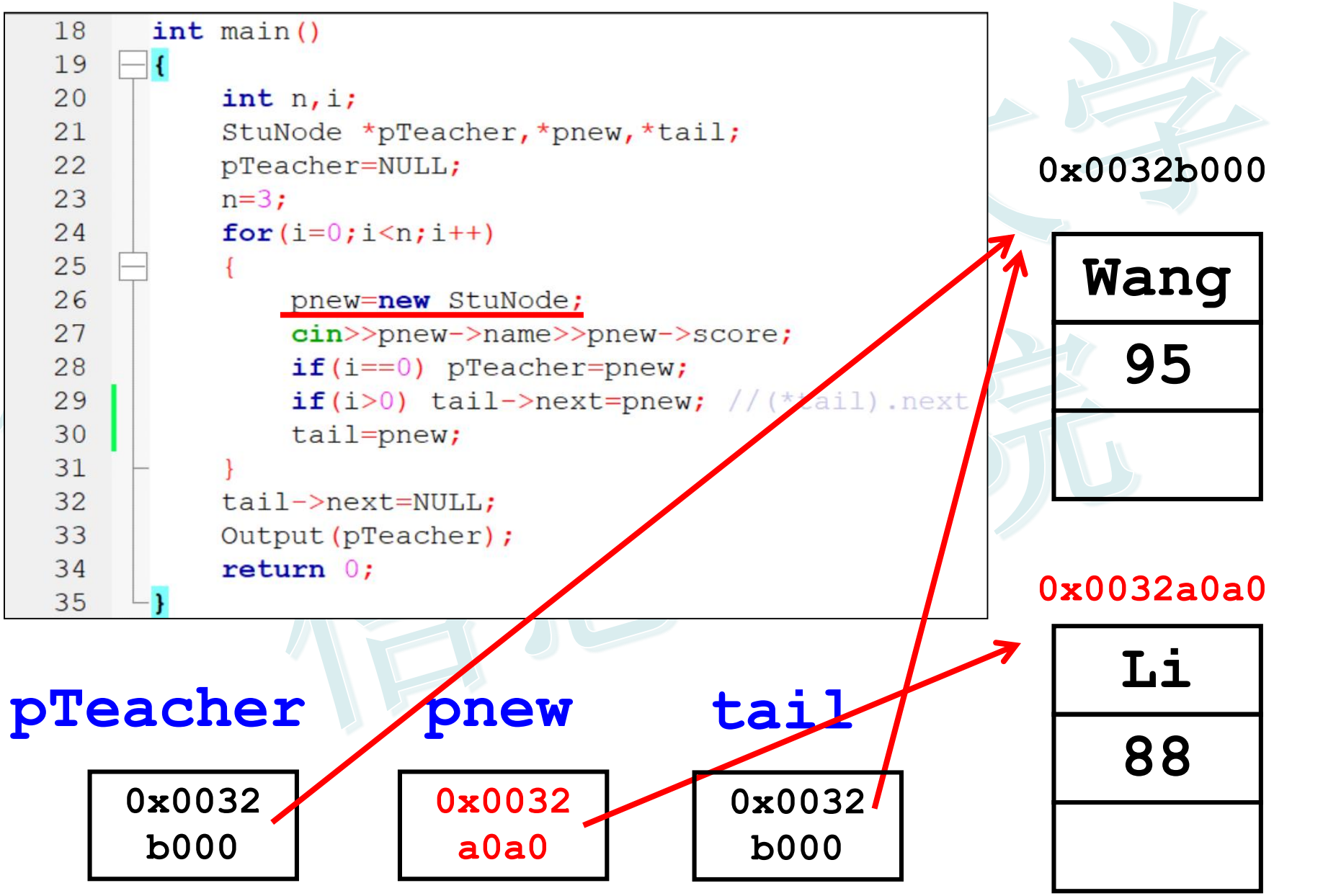
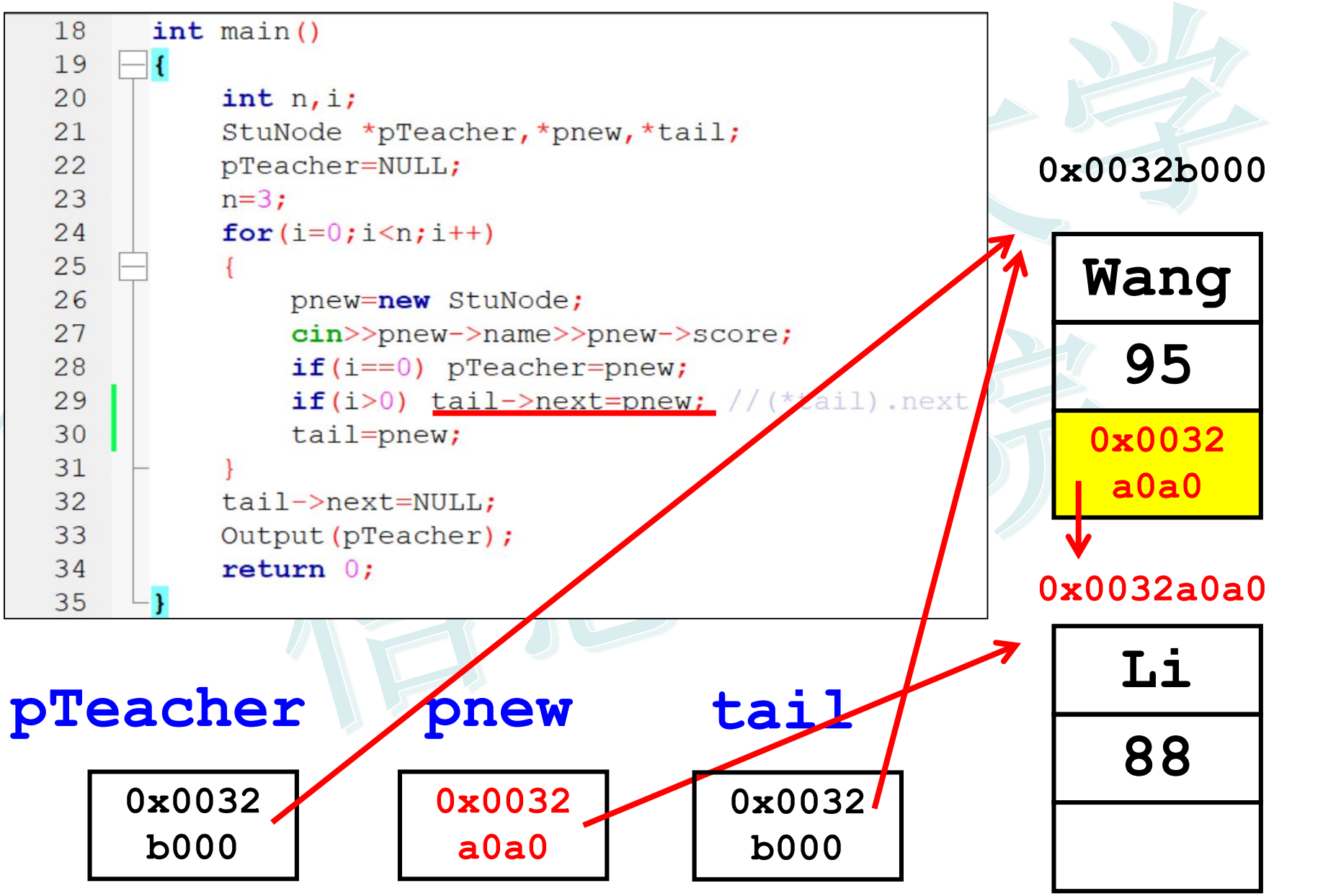
35  }
```



案例代码实现

(*tail).next = pnew

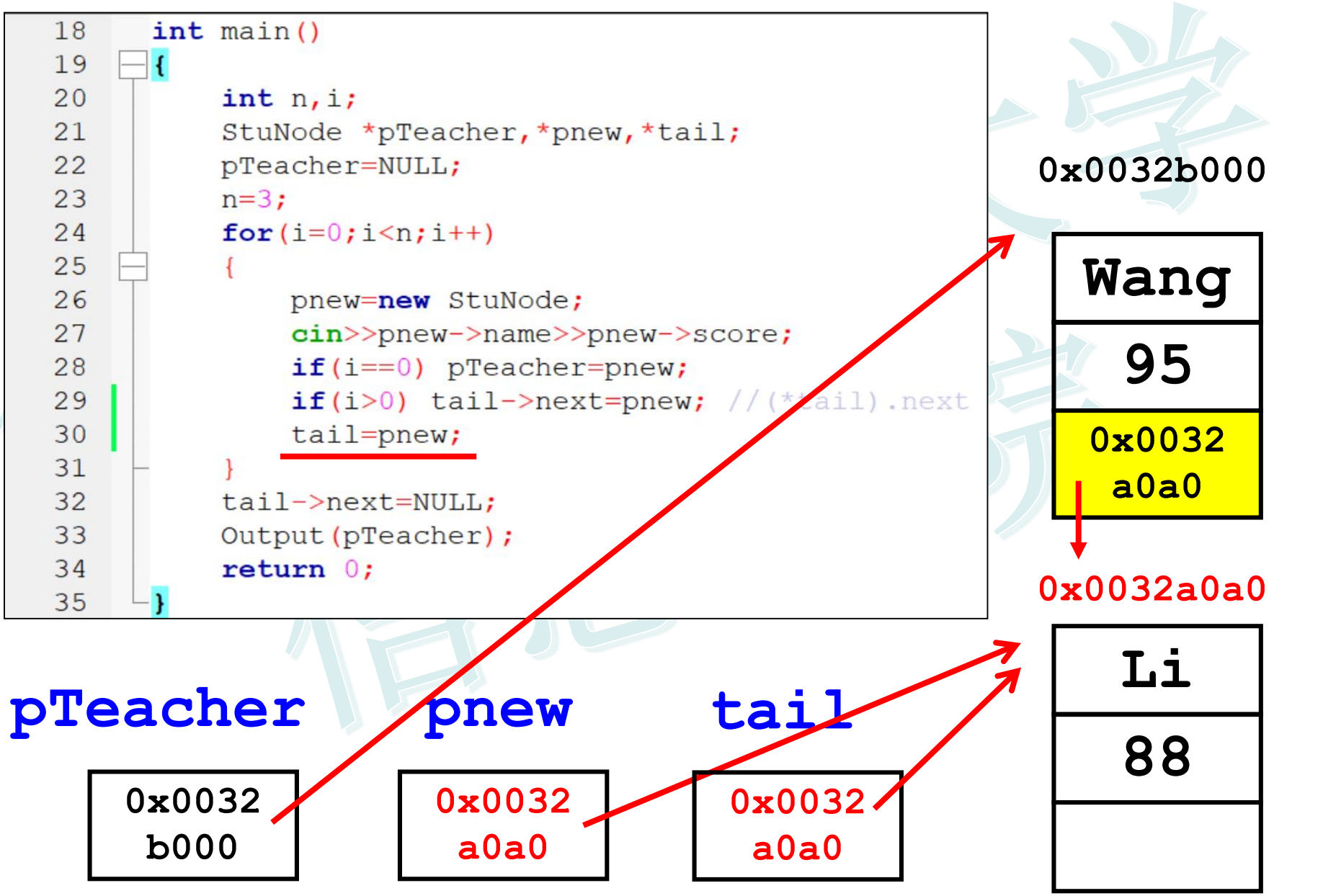
```
18  int main()
19  {
20      int n,i;
21      StuNode *pTeacher,*pnew,*tail;
22      pTeacher=NULL;
23      n=3;
24      for(i=0;i<n;i++)
25      {
26          pnew=new StuNode;
27          cin>>pnew->name>>pnew->score;
28          if(i==0) pTeacher=pnew;
29          if(i>0) tail->next=pnew; //(*tail).next
30          tail=pnew;
31      }
32      tail->next=NULL;
33      Output(pTeacher);
34      return 0;
35  }
```



案例代码实现

tail = pnew;

```
18  int main()
19  {
20      int n,i;
21      StuNode *pTeacher,*pnew,*tail;
22      pTeacher=NULL;
23      n=3;
24      for(i=0;i<n;i++)
25      {
26          pnew=new StuNode;
27          cin>>pnew->name>>pnew->score;
28          if(i==0) pTeacher=pnew;
29          if(i>0) tail->next=pnew; //(*tail).next
30          tail=pnew;
31      }
32      tail->next=NULL;
33      Output(pTeacher);
34      return 0;
35  }
```



演一演

pTeacher

pnew

tail

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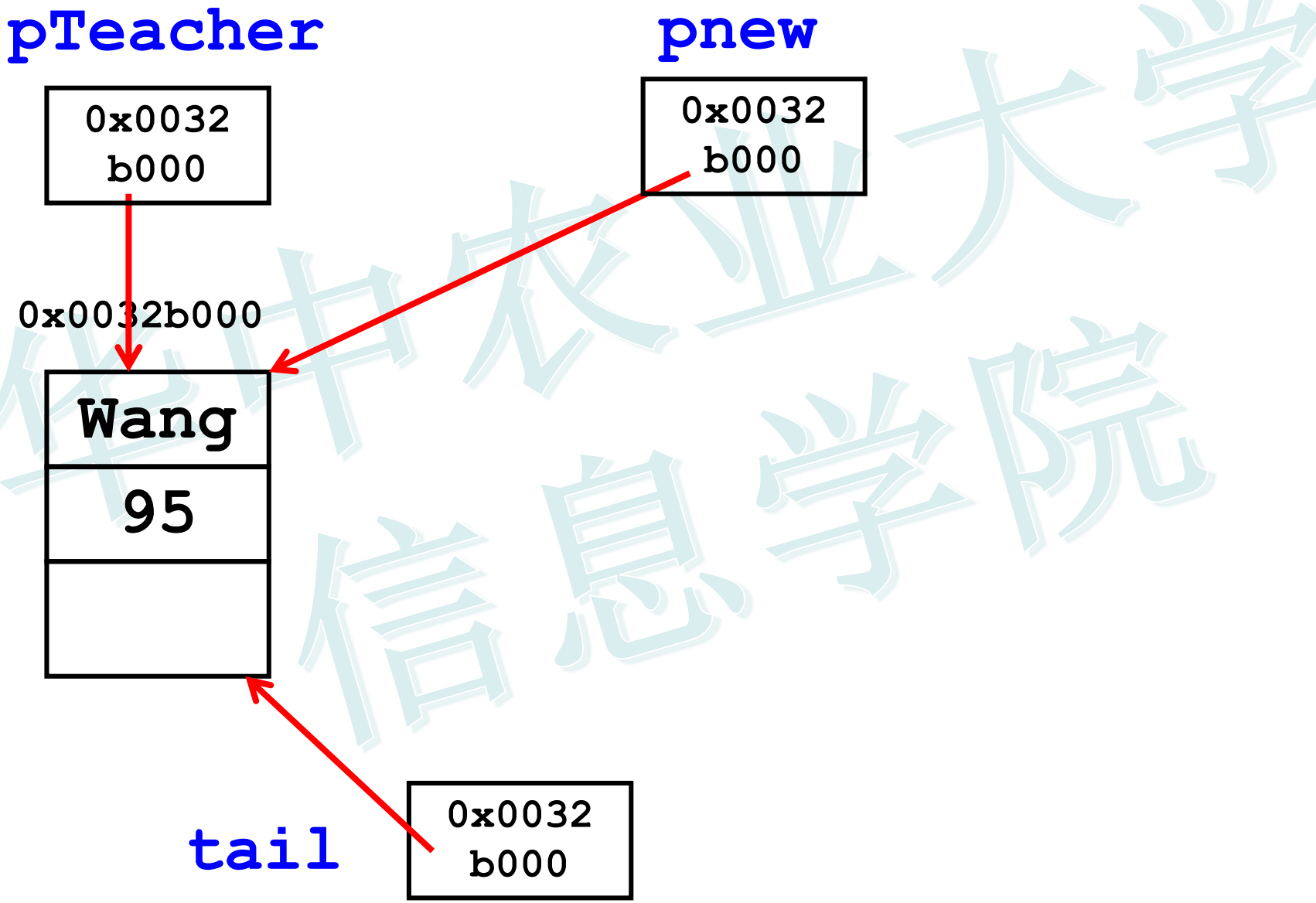
演一演



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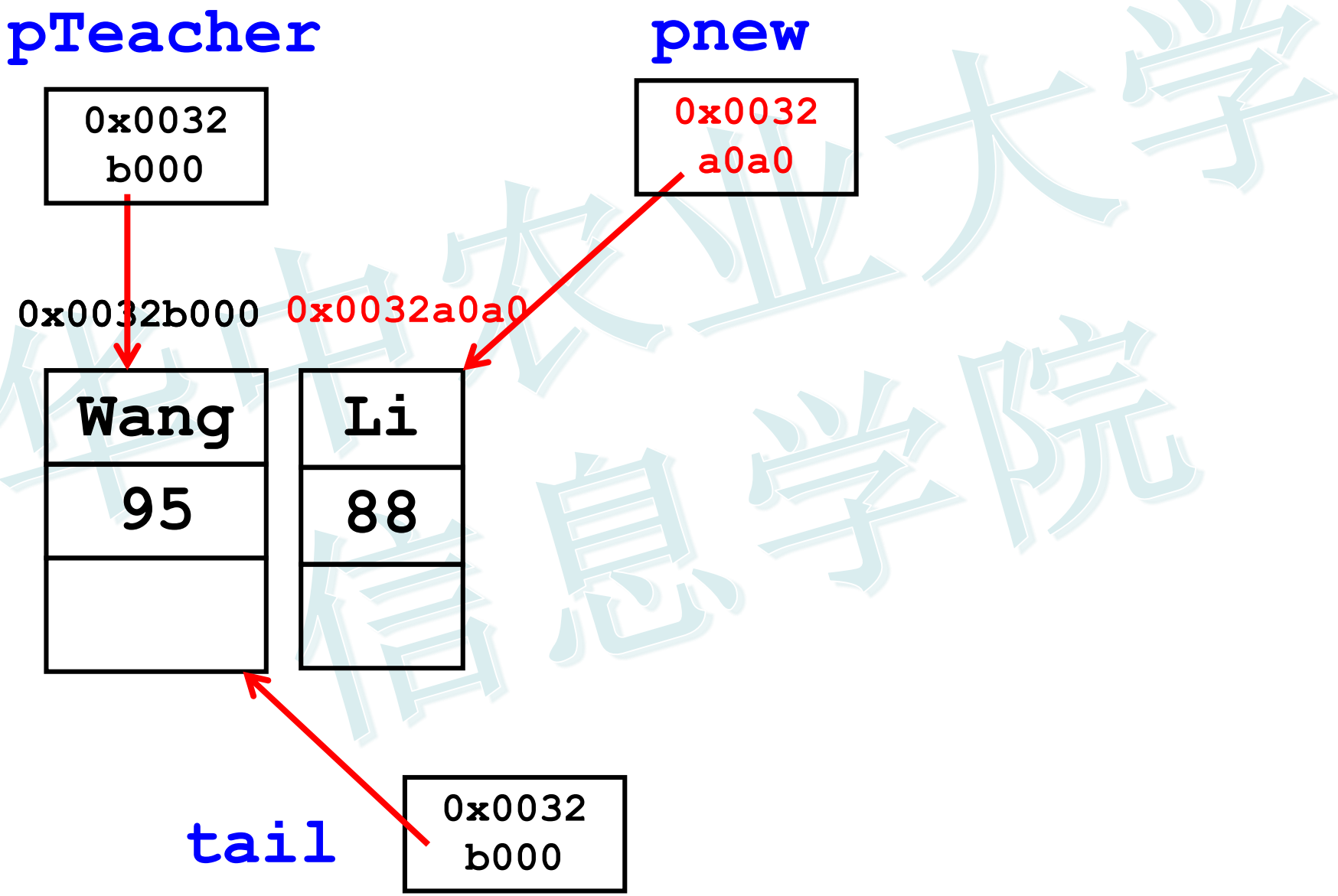
演一演



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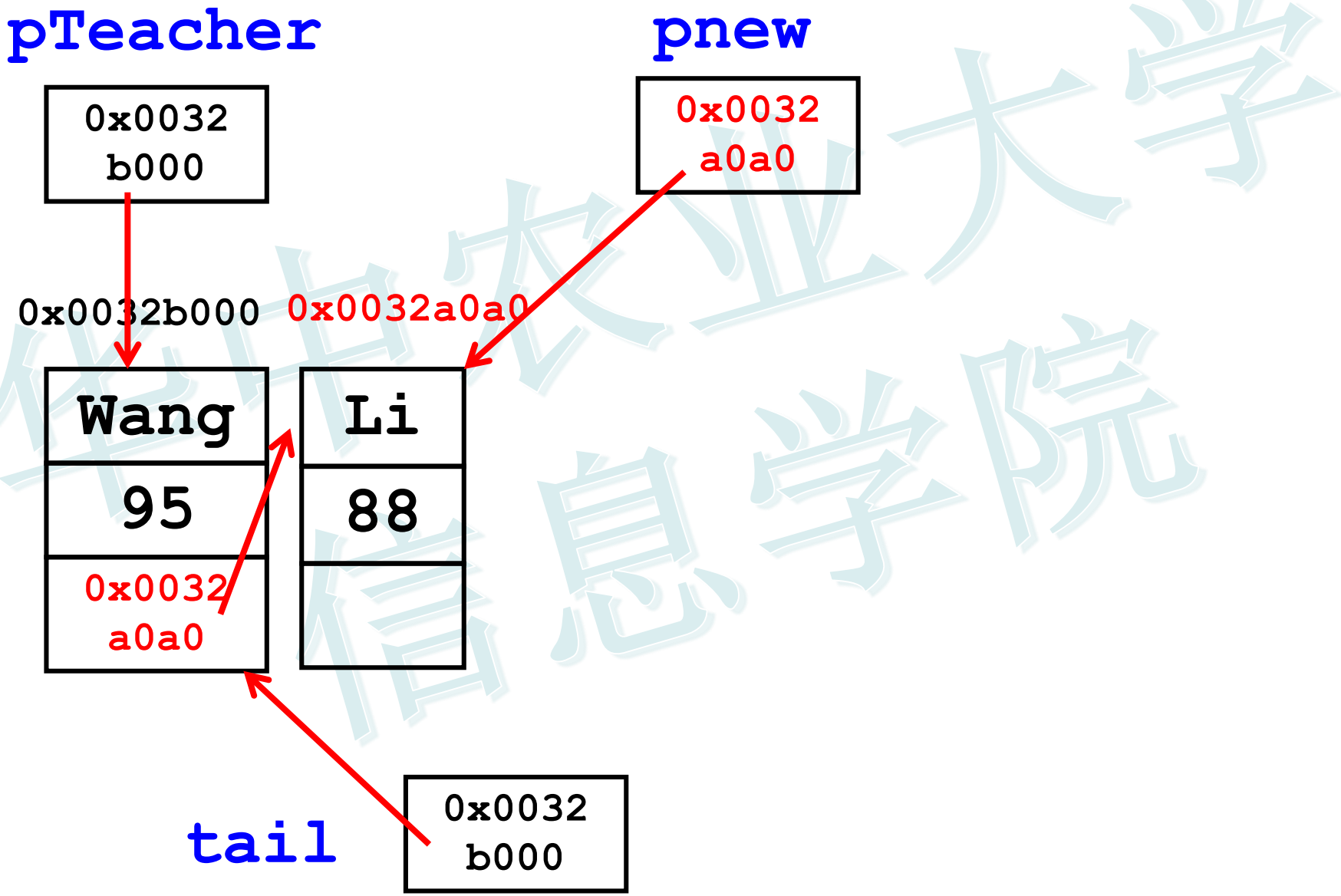
演一演



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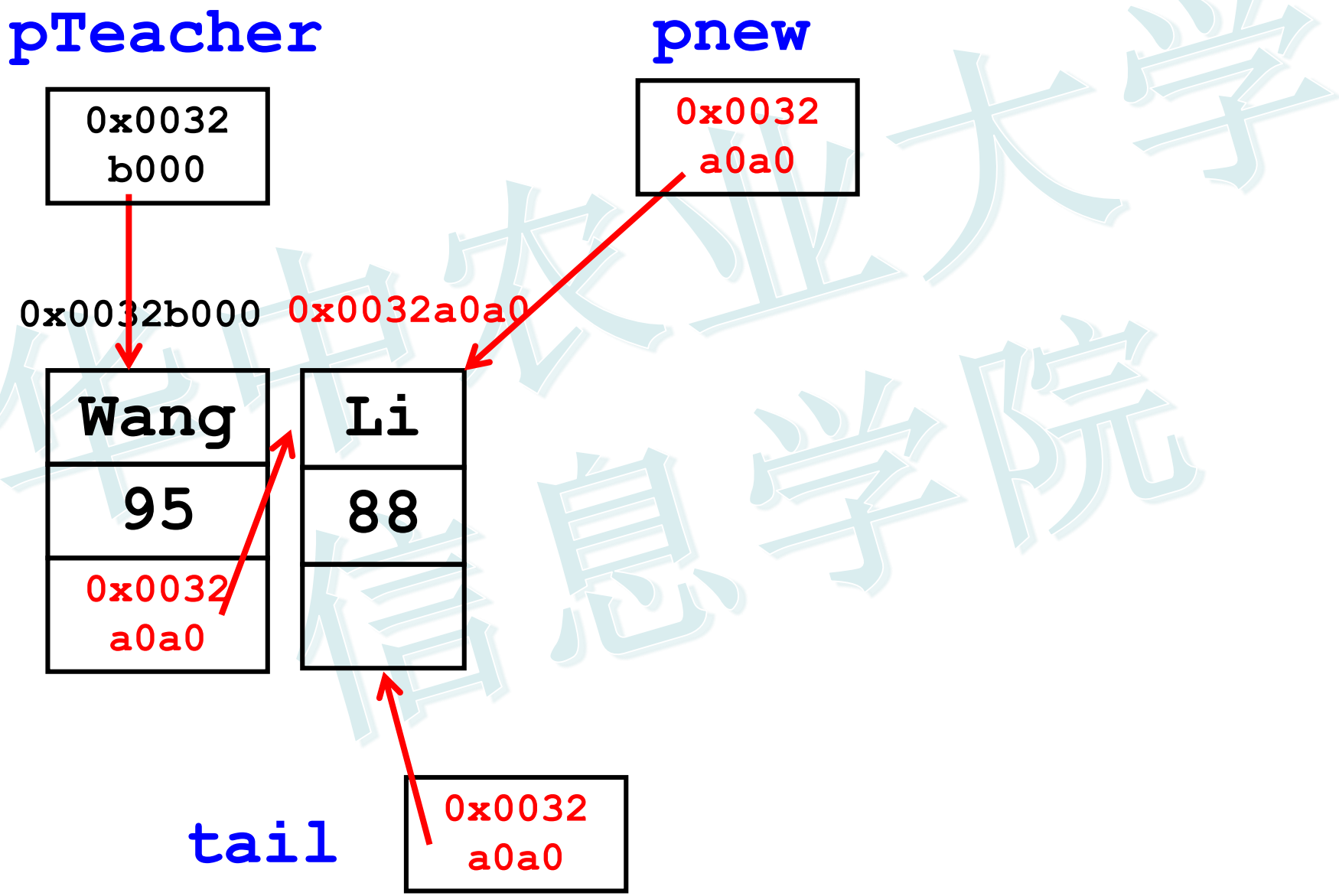
演一演



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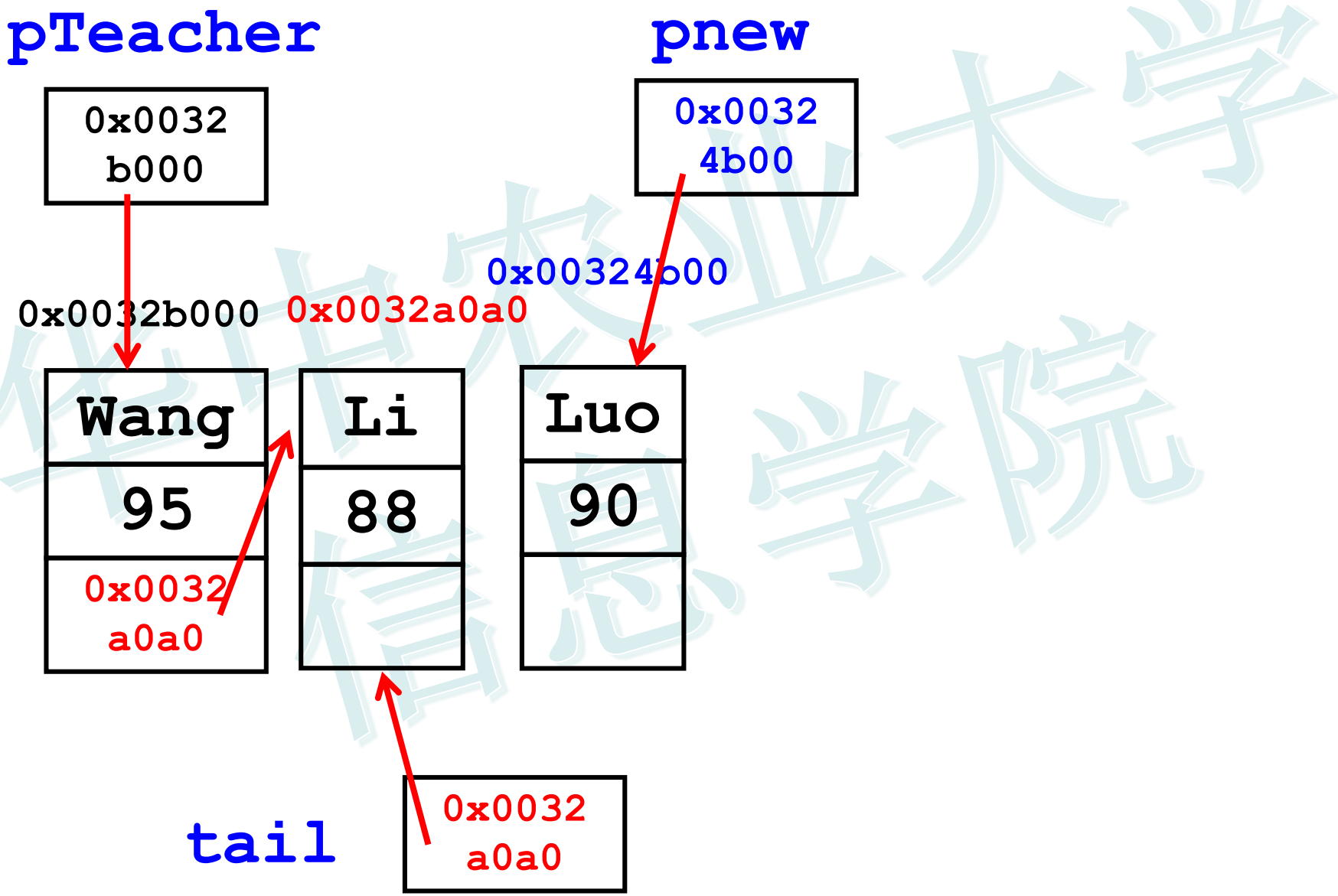
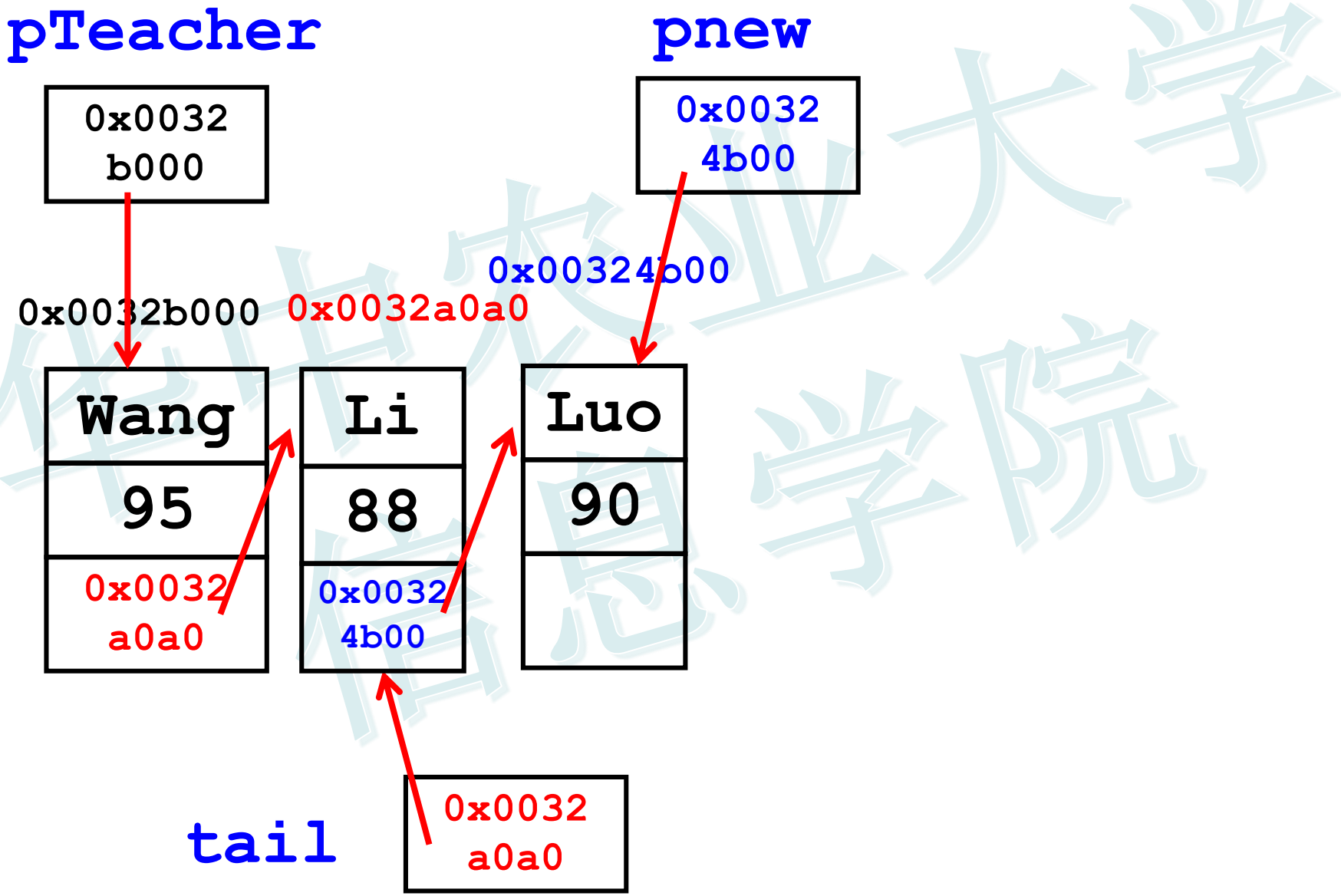
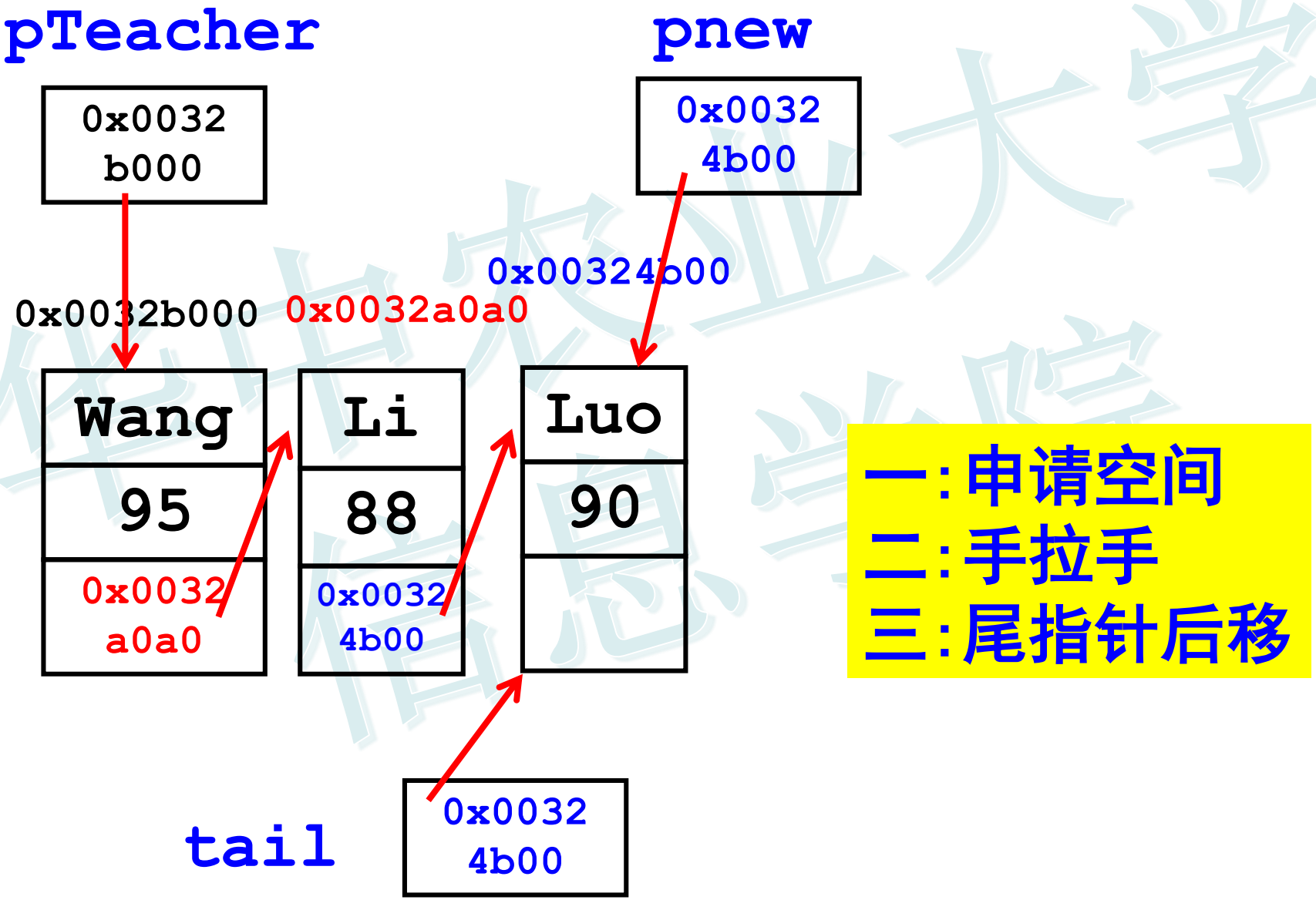
演一演


pTeacher
pnew
0x0032
b000
0x0032
4b00
0x00324b00
0x0032b000
0x0032a0a0
Wang
95
0x0032
a0a0
Li
88
Luo
90
tail
0x0032
a0a0

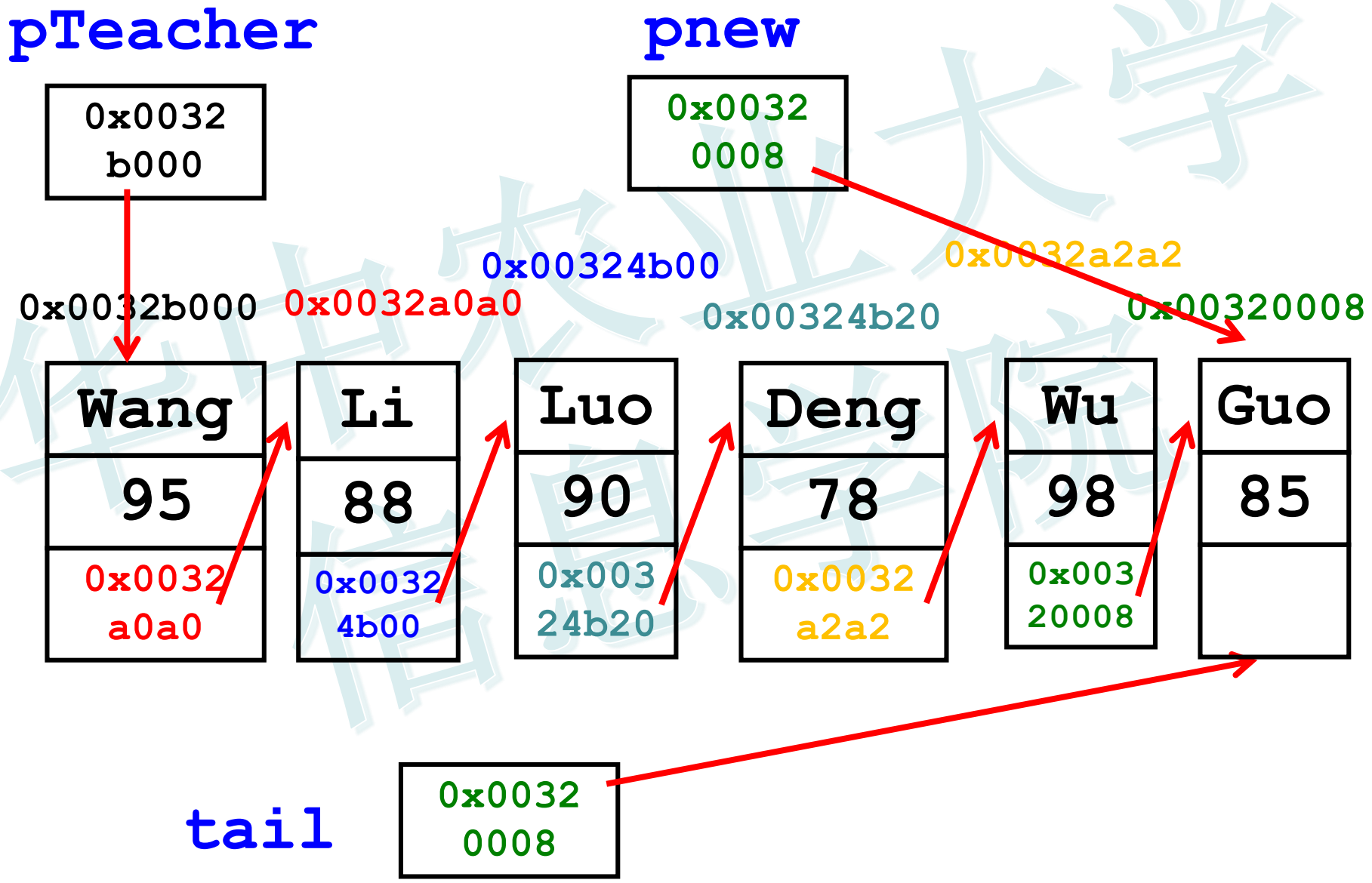
演一演


pTeacher
pnew
0x0032
b000
0x0032
4b00
0x00324b00
0x0032b000
0x0032a0a0
Wang
95
0x0032
a0a0
Li
88
0x0032
4b00
Luo
90
tail
0x0032
a0a0

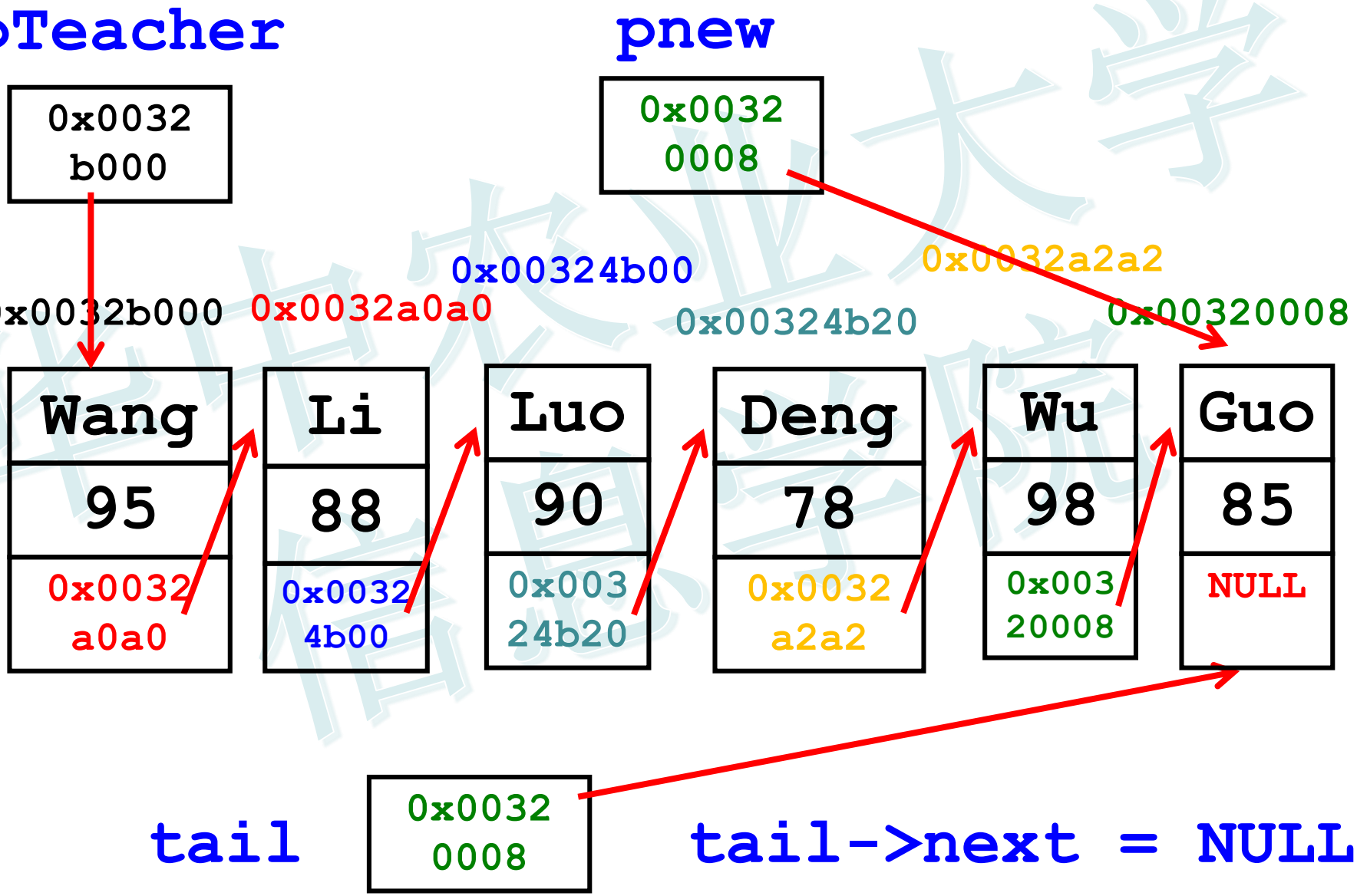
演一演


pTeacher
pnew
0x0032
b000
0x0032
4b00
0x0032b000
0x0032a0a0
0x00324b00
Wang
95
0x0032
a0a0
Li
88
0x0032
4b00
Luo
90
tail
0x0032
4b00
一:申请空间
二:手拉手
三:尾指针后移

演一演

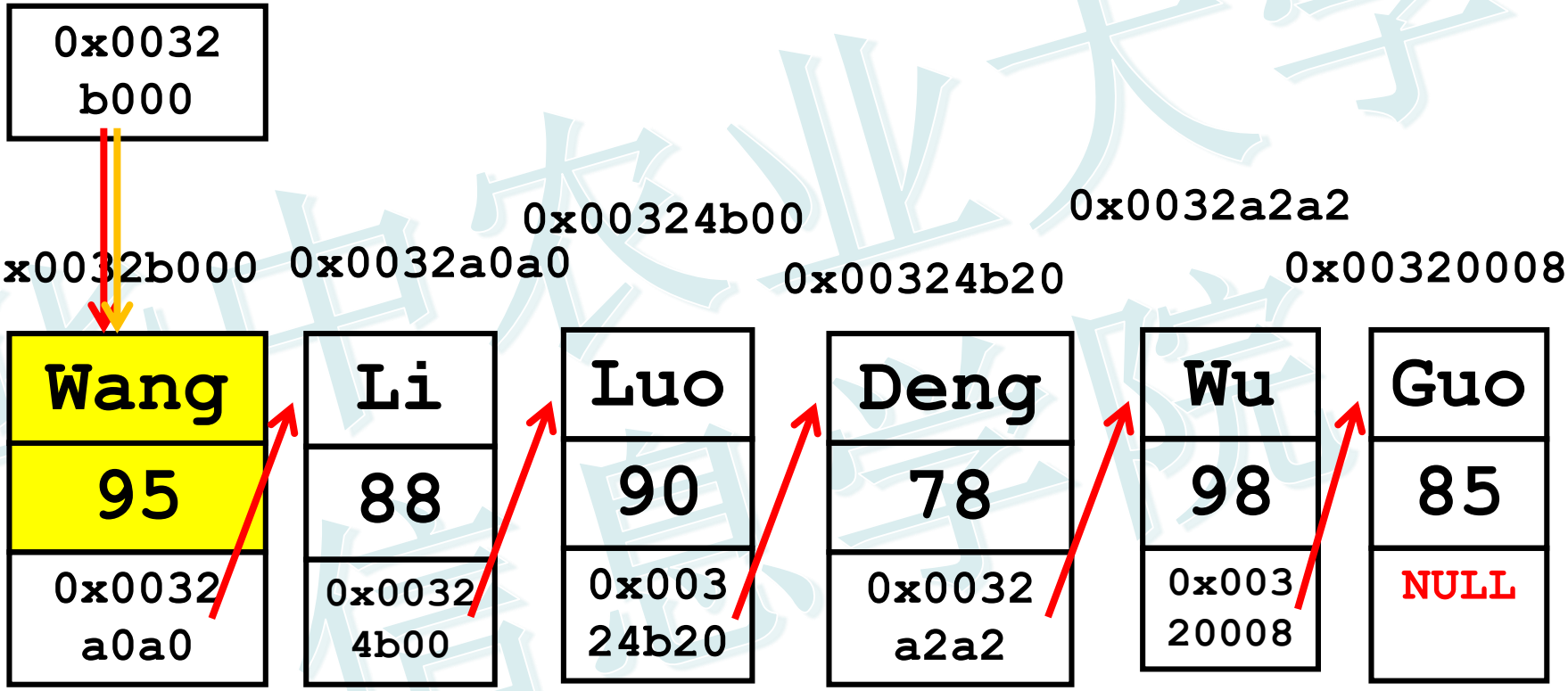

pTeacher
0x0032
b000
pnew
0x0032
0008
0x0032b000
0x0032a0a0
0x00324b00
0x00324b20
0x0032a2a2
0x00320008
Wang
95
0x0032
a0a0
Li
88
0x0032
4b00
Luo
90
0x003
24b20
Deng
78
0x0032
a2a2
Wu
98
0x003
20008
Guo
85
tail
0x0032
0008

演一演


pTeacher
pnew
0x0032
b000
0x0032
0008
0x0032b000
0x0032a0a0
0x00324b00
0x00324b20
0x0032a2a2
0x00320008
Wang
95
0x0032
a0a0
Li
88
0x0032
4b00
Luo
90
0x003
24b20
Deng
78
0x0032
a2a2
Wu
98
0x003
20008
Guo
85
NULL
tail
0x0032
0008
tail->next = NULL;

如何输出

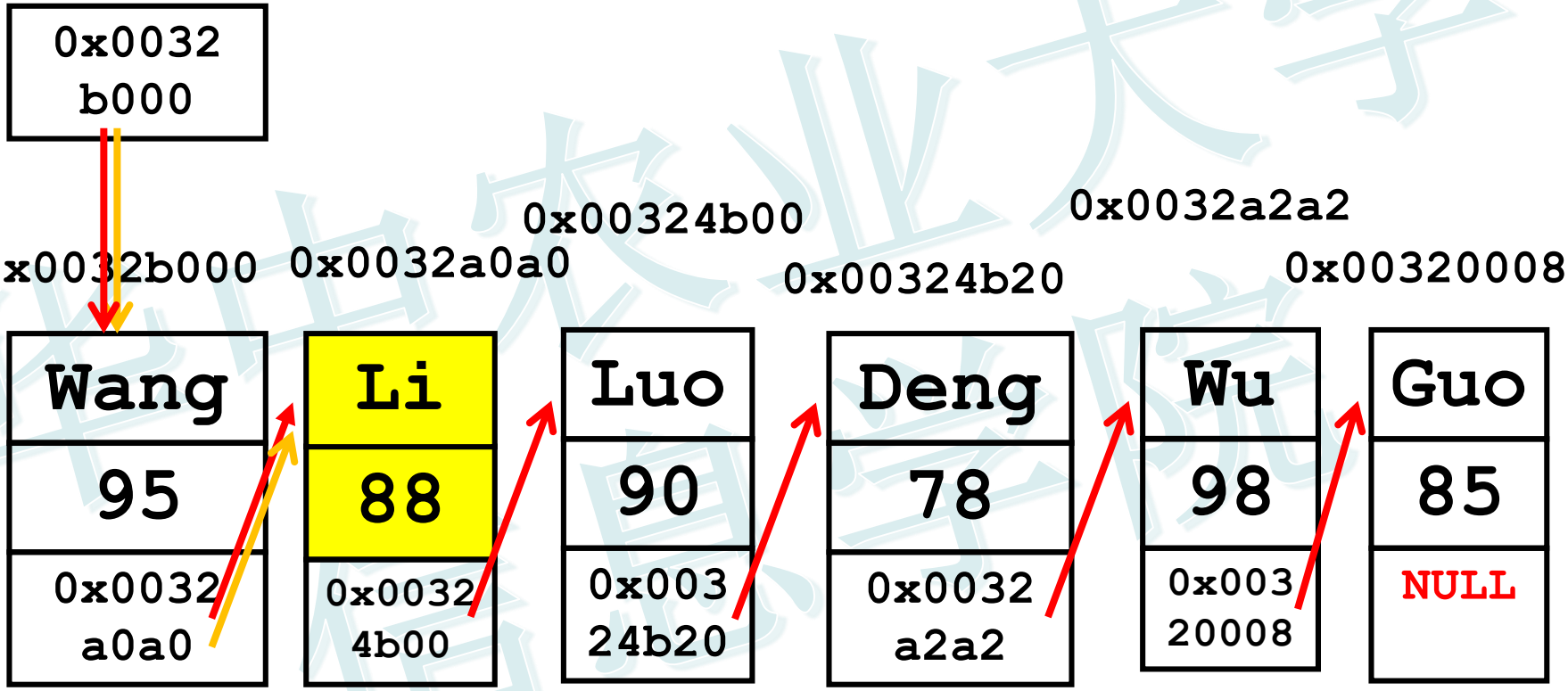
pTeacher




```
cout<<pTeacher->name;
cout<<pTeacher->score;
```

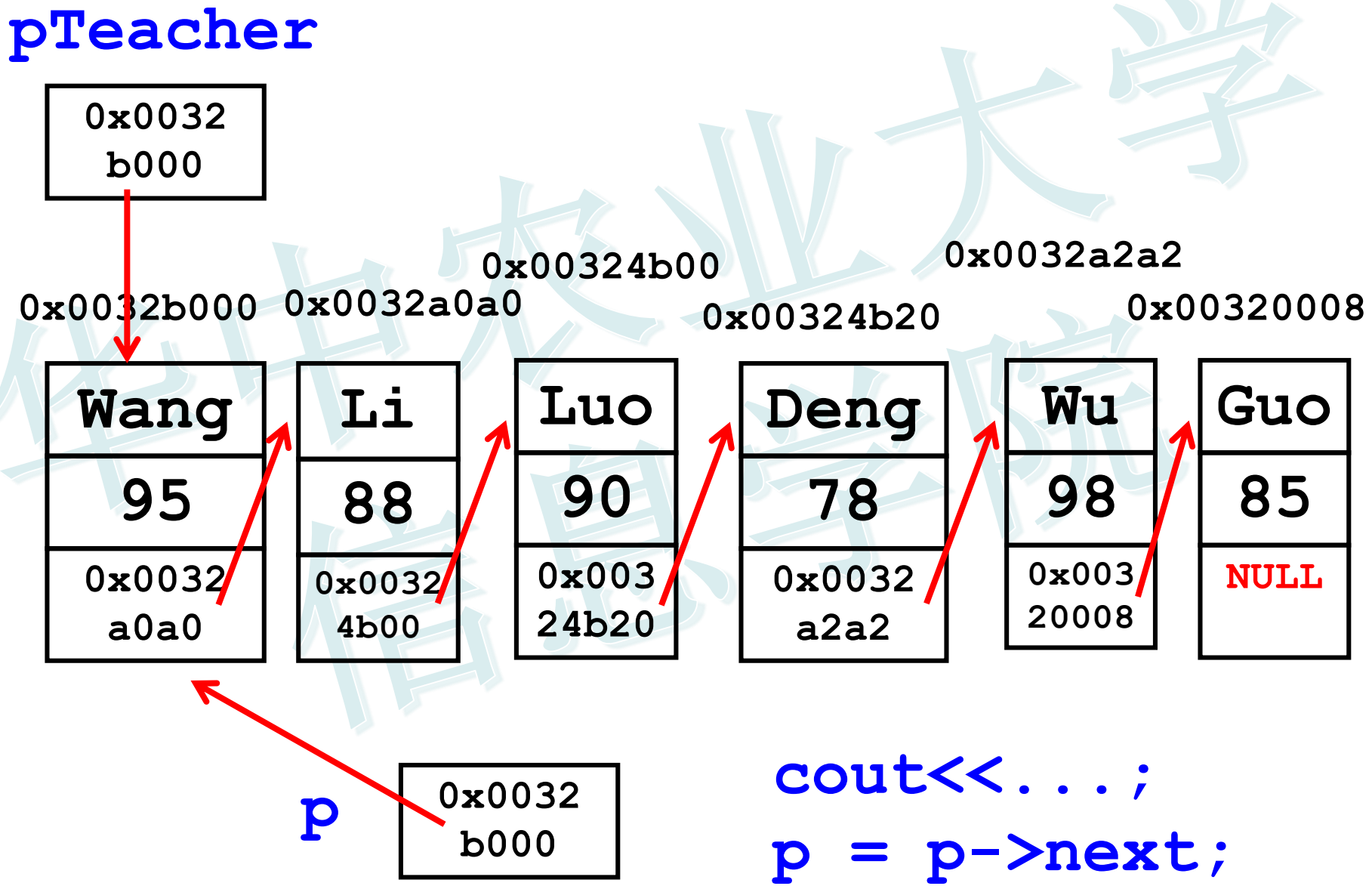
如何输出

pTeacher

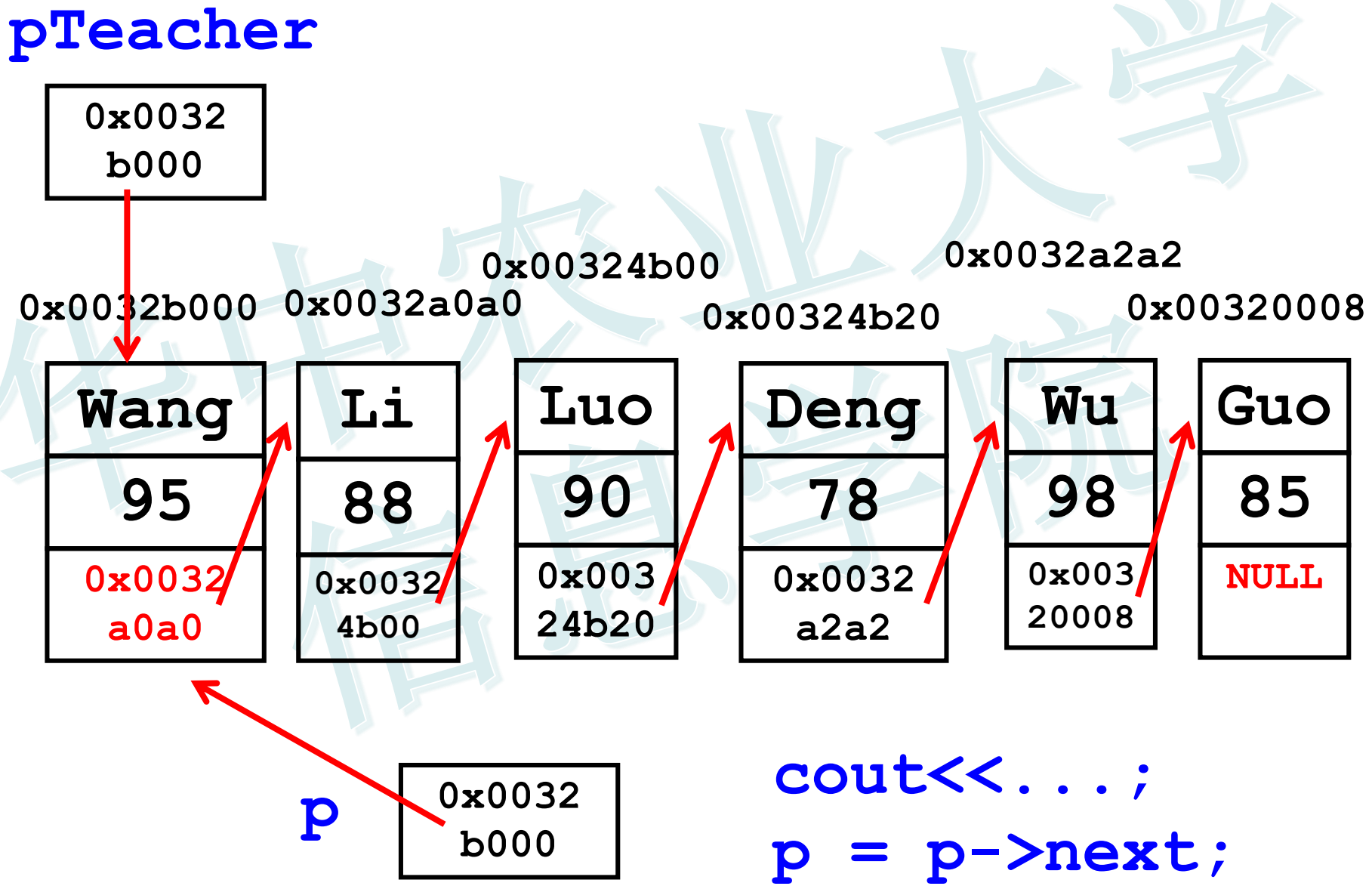



```
cout<<pTeacher->next->name;
cout<<pTeacher->next->score;
```

如何输出


pTeacher
0x0032
b000
0x0032b000
0x0032a0a0
0x00324b00
0x00324b20
0x0032a2a2
0x00320008
Wang
95
0x0032
a0a0
Li
88
0x0032
4b00
Luo
90
0x003
24b20
Deng
78
0x0032
a2a2
Wu
98
0x003
20008
Guo
85
NULL
p
0x0032
b000
cout<<...;
p = p->next;

如何输出


pTeacher
0x0032
b000
0x0032b000
0x0032a0a0
0x00324b00
0x00324b20
0x0032a2a2
0x00320008
Wang
95
0x0032
a0a0
Li
88
0x0032
4b00
Luo
90
0x003
24b20
Deng
78
0x0032
a2a2
Wu
98
0x003
20008
Guo
85
NULL
p
0x0032
b000
cout<<...;
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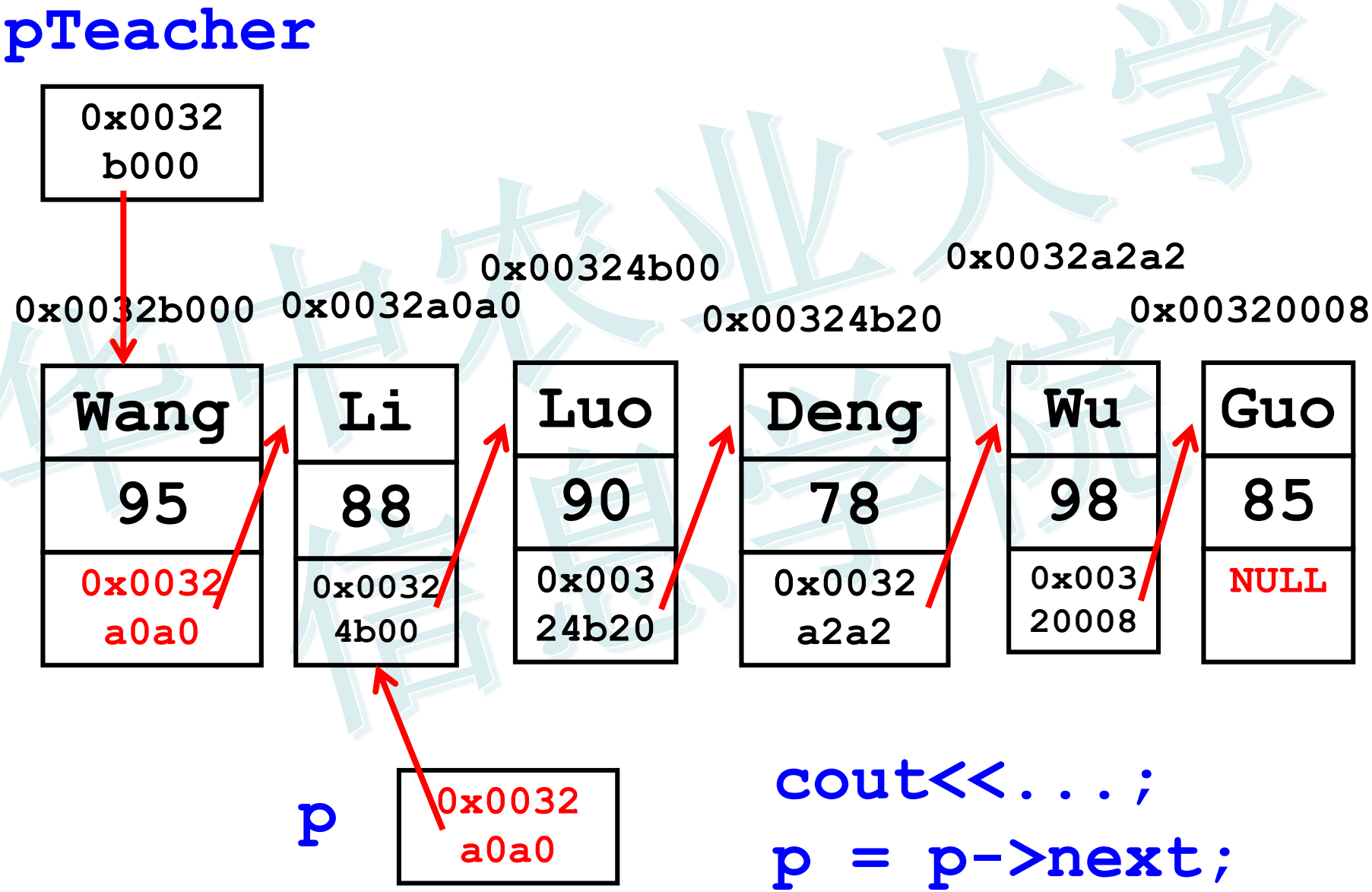
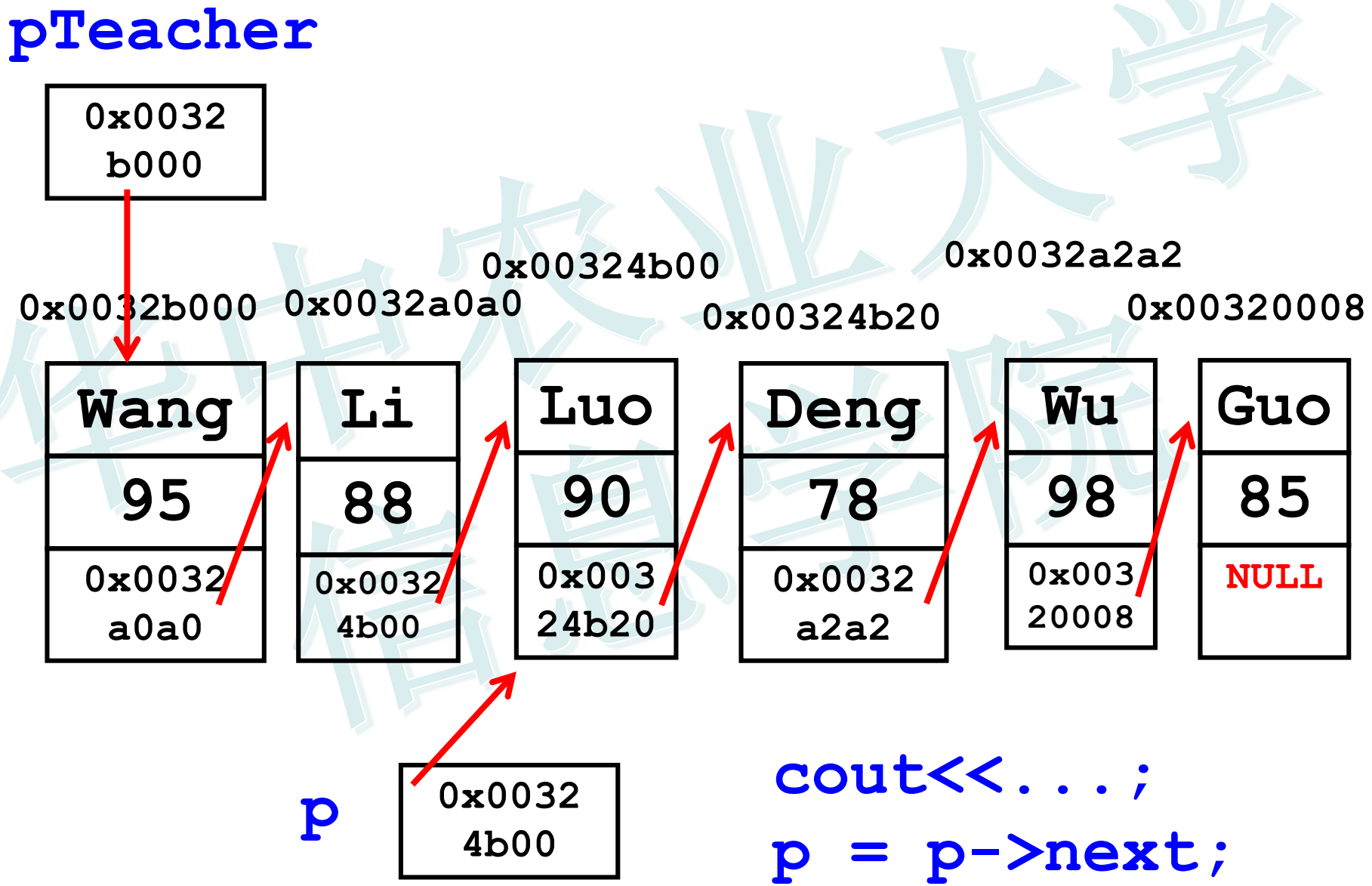
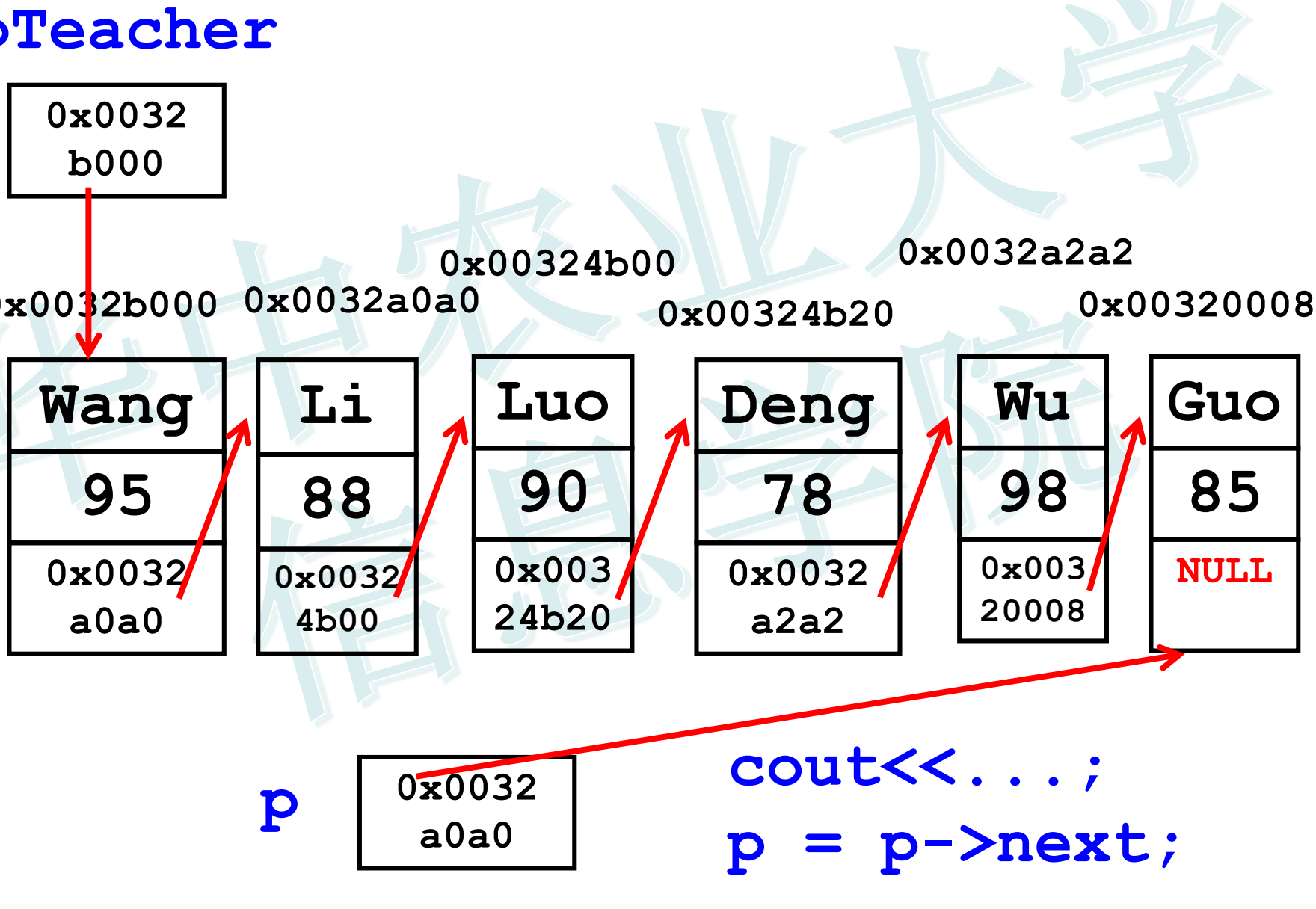
如何输出


pTeacher
0x0032
b000
0x0032b000
0x0032a0a0
0x00324b00
0x00324b20
0x0032a2a2
0x00320008
Wang
95
0x0032
a0a0
Li
88
0x0032
4b00
Luo
90
0x003
24b20
Deng
78
0x0032
a2a2
Wu
98
0x003
20008
Guo
85
NULL
p
0x0032
a0a0
cout<<...;
p = p->next;

如何输出


pTeacher
0x0032
b000
0x0032b000
0x0032a0a0
0x00324b00
0x00324b20
0x0032a2a2
0x00320008
Wang
95
0x0032
a0a0
Li
88
0x0032
4b00
Luo
90
0x003
24b20
Deng
78
0x0032
a2a2
Wu
98
0x003
20008
Guo
85
NULL
p
0x0032
4b00
cout<<...;
p = p->next;

如何输出


pTeacher
0x0032
b000
0x0032b000
0x0032a0a0
0x00324b00
0x00324b20
0x0032a2a2
0x00320008
Wang
95
0x0032
a0a0
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88
0x0032
4b00
Luo
90
0x003
24b20
Deng
78
0x0032
a2a2
Wu
98
0x003
20008
Guo
85
NULL
p
0x0032
a0a0
cout<<...;
p = p->next;

案例——输出结果

Start here | 7.2手拉手做游戏.cpp

```
1   #include<iostream>
2   using namespace std;
3
4   struct StuNode
5   {
6    char name[20];
7    int score;
8    StuNode *next;
9   };
10
11  void Output(StuNode *pT)
12  {
13      StuNode *p=pT;
14      for(;p!=NULL;p=p->next)
15          cout<<p->name<<" "<<p->score<<endl;
16  }
```

```
Wang 95 Li 88 Luo 90
Wang 95
Li 88
Luo 90
```

二:后移

一:输出

手拉手做游戏

1 2 3 5 6

出队！

4

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手拉手做游戏

1 2 3 5 6

4

插队！

重排！

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小结

（1）能够定义结点结构体
（2）能够编程实现单链表的创建
（3）能够编程实现单链表的遍历输出

延伸

编程实现在第x个同学后插入一个新的同学，并删除姓名为Wu的同学，完成这2个操作后，请遍历输出所有学生信息以检验操作的正确性。

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