

实验 10：接口程序设计

一、实验目的

- 1、通过安装使用 Postman 发送请求测试 API，了解网络请求的定义以及网络请求的基本步骤；
- 2、掌握通过 Java 程序来访问第三方 API。

二、实验学时

2 学时

三、实验类型

验证性

四、实验需求

1、硬件

每人配备计算机 1 台，建议优先使用个人计算机开展实验。

2、软件

安装 Postman，用于 API 测试。

安装 IntelliJ IDEA，以及 Java 运行所需要的相关基础环境。

3、网络

本地主机能够访问互联网和实验中心网络。

4、工具

无。

五、实验任务

- 1、在本地电脑上下载安装 Postman 工具；
- 2、通过 Postman 工具发送请求来测试 API；
- 3、编写一段 Java 程序，通过该程序来访问上一步任务中所请求的 API 地址；
- 4、验证通过不同方式来发送请求，服务器端返回的结果是否符合预期。

六、实验内容及步骤

1、安装 Postman

1. Postman 安装程序可通过以下地址进行下载（根据不同的操作系统下载不同的安装包）。

www.postman.com/downloads/

2. 执行安装程序并依照向导完成软件安装。

2、通过 Postman 工具发送请求来测试 API

1. 验证不带参数的 POST 请求
2. 请求内容：该 API 返回检查项目以及执行科室列表
请求地址：<http://123.56.60.184:8888/examine>
请求方式：POST
入参：无
出参示例：

```
{
  "inputDrugLists": [
    {
      "EXAM_SUBCLASS_NAME": "妇科门诊",
      "chander": [
        {
          "DEPT_NAME": "妇科门诊",
          "EXAM_SUBCLASS_NAME": "妇科彩超",
          "SERIAL_NO": 1,
          "DEPT_CODE": "2020"
        },
        {
          "DEPT_NAME": "妇科门诊",
          "EXAM_SUBCLASS_NAME": "心电图",
          "SERIAL_NO": 2,
          "DEPT_CODE": "2020"
        }
      ]
    },
    {
      "EXAM_SUBCLASS_NAME": "16排CT",
      "chander": [
        {
          "DEPT_NAME": "16排CT室",
          "EXAM_SUBCLASS_NAME": "腹部",
          "SERIAL_NO": 4,
          "DEPT_CODE": "3010"
        },
        {
          "DEPT_NAME": "16排CT室",
          "EXAM_SUBCLASS_NAME": "公共",
          "SERIAL_NO": 7,
          "DEPT_CODE": "3010"
        },
        {
          "DEPT_NAME": "16排CT室",
          "EXAM_SUBCLASS_NAME": "颈部",
          "SERIAL_NO": 1,
          "DEPT_CODE": "3010"
        }
      ]
    }
  ]
}
```

```
"DEPT_NAME": "16排CT室",
"EXAM_SUBCLASS_NAME": "四肢",
"SERIAL_NO": 6,
"DEPT_CODE": "3010"
},
{
"DEPT_NAME": "16排CT室",
"EXAM_SUBCLASS_NAME": "头颅",
"SERIAL_NO": 2,
"DEPT_CODE": "3010"
},
{
"DEPT_NAME": "16排CT室",
"EXAM_SUBCLASS_NAME": "胸部",
"SERIAL_NO": 3,
"DEPT_CODE": "3010"
},
{
"DEPT_NAME": "16排CT室",
"EXAM_SUBCLASS_NAME": "腰、骶",
"SERIAL_NO": 5,
"DEPT_CODE": "3010"
}
]
},
{
"EXAM_SUBCLASS_NAME": "彩超",
"chander": [
{
"DEPT_NAME": "彩超室",
"EXAM_SUBCLASS_NAME": "产科彩超",
"SERIAL_NO": 13,
"DEPT_CODE": "3003"
},
{
"DEPT_NAME": "彩超室",
"EXAM_SUBCLASS_NAME": "腹部脏器",
"SERIAL_NO": 3,
"DEPT_CODE": "3003"
},
{
"DEPT_NAME": "彩超室",
"EXAM_SUBCLASS_NAME": "公共",
"SERIAL_NO": 1,
"DEPT_CODE": "3003"
},
{
"DEPT_NAME": "彩超室",
"EXAM_SUBCLASS_NAME": "浅表器官",
```

```
        "SERIAL_NO": 4,
        "DEPT_CODE": "3003"
    },
    {
        "DEPT_NAME": "彩超室",
        "EXAM_SUBCLASS_NAME": "心脏彩超",
        "SERIAL_NO": 14,
        "DEPT_CODE": "3003"
    },
    {
        "DEPT_NAME": "彩超室",
        "EXAM_SUBCLASS_NAME": "血管彩超",
        "SERIAL_NO": 2,
        "DEPT_CODE": "3003"
    },
    {
        "DEPT_NAME": "彩超室",
        "EXAM_SUBCLASS_NAME": "子宫附件",
        "SERIAL_NO": 12,
        "DEPT_CODE": "3003"
    }
]
},
{
    "EXAM_SUBCLASS_NAME": "心电图",
    "chander": [
        {
            "DEPT_NAME": "彩超室",
            "EXAM_SUBCLASS_NAME": "心电图",
            "SERIAL_NO": 1,
            "DEPT_CODE": "3003"
        }
    ]
},
{
    "EXAM_SUBCLASS_NAME": "DR",
    "chander": [
        {
            "DEPT_NAME": "放射科 1",
            "EXAM_SUBCLASS_NAME": "尺桡骨",
            "SERIAL_NO": 12,
            "DEPT_CODE": "3001"
        },
        {
            "DEPT_NAME": "放射科 1",
            "EXAM_SUBCLASS_NAME": "腹部",
            "SERIAL_NO": 4,
            "DEPT_CODE": "3001"
        }
    ],
}
```

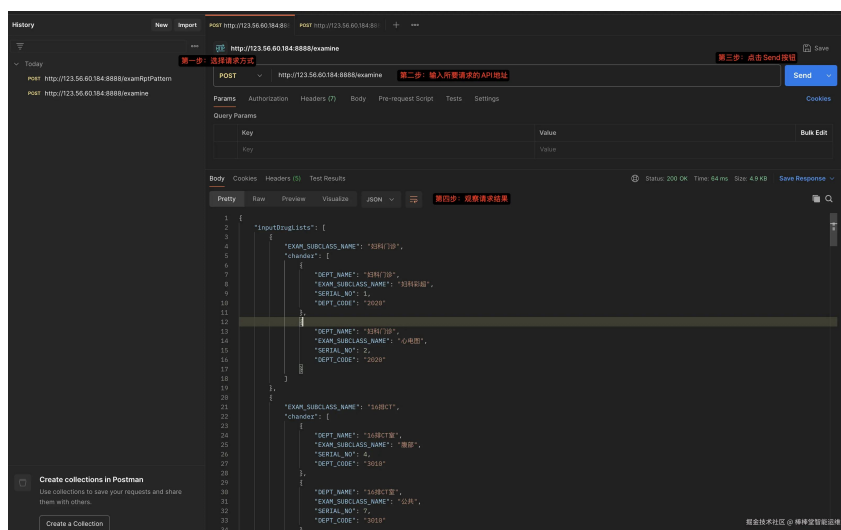
```
{
    "DEPT_NAME": "放射科 1",
    "EXAM_SUBCLASS_NAME": "跟骨",
    "SERIAL_NO": 22,
    "DEPT_CODE": "3001"
},
{
    "DEPT_NAME": "放射科 1",
    "EXAM_SUBCLASS_NAME": "骨盆",
    "SERIAL_NO": 8,
    "DEPT_CODE": "3001"
},
{
    "DEPT_NAME": "放射科 1",
    "EXAM_SUBCLASS_NAME": "股骨",
    "SERIAL_NO": 17,
    "DEPT_CODE": "3001"
},
{
    "DEPT_NAME": "放射科 1",
    "EXAM_SUBCLASS_NAME": "肩关节",
    "SERIAL_NO": 9,
    "DEPT_CODE": "3001"
},
{
    "DEPT_NAME": "放射科 1",
    "EXAM_SUBCLASS_NAME": "脚",
    "SERIAL_NO": 21,
    "DEPT_CODE": "3001"
},
{
    "DEPT_NAME": "放射科 1",
    "EXAM_SUBCLASS_NAME": "颈椎",
    "SERIAL_NO": 2,
    "DEPT_CODE": "3001"
},
{
    "DEPT_NAME": "放射科 1",
    "EXAM_SUBCLASS_NAME": "手",
    "SERIAL_NO": 14,
    "DEPT_CODE": "3001"
},
{
    "DEPT_NAME": "放射科 1",
    "EXAM_SUBCLASS_NAME": "锁骨",
    "SERIAL_NO": 23,
    "DEPT_CODE": "3001"
},
{
```

```
"DEPT_NAME": "放射科 1",
"EXAM_SUBCLASS_NAME": "头部",
"SERIAL_NO": 1,
"DEPT_CODE": "3001"
},
{
"DEPT_NAME": "放射科 1",
"EXAM_SUBCLASS_NAME": "腕关节",
"SERIAL_NO": 13,
"DEPT_CODE": "3001"
},
{
"DEPT_NAME": "放射科 1",
"EXAM_SUBCLASS_NAME": "膝关节",
"SERIAL_NO": 18,
"DEPT_CODE": "3001"
},
{
"DEPT_NAME": "放射科 1",
"EXAM_SUBCLASS_NAME": "胸部",
"SERIAL_NO": 3,
"DEPT_CODE": "3001"
},
{
"DEPT_NAME": "放射科 1",
"EXAM_SUBCLASS_NAME": "胸椎",
"SERIAL_NO": 5,
"DEPT_CODE": "3001"
},
{
"DEPT_NAME": "放射科 1",
"EXAM_SUBCLASS_NAME": "腰椎",
"SERIAL_NO": 6,
"DEPT_CODE": "3001"
},
{
"DEPT_NAME": "放射科 1",
"EXAM_SUBCLASS_NAME": "肘关节",
"SERIAL_NO": 11,
"DEPT_CODE": "3001"
},
{
"DEPT_NAME": "放射科 1",
"EXAM_SUBCLASS_NAME": "子宫造影",
"SERIAL_NO": 24,
"DEPT_CODE": "3001"
},
{
"DEPT_NAME": "放射科 1",
```

```
        "EXAM_SUBCLASS_NAME": "肱骨",
        "SERIAL_NO": 10,
        "DEPT_CODE": "3001"
    },
    {
        "DEPT_NAME": "放射科 1",
        "EXAM_SUBCLASS_NAME": "胫腓骨",
        "SERIAL_NO": 19,
        "DEPT_CODE": "3001"
    },
    {
        "DEPT_NAME": "放射科 1",
        "EXAM_SUBCLASS_NAME": "踝关节",
        "SERIAL_NO": 20,
        "DEPT_CODE": "3001"
    }
]
},
{
    "EXAM_SUBCLASS_NAME": "MRI",
    "chander": [
        {
            "DEPT_NAME": "核磁共振",
            "EXAM_SUBCLASS_NAME": "颈椎",
            "SERIAL_NO": 7,
            "DEPT_CODE": "3009"
        },
        {
            "DEPT_NAME": "核磁共振",
            "EXAM_SUBCLASS_NAME": "头颅",
            "SERIAL_NO": 1,
            "DEPT_CODE": "3009"
        },
        {
            "DEPT_NAME": "核磁共振",
            "EXAM_SUBCLASS_NAME": "膝关节",
            "SERIAL_NO": 8,
            "DEPT_CODE": "3009"
        },
        {
            "DEPT_NAME": "核磁共振",
            "EXAM_SUBCLASS_NAME": "下肢",
            "SERIAL_NO": 6,
            "DEPT_CODE": "3009"
        },
        {
            "DEPT_NAME": "核磁共振",
            "EXAM_SUBCLASS_NAME": "胸",
            "SERIAL_NO": 3,
```

```
        "DEPT_CODE": "3009"
    },
    {
        "DEPT_NAME": "核磁共振",
        "EXAM_SUBCLASS_NAME": "腰、骶",
        "SERIAL_NO": 2,
        "DEPT_CODE": "3009"
    },
    {
        "DEPT_NAME": "核磁共振",
        "EXAM_SUBCLASS_NAME": "髌",
        "SERIAL_NO": 4,
        "DEPT_CODE": "3009"
    }
]
},
{
    "EXAM_SUBCLASS_NAME": "胃肠镜",
    "chander": [
        {
            "DEPT_NAME": "胃镜室",
            "EXAM_SUBCLASS_NAME": "14 碳",
            "SERIAL_NO": 2,
            "DEPT_CODE": "3007"
        },
        {
            "DEPT_NAME": "胃镜室",
            "EXAM_SUBCLASS_NAME": "公共",
            "SERIAL_NO": 1,
            "DEPT_CODE": "3007"
        }
    ]
},
{
    "EXAM_SUBCLASS_NAME": "常规体检",
    "chander": [
        {
            "DEPT_NAME": "急诊科",
            "EXAM_SUBCLASS_NAME": "健康证体检",
            "SERIAL_NO": 1,
            "DEPT_CODE": "2001"
        }
    ]
}
},
"resultCode": "0",
"resultDesc": "查询成功"
}
```


操作步骤：



1. 验证带参数的 POST 请求
2. 请求内容：该 API 返回某一个检查项目分组下具体的检查项目列表
请求地址：<http://123.56.60.184:8888/examRptPattern>
请求方式：POST
入参示例：

```
{
  "ExamClass": "彩超",
  "ExamSubClass": "血管彩超"
}
```

出参示例：

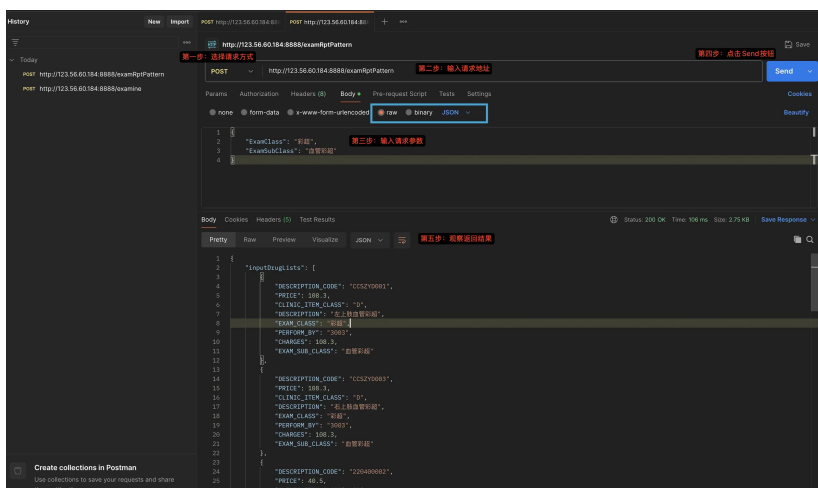
```
{
  "inputDrugLists": [
    {
      "DESCRIPTION_CODE": "CCSZYD001",
      "PRICE": 108.3,
      "CLINIC_ITEM_CLASS": "D",
      "DESCRIPTION": "左上肢血管彩超",
      "EXAM_CLASS": "彩超",
      "PERFORM_BY": "3003",
      "CHARGES": 108.3,
      "EXAM_SUB_CLASS": "血管彩超"
    },
    {
      "DESCRIPTION_CODE": "CCSZYD003",
      "PRICE": 108.3,
      "CLINIC_ITEM_CLASS": "D",
```

```
"DESCRIPTION": "右上肢血管彩超",
"EXAM_CLASS": "彩超",
"PERFORM_BY": "3003",
"CHARGES": 108.3,
"EXAM_SUB_CLASS": "血管彩超"
},
{
"DESCRIPTION_CODE": "220400002",
"PRICE": 40.5,
"CLINIC_ITEM_CLASS": "D",
"DESCRIPTION": "四肢多普勒血流图",
"EXAM_CLASS": "彩超",
"PERFORM_BY": "3003",
"CHARGES": 40.5,
"EXAM_SUB_CLASS": "血管彩超"
},
{
"DESCRIPTION_CODE": "CCSZYD002",
"PRICE": 108.3,
"CLINIC_ITEM_CLASS": "D",
"DESCRIPTION": "左下肢血管彩超",
"EXAM_CLASS": "彩超",
"PERFORM_BY": "3003",
"CHARGES": 108.3,
"EXAM_SUB_CLASS": "血管彩超"
},
{
"DESCRIPTION_CODE": "CCHK00022",
"PRICE": 216.6,
"CLINIC_ITEM_CLASS": "D",
"DESCRIPTION": "双上肢静脉彩超",
"EXAM_CLASS": "彩超",
"PERFORM_BY": "3003",
"CHARGES": 216.6,
"EXAM_SUB_CLASS": "血管彩超"
},
{
"DESCRIPTION_CODE": "CCHK00021",
"PRICE": 216.6,
"CLINIC_ITEM_CLASS": "D",
"DESCRIPTION": "双上肢动脉彩超",
"EXAM_CLASS": "彩超",
"PERFORM_BY": "3003",
"CHARGES": 216.6,
"EXAM_SUB_CLASS": "血管彩超"
},
{
"DESCRIPTION_CODE": "CCHK00023",
"PRICE": 216.6,
```

```
"CLINIC_ITEM_CLASS": "D",
"DESCRIPTION": "双下肢动脉彩超",
"EXAM_CLASS": "彩超",
"PERFORM_BY": "3003",
"CHARGES": 216.6,
"EXAM_SUB_CLASS": "血管彩超"
},
{
"DESCRIPTION_CODE": "CCHK00025",
"PRICE": 135.4,
"CLINIC_ITEM_CLASS": "D",
"DESCRIPTION": "颈部血管",
"EXAM_CLASS": "彩超",
"PERFORM_BY": "3003",
"CHARGES": 135.4,
"EXAM_SUB_CLASS": "血管彩超"
},
{
"DESCRIPTION_CODE": "CCSZYD0012",
"PRICE": 108.3,
"CLINIC_ITEM_CLASS": "D",
"DESCRIPTION": "四肢血管彩超 (单肢)",
"EXAM_CLASS": "彩超",
"PERFORM_BY": "3003",
"CHARGES": 108.3,
"EXAM_SUB_CLASS": "血管彩超"
},
{
"DESCRIPTION_CODE": "CCHK00024",
"PRICE": 216.6,
"CLINIC_ITEM_CLASS": "D",
"DESCRIPTION": "双下肢静脉彩超",
"EXAM_CLASS": "彩超",
"PERFORM_BY": "3003",
"CHARGES": 216.6,
"EXAM_SUB_CLASS": "血管彩超"
},
{
"DESCRIPTION_CODE": "CCSZYD004",
"PRICE": 108.3,
"CLINIC_ITEM_CLASS": "D",
"DESCRIPTION": "右下肢血管彩超",
"EXAM_CLASS": "彩超",
"PERFORM_BY": "3003",
"CHARGES": 108.3,
"EXAM_SUB_CLASS": "血管彩超"
},
{
"DESCRIPTION_CODE": "CCFBYD0008",
```

```
    "PRICE": 90,
    "CLINIC_ITEM_CLASS": "D",
    "DESCRIPTION": "腹部大血管彩超",
    "EXAM_CLASS": "彩超",
    "PERFORM_BY": "3003",
    "CHARGES": 90,
    "EXAM_SUB_CLASS": "血管彩超"
  },
  {
    "DESCRIPTION_CODE": "CCSSYD0006",
    "PRICE": 117,
    "CLINIC_ITEM_CLASS": "D",
    "DESCRIPTION": "双肾及肾血管彩超",
    "EXAM_CLASS": "彩超",
    "PERFORM_BY": "3003",
    "CHARGES": 117,
    "EXAM_SUB_CLASS": "血管彩超"
  }
],
"resultCode": "0",
"resultDesc": "查询成功"
}
```

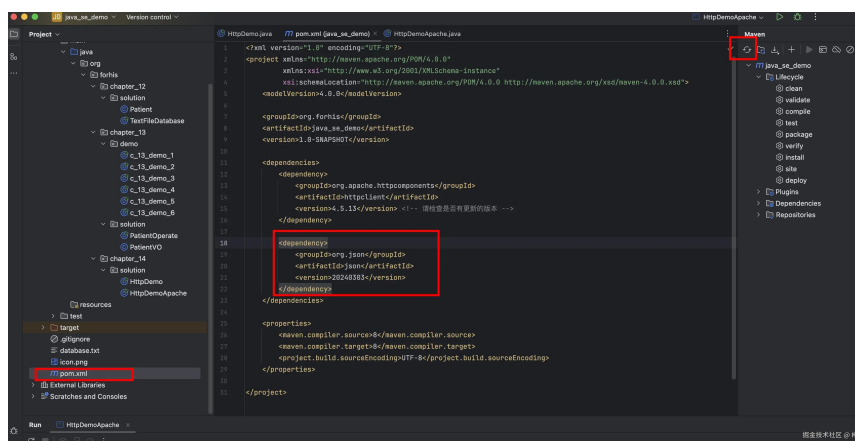
操作步骤:



3、编写一段 Java 程序来发送 Http 请求访问上一步任务中的 API 地址

1. 以下示例代码中模拟了客户端发送请求并打印输出返回结果,该示例中使用的为 Java8 版本,Java11 及以上版本也可引用 HttpClient 所封装好的方法来实现,或者引用其他第三方如 org.apache.http 也可以。

2. 该示例代码中引用了 JSONObject,需要在项目 pom.xml 文件中进行配置。



```
import org.json.JSONObject;
import java.io.*;
import java.net.HttpURLConnection;
import java.net.URL;
import java.nio.charset.StandardCharsets;

public class HttpDemo {

    public static void main(String[] args) throws IOException {
        // 创建 HttpURLConnection 对象
        // http://123.56.60.184:8888/examine
        // http://123.56.60.184:8888/examRptPattern
        String url = "http://123.56.60.184:8888/examine";

        URL obj = new URL(url);
        // 打开连接
        HttpURLConnection con = (HttpURLConnection) obj.openConnection();

        // 设置请求方法为 POST
        con.setRequestMethod("POST");

        // 设置请求头
        con.setRequestProperty("Content-Type", "application/json;charset=UTF-8");
        con.setRequestProperty("Accept", "application/json");

        // 设置请求体
        // JSONObject jsonObject = new JSONObject();
        // jsonObject.put("ExamClass", "彩超");
        // jsonObject.put("ExamSubClass", "血管彩超");
        // String jsonData = jsonObject.toString();
        // byte[] postDataJson = jsonData.getBytes(StandardCharsets.UTF_8);
```

```
// 发送 POST 请求并获取返回数据
con.setDoOutput(true);
DataOutputStream wr = new DataOutputStream(con.getOutputStream());
wr.write(postDataJson);
wr.flush();
wr.close();

// 获取响应码
int responseCode = con.getResponseCode();
System.out.println("\n 发送'POST'请求到: " + url);
System.out.println("Post 请求入参: " + jsonObject);
System.out.println("出参: " + responseCode);

// 读取服务器返回的数据
BufferedReader in = new BufferedReader(
    new InputStreamReader(con.getInputStream()));
String inputLine;
StringBuilder response = new StringBuilder();

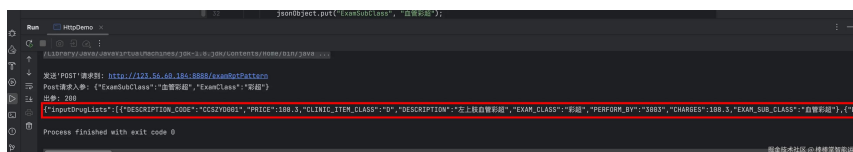
while ((inputLine = in.readLine()) != null) {
    response.append(inputLine);
}

// 关闭连接
in.close();

// 打印结果
System.out.println(response.toString());

}
}
```

1. 观察打印输出的出参结果是否与 Postman 测试的结果一致。



七、实验考核

本实验考核采用【实验随堂查】方式开展。

每个实验完成后，在实验课上通过现场演示的方式向实验指导教师进行汇报，并完成现场问答交流。

每个实验考核满分 100 分，其中实验成果汇报 60 分，现场提问交流 40 分。

实验考核流程：

- (1) 学生演示汇报实验内容的完成情况，实验指导老师现场打分。
- (2) 指导老师结合实验内容进行提问，每位学生提问 2-3 个问题，根据回答的情况现场打分。
- (3) 实验考核结束后，进行公布成绩。

八、创作说明

本实验指导书由河南中医药大学信息技术学院互联网技术教学团队与河南方和信息科技有限公司联合创作。

作者：黄子杰（河南方和信息科技有限公司）

审核：阮晓龙（河南中医药大学信息技术学院）

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