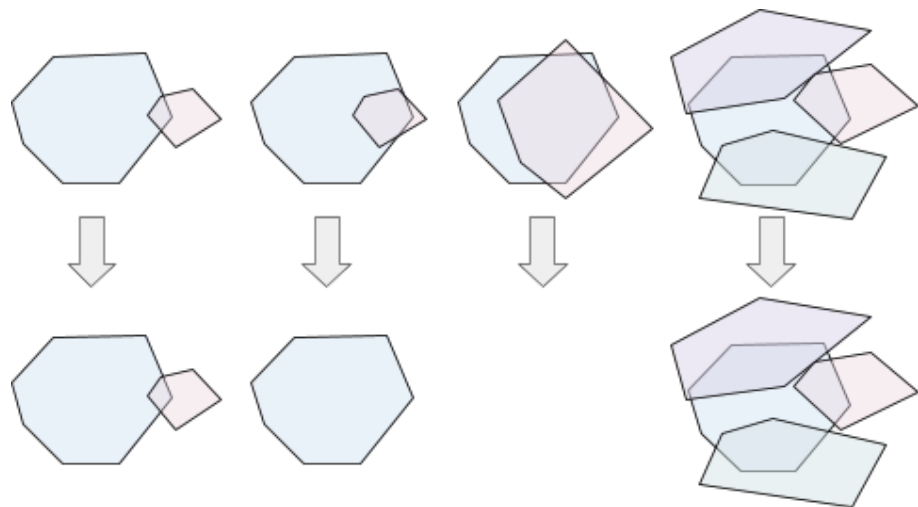


Offline Maas Coding Challenge: Eliminate overlapped convex hulls

Problem

1. Eliminate Overlapped Convex Hulls:
 - Load `convex_hulls.json`.
 - Some of the convex hulls stored in `convex_hulls.json` are overlapped.
 - Eliminate the overlapped convex hulls based on the following rule:
 - Eliminate the convex hull if it has more than 50% of its own area overlapped with another convex hull (pairwise area overlap). If two convex hulls overlap with each other by more than 50%, both convex hulls should be eliminated.
 - Example of an elimination pattern



1. Since the overlap between their convex hulls is 50% or less, neither is eliminated.
 2. The overlap of the convex hulls is more than 50% for the smaller convex hull and 50% or less for the larger convex hull, so only the smaller convex hull is eliminated.
 3. The overlap between the convex hulls is more than 50% for both convex hulls, so both are eliminated.
 4. The total overlap with the larger convex hull is more than 50%, but the overlap with each individual convex hull is 50% or less, so it is not subject to elimination.
2. Output:
 - Generate `result_convex_hulls.json` which stores only the remaining (non-eliminated) convex hulls.
 - The format should be the same as `convex_hulls.json`.

Constraints

The authorized programming languages are C++ and Python. However, if you have skills in both C++ and Python, it is recommended to take the test in C++. Choosing Python will be considered as not having C++ in your skill set.

- You are allowed to use the standard library in both C++ and Python.
 - Avoid using libraries outside the standard library, especially for calculating area or intersection.
 - For Python, this includes libraries such as math, datetime, collections, itertools, functools, and others commonly included in Python's standard library.
- Put appropriate comments for the reviewer to understand your code easily
- For C++:
 - Follow a coding style guide which you are using.
 - E.g. Google C++ Style Guide
 - Mention the style guide as a comment at the top of your program code.
 - E.g. `// This code follows Google C++ Style Guide.`
- For Python:
 - Follow a coding style guide which you are using.
 - E.g. PEP 8 -- Style Guide for Python Code
 - Mention the style guide as a comment at the top of your program code.
 - E.g. `# This code follows PEP 8 -- Style Guide for Python Code.`
- You are allowed to use a JSON library to read/write a JSON file.
 - For C++: E.g. `nlohmann/json`
 - For Python: E.g. `json` (standard library)

What to return back to us

Submit the following files:

1. Your code and the code for the JSON library you used
2. Your `result_convex_hulls.json`
3. Instructions to build and run your code so that we can reproduce your result using your submission

While tackling this problem, design the logic to solve the problem accurately and efficiently, and provide high-quality code. Good luck!

convex_hulls.json

```
{
  "convex hulls" : [
    {
      "ID" : 0,
      "apexes" : [
        {
          "x" : -36.230472607948855,
          "y" : -7.6428910113091888
        },
        {
          "x" : -35.782962675034355,
          "y" : -10.532111140042389
        },
        {
          "x" : -33.175859704884601,
          "y" : -12.73348359681188
        },
        {
          "x" : -29.849466292457123,
          "y" : -12.260130976378946
        },
        {
          "x" : -27.842505716133928,
          "y" : -9.814957111709532
        },
        {
          "x" : -27.425332927369368,
          "y" : -6.9247718530457405
        },
        {
          "x" : -28.925156060433892,
          "y" : -5.7464646090869564
        },
        {
          "x" : -31.503832180760014,
          "y" : -4.7110311400746241
        },
        {
          "x" : -33.738369118245714,
          "y" : -4.816124665018549
        }
      ]
    }
  ]
}
```

```
]
},
{
  "ID" : 1,
  "apexes" : [
    {
      "x" : -29.038862395260026,
      "y" : 5.7677750988766547
    },
    {
      "x" : -28.107662128224433,
      "y" : 3.4875824983992629
    },
    {
      "x" : -25.722376002803117,
      "y" : 2.1842458279491552
    },
    {
      "x" : -23.296171845282629,
      "y" : 3.0430863570394422
    },
    {
      "x" : -21.211092014580231,
      "y" : 4.1922272253458459
    },
    {
      "x" : -20.713618417030943,
      "y" : 7.7649880888676535
    },
    {
      "x" : -22.299220457065871,
      "y" : 10.072432410981776
    },
    {
      "x" : -25.238661480658948,
      "y" : 10.02812181873054
    },
    {
      "x" : -27.790767690595089,
      "y" : 9.0601380112079255
    },
    {
```

```
        "x" : -28.837138784914828,  
        "y" : 7.8227487097086623  
    }  
]  
},  
{  
    "ID" : 2,  
    "apexes" : [  
        {  
            "x" : -29.317074184905096,  
            "y" : 14.70919261723742  
        },  
        {  
            "x" : -29.493377184870496,  
            "y" : 10.801421519074665  
        },  
        {  
            "x" : -27.893104292360135,  
            "y" : 6.9924469132654394  
        },  
        {  
            "x" : -26.008093571799918,  
            "y" : 5.6789251620849655  
        },  
        {  
            "x" : -23.269802284543289,  
            "y" : 5.3877617768812911  
        },  
        {  
            "x" : -20.509021547248153,  
            "y" : 5.9465329058752445  
        },  
        {  
            "x" : -18.962299699170671,  
            "y" : 7.4608604203397704  
        },  
        {  
            "x" : -16.869496248761038,  
            "y" : 11.807376751686945  
        },  
        {  
            "x" : -17.410636728747249,
```

```
        "y" : 14.692318455469206
      },
      {
        "x" : -20.218251244498902,
        "y" : 17.381225426620745
      },
      {
        "x" : -23.013378115357227,
        "y" : 18.149694669585301
      },
      {
        "x" : -26.255815620888939,
        "y" : 17.060802197553983
      }
    ]
  },
  {
    "ID" : 3,
    "apexes" : [
      {
        "x" : -19.942447727272111,
        "y" : 28.743830707388497
      },
      {
        "x" : -19.192702786588484,
        "y" : 24.463450349218306
      },
      {
        "x" : -16.101220945052091,
        "y" : 21.674112693803181
      },
      {
        "x" : -12.847996197241969,
        "y" : 21.361601704164684
      },
      {
        "x" : -8.3266665757265628,
        "y" : 24.800928321225285
      },
      {
        "x" : -8.0879862945723744,
        "y" : 29.009561132826548
      }
    ]
  }
]
```



```
    },
    {
      "x" : -10.306635834883764,
      "y" : 33.187816317543025
    },
    {
      "x" : -15.529438375541758,
      "y" : 35.510995805332072
    }
  ]
},
{
  "ID" : 4,
  "apexes" : [
    {
      "x" : -13.568139474807595,
      "y" : 28.398212603478157
    },
    {
      "x" : -13.055197212933081,
      "y" : 27.390990911921676
    },
    {
      "x" : -11.203877919319552,
      "y" : 26.476540882868107
    },
    {
      "x" : -10.198534429420079,
      "y" : 28.034334630389139
    },
    {
      "x" : -10.678330744305754,
      "y" : 29.45390998498425
    },
    {
      "x" : -11.451652605283925,
      "y" : 30.782591878733342
    },
    {
      "x" : -13.396471005187777,
      "y" : 31.869133691488912
    }
  ]
}
```

```
]
},
{
  "ID" : 5,
  "apexes" : [
    {
      "x" : -23.735783320972587,
      "y" : -12.359878714969966
    },
    {
      "x" : -23.477282391333347,
      "y" : -14.831633175308639
    },
    {
      "x" : -20.497726002732406,
      "y" : -16.689705524175565
    },
    {
      "x" : -17.788183953628163,
      "y" : -17.859900144075368
    },
    {
      "x" : -14.700848841627362,
      "y" : -18.715791979721075
    },
    {
      "x" : -10.858824822018732,
      "y" : -18.759800665102375
    },
    {
      "x" : -11.204162906822262,
      "y" : -15.876982746373244
    },
    {
      "x" : -12.577469338647688,
      "y" : -14.262368666122143
    },
    {
      "x" : -15.64715769411066,
      "y" : -12.317905720093336
    },
    {
```

```
        "x" : -19.198697967614976,
        "y" : -11.298764157676032
    },
    {
        "x" : -21.200093052490274,
        "y" : -11.156035948600334
    }
]
},
{
    "ID" : 6,
    "apexes" : [
        {
            "x" : -9.9552786755974694,
            "y" : -21.716625257515489
        },
        {
            "x" : -7.3165200944844173,
            "y" : -23.159923220317296
        },
        {
            "x" : -4.1474429797409584,
            "y" : -23.745727172691886
        },
        {
            "x" : -1.0601993270303183,
            "y" : -23.153143695599056
        },
        {
            "x" : -2.3871463268683328,
            "y" : -19.748179946065193
        },
        {
            "x" : -5.1293539496081166,
            "y" : -17.054029419792812
        },
        {
            "x" : -9.4130614574963829,
            "y" : -15.83661545508852
        },
        {
            "x" : -12.928723685870864,
```

```
        "y" : -15.925885575652444
    },
    {
        "x" : -14.404160152460463,
        "y" : -16.882467902307383
    },
    {
        "x" : -13.442512097163103,
        "y" : -19.401156626158922
    }
]
},
{
    "ID" : 7,
    "apexes" : [
        {
            "x" : -9.6066341276680305,
            "y" : -0.49468875785316868
        },
        {
            "x" : 4.3949387496620602,
            "y" : -7.3520481606042267
        },
        {
            "x" : 8.5354082848963344,
            "y" : -0.51037142142320135
        },
        {
            "x" : -6.0213121217179832,
            "y" : 5.8044143621524995
        }
    ]
},
{
    "ID" : 8,
    "apexes" : [
        {
            "x" : -6.0565490951022412,
            "y" : -4.4602214192031511
        },
        {
            "x" : 0.3611278768256625,
```

```
        "y" : -7.2783960122422968
      },
      {
        "x" : 5.4373947438006098,
        "y" : 2.1874380074019086
      },
      {
        "x" : -0.78849537489952581,
        "y" : 4.9759691374605381
      }
    ]
  },
  {
    "ID" : 9,
    "apexes" : [
      {
        "x" : 4.2691302004402587,
        "y" : 15.210522308779218
      },
      {
        "x" : 7.4872893322217351,
        "y" : 13.417075436422408
      },
      {
        "x" : 9.5924490749639517,
        "y" : 15.094652787327789
      },
      {
        "x" : 10.228887872900032,
        "y" : 17.941812122762883
      },
      {
        "x" : 8.9910276768839594,
        "y" : 20.096828358884466
      },
      {
        "x" : 5.6745077235789267,
        "y" : 20.491623810213412
      },
      {
        "x" : 4.1310184162442738,
        "y" : 18.91269385450056
      }
    ]
  }
]
```

```
    },
    {
      "x" : 3.5159084728435346,
      "y" : 17.160158226947999
    }
  ]
},
{
  "ID" : 10,
  "apexes" : [
    {
      "x" : 3.7891219380933308,
      "y" : 21.220314158552242
    },
    {
      "x" : 3.9130585214403482,
      "y" : 19.161109206211393
    },
    {
      "x" : 5.0262282770701177,
      "y" : 17.287637397943399
    },
    {
      "x" : 7.0514351848555634,
      "y" : 16.396313586661336
    },
    {
      "x" : 8.6486931252421755,
      "y" : 17.236812062058107
    },
    {
      "x" : 10.320961739368954,
      "y" : 18.791602969560927
    },
    {
      "x" : 10.647039832155087,
      "y" : 20.90125835506575
    },
    {
      "x" : 8.6373170069372236,
      "y" : 22.763203012437202
    },
  ],
}
```

```
        {
          "x" : 5.8447293811724421,
          "y" : 23.371570086156339
        }
      ]
    },
    {
      "ID" : 11,
      "apexes" : [
        {
          "x" : -1.8574860785575993,
          "y" : 12.289017380331416
        },
        {
          "x" : 2.8248983552673508,
          "y" : 11.329643967136462
        },
        {
          "x" : 5.9170640883650094,
          "y" : 12.913575712809347
        },
        {
          "x" : 8.005688601105021,
          "y" : 15.564874909132357
        },
        {
          "x" : 8.2447384582088716,
          "y" : 18.415589851487425
        },
        {
          "x" : 7.7410720057596336,
          "y" : 21.168732411203223
        },
        {
          "x" : 4.0385357367024426,
          "y" : 24.688176250401
        },
        {
          "x" : 0.75011764603186748,
          "y" : 25.016774381567529
        },
        {
```

```
        "x" : -1.7012766004786499,  
        "y" : 22.833781279344464  
    },  
    {  
        "x" : -4.0290120251986536,  
        "y" : 19.825296967471104  
    },  
    {  
        "x" : -4.6478258350608712,  
        "y" : 15.580955471394191  
    }  
]  
}  
]
```