```
rccStep[g_Graph] :=
 Module[{edges, usedEdges, newEdges, nextV}, edges = EdgeList[g];
  nextV = Max[VertexList[g]] + 1;
  usedEdges = {};
  newEdges = {};
  Do[With[{e1 = edges[[i]], e2 = edges[[j]]},
   If[Intersection[usedEdges, {e1, e2}] == {} &&
    Length[Intersection[List @@ e1, List @@ e2]] == 1,
    Module[{y = Intersection[List @@ e1, List @@ e2][[1]],
     x = Complement[
       List @@ e1, {Intersection[List @@ e1, List @@ e2][[1]]}][[
       1]], z =
      Complement[
       List @@ e2, {Intersection[List @@ e1, List @@ e2][[1]]}][[
       1]], w}, w = nextV;
     nextV++;
     AppendTo[newEdges, x ⇀ z];
     AppendTo[newEdges, x ⇀ w];
     AppendTo[newEdges, w ⇀ z];
     AppendTo[usedEdges, e1];
     AppendTo[usedEdges, e2];]]], {i, Length[edges]}, {j, i + 1,
    Length[edges]}];
  Graph[Union[Complement[edges, usedEdges], newEdges]]];
```

```
(*2. 初始宇宙：基础三角形*)
initG = CycleGraph[3];
steps = 15;
results = NestList[rccStep, initG, steps];
```

```
(*3. 全量真理属性提取*)
analysis =
 Table[Module[{g = results[[i]], totalM, residM, dimension,
   clusterCoeff, entropy}, totalM = EdgeCount[g];
  residM = Total[Abs[VertexDegree[g] - Mean[VertexDegree[g]]]];
  (*维度监测：看逻辑平面如何向 3D 物理空间生长*)
  dimension = If[i < 2, 2.0, N[Log[EdgeCount[g]] / Log[VertexCount[g]]]];
  (*集群系数：验证各向异性（宇宙网结构)*)
  clusterCoeff = GlobalClusteringCoefficient[g];
```

```
(*结构熵：验证 0.14 临界点的相变*)
entropy =
 Module[{degrees =
   VertexDegree[
    g]}, -Total[(♯/Total[degrees])*
    Log[♯/Total[degrees] + 1*^-10] & /@ degrees]];
 {i - 1, totalM/(residM + 1*^-10), dimension, clusterCoeff,
  entropy}], {i, Length[results]}];
```

```
(*4．结果可视化：真理的三重奏*)
Grid[{{ListLinePlot[analysis[[All, {1, 2}]],
  PlotLabel →, GridLines → {{}, {1.875}},
  PlotStyle → Red, ImageSize → 300],
 ListLinePlot[analysis[[All, {1, 3}]],
  PlotLabel →,
  GridLines → {{}, {3.14}}, PlotStyle → Blue,
  ImageSize → 300]}, {ListLinePlot[analysis[[All, {1, 4}]],
  PlotLabel →, PlotStyle → Orange,
  ImageSize → 300],
 ListLinePlot[analysis[[All, {1, 5}]],
  PlotLabel →, PlotStyle → Purple,
  ImageSize → 300]}}]
```

```
(*在不改动 Rule 的前提下，增加广义相对论度规监测*)
grAnalysis =
 Table[Module[{g = results[[i]], ricciK,
   massDensity}, (*测量局部因果链堆叠密度（对应 T_uv）*)
  massDensity = Mean[VertexDegree[g]];
  (*测量离散曲率（对应 G_uv）*)(*简化版：通过环结构分布探测拓扑曲率*)
  ricciK = N[Total[Length /@ FindCycle[g, {3}, All]]/VertexCount[g]];
  {massDensity, ricciK}], {i, Length[results]}];
```

```
(*绘制引力关联图：密度 vs 曲率*)
ListLinePlot[grAnalysis,
 PlotLabel →,
 AxesLabel → {, },
 PlotStyle → {Thick, Darker[Green]}]
```

1.875 Ratio Pulse

Dimension Growth (Target ~3)

Out[6]=

Anisotropy (Clustering)

Causal Entropy (0.14 Point)

Emergence of Einstein Field Equations

Topology Curvature (G)

Out[8]=

Causal Mass Density (T)