```
q[{u_List, v_List}] := q[{u, v}] = N[Dot[u - v, u - v] ^ (-3 / 2)];
(*exponent -3 is choice. but can replace with -2 or -4,-5,...*)

proj1[w_List] := proj1[w] = { w[[1]] (1 - w[[3]]) ^ (-1) , w[[2]] (1 - w[[3]]) ^ (-1) , 0 };
q1[w_List] := q1[w] = N[ ( q[{w, proj1[w] }] + (1 / 2) q[{w, {0, 0, 1.}}])];
(*  above cost c(w,z) to target z *)


proj2[w_List] := proj2[w] = { 0, w[[2]] (1 - w[[1]]) ^ (-1), w[[3]] (1 - w[[1]]) ^ (-1) };
q2[w_List] := q2[w] = N[ ( q[{w, proj2[w] }] + (1 / 2) q[{w, {1., 0., 0.}}])];
(* cost c(w,x) with target x  *)


proj3[w_List] := proj3[w] = { w[[1]] (1 - w[[2]]) ^ (-1) , 0, w[[3]] (1 - w[[2]]) ^ (-1) };
q3[w_List] := q3[w] = N[ ( q[{w, proj3[w] }] + (1 / 2) q[{w, {0., 1., 0.}}])];
(* cost c(w,x) with target y  *)
```

```
prod[n_Integer] := prod[n] = ((Table[e^y[j], {j, 1, 3}] // Total) ^n // Expand);
A = {{1, 0, 0}, {0, 1, 0}, {0, 0, 1}};
simp[m_Integer] := simp[m] = (Level[(
        (prod[m] //. Table[y[j] → pt[A[[j]]], {j, 1, 3}]) //.
         {n_Integer pt[z_List] → pt[Times[n, z]]}
       ) //. {pt[z_] + pt[z1_] → pt[z + z1], n_Integer e^z_ → e^z}, 1]) //.
    {e^pt[z_List] → v[Times[N[1 / m], z]]};


B :=
  ((simp[21] // Total) /. {v[{z1_, z2_, z3_}] :> c[ q1[{z1, z2, z3}] ] v[{z1, z2, z3}]
    }); (*evaluating cost c(w,z) as sum q1+
 q2 over gates containing target z.   *)

B1 := Coefficient[(B /. {c[z_Real] → f c[z]}), f];
B2 := B2 = (B1 /. {c[a_Real] v[{z1_, z2_, z3_}] → pt[{z1, z2, a}]});
B3 := (Level[B2, 1]) //. pt[z_List] → z;


F := ((simp[21] // Total) /. {v[{z1_, z2_, z3_}] :> c[ q2[{z1, z2, z3}]] v[{z1, z2, z3}]
    }); (* evaluating cost c(w,x)  *)
F1 := Coefficient[(F /. {c[z_Real] → f c[z]}), f];
F2 := F2 = (F1 /. {c[a_Real] v[{z1_, z2_, z3_}] → pt1[{z1, z2, a}]});
F3 := (Level[F2, 1]) //. pt1[z_List] → z;

G := ((simp[21] // Total) /. {v[{z1_, z2_, z3_}] :> c[ q3[{z1, z2, z3}]] v[{z1, z2, z3}]
    }); (* evaluating cost c(w,y)  *)
G1 := Coefficient[(G /. {c[z_Real] → f c[z]}), f];
G2 := G2 = (G1 /. {c[a_Real] v[{z1_, z2_, z3_}] → pt2[{z1, z2, a}]});
G3 := (Level[G2, 1]) //. pt2[z_List] → z;

Print[ListPointPlot3D[{B3, F3, G3},
   PlotRange → {0, 100}, PlotStyle -> PointSize[Large]]];
```

Power::infy : Infinite expression $\frac{1}{0.^{3/2}}$ encountered. ≫

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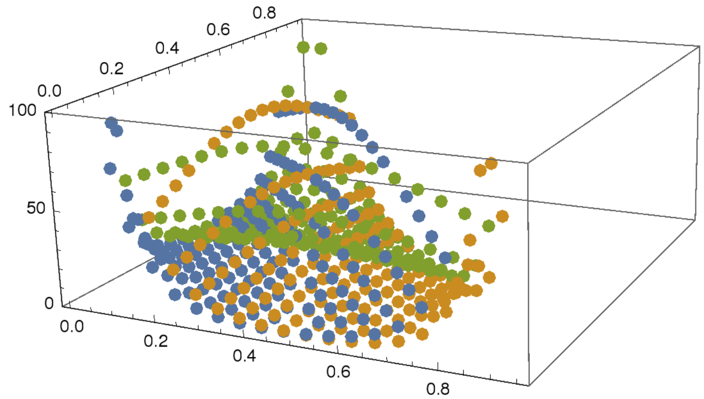
General::stop : Further output of Power::infy will be suppressed during this calculation. ≫



0.0
0.2
0.4
0.6
0.8
100
50
0
0.0
0.2
0.4
0.6
0.8

```
(*Print[ListPointPlot3D[B3,PlotRange->Automatic]];
Print[ListPointPlot3D[F3]];
G2*)

T := T = B2 + F2 + G2;
T1 :=
  T1 = (T //. {pt[{z1_Real, z2_Real, a_Real}] + pt1[{z1_Real, z2_Real, b_Real}] + pt2[
         {z1_Real, z2_Real, c_Real}] → p[{z1, z2}] argval[z, 0.]
        argval[x, (b - a)] argval[y, (c - a) ] max[Min[0., b - a, c - a]] });

T2 := T2 = (T1 //. {
      (argval[y_, l1_Real] max[m_Real] :> maxarg[y] max[m] /; l1 ≤  m),
      (argval[y_, l1_Real] max[m_Real] :> max[m]  /; l1 > m)
     });

sub[z] := sub[z] = (Coefficient[T2, maxarg[z]]) //. {maxarg[z_] :> 1};
sub[y] := sub[y] = (Coefficient[T2, maxarg[y]]) //. {maxarg[z_] :> 1};
sub[x] := sub[x] = (Coefficient[T2, maxarg[x]]) //. {maxarg[z_] :> 1};
postsub[y] :=
  postsub[y] = Level[sub[y], 1] //. {max[l_Real] p[{z1_Real, z2_Real}] → {z1, z2, l}};
postsub[x] := postsub[x] = Level[sub[x], 1] //.
    {max[l_Real] p[{z1_Real, z2_Real}] → {z1, z2, l}};
postsub[z] := postsub[z] = Level[sub[z], 1] //.
    {max[l_Real] p[{z1_Real, z2_Real}] → {z1, z2, l}};

ListPointPlot3D[{postsub[x], postsub[z], postsub[y]},
 PlotStyle -> PointSize[Large]]
```