```
SetDirectory@NotebookDirectory[]
Needs["FCMLib`", FileNameJoin[{"../lib", "FCMLib-cur.wl"}]]
$FCMLibVersion
```

```
/Users/oosoba/Documents/RAND/Coding/fcm-fusion/lib
```

```
Fuzzy Cognitive Map Library ver. 0.0.8
```

FCM Combination Demo

```
nds = {
   (*{1,"HCP","Hypercoagulation Positional Factors"},
   {2,"stas", "Blood Stasis"},
   {3,"inju", "Endothelial Injury"},
   {4,"HCF", "Hypercoagulation Factors"}*)
   {1, "C1"},
   {2, "C2"},
   {3, "C3"},
   {4, "C4"}
  };
nds[[ ;; , 2]] = Map[Style[#, 22, Bold] &, nds[[ ;; , 2]]];
(*gspec={{1,2,1},{1,3,-1},{1,4,1},{2,4,-1},{3,1,-1},{3,4,-1},{3,2,1},{4,3,1}};
altGspec={{1,2,1},{1,4,1},{2,4,1},{3,1,-1},{3,2,1},{4,3,1}};

gspec={{1,1,1},{1,2,0.4},{1,3,1}, {1,4,1},{2,3,0.5},{3,2,0.4},{3,4,0.75}};
altGspec={{1,1,1},{1,2,0.4},{1,3,1},{2,3,0.5},{3,2,0.4}};*)

gspec1 = {{1, 1, 1}, {1, 2, 1}, {1, 3, 1}, {1, 4, 1}, {2, 3, 1}, {3, 2, 1}, {3, 4, 1}};
gspec2 = {{1, 1, 1}, {1, 2, 1}, {1, 3, 1}, {2, 3, 1}, {3, 2, 1}};
gspec3 = {{1, 2, 1}, {1, 4, 1}, {2, 4, 1}, {3, 1, 1}, {4, 3, 1}};


expFCMs = {
   FCM[nds, gspec1, 0.5],
   FCM[nds[[ ;; 3]], gspec2, 0.5],
   FCM[nds, gspec3, 0.5]
  };

combFCM = FCMJoin[nds, expFCMs, {2, 1, 1}];
compfcms = Flatten@{expFCMs, combFCM};
```

```
compfcms = Table[
  Graph[
   f,
   GraphLayout → "LayeredDrawing",
   EdgeLabelStyle → Directive[24, Bold],
   EdgeStyle → Thick,
   EdgeShapeFunction → GraphElementData[{"FilledArrow", "ArrowSize" → 0.073}],
   VertexLabels → (PropertyValue[f, VertexLabels]),
   VertexShape → Graphics[{EdgeForm[Thick], LightBlue, Disk[{0, 0}, 0.5 × {1.5, 1}]}],
   ImageSize → 72 × 7
  ], {f, compfcms}
 ]
expfcms = compfcms[[ ;; -2]];
candedgs = (EdgeList /@ expfcms)
ucands = Sort@Union@Flatten@candedgs


votes = Outer[Boole@Not@FreeQ[candedgs[[#2]], #1] &, ucands, Range@Length@candedgs];
TableForm@votes
```

```
{{1 ↦ 1, 1 ↦ 2, 1 ↦ 3, 1 ↦ 4, 2 ↦ 3, 3 ↦ 2, 3 ↦ 4},
 {1 ↦ 1, 1 ↦ 2, 1 ↦ 3, 2 ↦ 3, 3 ↦ 2}, {1 ↦ 2, 1 ↦ 4, 2 ↦ 4, 3 ↦ 1, 4 ↦ 3}}
```

```
{1 ↦ 1, 1 ↦ 2, 1 ↦ 3, 1 ↦ 4, 2 ↦ 3, 2 ↦ 4, 3 ↦ 1, 3 ↦ 2, 3 ↦ 4, 4 ↦ 3}
```

```
1    1    0
1    1    1
1    1    0
1    0    1
1    1    0
0    0    1
0    0    1
1    1    0
1    0    0
0    0    1
```

```
Total@Transpose@votes
Select[Range@Length@ucands, (Total[Transpose@votes][[#]] < 2) &]
vetoed = ucands[[%]]
allowed = Complement[ucands, vetoed]
```

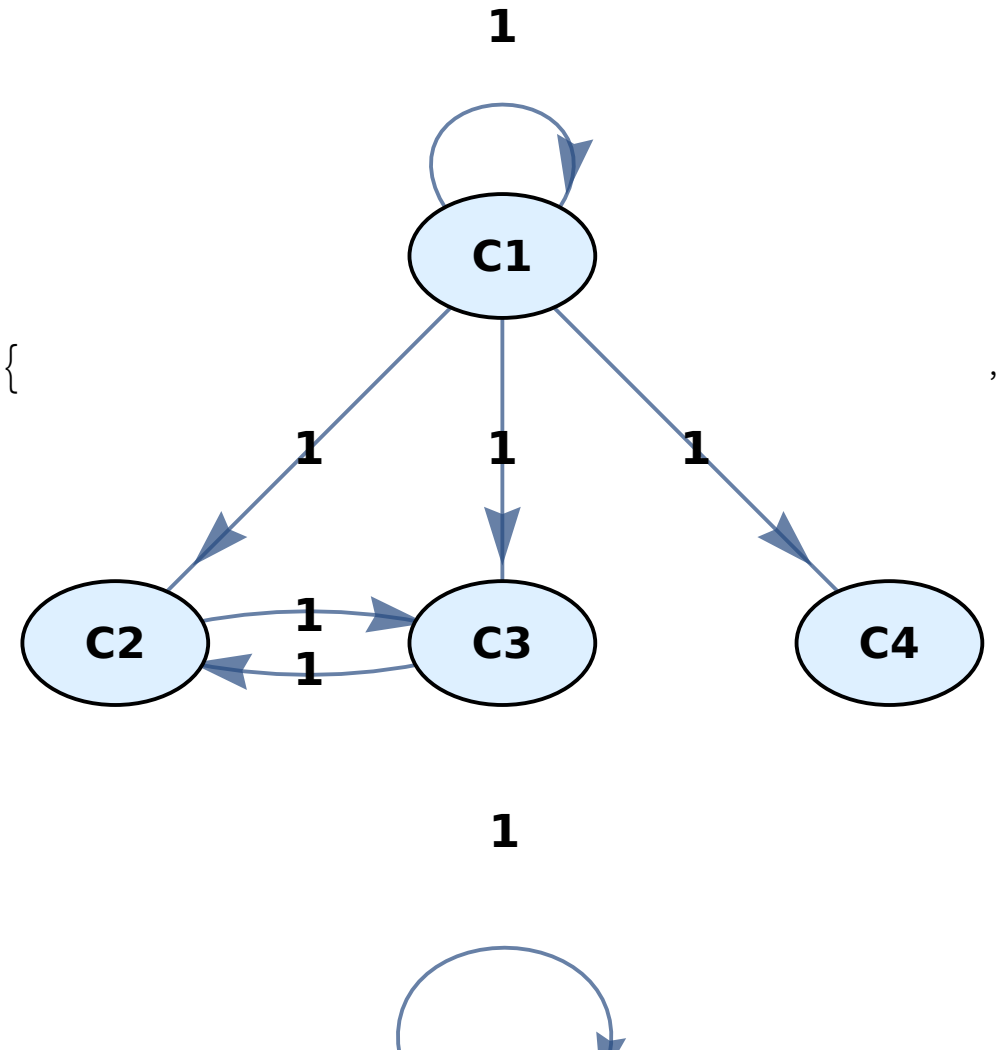
```
{2, 3, 2, 2, 2, 1, 1, 2, 1, 1}
```

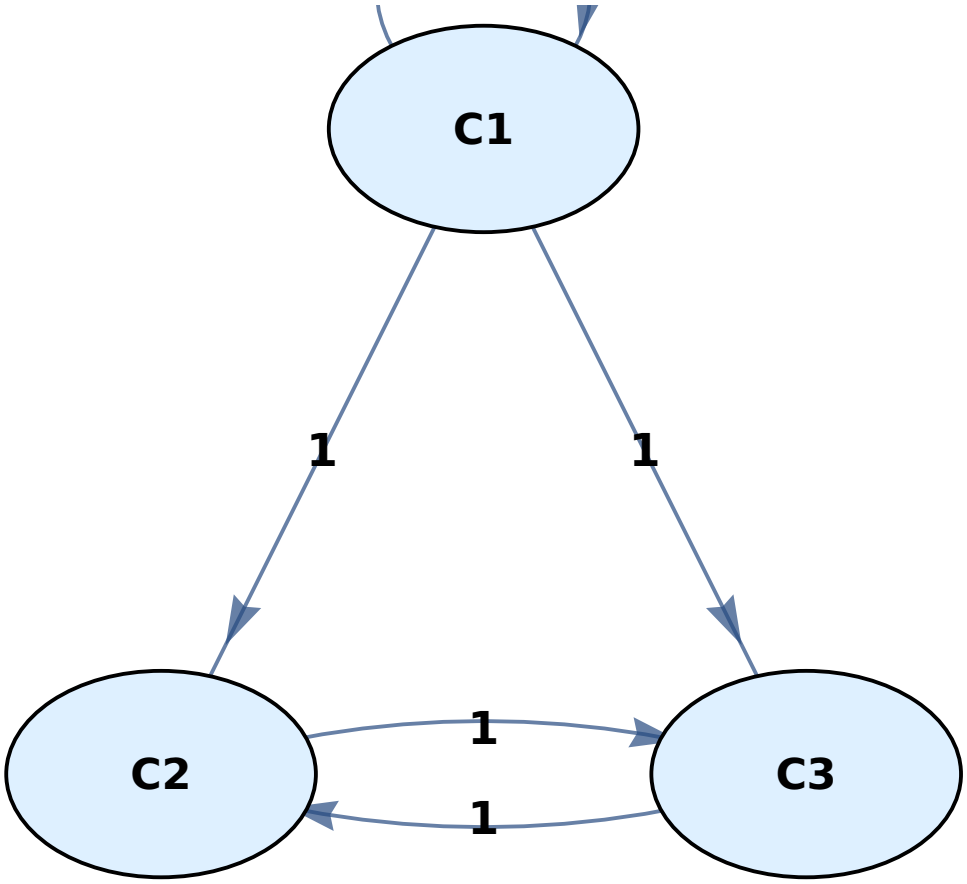
```
{6, 7, 9, 10}
```

```
{2 ↦ 4, 3 ↦ 1, 3 ↦ 4, 4 ↦ 3}
```

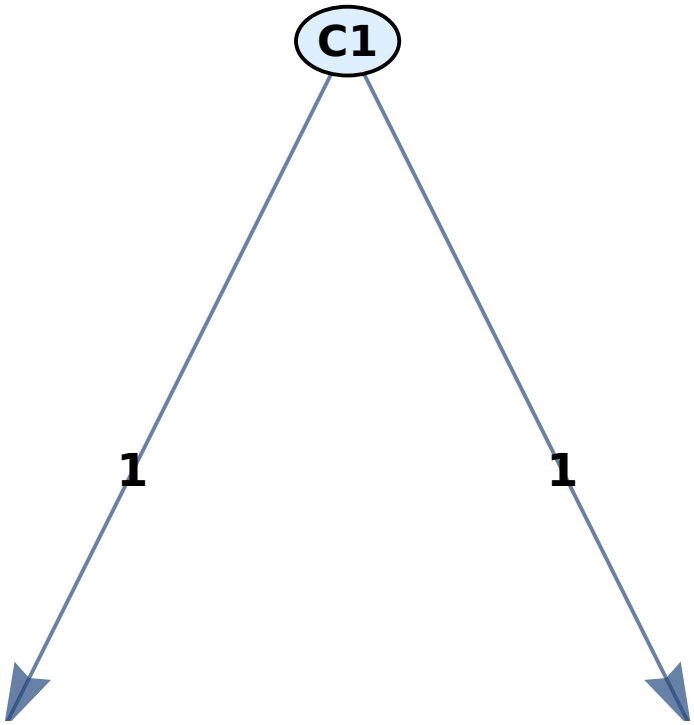
```
{1 ↦ 1, 1 ↦ 2, 1 ↦ 3, 1 ↦ 4, 2 ↦ 3, 3 ↦ 2}
```

```
updfcms = Table[
  EdgeDelete[f, Intersection[EdgeList[f], vetoed]],
  {f, expfcms}
 ]
(*FCMJoin[nds,updfcms,{2,1,1,1}]*)
```




C1
1
1
C2
1
1
C3

,


C1
1
1

}


```
FCMJoinByVote[nodespec_?MatrixQ,fcms_List,wgts_:0,sz_Real:0.25, asz_Real:0.02]:=Module[
    {n=Length@fcms,ws,fincm,newedgs,ucands,candedgs=(EdgeList/@fcms),votes,vetoedLnks}
    ws = If[
        n==Length@wgts,
        (wgts/Total[wgts]),
        ConstantArray[1/n,n]
    ];
    ucands = Sort@Union@Flatten@candedgs;
    votes=Outer[Boole@Not@FreeQ[candedgs[[#2]],#1]&,ucands, Range@Length@candedgs]; (*c
    vetoedLnks = ucands[[Select[Range@Length@ucands, (Total[Transpose@votes][[#]]<2)&]]];
    fincm = Table[
        EdgeDelete[ f,Intersection[EdgeList[f], vetoedLnks] ],
        {f,fcms}
    ];
    fincm = FCMJoin[nodespec,fincm,ws];
    Return[fincm];
]
```

```
FCMJoinByVote[nds, expfcms, {2, 1, 1, 1}]
```

```
Grid[
 {compfcms,
  Panel /@ (Style[#, 22] & /@
     {"Expert #1", "Expert #2", "Expert #3", MatrixForm@FCMat@Last@compfcms})
 },
 Spacings → {0, 0}
]
(*Export["fcm-combo.pdf",%]*)
(*Export["fcm-combo.eps",%]*)
```