BC Cancer Agency
CARE + RESEARCH
An agency of the Provincial Health Services Authority

Cancer Surveillance & Outcomes

Explaining Interaction Effects with 3D Graphics in SAS

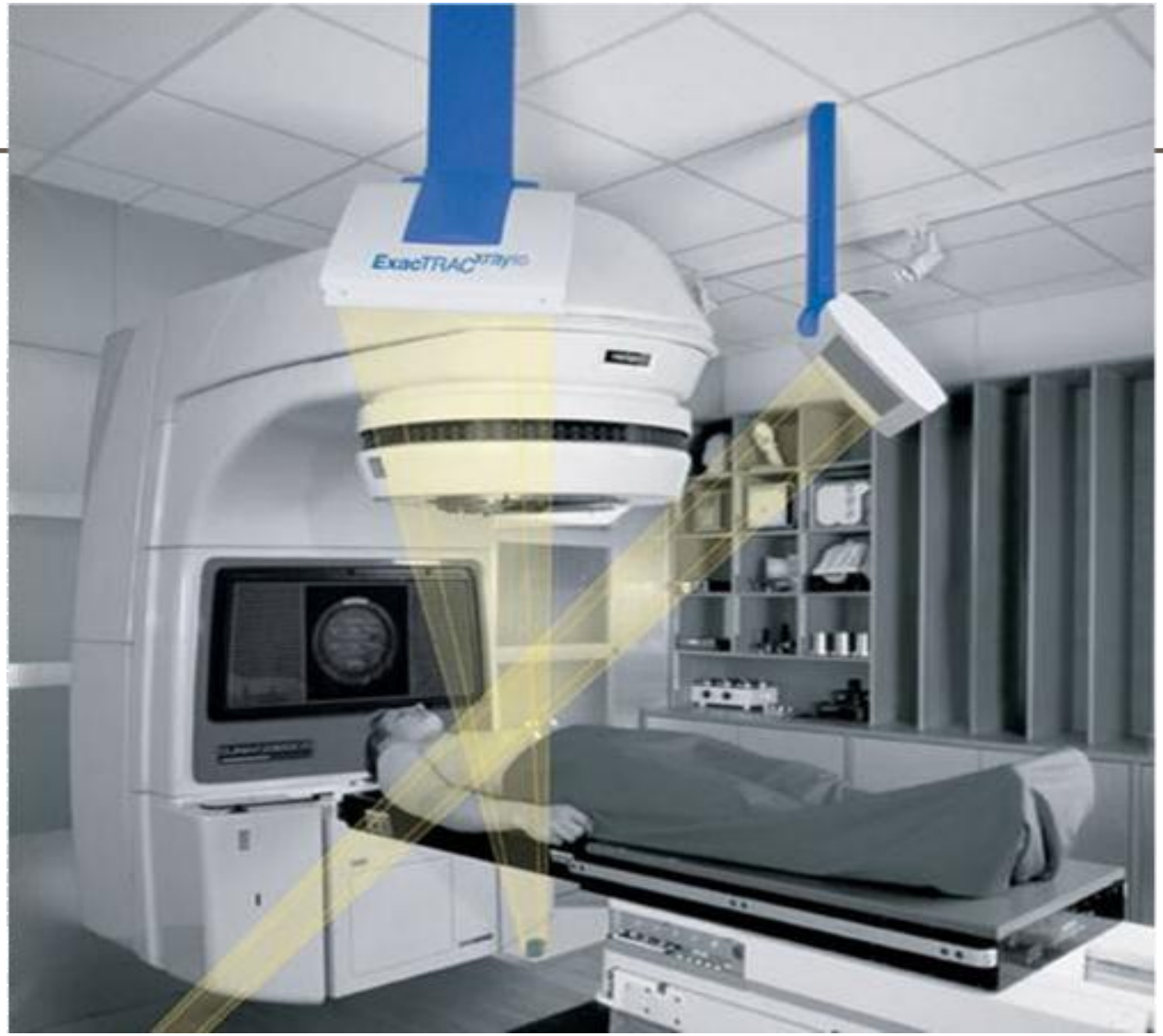
Jeremy Hamm
Cancer Surveillance & Outcomes (CSO)
Population Oncology
BC Cancer Agency

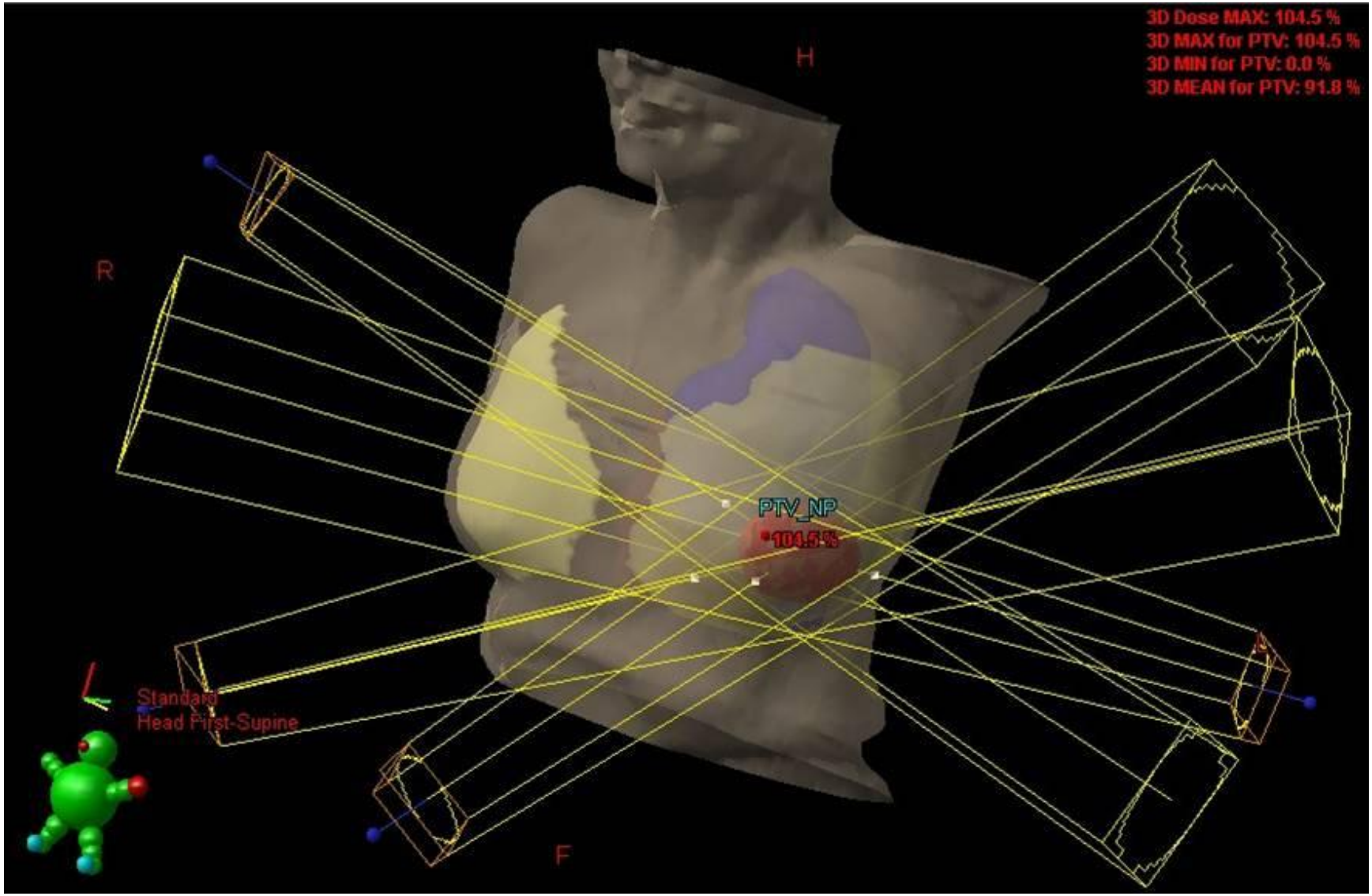
Outline

- Clinical Background
- Analysis
- 3D Graphic

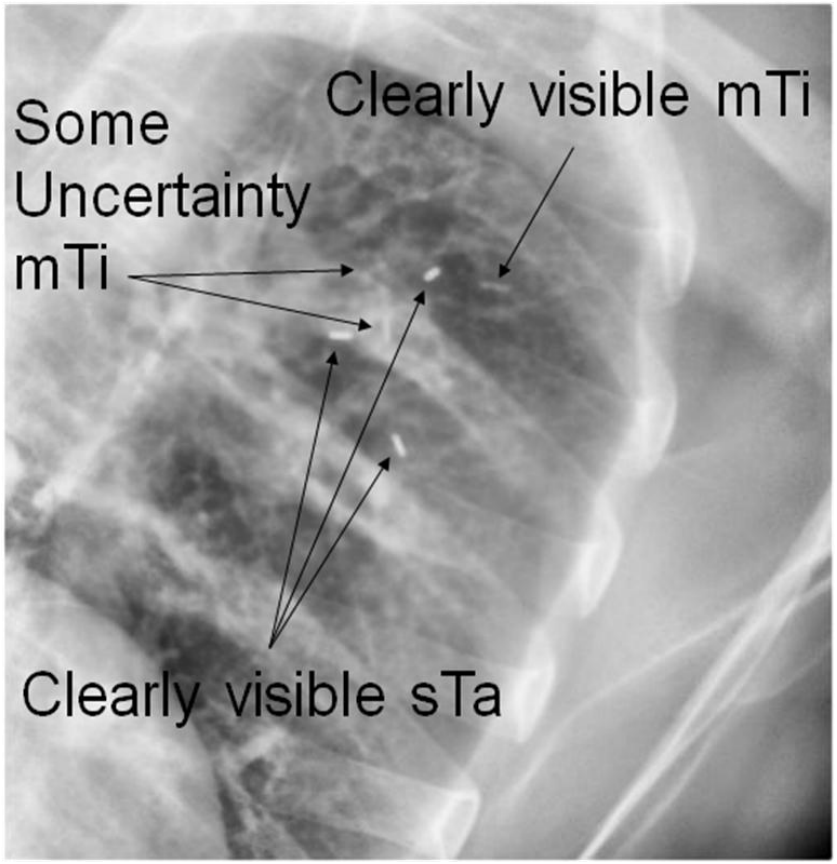
Background

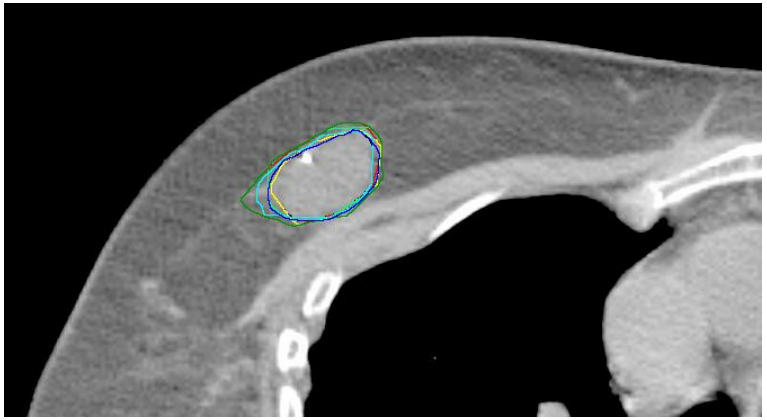
- Surgical clips are routinely placed in the tumor bed during partial mastectomies
  - Allows radiation oncologists to properly map the contour that may need to be radiated
  - Contouring is performed using X-ray or CT scan


ExactTRAC


3D Dose MAX: 104.5 %
3D MAX for PTV: 104.5 %
3D MIN for PTV: 0.0 %
3D MEAN for PTV: 91.8 %
H
R
PTV_NP
104.5 %
Standard
Head First-Supine
F

Background





X-ray and CT scan showing visible clips and resulting contour

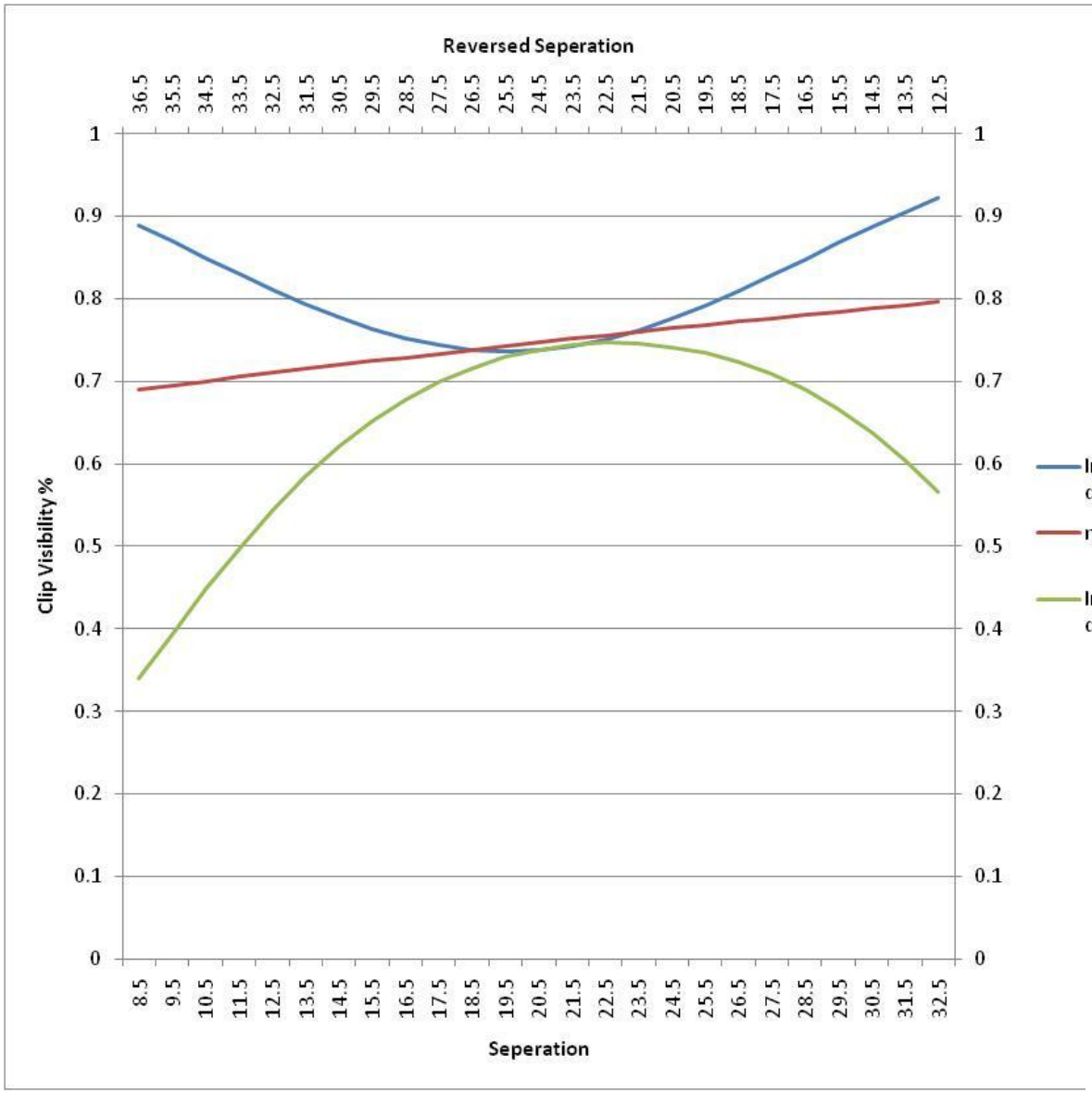
Research question

- Does seperation - distance between where beam enters and leaves the body – affect clip visibility?
  - Maximum of 6 clips used and defined as clearly visible or otherwise
  - 3 reviewers
  - Outcome variable is overall percentage of visible clips per patient
    - Eg. 6 clips x 3 reviewers=18 possible clearly viewed

Analysis

- Basic genmod logistic model associating medial seperation and lateral seperation with clip visibility

Parameter	DF	Estimate	Wald Chi-Square	Pr > ChiSq
Intercept	1	5.0607	7.61	0.0058
RPO_Sep	1	-0.1830	5.35	0.0207
LPO_Sep	1	-0.1874	5.54	0.0186
RPO_Sep*LPO_Sep	1	0.0086	6.29	0.0121



Indicates that visibility is good if both seperations are small or large but visibility is low at opposite extremes

Explaining Interaction

- I think that this interaction effect might be better explained with some sort of cool surface graph
  - SAS should be able to do something like that.
  - Dug around and found a template in the GTL (graphing template language) that supported a 3dimensional type graph

Graphing in 3 Steps

- 1. Surface plots require a grid structure to be created.
  - This can be done using proc g3grid

```
proc g3grid data=test out=mti;
   grid LPO_Sep*rpo_sep=mean_all /
     axis1=10 to 35 by 2.5
     axis2=10 to 35 by 2.5;
run;
```

  - This interpolates results based on the supplied grid and produces a dataset that can be used

Proc G3grid

	LPO Sep	RPO Sep	mean_all
1	10	10	0.0431351108
2	12.5	10	0.2620856853
3	15	10	0.4687515562
4	17.5	10	0.640008466
5	20	10	0.7572894116
6	22.5	10	0.8229445926
7	25	10	0.7816329478
8	27.5	10	0.7068383431
9	30	10	0.6089554645
10	32.5	10	0.511286642
11	35	10	0.4348621675
12	10	12.5	0.2549536961
13	12.5	12.5	0.4204498616
14	15	12.5	0.5915182775
15	17.5	12.5	0.7452996359

Covariate Values

Model Estimates

Graphing in 3 Steps

- Use proc template with the layout 'overlay3d'

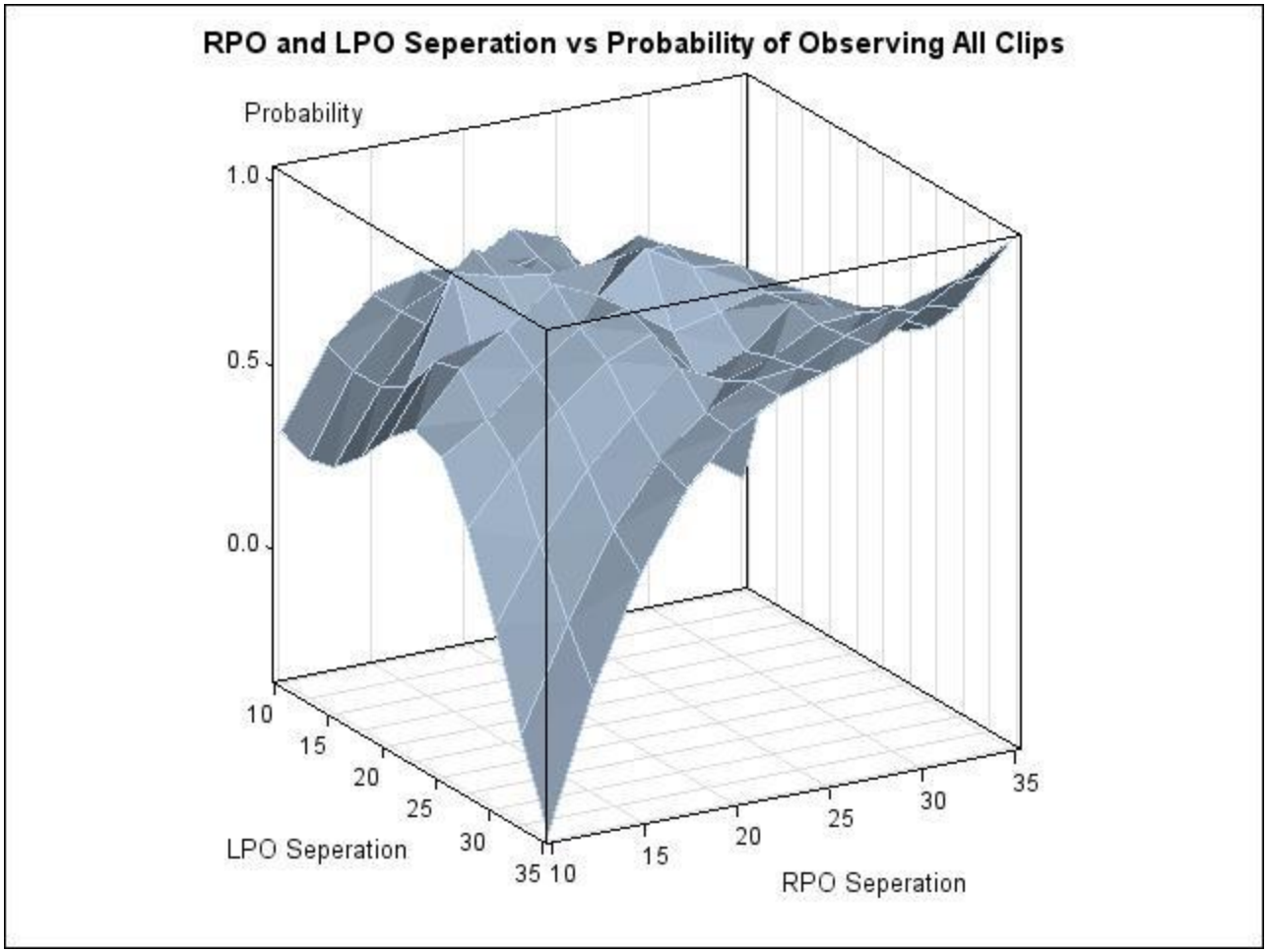
```
proc template;
 define statgraph new_graph_template;
   begingraph;
        entrytitle "RPO and LPO Seperation vs Probability of Observing All Clips";
      layout overlay3d /
        xaxisopts=(label="LPO Seperation" griddisplay=on
        linearopts=(tickvaluesequence=(start=35 end=10 increment=-2.5))
        )
        yaxisopts=(label="RPO Seperation" griddisplay=on )
        zaxisopts=(label="Probability")
        rotate=60 tilt=20;
      surfaceplotparm x=lpo_sep y=rpo_sep z=mean_all;

endlayout;
   endgraph;
end;
run;
```

Proc Sgrender

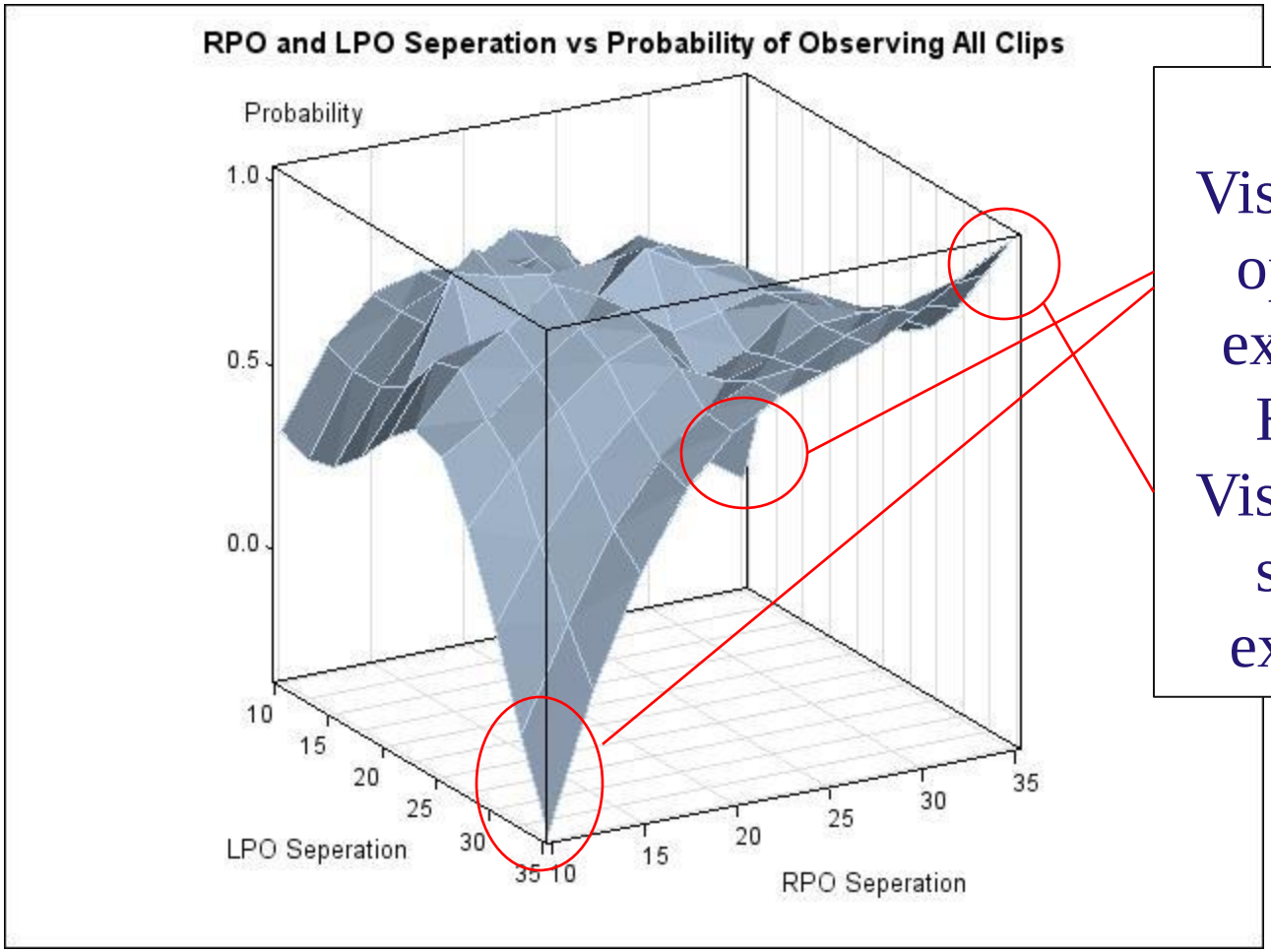
```
proc sgrender data=mti
  template=new_graph_template;
run;
```

- Applies newly created template on proc g3grid created dataset

3D graph

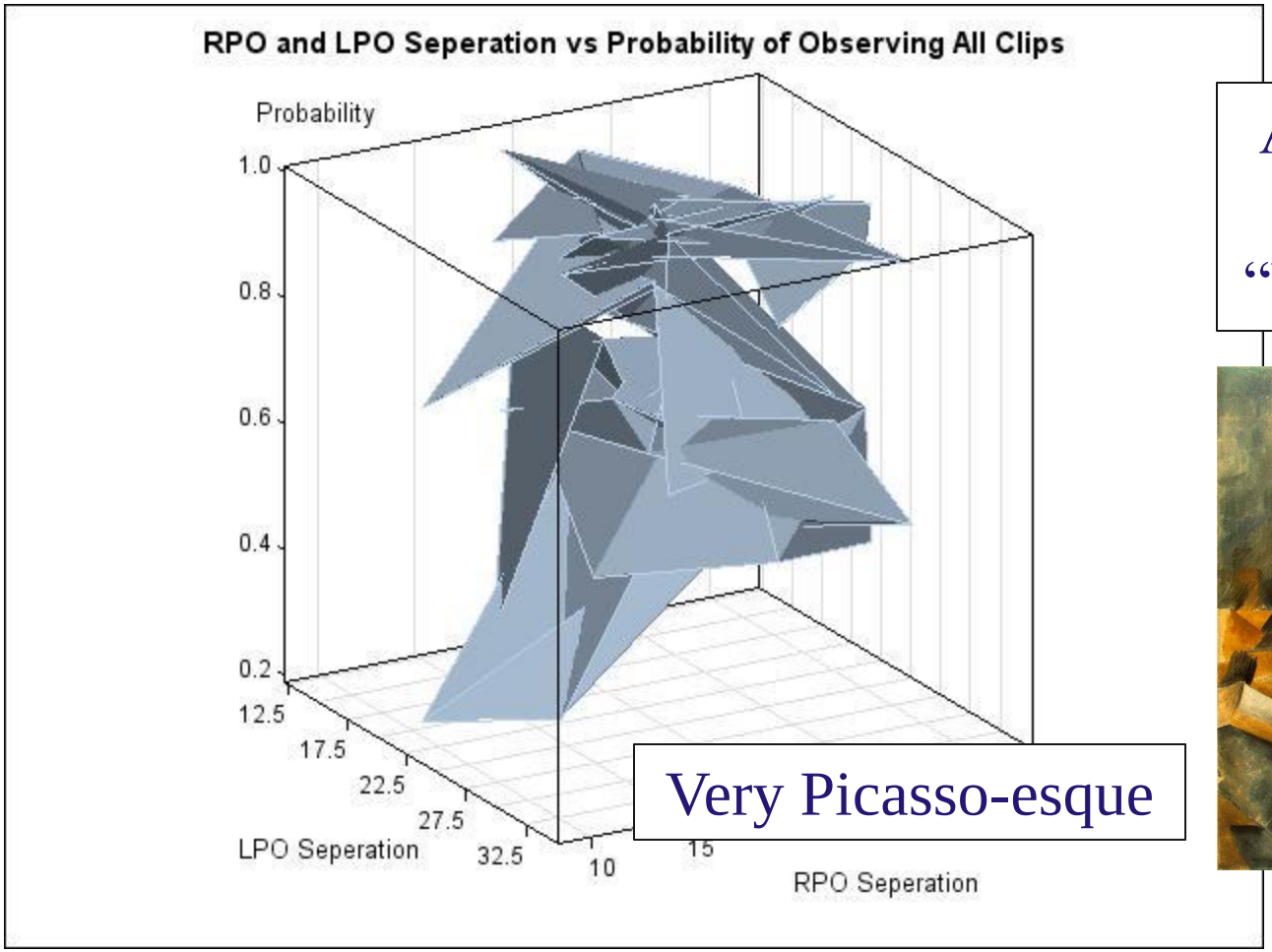

RPO and LPO Seperation vs Probability of Observing All Clips
Probability
1.0
0.5
0.0
10
15
20
25
30
35
LPO Seperation
10
15
20
25
30
35
RPO Seperation

3D graph



Low Visibility at opposite extremes. Higher Visibility at similar extremes

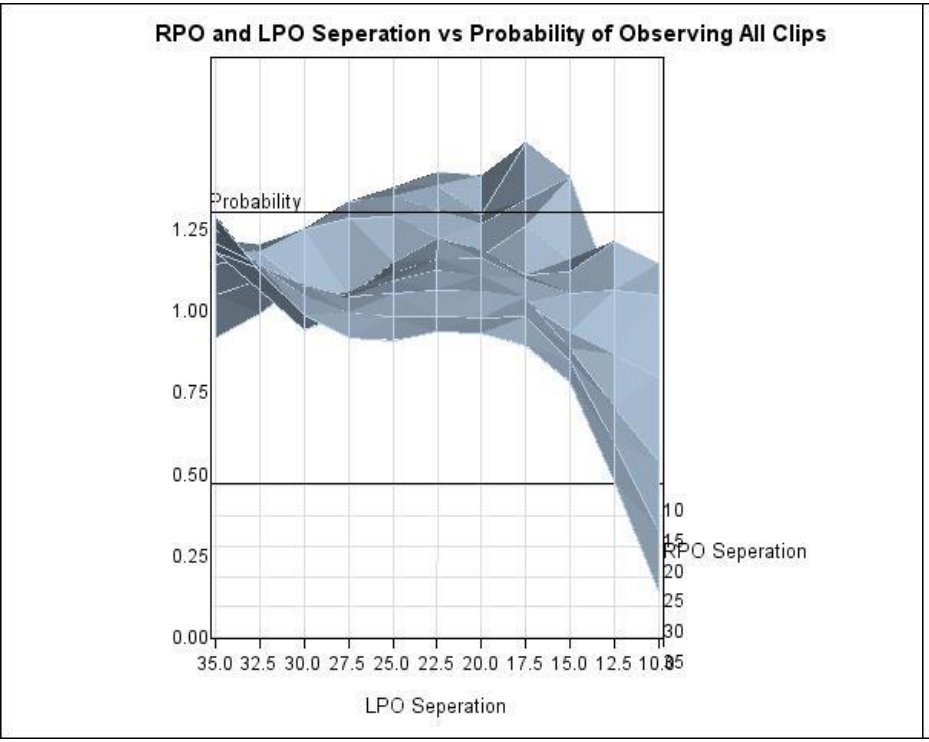
Without G3grid



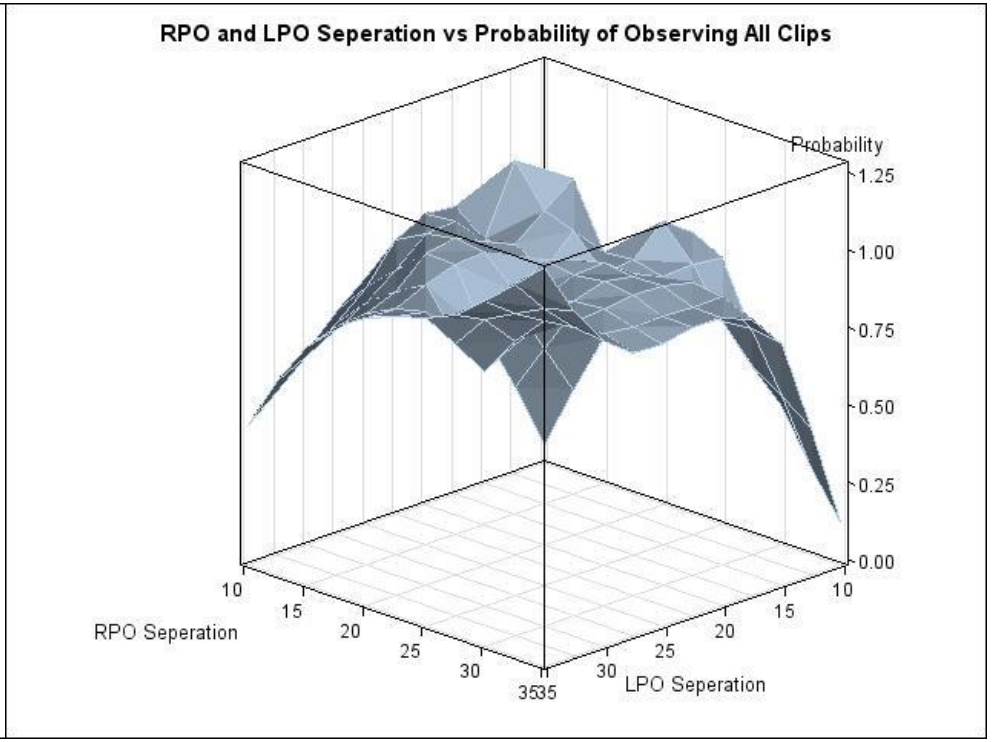
Very Picasso-esque

And I'm all like, "Whaaat??!"

Different Rotations



180 degree rotation



135 degree rotation

Questions?