GENERAL ASSEMBLY

Communicating Results

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LEARNING OBJECTIVES

- Analyze costs and benefits when presenting data
- Decide how to present it based on audience
- Find common mistakes in visualizations
- Correct such mistakes

GENERAL ASSEMBLY

Review: Stakeholder Analysis

Communicating Results: Stakeholder Review

What is are the two types of stakeholders?

Communicating Results: Stakeholder Review

Communicating Results: Stakeholder Review

What is are the two types of stakeholders?

- Primary
- Secondary

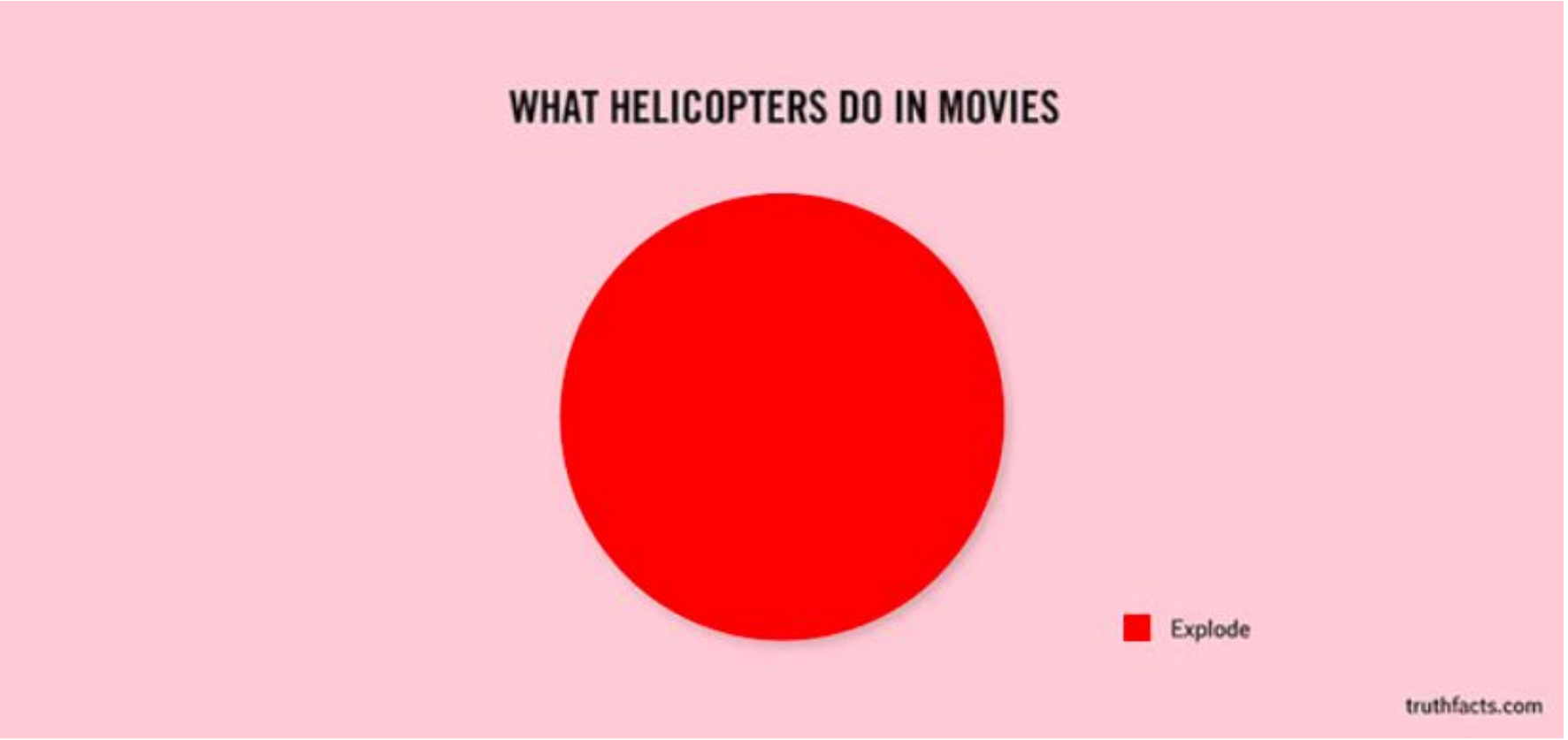
Review: Results

Communicating Results: Results Review

- Outputs
- Statistics
- Metrics

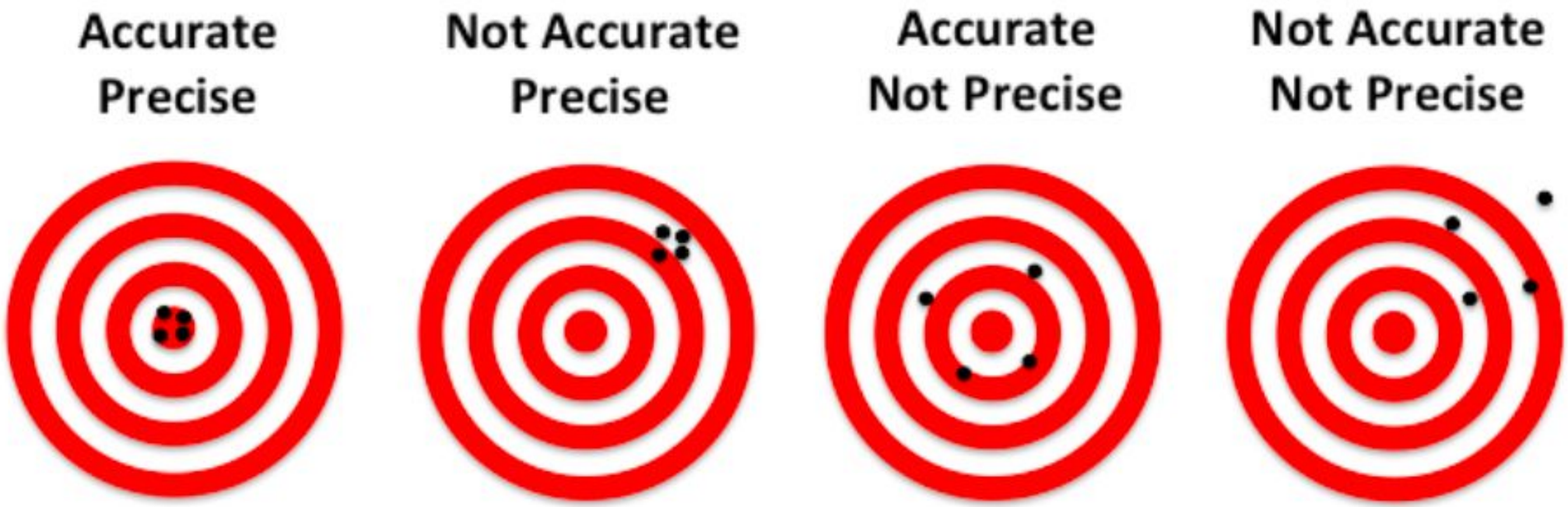
Communicating Results: Results Review

- High level review question: what are the two types of models we've discussed? How do they differ?



Communicating Results: Results Review

- What are the Metrics we use to assess classification models?



Communicating Results: Results Review

- What are the Metrics we use to assess classification models?
  - Confusion Matrix
  - Accuracy score
  - Misclassification Rate?
  - True Positive Rate? (Recall)
  - False Positive Rate?
  - Specificity?
  - Precision?

Communicating Results: Results Review

- What are the Metrics we use to assess classification models?

n=165	Predicted: NO	Predicted: YES	
Actual: NO	TN = 50	FP = 10	60
Actual: YES	FN = 5	TP = 100	105
	55	110	

Accuracy: Overall, how often is the classifier correct? (TP+TN)/total = (100+50)/165 = 0.91

True Positive Rate: When it's actually yes, how often does it predict yes? TP/actual yes = 100/105 = 0.95

False Positive Rate: When it's actually no, how often does it predict yes? FP/actual no = 10/60 = 0.17

Specificity: When it's actually no, how often does it predict no? TN/actual no = 50/60 = 0.83

Precision: When it predicts yes, how often is it correct? TP/predicted yes = 100/110 = 0.91

Communicating Results: Results Review

- What are the Metrics we use to assess regression models?

$$= \sqrt{\frac{\sum_{t=1}^{n} (\hat{y}_t - y_t)^2}{n}}. \qquad \equiv 1 - \frac{SS_{\mathrm{res}}}{SS_{\mathrm{tot}}}$$

Communicating Results: Results Review

- What are the Metrics we use to assess regression models?

$$\mathrm{RMSD} = \sqrt{\frac{\sum_{t=1}^{n} (\hat{y}_t - y_t)^2}{n}}. \qquad R^2 \equiv 1 - \frac{SS_{\mathrm{res}}}{SS_{\mathrm{tot}}}$$

Communicating Results: Results Review

- What are some of the main differences between ensemble and baseline models?
- When considering these, which of them seem to be things that a stakeholder may find relevant.

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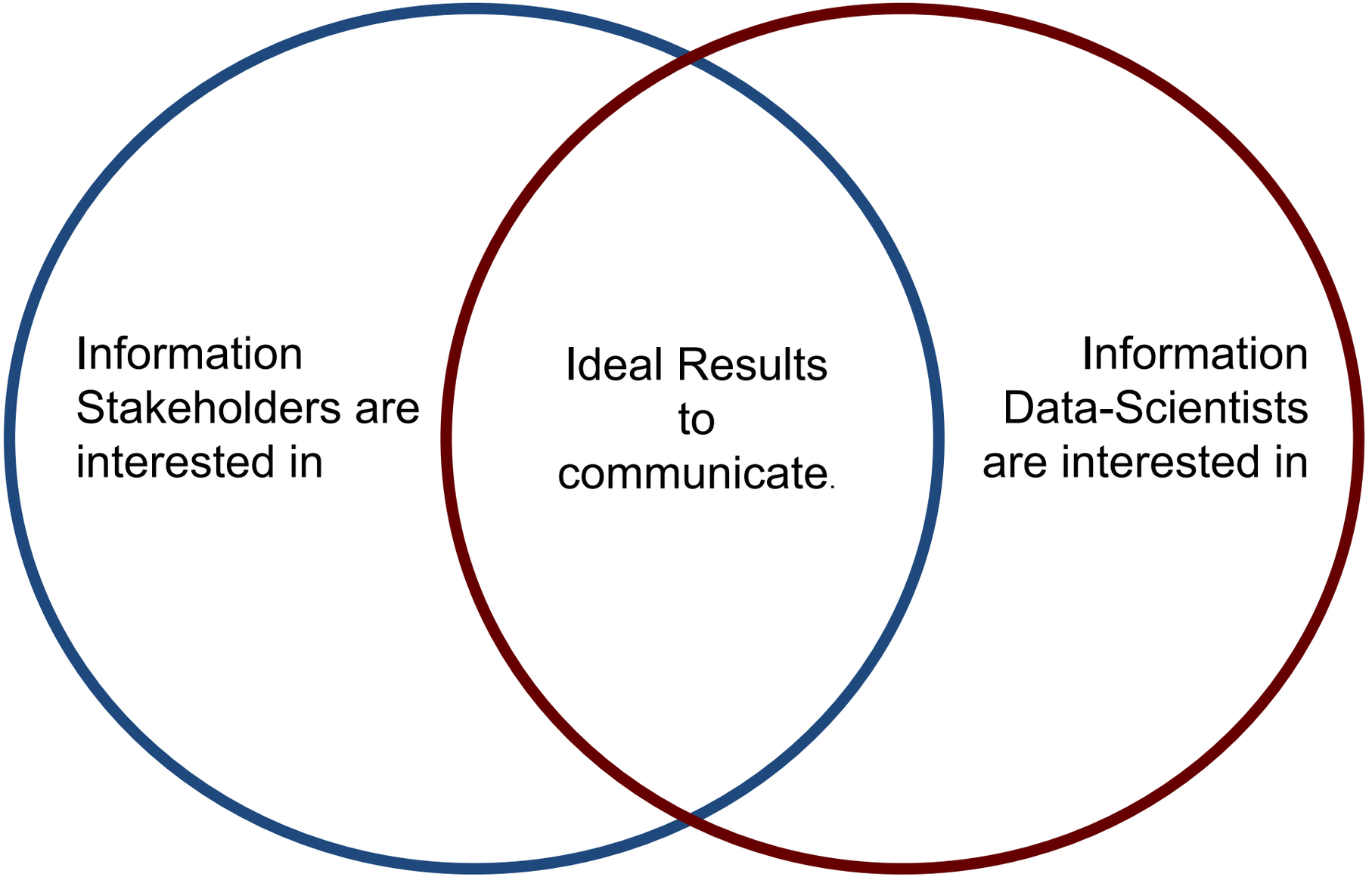

Speaking the Language

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Identify Metrics the stakeholder will find useful and express them accordingly.

Transform metrics we find userful into things stakeholders will find useful.

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r2 = 0.82

False Positive Rate = 0.12

Precision = 0.50

Baseline Score = 0.72

All scores are taken from different models

Communicating Results

Scenario: Your marketing department developed and tested a campaign that was designed to prevent or reduce user churn.

- Your marketing department would like you to build a model to identify users who will or will not churn after seeing the advertisement.

- As a data scientist what are some things that you could do and information you could provide that would be beneficial?

Communicating Results

Scenario: Your marketing department developed and tested a campaign that was designed to prevent or reduce user churn.

- You create a classifier model with the following output/classification rate.

TP: 20	FP: 20
FN: 20	TN: 40

You were only given 100 samples so this was the best you could do.

Communicating Results

Scenario: Your marketing department developed and tested a campaign that was designed to prevent or reduce user churn.

- Plot Twist! Your marketing team has been fired for sharing passwords. You're now responsible for interpreting your results into a tangible business action.

TP: 20	FP: 20
FN: 20	TN: 40

You were only given 100 samples so this was the best you could do.

Communicating Results

Scenario: Your marketing department developed and tested a campaign that was designed to prevent or reduce user churn.

- Fortunately they left you with some information about the campaign on a napkin.
- The benefit of retaining a user is $10 per user.
- The cost of the advertisement is $2 per user.

TP: 20	FP: 20
FN: 20	TN: 40

You were only given 100 samples so this was the best you could do.

Communicating Results

Scenario: Your marketing department developed and tested a campaign that was designed to prevent or reduce user churn.

- Should we advertise to everyone?

- Should we use the model as a means to deploy the advertisement?

If only there was some way that we could weigh the costs and benefits of each….

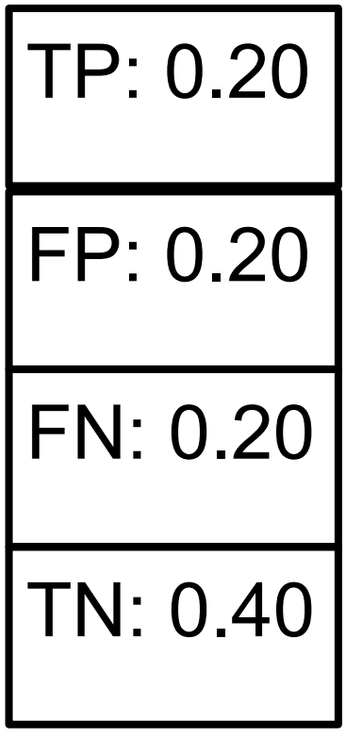
GENERAL ASSEMBLY

Cost Benefit Analysis

Communicating Results

Scenario: Your marketing department developed and tested a campaign that was designed to prevent or reduce user churn. *You decide to use you model to market it.*

- The *benefit* of a t**rue positive** B_{TP} is the retention of a user ($10 for the month)
- The *cost* of a **false positive** C_{FP} is the spend of the campaign per user (- $2.00)
- The *cost* of a **false negative** C_{FN} (someone who could have retained if sent the campaign) is, effectively, 0 (we didn't send it... but we certainly didn't benefit!)
- The *benefit* of a **true negative** B_{TN} is 0: No spend on users who would have never retained.a



Communicating Results

Scenario: Your marketing department developed and tested a campaign that was designed to prevent or reduce user churn.
You decide to advertise to everyone!

- The *benefit* of a **YA** B_{TP+FN} is the retention of a user ($10 for the month)
- The *cost* of a **NA** C_{FP+TN} is the spend of the campaign per user (- $2.00)

YA: 0.40

NA: 0.60

Communicating Results

Scenario: Your marketing department developed and tested a campaign that was designed to prevent or reduce user churn.
You decide to advertise to everyone!

- Cost Benefit using Model =

- Cost Benefit without Model =

Communicating Results

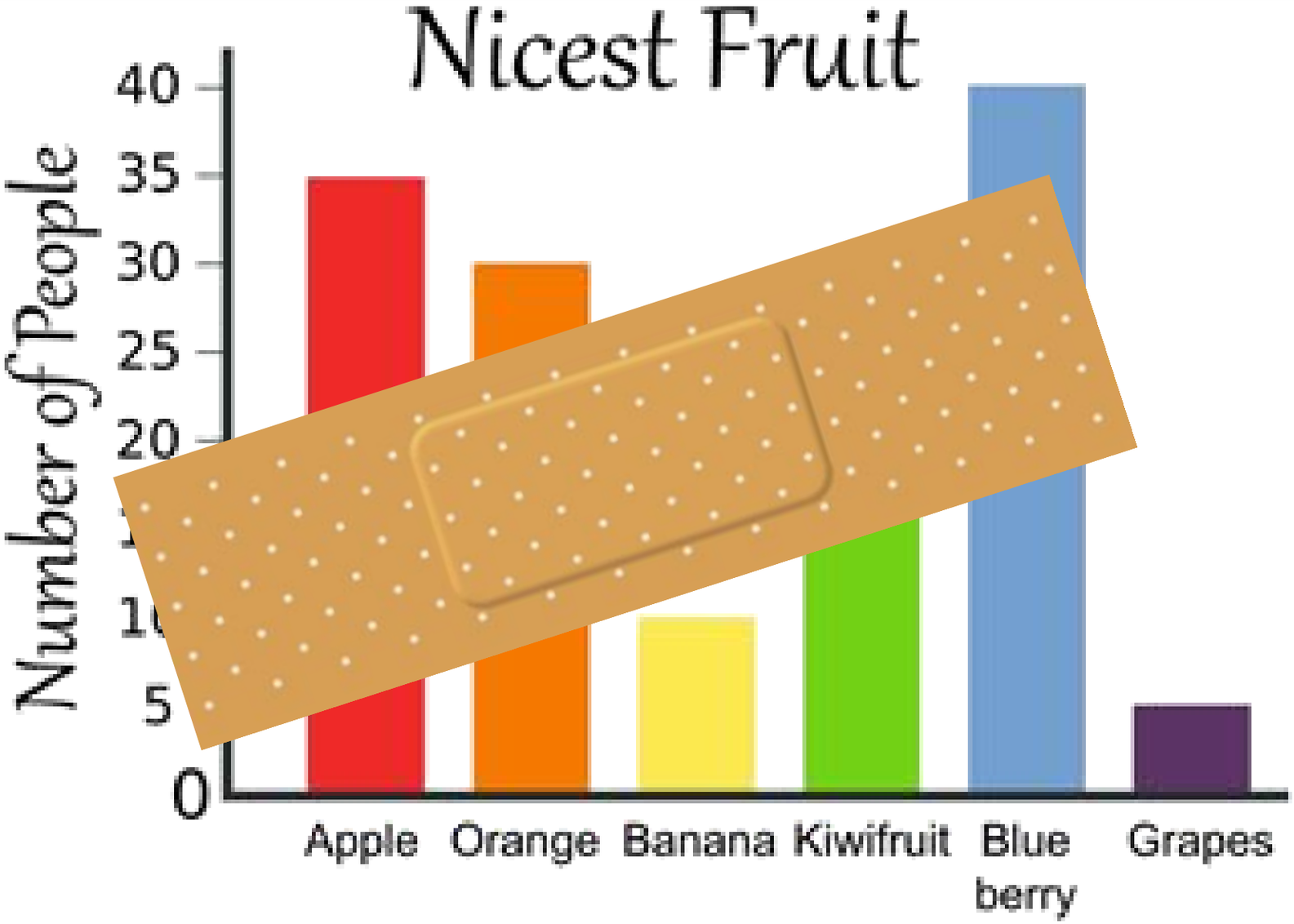
Scenario: Your marketing department developed and tested a campaign that was designed to prevent or reduce user churn.
You decide to advertise to everyone!

- Cost Benefit using Model = $3 per person

- Cost Benefit without Model = $2 per person

Using Visual Aid

Communicating Results



Communicating Results

As we have learned in week 4, visualizations and presentations should be:

- Simplified
- Easy to interpret
- Clearly Labeled

Let’s take a look at a few identify if they are good or bad and ways they can improve.

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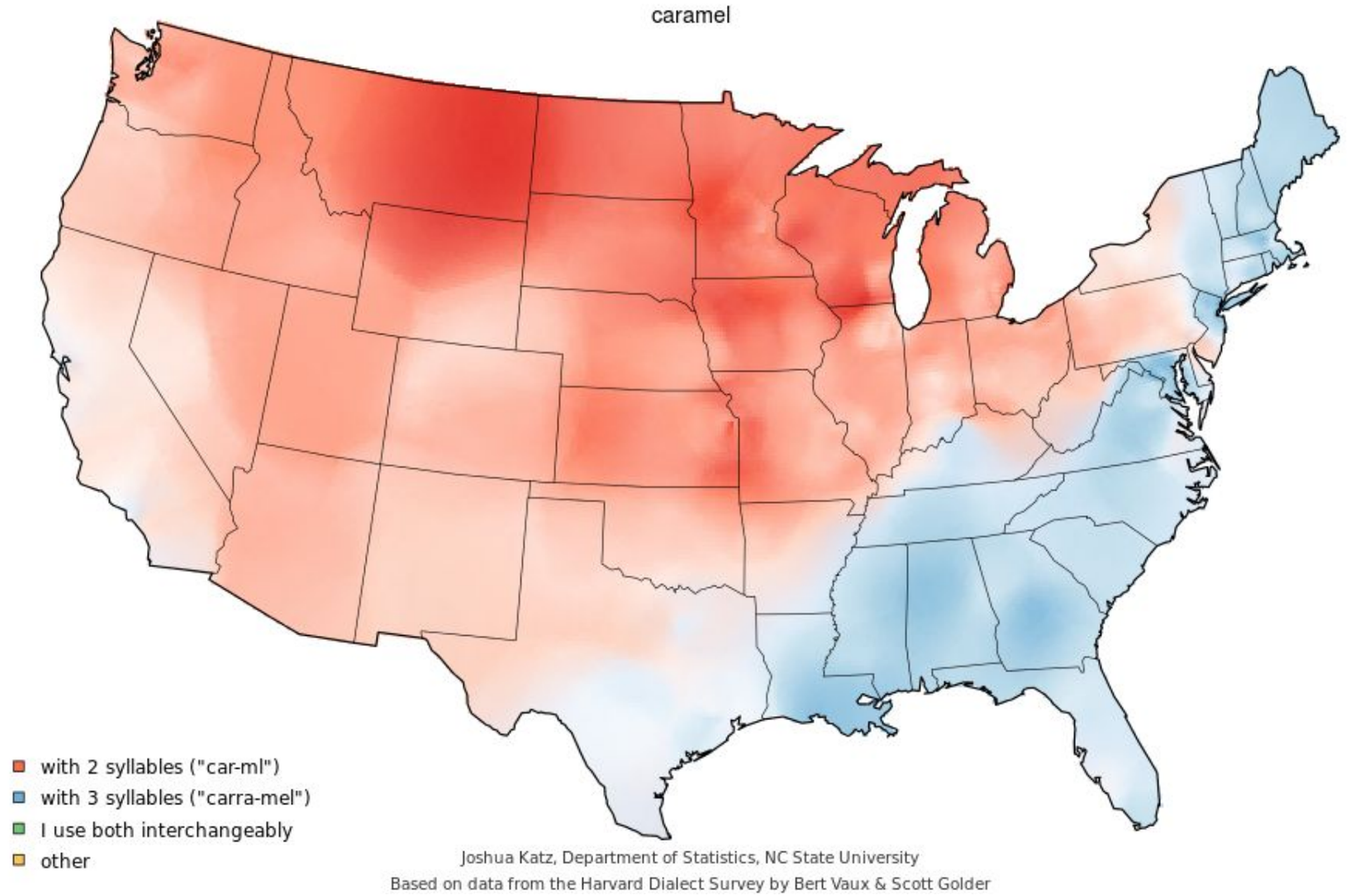
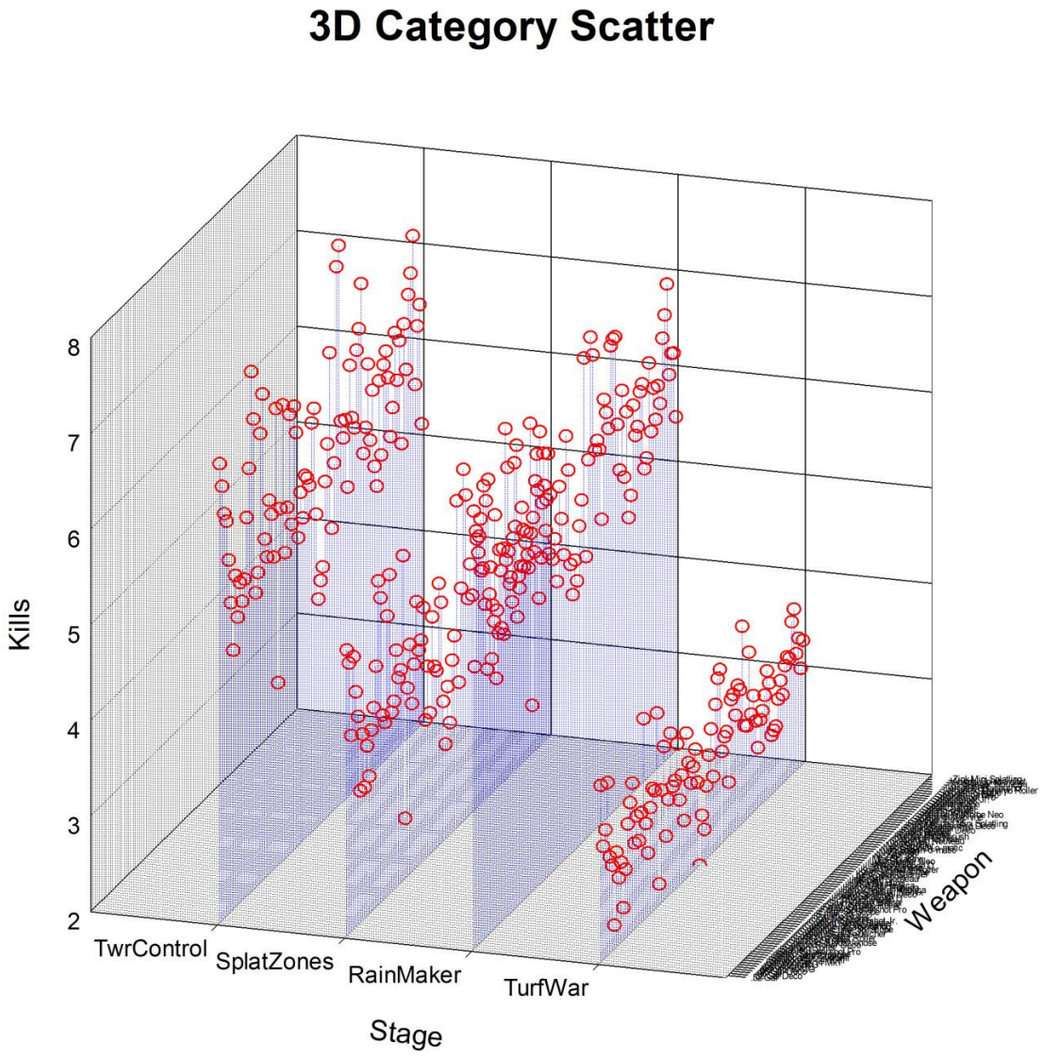


Good? Bad? Ways to Improve?

Communicating Results



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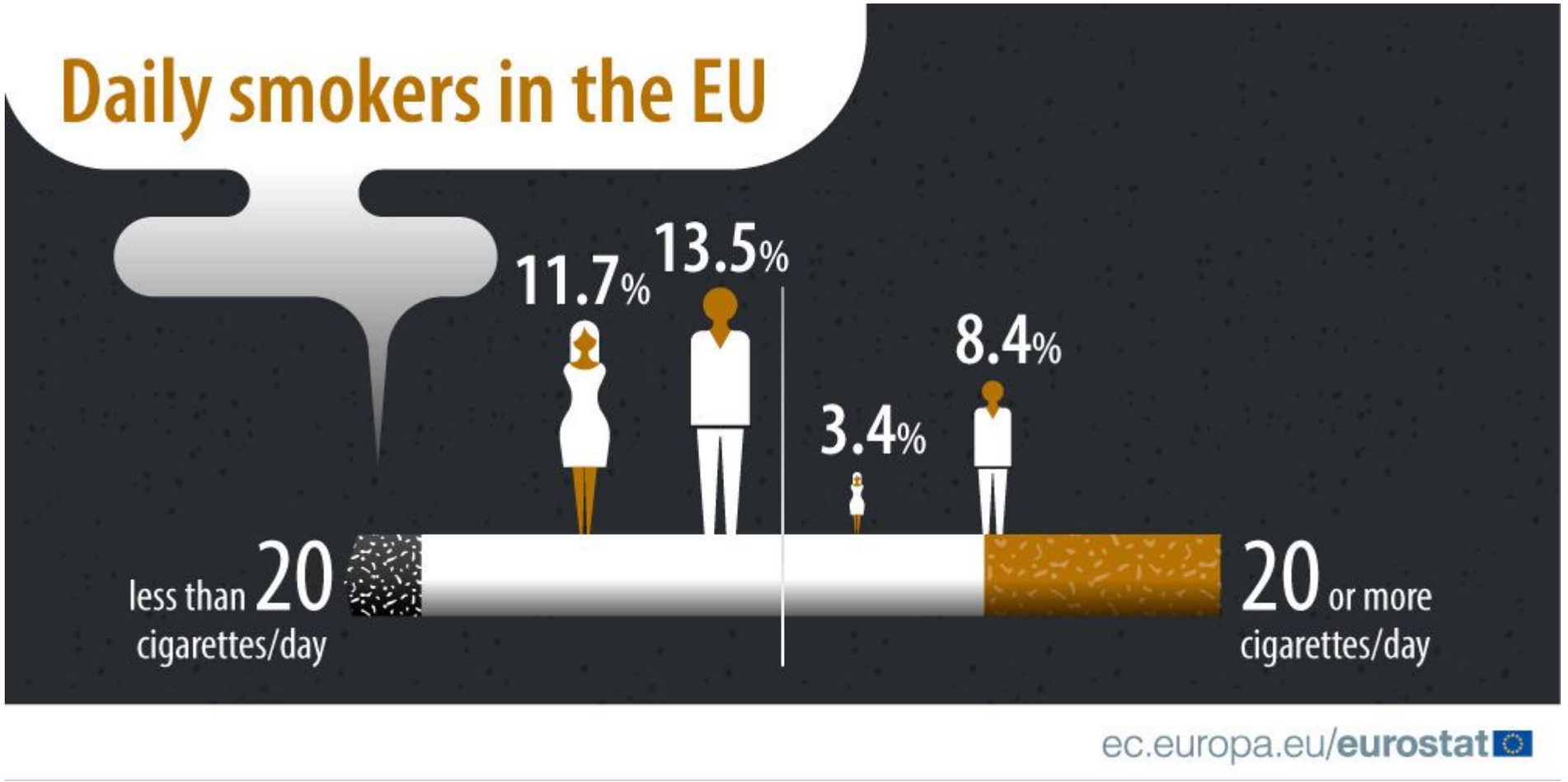

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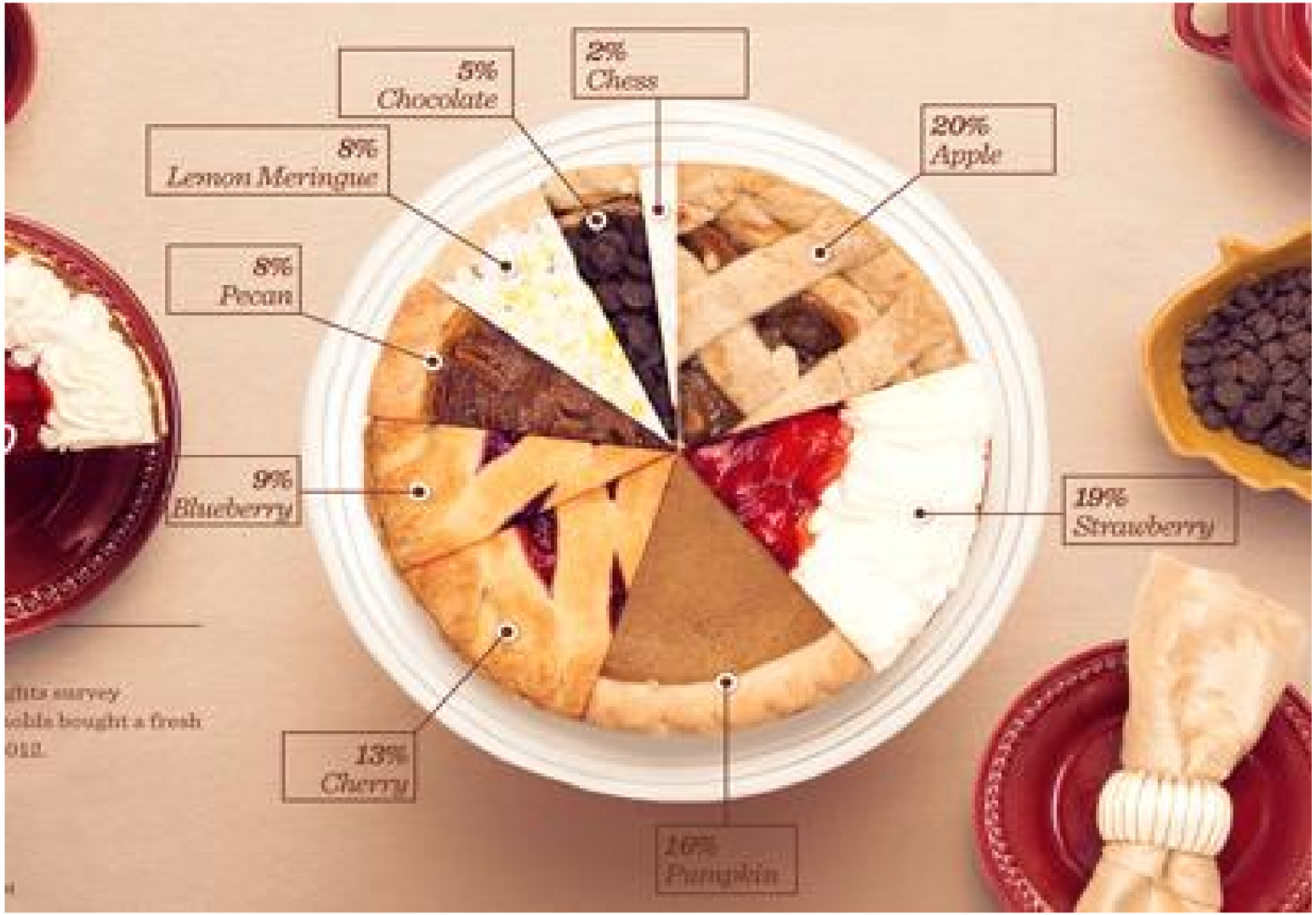

Good? Bad? Ways to Improve?

Communicating Results

Keep the following in mind when constructing visuals for communication purposes.

- **Who**: Who is my target audience for this visual?
- **What**: What do they already know about this project? What do they need to know?
- **How**: How does my project affect this audience? How might they interpret (or misinterpret) the data?

Talking about Failures

Communicating Results

”All models are wrong, some are useful.
-George Box”
- Joseph Nelson

Communicating Results

Communicating Results

- Just because we didn’t achieve the ideal results doesn’t mean what we did was a waste of time.

- We are data **Scientists.** How often does a science experiment yield ideal results?

- Think of all the research trial and error that goes into finding cures and creating vaccines.

Communicating Results

- **Rational:** You did something for a reason, express it.
- **Information Gain**: You most likely learned something from your failure, tell them about that.
- **Next Steps:** What are your plans are now that you have this new information and eliminated a less than ideal method.