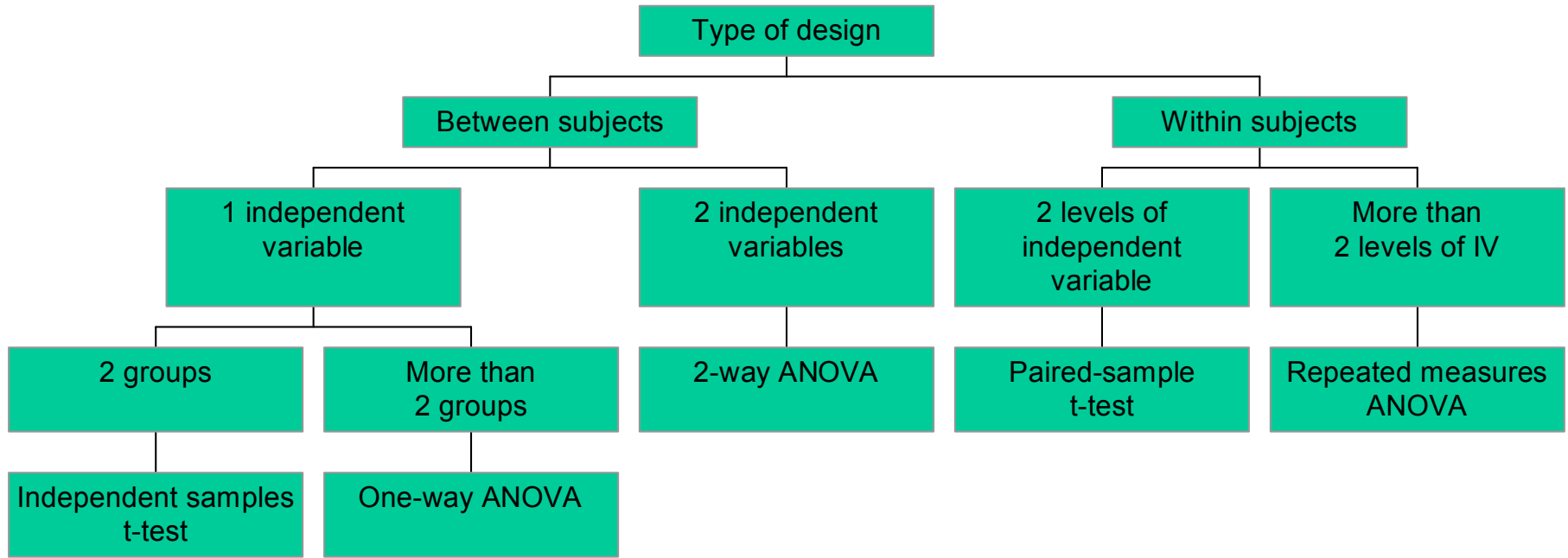
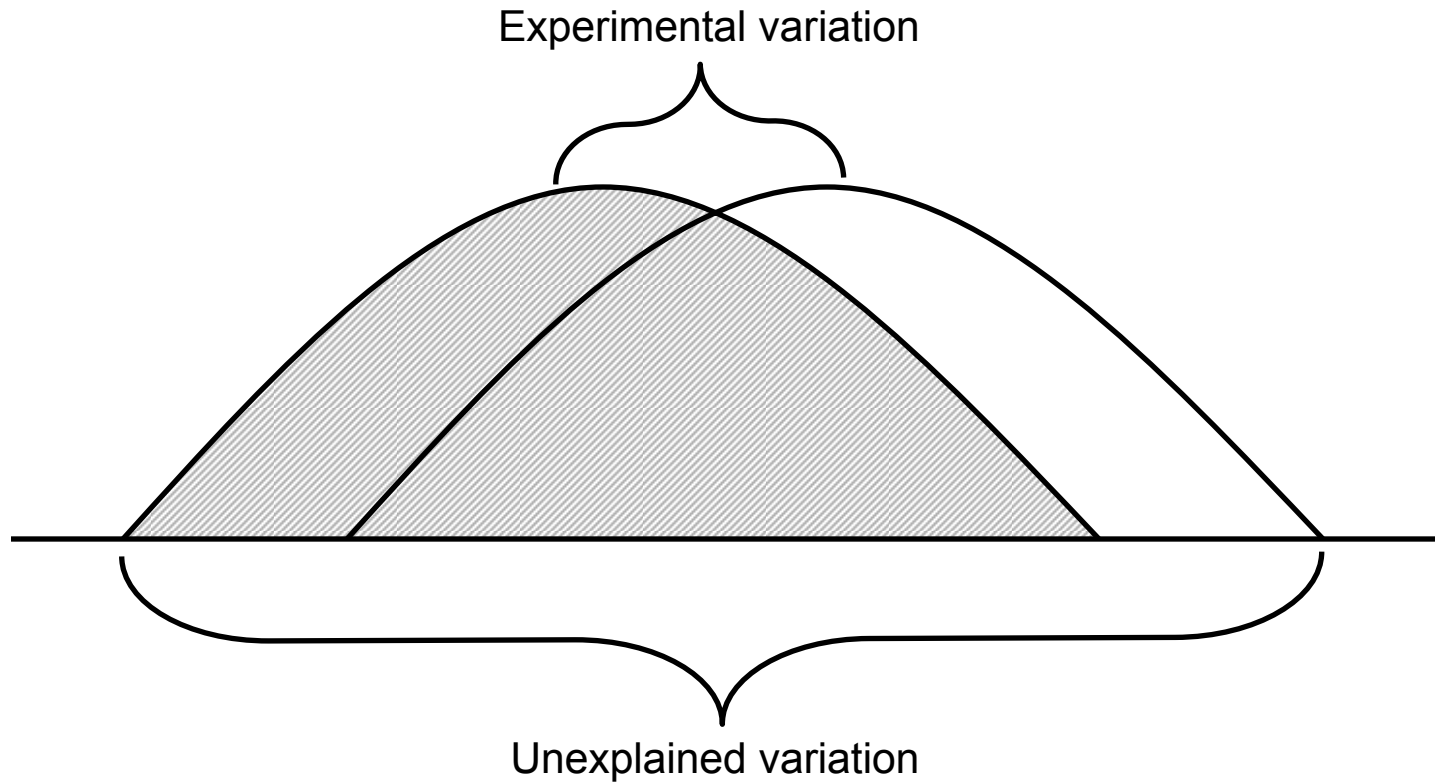


Experimental Data Analysis

Statistical Decision Tree



Signal-to-Noise Analogy



Experiment Design

Tone

		Negative	Positive
Medium	TV	Intention to vote Smith evaluation Jones evaluation	Intention to vote Smith evaluation Jones evaluation
	Print	Intention to vote Smith evaluation Jones evaluation	Intention to vote Smith evaluation Jones evaluation

Vote intention = $f(\text{Tone}, \text{Medium}, \text{Tone} \times \text{Medium}) + e$

Candidate evaluation = $f(\text{Tone}, \text{Medium}, \text{Candidate}, \text{Tone} \times \text{Medium}, \text{Tone} \times \text{Candidate}, \text{Medium} \times \text{Candidate}, \text{Tone} \times \text{Medium} \times \text{Candidate}) + e$

Mean and Variance

$$\text{Sample mean: } \bar{X} = \frac{1}{n} \sum X$$

$$\text{Sample Variance: } S^2 = \frac{1}{n-1} \sum (X - \bar{X})^2$$

$$\text{Standard Deviation: } S = \sqrt{S^2}$$

$$\text{Standard error of the mean: } S_X = \frac{S}{\sqrt{n}}$$

t test: Difference Between Two Means

Difference of means : $d = \bar{X}_A - \bar{X}_B$

Standard Error of d : $S_d = \sqrt{S_{X_A}^2 + S_{X_B}^2}$

$$t = \frac{d}{S_d}$$

$$dF = N - 2$$

Raw Data					
	Treatment Group				
	Negative	Positive		Mean Difference (d)	2
	1	7		Standard error of d	0.98
	4	7		t	2.03
	5	5		dF	10
	1	4		$p < .06$ (one-tailed)	
	5	6			
	5	4			
Group Mean:	3.5	5.5			
Standard D.	1.97	1.38			
Standard Error of Mean	0.81	0.56			

ANOVA Formulas

$$\text{Grand Mean : } GM = \frac{1}{n} \sum_k \sum_i x_i$$

$$\text{Sum of Squares (Total) : } SS_T = \sum_k \sum_i (x_i - GM)^2$$

$$\text{Sum of Squares (Groups) : } SS_G = \sum_k n_k (\bar{x}_k - GM)^2$$

$$\text{Sum of Squares (Error) : } SS_e = \sum_k \sum_i (x_i - \bar{x}_k)^2$$

$$SS_T = SS_G + SS_e$$

$$\text{Mean Square : } MS = \frac{SS}{dF}$$

$$F = \frac{MS_G}{MS_e}$$

Raw Data									
	Tone				Degrees of Freedom		Mean Square	F ratio	
	Negative	Positive							
	1	7	Grand Mean:	4.5	1				
	4	7	Sum of Squares (Groups):	12	k-1	1	12	MSG -MSe	4.14
	5	5	Sum of Squares (Error):	29	n-k	10	2.9		
	1	4	Sum of Squares (Total):	41	n-1	11	3.73		
	5	6							
	5	4							
Group Mean:	3.5	5.5							
Squared Deviations from Grand Mean									
	Negative	Positive							
	12.25	6.25							
	0.25	6.25							
	0.25	0.25							
	12.25	0.25							
	0.25	2.25							
	0.25	0.25							
Squared Group Deviations									
	Negative	Positive							
	6	6							
Squared Within-Groups Deviations									
	Negative	Positive							
	6.25	2.25							
	0.25	2.25							
	2.25	0.25							
	6.25	2.25							
	2.25	0.25							
	2.25	2.25							

Factorial ANOVA: Interactions

$$\text{Sum of Squares (AxB)} : SS_{AxB} = \left[\sum_a \sum_b n_{ab} (\bar{x}_{ab} - GM)^2 \right] - (SS_A + SS_B)$$

