The Wonderful and Wacky World of Math!
https://github.com/KyleDavisGithub

Introduction: **Basic Concepts**
Math is great and all but how can we make math look great in LaTeX? Isn't most of it as simple as $1 + 1$? Well no, we can have it separated:

$$1 + 1$$

or noted off to the side for reference (See equation 1).

$$1 + 1 \tag{1}$$

From here we can expand and express anything mathematically! I've listed a ton of examples below on formatting that should help with a lot of different scenarios.

Common Math Equations:
Basic Linear Model

$$y = \beta_0 + \beta X + \epsilon \tag{2}$$

z Score Formula

$$z_i = \frac{x_i - \bar{x}}{s} = z = \frac{x - \mu}{\sigma} \tag{3}$$

T-score

$$t = \frac{X - \mu}{\frac{s}{\sqrt{(n)}}} \tag{4}$$

Error Assumption Equation

$$\epsilon_i \sim \mathcal{N}(0, \sigma^2) \tag{5}$$

Calculating Explained Variance

$$\mathrm{R}^2 = 1 - \frac{\mathrm{RSS}}{\mathrm{TSS}} = \frac{\Sigma \epsilon_i^2}{\Sigma \left(Y_i - \bar{Y}\right)^2} \tag{6}$$

Logit and Probit

$$\text{Logit/Probit DV} \begin{cases} 1 = \text{for event occuring} \\ 0 = \text{for event not occuring} \end{cases}$$

$$\text{logit: } \eta = p\left(\frac{p}{1-p}\right) \tag{7}$$

$$\text{probit: } \eta = \Phi^{-1}(p) \text{where } \Phi^{-1} \text{ is the inverse normal distribution CDF} \tag{8}$$

$$\text{logit}^{-1}(\eta_i) = \frac{e^{\eta_i}}{1 + e^{\eta_i}} \text{ to or from: } \eta_i = p\left(\frac{p}{1-p}\right) \tag{9}$$

Poisson PDF

$$\frac{\lambda^k e^{-\lambda}}{k!} \tag{10}$$

AIC and BIC

$$AIC = -2\ln L(\hat{\theta}|y) + 2p = D(\hat{\theta}) + 2p \tag{11}$$

$$BIC = -2\ln L(\hat{\theta}|x) + plog(n) = D(\hat{\theta}) + p\ln(n) \tag{12}$$

Inverse Logit Predicted Probabilities: Ordered Logit

$$logit^{-1}(\theta_{k+1}) - logit^{-1}(\theta_k) \tag{13}$$

Multinomial Link Function

$$\eta_{ij} = x_i^T \beta_j = log\frac{p_{ij}}{p_{i1}} \quad \forall \quad j = 2, ..., J \tag{14}$$

$$p_{ij} = \frac{exp(\eta_{ij})}{1 + \Sigma_{j=2}^{J} exp(\eta_{ij})} \tag{15}$$

Types of Machine Learning

$$\begin{cases} \text{Supervised learning} \begin{cases} \text{Classification} \\ \text{Regression} \end{cases} \\ \text{Unsupervised learning} \begin{cases} \text{Discovering clusters} \\ \text{Discovering latent factors} \\ \text{Discovering graph structure} \\ \text{Matrix completion} \end{cases} \end{cases}$$

Tables:
The following two examples are using R's `texreg` package. This R package will build LaTeX code for tables depending on the model and code within R. That package's help file is useful in specifying the contents for the tables here, but we can change the tables within LaTeX as well:

Table 1: Model

	$\hat{y}$
Intercept	2.09^*
	$[2.09;\ 2.09]$
x_1	-1.00^*
	$[-1.00;\ -1.00]$
x_2	2.99^*
	$[2.99;\ 2.99]$
R^2	0.88
Adj. R^2	0.88
Num. obs.	1000
RMSE	2.04

CI's Overridden by Bootstrap; [.05, .95]

Table 2: Survival Modeling Duration

	Exponential	Weibull	exp(Cox)
Intercept	3.60	3.59	
	(0.10)	(0.10)	
Investiture	−0.36	−0.34	
	(0.13)	(0.12)	
Polarization	−0.039	−0.04	1.04
	(0.01)	(0.005)	(0.01)
Crisis Duration	0.01	0.01	0.99
	(0.002)	(0.002)	(0.002)
Log(Scale)		−0.12	
		(0.05)	
Scale	Fixed 1	0.884	
Log Likelihood	-1056.7	-1053.8	56.6
χ^2	88.08	93.6	
df	3	3	2
Num. obs.	314	314	314

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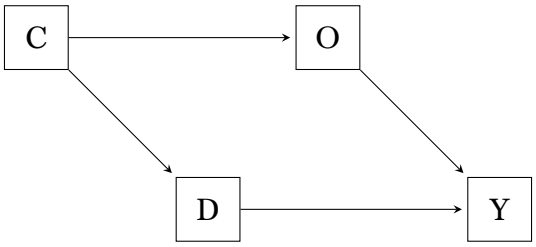
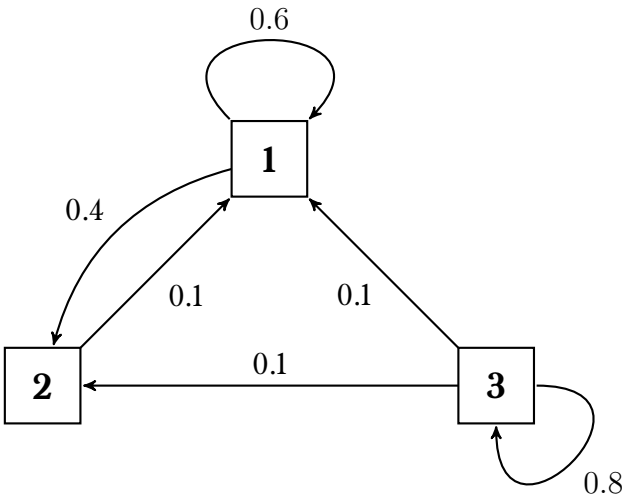
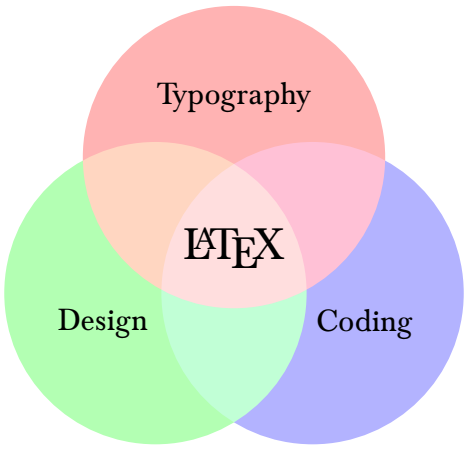
Graphs and Visualizations:







Flowchart of participants' progress through the phases of the trial